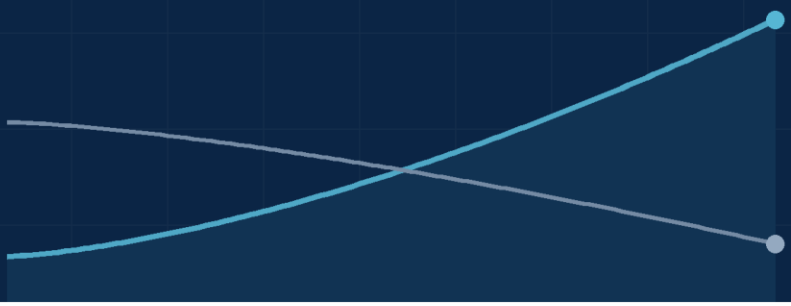
Post Labor Economics Metrics Reference

A consolidated glossary of labor capital household and automation evidence



140 standalone metric chapters

Version 2 · Research cutoff 4 October 2026

Prepared for David Shapiro

This revised reference consolidates the original indicator inventory with the supplementary secular evidence glossary. It preserves all 126 original chapters and adds 14 distinct reference chapters, integrating verified findings into their existing topics and documenting the claims that require qualification.

Executive summary

The post labor economics question is whether human work is losing structural centrality in production and in the distribution of prosperity. This reference assembles 140 metrics and research indicators through which that question can be examined. It consolidates the original labor and capital dashboard with the expanded research on secular trends, household support, economic opportunity, firm organization, and automation. Each metric has a standalone chapter. The purpose is to make the argument inspectable at the level of definitions, dated evidence, mechanisms, and competing explanations.

The strongest interpretation is multidimensional. An economy can produce more with fewer hours per unit of output, distribute less of a given productive surplus through ordinary compensation, weaken institutions that support workers, and rely more heavily on transfers or ownership to sustain household resources. These changes need not occur at the same speed. They do not require every industry to reduce employment or every worker to become worse off. Long historical production records and the capital input accounts establish important changes in labor intensity; employment counts alone cannot describe those changes. [3, 4]

The labor side contains substantial historical deterioration in some measures, alongside recovery and resilience in others. Union density has a clear long decline. Prime age employment has recovered strongly after downturns. Official contracting data show modest historical change rather than a continuous replacement of employment by contracting. These observations belong in the same reference because they determine which version of the framework the evidence can sustain. A claim about declining labor intensity and income transmission is more defensible than a claim that every measure of human employment has already been falling for decades. [2, 5, 6]

The household side asks whether wages remain an adequate route to essentials and economic advancement. Transfer dependence is a central part of that inquiry. Its meaning becomes clearer when retirement and medical benefits are separated from support for working age households. Housing burdens and intergenerational mobility add information about the conversion of income into security and opportunity. They are outcome measures, with mechanisms beyond automation, rather than direct counts of replaced tasks. [7, 8, 9]

The resulting document is a reference and an evidence map. It preserves the full inventory, including mixed findings, proposed ratios, and recent indicators that do not yet meet the twenty year rule. The synthesis rests on relationships across evidence families, not on an assumption that 140 entries constitute 140 independent demonstrations.

The economic roles of labor

Labor has several economic roles that can change separately. It supplies hours and capabilities to production. It gives households a claim on income. Employment institutions attach benefits and protections to that claim. Jobs can provide training, advancement, social connection, and a path into ownership. A measure of one role cannot stand in for all the others.

Production intensity asks how much human input is needed for a given amount of output. If output doubles while hours rise by one quarter, hours per unit fall substantially even though total hours increase. This arithmetic is compatible with strong demand for some workers. It establishes a change in the production relationship, while the employment outcome still depends on demand, prices, new tasks, and the organization of the supply chain.

Distribution asks how income generated by production reaches people. Labor share and the gap between typical pay and productivity address different parts of that transmission. Average compensation can rise while typical compensation lags if gains concentrate among highly paid employees. Capital income can become more important without becoming broadly accessible. The relevant question is both the size of each income channel and who receives it.

Security and access ask what households obtain through work. An employee may have stable hours but no pension, good hourly pay but too few hours, or a job that does not cover local housing costs. A displaced worker can regain employment while suffering a persistent earnings loss. An entrant can find work while losing access to the career ladder available to earlier cohorts. These are distinguishable changes, requiring distinct denominators and histories.

This reference uses structural decline to mean a sustained weakening in one or more of these roles. It does not use the phrase as a synonym for any disappointing statistic. A long decline in a labor input ratio establishes a production change; a long decline in benefit coverage establishes an institutional change. Connecting them into a wider post labor interpretation requires an account of the mechanisms and of the households exposed to both.

Economic role	Question	Representative chapters
Production	How much human input produces a unit of output	049 to 059 and 065 to 080
Distribution	How much prosperity reaches people through work	005 to 009 and 037 to 040
Security and opportunity	What work buys and what pathways remain open	017 to 031 and 041 to 048
Household provision	How resources reach households beyond wages	033 to 039 and 061 to 064

Why employment does not settle the question

High employment and low unemployment are meaningful economic achievements. They show that a large share of people are being absorbed into paid work and that many people seeking jobs are finding them. A post labor argument should preserve that information. The question is whether those outcomes also establish that labor retains its former role in production, bargaining, household security, and opportunity. The employment measures are not designed to answer all of those questions. [1, 2]

The headline unemployment rate counts unemployed people as a share of the labor force. The prime age employment to population ratio counts employed people aged 25 to 54 as a share of that population. They have different denominators. Employment status does not require a full time schedule, a particular wage, employer benefits, or a job commensurate with a person's qualifications. A person can be employed while facing inadequate hours, a poor match, or a large decline from previous earnings. The relevant additional measures are included separately in this reference. [1]

Households still need food, housing, healthcare, and other essentials. Many have limited savings and limited claims on capital income. Under those conditions, accepting available work can be necessary even when the terms of work weaken. Workers can increase hours, add a second activity, accept lower pay, or move into a different occupation. This is a plausible adjustment mechanism, not something that can be inferred about every employed person from an aggregate ratio. Evidence about income dependence and job quality must test it directly.

There is also a production arithmetic reason that unemployment need not rise immediately. Demand can expand fast enough to support total employment even while the human input required for each unit falls. New labor intensive services can absorb workers released from other sectors. Labor supply can change. Institutions can influence the sharing of productivity gains and the availability of work. The same employment total can therefore accompany several different paths of productivity, wages, and household security.

The framing used throughout the book is that frank unemployment is not a necessary first symptom of a post labor transition. At the same time, persistent high employment constrains any claim of a generalized collapse in demand for human work. The useful empirical test combines employment with the quality, distribution, and production measures that employment does not contain. This framing is established here so that individual metric chapters can concentrate on their own contribution.

What qualifies as secular evidence

The working rule is a trend observed over at least twenty years. That threshold reflects the argument that post labor economics began with earlier waves of mechanization, computerization, coordination technology, and organizational change. Generative AI and contemporary robotics can extend the process; they do not provide the starting date for every relevant series.

A long available history is necessary but insufficient. A thirty year series can be mainly cyclical, can reverse direction, or can have similar endpoints. The chapter must examine the path, comparable definitions, major breaks, and the persistence of the proposed change. Declining union density qualifies differently from a recent fall in hiring. A multi decade official contracting series qualifies as a long historical test but gives mixed support to a rising contracting claim. [5, 6]

Calendar time and cohort time also differ. Intergenerational mobility compares people born in successive cohorts, with income measured at a comparable age. A study of children born in 1940 and in the 1980s spans decades of cohort experience even if its publication is much more recent. A 2026 publication may contain observations ending in 2015. The source year, observation endpoint, and research cutoff are therefore recorded separately. [8]

Recent indicators remain in the superset because excluding them would discard part of the research record. They receive an explicit short history or supporting status. AI cost and capability, recent freelance market responses, and early career hiring can identify a developing mechanism. Their short windows cannot establish that the same series has deteriorated for twenty years. A modern measure can be connected to an older production or task history without being relabeled as that history.

Proposed metrics also remain. The Capital Allocation Ratio and Public Wealth Ratio express particular household accounting questions in the user's framework. Their chapters define the measures and the evidence needed to construct them. They are not presented as official longitudinal datasets. Historical evidence, current measurements, and proposed future instruments all have a place in a reference, provided the reader can tell which kind of evidence is being used.

The practical discipline is to keep the available observations visible. Do not fill missing years with invented values, splice unlike surveys into one curve, or convert projections into measurements. A sparse historical set can be informative when the chart shows its actual points and dates.

The production and capital synthesis

Production evidence provides the longest historical anchor. U.S. agriculture demonstrates that an essential category of output can expand over many decades while direct farm labor contracts sharply. Manufacturing supplies another extended record of higher output with fewer hours relative to an earlier baseline. These are sector histories, with important changes in inputs and boundaries. Their relevance is that production growth does not require a proportional expansion of the workforce within the sector. [4, 12]

The broader capital accounts identify the input mix through which output grows. Capital services differ from the market value of financial wealth: they measure productive services from assets. BLS reports average annual capital input growth of 3.4 percent and hours growth of 0.9 percent in private nonfarm business over 1987 to 2025. This is a durable change in capital intensity. It does not identify how much capital substitutes for labor rather than complementing it. [3]

The latest annual observations also illustrate why vintages matter. In the March 2026 release, 2025 capital input grew 2.7 percent and hours grew 0.4 percent. The revised 2024 hours estimate was a decline of 0.1 percent. Earlier reports used different 2024 values. This reference records the relevant source and vintage instead of treating all previously quoted figures as simultaneously current. [3]

Company and service sector comparisons examine whether a similar pattern is appearing in knowledge work. Revenue per employee is an accessible starting ratio, but nominal revenue, acquisitions, prices, overseas production, and contractors can change it. Real value added, total workforce hours, and human work cost provide stronger boundaries when available. Recent service sector comparisons should be read alongside the longer sector histories, rather than being made to satisfy a twenty year test they cannot meet.

The task framework supplies a mechanism: technologies can move existing tasks from labor to capital, while new tasks can create work for people. The historical balance between those channels matters more than the existence of either one alone. A published decomposition finds stronger displacement and weaker reinstatement in a later U.S. period. That result informs a mechanism claim, while the chapter specifies its model, dates, and limits. [10]

Private nonfarm business measure	1987 to 2025 annual average	2025 annual change
Real output	2.9 percent	2.6 percent
Capital input	3.4 percent	2.7 percent
Hours worked	0.9 percent	0.4 percent
Labor productivity	2.0 percent	2.2 percent

BLS Total Factor Productivity 2025 Table A March 19 2026 vintage. Growth rates are distinct measures and are not additive without the relevant growth accounting weights. [3]

Income transmission and household support

The household question is whether production continues to support ordinary people through labor income, or whether other channels increasingly carry that role. Transfer dependence belongs in this framework because it measures an income route beyond current wages. It can show the growing importance of the welfare state in maintaining resources, while its components reveal the reasons for that importance. BEA personal income includes labor earnings, ownership income, government benefits, and other items; these categories need a consistent accounting boundary. [7]

A broad transfer share can rise because the population ages, public medical spending grows, eligibility changes, or a recession temporarily reduces earnings and expands support. None of those channels can be treated as a direct measure of technological displacement. The stronger working age test compares income and poverty before and after taxes and transfers, separates cash from medical benefits, and follows comparable households. County dependence adds a geographic view but is also affected by migration and age composition.

The importance of this distinction is substantive. If retirement accounts for the national increase, the finding is that an aging society distributes more resources outside current employment. If working age earnings fail to cover essentials and tax credits or other transfers fill a persistent gap, the finding is that work alone is a weaker provisioning mechanism for those households. Both concern the changing role of labor, but they support different causal arguments and different institutional responses.

Housing and mobility help measure the conversion of resources into economic possibility. A person can receive a larger real income and still find it harder to purchase a home if home prices grow faster. Rent burdens identify pressure on a recurring essential cost, while price to income ratios concern access to an asset. Absolute mobility asks whether successive generations exceed their parents' real income. Each measure has its own geographic, demographic, and accounting limits. [8, 9]

Ownership adds another route. Dividends, interest, business income, rents, inheritance, and public asset benefits can reduce dependence on wages. Their aggregate growth does not ensure broad access. Concentration and household income composition are therefore necessary companions to the national capital measures. The proposed CAR and PWR chapters keep cash ownership income, transfers, services, and financing distinct so the same benefit is not credited to multiple income channels.

The household synthesis becomes convincing when comparable working age groups show persistent pressure on labor income and access to essentials alongside a larger contribution from transfers or ownership. Its purpose is to test whether wages still do the economic work once expected of them, rather than to presume that every additional public benefit signals a failing labor market.

How to assess convergence across metrics

The value of a large inventory is breadth of observation. Production accounts, household surveys, tax records, employer data, benefit surveys, mortality records, and original task research reveal different parts of the economy. Agreement across those domains can support a structural interpretation more strongly than a single chart. The appropriate question is whether a coherent mechanism explains the joint pattern, including the measures that remain resilient.

The number of entries does not equal the number of independent tests. Output per hour and hours per unit are reciprocal versions of the same production relationship. Capital input relative to hours and capital deepening share closely related inputs. Labor share and the residual nonlabor share are connected by accounting. County transfers and national transfers reuse income categories. Several chapters may report the same underlying survey. Counting these as independent votes would exaggerate the strength of the evidence.

Aggregation should instead begin with evidence families. Establish the production pattern, the income transmission pattern, institutional changes, household provisioning, and the task mechanisms separately. Then ask where the relationships align in time and population. Falling labor intensity, weaker income transmission, and increasing working age support have a different joint meaning from falling intensity accompanied by rapidly rising wages and broad ownership. Each combination is economically possible; the observations decide which one describes the setting.

A secular trend is also not automatically a causal estimate of automation. Health, trade, housing supply, demography, fiscal rules, employer power, and labor institutions can influence the outcomes. Technology may enable organizational options without determining which option is chosen. Identifying the effects of a particular technology requires variation in exposure, a credible comparison, and attention to spillovers. Accounting decompositions explain where measured growth appears; they do not supply that identification by themselves.

This does not make the structural question disappear. A persistent weakening of the wage channel is a consequential finding even when several mechanisms contribute. It means the production of prosperity and its distribution through labor are becoming less closely aligned. The post labor framework can organize that finding and test technology's contribution without reducing every outcome to one cause.

Evidence that limits one claim has a specific role. Strong prime age employment, preferred independent work, new occupational creation, stable benefit access, and declining local employer concentration constrain the adverse stories they directly test. A flat series can rule out continuous worsening through that lens while leaving a previously established deterioration intact. A plateau does not establish that good jobs recovered, and it does not by itself establish that deterioration reached a saturation point. Both interpretations need their own evidence. An adverse labor share result likewise cannot rescue an unsupported claim about contracting or job tenure.

Reading a standalone metric chapter

Each chapter starts with a finding, an evidence status, and an observation span. The status classifies the chapter's contribution to this particular post labor question. It is not a ranking of the statistical agency or of the subject's importance. A highly reliable official series can offer mixed evidence for an adverse secular claim. A well designed recent study can offer a useful mechanism without a twenty year history.

The chapter then defines the measure, explains the observed path, develops its economic meaning, and tests alternative readings. The final section describes a useful chart or monitoring design and identifies related chapters. References appear within the chapter so it can be read or shared independently. Numbered citations restart in each chapter and link to its own source list. Source titles link to the underlying publication or data page.

The metric directory groups the original inventory into eight families and provides a separate directory for the additions, preserving the original chapter identifiers. The alphabetical index supports lookup across the complete reference. Word headings and related chapter links connect the text, while the primary source register identifies reused sources so their repeated appearance is visible.

For a public argument, begin with the secular evidence and historical anchors, then add supporting or recent observations as such. For research, use the monitoring instructions to reproduce the series and the competing readings to specify a test. Proposed metrics belong in the measurement program until a consistent empirical series exists. Disputed measures should remain in the archive rather than silently disappearing after they fail a favored interpretation.

Evidence status	Meaning in this reference
Secular evidence	At least twenty years of reasonably comparable observations support the stated durable pattern
Historical evidence	An extended historical record establishes a relevant transition with a bounded endpoint
Supporting evidence	Useful context or a mechanism that does not alone establish the secular claim
Mixed evidence	Reliable observations support some readings and limit or reverse others
Short history	The available relevant window is shorter than twenty years
Proposed metric	A defined instrument without an established official longitudinal series
Counterevidence	The observed record challenges the suggested adverse or rising trend

Research scope and provenance

The research cutoff is 4 October 2026. A source released before that date may describe an older reference year, and a publication page may later change. The chapters identify observation windows and, where material, release vintages. The latest verified comparable observation is preferred over a promised survey, a projection, or a newer statistic with a different definition.

The consolidation used the earlier seven signal research, the Great Decoupling research dossier, its chart source register, the Critical Path enterprise measurement report, and the current Labor Zero manuscript. These user materials supplied the inventory and the trail to underlying evidence. They are not treated as independent confirmation of empirical claims. Where the expanded research revised an earlier figure or contradicted an earlier framing, the chapter records the corrected reading. Version two also uses the supplied Post Labor Evidence Glossary, edition of October 2026, as a research lead. Its 58 metrics are mapped to the revised reference in the supplementary research concordance. The primary sources, rather than the number of overlapping descriptions, determine the contribution of each addition.

The original seven categories remain visible: prime age male withdrawal; female labor supply and demographic change; productivity and typical compensation; labor share; underemployment; independent and contingent arrangements; and transfer dependence. The capital side is unpacked into input services, growth contributions, asset types, returns, wealth, and ownership. Enterprise leverage measures separate revenue, value added, total human work, profits, and counterfactual staffing. The expanded round adds institutions, mobility, housing, health, job dynamism, task creation, and the automation frontier.

The 140 entries are reference units, not 140 equally persuasive secular indicators. Some chapters contain companion series needed to interpret their named metric. Official and original research sources are preferred for observed facts. Definitions and hypothetical arithmetic are marked as such. No numerical index of post labor progress is calculated because there is no justified set of weights or causal model that would turn all these unlike measures into a single score.

Perceived socially useless jobs is retained because it was explicitly raised as a candidate. Its historical survey evidence does not substantiate a general rise in jobs without social value. Worker dissatisfaction, social contribution, utilization, and economic usefulness are different concepts. The chapter assesses them without assuming that unpopular work is valueless. This is an example of the reference's broader method: preserve the question, examine the original evidence, and keep its actual contribution proportionate. [11]

The document is designed for revision. Updating a chapter requires updating its comparable data, citation notes, and interpretation together. A newer endpoint should not silently rewrite the older evidence base. Maintaining that history makes it possible to tell whether the framework is gaining support, changing shape, or being contradicted by subsequent developments.

Changes in version two

Version two brings the original reference and the supplementary Post Labor Evidence Glossary into one evidence base. It retains the 126 original chapters and adds 14 distinct chapters, for 140 reference entries. The supplementary glossary's 58 headings are all accounted for in a concordance near the end. Overlapping findings are integrated into existing chapters rather than counted again as separate corroboration.

The additions broaden the account of labor's economic role. They distinguish a relative job quality index from wage and benefit coverage, changes in the middle-income population from changes in income quintiles, occupational downgrading from unemployment, and unpaid customer work from paid employment. The capital side adds the reallocation of sales toward firms with lower labor shares. The household side adds social expenditure across countries and the relationship between concentrated saving and debt financing.

The global and historical additions also change what the reader can test. Manufacturing employment in China is examined across explicitly bounded census populations. Global labor underuse is separated into unemployment, unmet employment aspirations, inadequate hours, and informality. Long-run work-time reductions are distinguished from involuntary exclusion, while the hours and headcount decomposition specifies how to test whether adjustment has moved from shorter schedules toward fewer people employed.

Several attractive claims need narrower wording. Broad Chinese manufacturing census checkpoints do not support simply extending an earlier decline through 2023. Government payments for care and other services support wages and purchased output; they cannot all be booked as household transfers. Management and security occupations do not measure socially valueless work. The supplementary glossary's proposed link from felt pointlessness to automation exposure remains a hypothesis, not a validated leading indicator. These decisions are explained where each measure is used.

A changing statistic is not automatically a new secular trend. Historical studies remain tied to their original windows; newer source releases replace stale current readings only where the definitions match. Proposed measures, including publicly financed employment and unpaid customer work, receive a construction method and a clear statement of the missing series. The original enterprise measurement chapters remain useful for testing emerging mechanisms without being relabeled as decades of observed national evidence.

The result is a broader but more discriminating account of post labor economics. The strongest findings concern particular production, distribution, institutional, and opportunity relationships. Their joint interpretation gains credibility when those relationships are measured consistently and the alternatives are tested. Additional chapters increase the range of questions this reference can answer; they do not increase the number of independent proofs by the same amount.

Reading plateaus recoveries and saturation

A trend can stop worsening while leaving a substantial historical change in place. A plateau after a documented deterioration is therefore different from a recovery toward the earlier level. It constrains a claim of continuing deterioration through that particular measure. It does not, by itself, undo the earlier change or settle the condition of other aspects of labor. This distinction is especially important when interpreting gigification, labor-market fluidity, hours, and job quality.

The contracting example needs two separate judgments. Official main-job contracting shares can be approximately stable even while the quality of some employee jobs changes. Conversely, independent contracting is not itself a measure of bad work: preferences, net earnings, benefit access, bargaining power, and control over schedules determine its welfare meaning. A flat contracting share consequently establishes neither that good jobs recovered nor that a loss of good jobs reached its maximum. The contracting chapters retain the observed path and examine those additional dimensions.

Saturation is a testable explanation for a plateau. It would require evidence that an earlier process had already reached much of the population or activity susceptible to that particular form of change, or that a binding economic or institutional limit prevented further expansion. One would look for adoption or transition patterns, the remaining exposed population, and outcomes within the stable aggregate. A proposed saturation mechanism should specify the boundary, the time window, and the observation that would make it less plausible.

Competing explanations deserve the same treatment. Stable aggregate shares may conceal offsetting entry and exit, changes in industry mix, survey omissions, regulatory reclassification, or improving opportunities. Evidence of rising net pay, preferred arrangements, greater security, or successful transitions into better jobs would support improvement in those dimensions. Evidence that risk increased inside conventional employment would locate the deterioration elsewhere. A label such as plateau cannot decide among these accounts.

The reference therefore separates the direction of an observed series from its contribution to a specific hypothesis. A historical decline can remain relevant after stabilization. A recent reversal must be reported even if its durability is uncertain. An improved outcome counts as improvement within its stated population and period. A missing series remains missing. None of these observations automatically supplies a verdict on all of post labor economics, and none may be reclassified as favorable evidence merely because the framework can accommodate it.

The aggregate argument must remain capable of losing support. Sustained improvements in ordinary workers' share of income, compensation, security, entry opportunities, and access to productive wealth would weaken a broad claim that labor is failing to distribute prosperity, even if labor input per unit of output continued to fall. Persistent deterioration across those same independent dimensions would strengthen that claim. The production and distribution propositions can move differently; the useful task is to measure their relationship rather than assume a verdict from either one alone.

Sources for the opening synthesis

[1] U.S. Bureau of Labor Statistics (Current methods). Concepts and Definitions CPS. Employment labor force unemployment and population boundaries. See chapters 001 to 016. Consulted 4 October 2026.

[2] U.S. Bureau of Labor Statistics via Federal Reserve Bank of St Louis (2026). Employment Population Ratio 25 to 54 Years LNS12300060. Prime age employment series. Observation and recovery details in chapter 004. Consulted 4 October 2026.

[3] U.S. Bureau of Labor Statistics (2026). Total Factor Productivity 2025. March 19 2026 release Table A and technical notes. Revised 1987 to 2025 averages and 2024 and 2025 annual observations. Consulted 4 October 2026.

[4] U.S. Department of Agriculture Economic Research Service (2026). Agricultural Productivity in the United States. Updated June 2026 national series 1948 to 2023. Farm labor boundary and historical comparisons in chapter 065. Consulted 4 October 2026.

[5] U.S. Bureau of Labor Statistics (2026). Union Members 2025. Annual union membership series and2025 comparability note. See chapters 020 and 021. Consulted 4 October 2026.

[6] U.S. Bureau of Labor Statistics (2024). Contingent jobs and alternative work arrangements What you need to know. Historical CWS waves 1995 to 2023. Main job contracting differs from broad independent activity. Consulted 4 October 2026.

[7] U.S. Bureau of Economic Analysis (2026 and current methods). Personal Income. Income components data methods and archives. Cash medical and retirement distinctions elaborated in chapters 033 to 039. Consulted 4 October 2026.

[8] Raj Chetty and colleagues at Opportunity Insights (2017). The Fading American Dream Trends in Absolute Income Mobility Since 1940. Birth cohort comparison and methods. See chapter 041 for income units and interpretation. Consulted 4 October 2026.

[9] Harvard Joint Center for Housing Studies (2026). The State of the Nations Housing 2026. Original national housing research. Rent and price to income evidence in chapters 042 and 043. Consulted 4 October 2026.

[10] Daron Acemoglu and Pascual Restrepo (2019). Automation and New Tasks How Technology Displaces and Reinstates Labor. Original task framework and U.S. historical decomposition. See chapter 084 for units periods and model limits. Consulted 4 October 2026.

[11] Robert Dur and Max van Lent (2018 working paper and 2019 publication). Socially Useless Jobs. Original ISSP study with waves spanning 1989 to 2015. See chapter 096 for comparisons with other questions and studies. Consulted 4 October 2026.

[12] U.S. Bureau of Labor Statistics (2020). Forty years of falling manufacturing employment. Beyond the Numbers volume 9; long run employment and manufacturing output context; verified retrieval 4 October 2026

Metric directory

LABOR ATTACHMENT AND EARNINGS

001 Prime age male labor force participation 38
Secular evidence · 1948 to 2025 verified annual history with September 2026 release context
Prime age male participation shows a substantial long run decline that predates contemporary AI and survives removal of retirement age populations.

002 Female labor force participation 43
Mixed evidence · 1948 to 2025 annual history and September 2026 monthly observation
The end of mass female entry is a secular labor supply change while rising prime age participation contradicts a universal female withdrawal story.

003 Overall participation and population aging 48
Mixed evidence · 1970 to 2018 annual historical checkpoints and September 2026 monthly observation
Aggregate participation has declined for more than two decades but aging and the end of mass female entry prevent a direct automation interpretation.

004 Prime age employment to population ratio 53
Mixed evidence · 1948 to September 2026 monthly series
Prime age employment remains below the 2000 high but its substantial recoveries and recent strong levels limit a generalized secular job scarcity claim.

005 Productivity and typical compensation 58
Secular evidence · 1948 Q1 to 2026 Q2 with principal comparison from 1979 Q4
Typical worker compensation has risen substantially more slowly than net productivity over several decades showing weaker transmission of productive gains through ordinary work.

006 Productivity and average real compensation 63
Secular evidence · 1987 to 2015 industry study and current nonfarm business observations through 2026 Q2
Average real compensation has often lagged productivity over a multidecade horizon with labor share and relative prices explaining distinct parts of the gap.

007 Labor income share 68
Secular evidence · 1947 Q1 to 2026 Q2 nonfarm business history
The nonfarm business labor share has fallen over several decades and reached a verified series low in 2026 Q2 while remaining compatible with rising real wages.

008 Real median earnings 73
Mixed evidence · 1979 Q1 to 2026 Q2 weekly series and 1960 to 2025 annual earnings history
Median earnings show long periods of weak growth alongside meaningful recent gains and different male and female histories requiring a relative rather than universal stagnation claim.

009 Real minimum wage 78
Mixed evidence · Federal statutory history 1968 to September 2026 with price observations through August 2026
The federal wage floor has lost substantial purchasing power over decades but higher state floors and market wages prevent treating that decline as the wage path of all low paid workers.

010 **Broad underemployment and headline unemployment** 83
Mixed evidence · U3 from 1948 and U6 from 1994 through September 2026
Broad underutilization captures missing work beyond headline unemployment but its long history is strongly cyclical and does not show uninterrupted secular worsening.

011 **Involuntary part time employment** 88
Mixed evidence · 1955 to September 2026 monthly counts with 1994 to 2016 comparable subgroup study
Involuntary part time work measures inadequate desired hours but large cyclical swings and subsequent recoveries prevent an automatic secular worsening conclusion.

012 **Marginal attachment to the labor force** 93
Mixed evidence · 1994 to September 2026 monthly record and 2024 to 2025 annual detail
Marginal attachment reveals available people with a recent search history outside headline unemployment but its measured trend is cyclical and bounded by the twelve month search rule.

013 **People outside the labor force who want a job** 98
Mixed evidence · 1994 to September 2026 monthly history
The broader want job population captures unmet interest beyond recent search rules but its long record and demographic denominators do not establish a universal secular rise.

014 **Unemployment duration and long term unemployment** 103
Mixed evidence · Long term counts 1948 to 2026 median 1967 to 2026 with mean measurement break 2011
Unemployment spells have a higher recent median than around 2000 and a substantial long term tail but recession dynamics composition and a mean series break require careful interpretation.

015 **College graduate underemployment** 108
Mixed evidence · 1990 to 2026 Q2 national monitoring with original study through 2012
Degree holders have persistently worked in jobs not typically requiring degrees and current recent graduate mismatch is high but the history is cyclical and some nondegree jobs are economically valuable.

016 **Youth not in employment education or training** 113
Mixed evidence · Global modeled comparisons 2005 to 2025 and US observed comparison 2015 to 2025
Youth disconnection is a useful access measure but global and high income rates improved over twenty years while regional differences and recent reversals prevent a universal secular worsening claim.

EMPLOYMENT INSTITUTIONS AND WORKER SECURITY

017 **Independent contracting** 118
Mixed evidence · February 1995 to July 2023
Main job independent contracting increased modestly from 1995 but the 2023 share equaled 2005 and most contractors preferred their arrangement.

018 **Contingent and alternative employment arrangements** 123
Mixed evidence · February 1995 to July 2023
Contingency increased after 2017 but its 2023 prevalence was below 1995 and alternative arrangements show divergent long run paths.

019 **Domestic outsourcing and fissured employment** 128
Secular evidence · 1995 to 2019 in OECD comparisons with supporting national studies
Domestic outsourcing grew across several advanced economies and can separate workers from the rents and employment institutions of lead firms.

020 **Union membership density** 133
Secular evidence · 1983 to 2025
The U.S. union membership rate approximately halved over four decades although membership and density increased modestly in 2025.

021 **Collective bargaining coverage** 138
Secular evidence · 1983 to 2025 for the United States and 1985 to 2024 for OECD comparison
Collectively negotiated employment terms cover a substantially smaller share of workers than four decades ago with large differences across national institutions.

022 **Defined benefit retirement participation** 143
Secular evidence · March 2006 to March 2026 with longer administrative plan histories
Private industry participation in defined benefit plans fell from 20 to 9 percent while participation in any employer retirement plan remained approximately stable.

023 **Employer health insurance and benefit access** 148
Mixed evidence · March 2006 to March 2026 with 2025 household coverage context
Medical plan access remained stable over twenty years while participation declined and benefit quality requires separate measurement of costs and coverage.

024 **Good job coverage** 153
Historical evidence · 1979 to 2010 for the verified historical composite with current component data through 2026
A historical pay and benefits composite declined despite workforce upgrading and motivates an updated direct measure of access to adequate employment.

025 **Early career hiring and entry opportunities** 158
Short history · Historical career entry research from 1982 to 1999 and current observations through June and second quarter 2026
Recent evidence identifies pressure on entry into some exposed occupations, while a nationwide secular decline in entry opportunities remains unestablished.

026 **Earnings recovery after displacement** 163
Historical evidence · Administrative earnings research 1974 to 2008 and displacement cohorts 2021 to 2025 observed in January 2024 and January 2026
Job loss can leave persistent earnings losses, but existing evidence does not establish a continuous nationwide deterioration in recovery.

027 **Concentration of job growth in health and care** 168
Secular evidence · January 1990 to September 2026 with a separate September 2025 to September 2026 growth comparison
Health care and social assistance have gained a substantial share of payroll employment over decades, while recent net growth concentration needs separate interpretation.

028 **Deaths of despair** 174
Mixed evidence · Mortality components 1999 to 2024 with original midlife research 1999 to 2013
Several mortality components rose over a multidecade period, but recent declines and distinct causal channels prevent treating them as a direct automation index.

029 **Chronic pain and labor force withdrawal** 179
Supporting evidence · Selected NHIS observations 2016 2019 2023 and 2025 with a 2019 survey break
Pain is a substantial functional constraint associated with labor withdrawal, while a short and nonmonotonic comparable history limits secular claims.

030 **Opioid exposure and labor market outcomes** 184
Mixed evidence · Overdose history 1999 to 2024 and retail dispensing 2019 to 2024 with original labor outcome studies
Opioid exposure can impair employment and increase disability reliance, while supply institutions and divergent prescribing trends challenge a simple labor distress explanation.

031 **Disability and labor force attachment** 189
Mixed evidence · Social Security disabled worker records 1960 to 2024 and CPS disability employment 2009 to 2025
Disability is closely related to labor attachment, but declining beneficiary stocks and improved working age employment complicate a general claim of rising exclusion.

032 **Employee engagement and meaningful work** 194
Counterevidence · United States engagement 2000 to first half 2026 and global engagement 2009 to 2025
Engagement is low and below its recent peak, but the long United States endpoint is higher than in 2000 and does not establish secular growth in meaningless work.

HOUSEHOLD INCOME AND ACCESS TO PROSPERITY

033 **National transfer dependence** 199
Secular evidence · United States annual government transfer share 1970 to 2022 with separately defined August 2026 context
Government transfers became a much larger source of personal income over five decades, demonstrating a structural expansion of public support while aging and medical costs limit its use as evidence of weakening working age earnings.

034 **County transfer dependence** 204
Secular evidence · United States counties annual observations 1970 to 2022 with county data availability through 2024 noted
A majority of counties crossed a high transfer income threshold by 2022, revealing geographically widespread reliance on public support while county counts, aging and migration complicate its interpretation.

035 **Working age poverty before and after taxes and transfers** 209
Secular evidence · United States adults ages 18 to 64 reconstructed historical series 1967 to 2023
Public taxes and transfers play a larger role in keeping working age adults out of poverty, while the direction of poverty itself depends on whether the threshold tracks a fixed or changing standard of living.

036 **Refundable tax credit supplementation** 214
Secular evidence · United States CBO distributional series 1979 to 2023 with IRS tax year 2025 rules as current context
Refundable credits grew from a small to a substantial addition relative to low income households' base resources, indicating a structural tax system role in supplementing market and social insurance income.

037 **Household labor capital and transfer income composition** 219
Mixed evidence · United States CBO observations 1979 to 2023 and Survey of Consumer Finances 1989 to 2022
Income sources differ across households and public support expanded over decades, but labor remains the largest component of average base income in every broad quintile and cash and noncash accounts require separate treatment.

038 **Capital Allocation Ratio** 224
Proposed metric · Author developed definition in Labor Zero version 36 September 2026 with no verified official longitudinal CAR series
CAR compares recurring cash ownership income with cash labor earnings plus government cash transfers, providing a proposed household composition lens that must be paired with income adequacy and distribution.

039 **Public Wealth Ratio** 229
Proposed metric · Author developed definition in Labor Zero version 36 September 2026 with current institutional examples and no official longitudinal PWR series
PWR measures qualifying inclusive capital benefits as a share of the whole household resource account, requiring documented asset backing, household transmission and separate cash and service adjusted versions.

040 **Distribution of household income growth** 234
Secular evidence · United States CBO comparable annual distributional history 1979 to 2023 with separate Census 2025 context
Household income grew across broad income groups but much faster at the top, and taxes and transfers moderated rather than eliminated the resulting increase in inequality.

041 **Absolute intergenerational income mobility** 239
Historical evidence · United States birth cohorts 1940 to 1984 assessed at comparable adult ages
The probability that children exceed their parents real income fell substantially across successive birth cohorts even as aggregate production continued to grow.

042 **Renter housing cost burden** 244
Supporting evidence · United States 1960 to 2024 with observed historical benchmarks and annual ACS updates
Rent consumes a larger share of many households resources than it did several decades ago making income from work less effective at securing an essential good.

043 **Home prices relative to household income** 249
Supporting evidence · United States 1990 to 2025 in the verified JCHS comparison with longer official price and income series available
The purchase price of housing has risen relative to household income over the long run separating access to an important asset from progress in current earnings.

044 **Inheritance and gift flows** 254
Historical evidence · Italy 1995 to 2016 France 1950 to 2010 and selected inherited wealth comparisons through 2010
Verified European series show inherited resources becoming more important relative to current income while a current comparable United States flow series was not established in this review.

045 **Household debt relative to income** 259
Mixed evidence · United States quarterly observations 1980 to second quarter 2026
Household debt rose strongly relative to disposable income before 2008, then declined substantially, leaving a mixed long history that does not support continuous financial deterioration.

046 **Household debt service burden** 264
Counterevidence · United States current methodology quarterly series 2005 to second quarter 2026
Required debt payments absorbed a smaller aggregate share of disposable income in 2026 than in 2005 or 2007, countering a secular claim of continuously increasing debt payment burden.

047 **Multiple jobholding** 269
Counterevidence · United States monthly comparable CPS series January 1994 to September 2026
The official multiple jobholding rate remains below its mid 1990s levels despite a recent rebound, so it does not establish a twenty year rise in households needing several jobs.

048 **Job tenure** 274
Mixed evidence · United States selected CPS observations 1983 to January 2026 with survey changes disclosed
Overall median tenure does not show a decades long collapse, while age composition, sector and the reasons for job transitions determine whether shorter tenure indicates insecurity or opportunity.

CAPITAL PRODUCTION AND OWNERSHIP

049 Capital input relative to labor hours 279
Secular evidence · 1987 to 2025
Capital services grew substantially faster than human hours over almost four decades, documenting a durable change in the input mix.

050 Capital services per labor hour 283
Secular evidence · 1987 to 2025
The capital services available behind each hour of private nonfarm work rose across the published multidecade record.

051 Capital deepening contribution to growth 288
Secular evidence · 1987 to 2025
Capital intensity supplied a persistent positive contribution to labor productivity, though its contribution has varied rather than continuously accelerated.

052 Labor composition contribution to growth 293
Supporting evidence · 1987 to 2025
Changing workforce characteristics supplied a persistent positive productivity contribution, showing that human input changes alongside capital deepening.

053 Total factor productivity 298
Secular evidence · 1987 to 2025
Output efficiency improved over decades, with a substantial slowdown after 2007 and a partial recent recovery rather than an established continuous acceleration.

054 Productive fixed capital stock 302
Supporting evidence · 1925 to 2024 verified stock extract with BEA update through 2025
The productive asset base expanded over decades, while current cost valuation alone cannot establish real automation or labor substitution.

055 Nonresidential structures investment 306
Mixed evidence · 1947 to second quarter 2026
Business structures are a durable component of productive capital, but their investment cycle does not establish a continuously rising secular automation share.

056 Equipment investment 310
Supporting evidence · 1947 to second quarter 2026
Equipment investment sustains the productive machinery of automation, though spending levels and economic shares need separate interpretation.

057 Intellectual property and intangible investment 314
Secular evidence · 1990 to second quarter 2026 for audited official intellectual property checkpoints
Official intellectual property investment became a larger share of GDP over decades, while broader intangibles require a separate accounting boundary.

058 Digital and AI capital expenditure relative to GDP 319
Proposed metric · Digital production accounts 1997 to 2024 with AI specific research beginning in the 2020s
A digital investment share can extend the secular capital story, but an AI only spending series has insufficient comparable history and requires a carefully defined boundary.

059 **Relative price of machinery and equipment** 324
Historical evidence · 1947 to 2026 equipment price series and several decades of relative investment price research
A long decline in the price of equipment relative to other output can encourage capital substitution, but the result depends on quality adjustment and the full cost of using capital.

060 **Corporate profits relative to GDP** 329
Secular evidence · 1947 to 2026 quarterly profits and GDP with a 1990 to 2026 audited comparison
Corporate profits occupy a larger share of aggregate output than in earlier decades, but taxes, geography, market power and business cycles complicate an automation interpretation.

061 **Corporate dividends and share repurchases** 334
Supporting evidence · 1947 to 2026 dividends and 1996 Q4 onward equity issuance and retirement
Corporate payouts trace the distribution of returns to owners, while the long series distinguishes dividends, buybacks, new issuance and merger related equity retirement.

062 **Wealth relative to national income** 339
Secular evidence · 1970 to 2010 international wealth income research and 1980 to 2026 U S household wealth relative to disposable income
Wealth has become larger relative to annual income over decades, increasing the importance of ownership while combining productive assets with housing, land and financial valuations.

063 **Concentration of capital ownership** 344
Secular evidence · 1989 Q3 to 2026 Q2 Distributional Financial Accounts
Ownership of corporate equities and net worth is highly concentrated and became more concentrated over the long comparison, shaping who receives gains from productive capital.

064 **Household capital income** 349
Mixed evidence · 1959 to 2026 personal income series and 1979 to 2023 CBO household distribution
Asset income is an important and unevenly distributed household resource, but its aggregate share is cyclical and does not show a simple secular rise in the verified long comparison.

PRODUCTION INTENSITY AND ENTERPRISE EVIDENCE

065 **Agricultural output relative to labor hours** 354
Secular evidence · 1948 to 2023 with raw labor hours benchmark through 2017
U.S. agriculture supplies a long historical demonstration that production can expand greatly while direct farm labor contracts.

066 **Manufacturing output relative to labor hours** 359
Secular evidence · Q1 1987 to Q2 2026
Manufacturing produces substantially more measured output than in 1987 using substantially fewer hours, with a marked slowdown in productivity growth in later years.

067 **Information sector output relative to employment** 364
Short history · Q4 2022 to Q2 2026 with employment history beginning in 1939
The updated information-sector comparison shows strong real value-added growth alongside declining direct payroll employment.

068 **Professional services output relative to employment** 369
Short history · Q4 2022 to Q2 2026 with matched historical data from 2005
Professional scientific and technical services have expanded real value added much faster than payroll positions in the recent comparison.

069 **Financial sector output relative to employment** 374
Mixed evidence · Q4 2022 to Q2 2026 with commercial banking context from 1987 to 2025
Finance and insurance have recently expanded measured real value added with nearly flat payrolls while narrower banking data show a much older output-hours separation.

070 **Software publishing output relative to labor hours** 379
Secular evidence · 1987 to 2025 with the latest annual comparison for 2025
Software publishing has a long history of output growing much faster than hours although total hours expanded over most of that history.

071 **Economy wide output relative to labor hours** 384
Secular evidence · Q1 1947 to Q2 2026 for nonfarm business productivity
Long-run nonfarm business productivity establishes rising output per hour while recent output growth has greatly outpaced hours growth.

072 **Company revenue per employee** 389
Short history · Public annual company observations through fiscal 2026 where available
Selected company disclosures show large variation in nominal revenue supported by each direct employee and provide bounded examples of changing staffing intensity.

073 **Revenue workforce growth elasticity** 394
Proposed metric · Repeated firm and sector windows with selected Microsoft comparisons from fiscal 2019 to fiscal 2025
Workforce elasticity tests whether expanding real activity requires proportionate additions to human labor rather than relying on a single revenue per employee level.

074 **Real value added per total workforce equivalent** 399
Proposed metric · Enterprise monitoring specification with no verified universal twenty year series
A declared value-added and workforce boundary can distinguish real production leverage from revenue inflation and payroll outsourcing.

075 **Total human work cost share** 404
Proposed metric · Enterprise accounting specification with selected fiscal 2024 to fiscal 2026 public disclosures
Counting employee and purchased work costs together tests whether apparent payroll leverage survives the outsourcing boundary.

076 **Operating profit per workforce equivalent** 409
Proposed metric · Enterprise specification with a fiscal 2024 to fiscal 2025 Accenture employee proxy
Profit per included human unit tests whether apparent production leverage remains after suppliers technology and operating costs are paid.

077 **Avoided hiring and historical staffing benchmarks** 414
Proposed metric · Historical professional services baseline from 2015 to 2019 compared with 2022 to 2026 and enterprise workload methods
Counterfactual staffing can make reduced hiring requirements visible while remaining conditional on a disclosed model rather than an observed count of eliminated jobs.

078 **Freelance job postings** 419
Short history · Online platform studies around 2022 to 2023 technology releases
Project postings reveal early adjustment in purchased task demand but the evidence includes expanding complementary work and cannot establish a twenty year macro contraction.

079 **Freelance earnings** 424
Short history · Early platform worker research with public marketplace indicators through 2026 Q2
Worker earnings determine whether disappearing assignments and changing project composition reduce livelihoods even when surviving transactions have higher average values.

080 **Purchased labor expenditure relative to AI expenditure** 429
Short history · Selected purchaser transactions from 2021 to 2025 with companion adoption research published in 2026
Changing work purchases and AI bills can reveal a sourcing shift but they do not establish an equal output labor replacement rate or a secular macro trend.

DYNAMISM TASKS AND AUTOMATION

081 **Employment per new establishment** 434
Secular evidence · March 1994 to March 2025
New United States private establishments begin with roughly half as many payroll employees as they did three decades earlier.

082 **Employer firm birth and startup rates** 439
Mixed evidence · 1978 to 2023
United States employer firm startup rates remain below their early historical levels after a long decline and a meaningful recovery after 2010.

083 **Job creation destruction and reallocation** 444
Secular evidence · Third quarter 1992 to fourth quarter 2025
United States establishment job flows have become smaller relative to employment over a long period while retaining substantial cyclical variation.

084 **Automation displacement and task reinstatement** 449
Historical evidence · 1947 to 1987 compared with 1987 to 2017
A published United States decomposition finds a later historical balance of stronger automation displacement and weaker creation of new tasks for human labor.

085 **New work creation and occupational polarization** 454
Mixed evidence · United States 1940 to 2018
New work has continued to emerge across eight decades, while its location shifted away from accessible middle paid occupations after 1980.

086 **Automation and loss of wage premiums** 459
Supporting evidence · United States 1980 to 2016 with separate January 2026 displacement outcomes
Automation can remove better paying positions and the earnings premiums attached to them, producing compression that employment counts alone cannot reveal.

087 **Earnings segregation between employers** 464
Supporting evidence · United States 1978 to 2013
Workers with similar earnings increasingly cluster at similar employers, making access to particular organizations an important part of the distribution of opportunity.

088 **Urban wage opportunity for noncollege workers** 469
Mixed evidence · United States wage gradients 1970 to 2015 with separate employment comparisons 2000 to 2021
The urban wage advantage for workers without a four year degree weakened over several decades even while metropolitan employment advantages persisted.

089 **Premature deindustrialization** 474
Mixed evidence · Country specific historical series mainly 1950s or 1960s to 2010 or 2012 with separate UNIDO 2024 output checkpoint
Many later developing economies reached manufacturing employment peaks at lower incomes and smaller employment shares than earlier industrializers, with important regional exceptions.

090 **Firm markups** 479
Mixed evidence · United States publicly traded firm research 1955 to 2016 with measurement review revised July 2026
A prominent long run estimate finds rising average price to marginal cost ratios concentrated in the upper tail, but markup measurement and causal interpretation remain contested.

091 **Local employer concentration** 484
Mixed evidence · United States broad employment concentration 1976 to 2014 and manufacturing research 1978 to 2016
Concentrated local markets can limit worker alternatives, but broad long run evidence includes declining local concentration and cannot support a universal secular rise.

092 **Frontier and laggard productivity** 489
Supporting evidence · United States manufacturing dispersion 1987 to 2021 with separate OECD frontier comparison 2003 to 2020
A decades long United States record shows wider productivity dispersion within manufacturing industries, while shorter international evidence documents divergence between leading and other firms.

093 **Industrial robot installations and stock** 494
Secular evidence · Global robot database 1993 to 2025 with verified historical checkpoints 2005 and 2025
The industrial robot population expanded substantially over two decades, demonstrating sustained automation deployment while leaving its net employment consequences to separate analysis.

094 **AI capability relative to cost** 499
Short history · Verified language model cost windows November 2022 to October 2024 and April 2024 to November 2025
The cost of achieving a fixed level of benchmark performance fell rapidly in short recent windows, while the cost of running the most capable models can rise.

095 **Humanoid robot cost and useful capability** 504
Proposed metric · Commercial product snapshots retrieved October 2026 and IFR calendar 2025 shipments
Published humanoid prices and demonstrations provide short history checkpoints, but a reproducible measure of cost per useful autonomous output is still needed.

096 **Perceived socially useless jobs** 509
Counterevidence · International repeated survey waves 1989 to 2015 with separate Europe 2005 to 2015 and United States 2015 studies
Workers' perceptions of social usefulness are measurable, but the strongest long record does not show a clear secular rise and shorter studies cannot establish one.

CAPITAL COST SHARES PARTICIPATION AND DEMOGRAPHY

097 **Capital services cost share** 514
Secular evidence · 1987 to 2024
The gross capital cost share rose over more than three decades, with the original 2024 value of 0.421 verified for private business rather than private nonfarm business.

098 **Prime age male employment to population ratio** 519
Secular evidence · 1948 to 2023 comparable annual history with 2025 exceptional annual and September 2026 unadjusted updates
Prime age male employment has a lower multidecade baseline despite cyclical recoveries while the matching female trajectory is substantially different.

099 **Demographic dependency ratios** 524
Supporting evidence · 2000 to 2020 decennial history and separate Vintage 2025 update through July 2025
The older population rose relative to working ages across two decades while child dependency fell and demographic ratios remain distinct from economic support burdens.

ENTERPRISE MECHANISMS AND OUTCOME SAFEGUARDS

100 **AI enabled gross margin** 529
Proposed metric · Enterprise measurement specification with recent supporting evidence and no comparable twenty year national series
Incremental margin can test whether automation creates profitable new activity while requiring a credible no intervention baseline complete direct costs and a cannibalization adjustment.

101 **Human work per valid unit** 534
Proposed metric · Enterprise measurement specification with recent supporting evidence and no comparable twenty year national series
Measuring all human touch time per accepted outcome tests whether a workflow actually becomes less labor intensive after review rework and exception handling are included.

102 **Straight through completion** 539
Proposed metric · Enterprise measurement specification with recent supporting evidence and no comparable twenty year national series
Completion without substantive human intervention tests the extent of end to end automation while requiring visible eligibility quality exceptions and all initiated cases.

103 **End to end workflow throughput** 544
Supporting evidence · Production measurement methods published 2016 and selected firm studies published 2025 with updates available through October 2026
Valid workflow output per unit of total human input can reveal labor saving mechanisms, but local task acceleration and enterprise throughput require separate evidence.

104 **Cost per valid outcome** 549
Proposed metric · Established cost estimation methods 2009 to 2020 and technology cost specifications through June 2026 with no national valid outcome cost series
Full cost per accepted outcome tests economic substitution only when labor machine support quality and risk boundaries remain consistent.

105 **Cycle time and waiting time** 554
Supporting evidence · Queueing methods published 1961 and manufacturing flow measurement 2015 with selected AI work evidence available through October 2026
Elapsed workflow time shows whether local automation survives queues and handoffs, while active human time and calendar waiting must be measured separately.

106 **First pass yield** 559
Supporting evidence · Established process quality methods; selected workplace studies from 2020 to 2023, published through 2026; no comparable national longitudinal series
First pass yield tests whether apparent automation speed produces accepted work without repair, but supplies workflow evidence rather than a twenty year macroeconomic trend.

107 **Rework and defect rates** 564
Supporting evidence · Established process quality methods; selected software task observations February to June 2025, with methodological update February 2026; no comparable national longitudinal series
Rework and defect measures reveal repair labor and output harm that can offset automation gains; no verified national twenty year trend supports a uniform conclusion.

108 Human escalation and exception handling 569

Supporting evidence · Selective classification methods published 2010; customer support deployment around 2020 and 2021, article 2025; enterprise framework 2026; no comparable national longitudinal series

Escalation frequency and exception labor show where automation still needs human judgment, but a lower frequency is beneficial only when appropriate routing and output quality remain adequate.

109 Full AI cost per valid outcome 574

Proposed metric · Workflow research in 2025 and measurement framework in 2026

A proposed enterprise measure compares human and machine alternatives using complete workflow costs and accepted outcomes; it is a diagnostic for current deployments rather than a secular national series.

110 Capacity realization and redeployment 579

Proposed metric · Recent workflow studies in 2025 and enterprise measurement framework in 2026

A proposed capacity ledger separates validated reductions in required human work from evidenced destinations, hiring avoidance, and actual expense reductions, without treating each as an independent financial benefit.

111 Customer retention and service outcomes 584

Supporting evidence · Enterprise cohort measurement proposed; separate customer support rollout mainly fall 2020 and winter 2021 published 2025 and satisfaction measurement history beginning 1994

Customer retention and service outcomes test whether lower human effort preserves the customer value that makes an enterprise productivity gain economically meaningful.

112 Compliance security and incident losses 590

Supporting evidence · Risk methods published 2024 and 2025 with a separate IC3 calendar 2025 checkpoint; enterprise exposure and loss series proposed

Exposure adjusted incident frequency, severity and loss establish whether apparent automation savings survive compliance and security failures that can otherwise remain outside the productivity account.

113 Workforce health and workload 596

Supporting evidence · Proposed enterprise guardrail with 2019 to 2021 workflow evidence and 2000 to 2016 health research

Workload and employee outcomes test whether enterprise labor savings reflect sustainable reduced effort rather than hidden overtime or intensified work.

114 Operational resilience and vendor concentration 601

Supporting evidence · Continuity methods published 2010 and bank resilience principles published 2021 and 2025; separate July 2024 incident checkpoint; enterprise series proposed

Critical dependency shares and demonstrated recovery test whether labor leverage survives disruptions and supplier dependence rather than relying on a production system that works only under normal conditions.

115 Revenue per employee alpha 606

Proposed metric · Proposed enterprise specification in September 2026 with a separately dated fiscal 2025 disclosure illustration and no official comparable twenty year company alpha series

RPE Alpha compares company and matched benchmark real revenue per employee growth, identifying relative commercial performance while leaving automation attribution to separate evidence.

116 Value per work dollar 611

Proposed metric · September 2026 framework with June 2026 compensation context

A proposed ratio of real GVA to complete work expenditure tests enterprise labor cost dependence, with production boundaries, compensation prices, and human hours needed to distinguish automation from lower pay.

117 Operating profit per work dollar 616

Proposed metric · Enterprise measurement specification from September 2026 with accounting context and no verified twenty year national series

Operating income relative to total employee and purchased work cost tests economic capture across the payroll boundary while remaining sensitive to compensation prices product mix and investment.

118 Realized labor expense reduction 621

Proposed metric · Original enterprise framework September 2026 with established cost measurement methods published 2009 to 2020 and no comparable national savings series

Observed reductions in paid labor and purchased work identify one financial destination of released capacity, while avoided future hiring and unchanged salary expense remain separate.

119 AI enabled contribution margin 626

Proposed metric · Original enterprise definition September 2026 with accounting interpretation updated December 2022 and cost and evaluation methods available through October 2026

Incremental commercial margin tests whether attributed AI gross margin survives the added costs of selling servicing and supporting the offering, without equating captured profit with reduced labor demand.

120 Decision latency 631

Proposed metric · Enterprise event timestamps proposed; separate workflow context from a September 2023 to October 2024 field experiment and December 2018 risk methods

Decision latency identifies the elapsed wait after a decision becomes ready, testing whether organizational bottlenecks absorb task level productivity gains while preserving necessary risk review.

121 Manager coordination load 636

Proposed metric · Enterprise touch time sampling proposed; separate September 2023 to October 2024 field experiment and ATUS 2003 to 2025 measurement context

Manager touch minutes per valid output test whether task automation reduces organizational coordination effort or transfers that effort into managerial review routing and exception work.

122 Backlog days 641

Proposed metric · Enterprise workload stock and daily valid throughput proposed; separate original queueing methods 1961 and customer support rollout mainly 2020–2021 published 2025

Backlog days express open eligible work in units of observed daily valid throughput, testing whether released capacity actually covers demand rather than allowing unresolved work to accumulate.

123 Time to sustained value 646

Proposed metric · Measurement framework proposed in 2026 with earlier schedule and statistical methods

Elapsed time from a funded decision to sustained evidenced value tests implementation and realization speed, while unfinished and retired initiatives must remain visible to avoid a success-only timing series.

124 Initiative conversion and retirement rates 651

Proposed metric · Portfolio measurement proposal in 2026 with earlier technology readiness and iterative evaluation methods

An evidence-qualified scaling rate and a documented scale-or-retire decision rate measure different portfolio outcomes and require a fixed mature cohort rather than a count of surviving pilots.

125 Net realized AI value 656

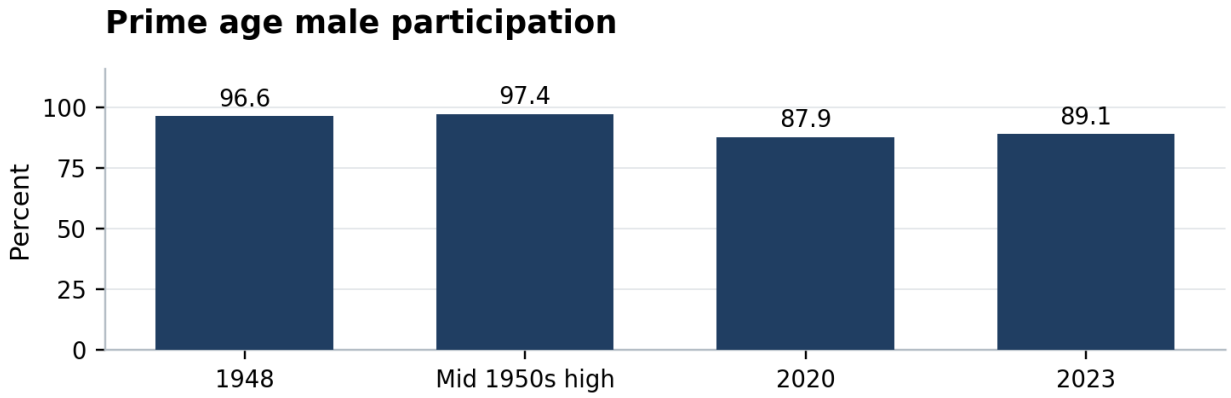
Proposed metric · Proposed enterprise valuation specification in September 2026 with appraisal accounting and evaluation methods; no official comparable twenty year realized AI value series

Net realized AI value connects verified capacity changes to distinct economic benefits after complete costs, while keeping cash profit avoided future spending and modeled risk reduction separately visible.

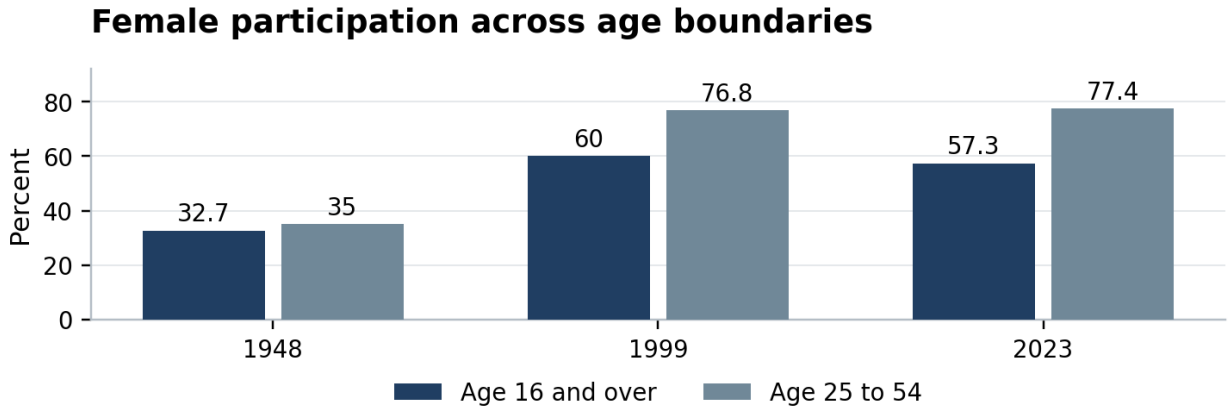
126 **Financial benefit to total cost of ownership ratio** 661
Proposed metric · September 2026 enterprise framework with current appraisal and established lifecycle cost methods
A proposed lifecycle benefit cost multiple tests evidenced enterprise financial capture after complete AI costs, with matched horizons, attribution, monetary recognition and binding outcome constraints.

Labor participation across sexes

These comparisons show why population boundaries matter. The male participation record has a long decline, while female participation includes a historic expansion and recent prime age resilience. Neither series can be substituted with overall employment. Bars display the listed observations; they do not create a continuous annual time series.



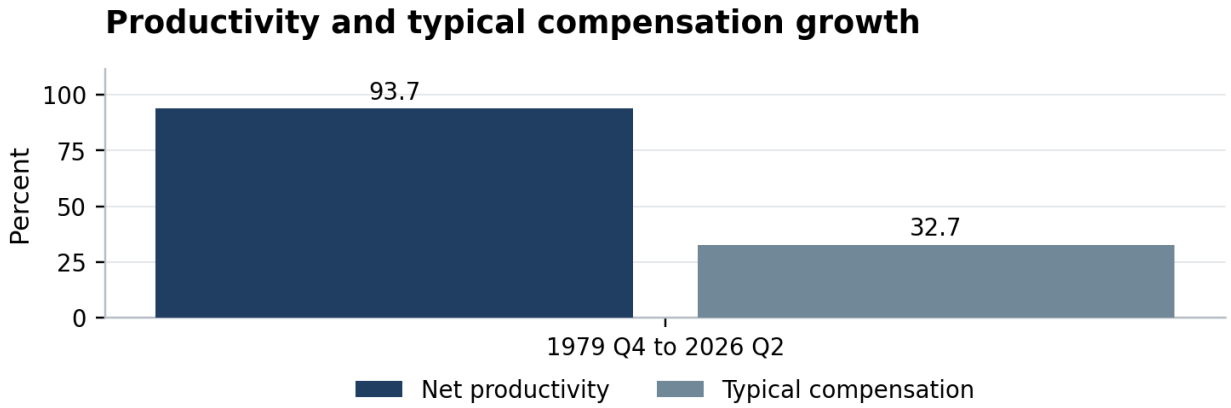
Annual observations from chapter 001. The mid 1950s point is the historical annual high. These bars show published checkpoints and do not imply observations in omitted years. Source definitions and citations Chapter 001.



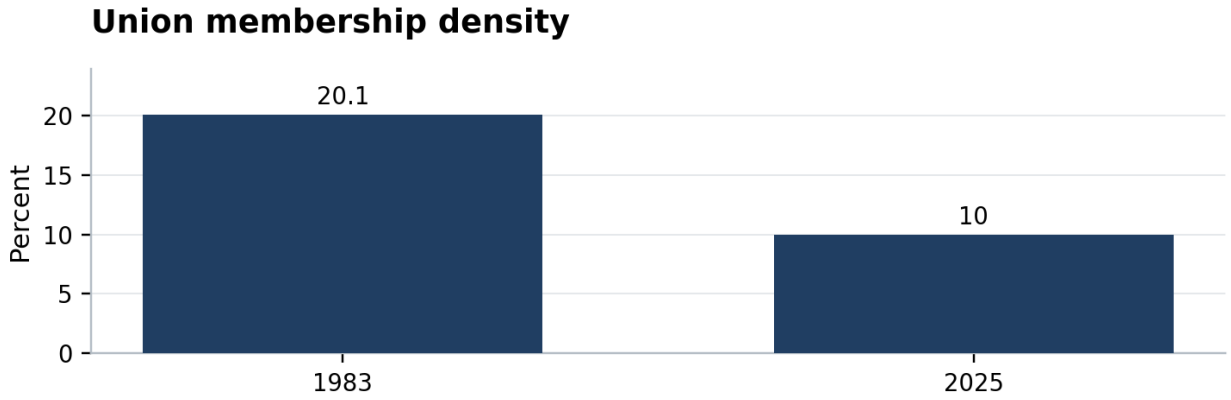
Annual observations from chapter 002. Prime age participation rises beyond the late 1990s comparison while the all age series also reflects population aging. Source definitions and citations Chapter 002.

Productivity pay and bargaining

The first chart measures cumulative output and compensation growth over a common window. The second measures the fraction of workers belonging to unions. Together they identify different parts of labor income transmission: productive capacity and an institution through which workers can claim gains. Their relationship still requires mechanism evidence.



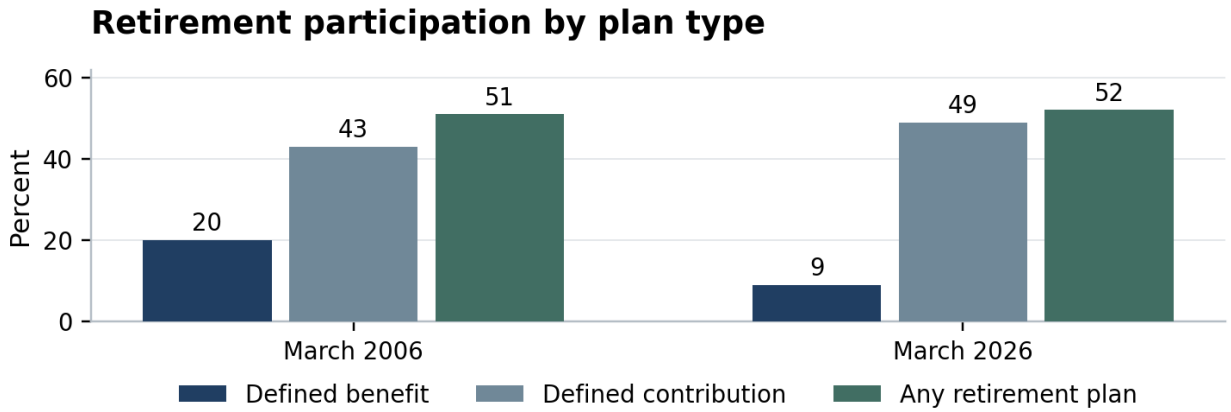
EPI tracker comparison in chapter 005. This is cumulative real growth over one common window rather than annual growth or a labor share. Source definitions and citations Chapter 005.



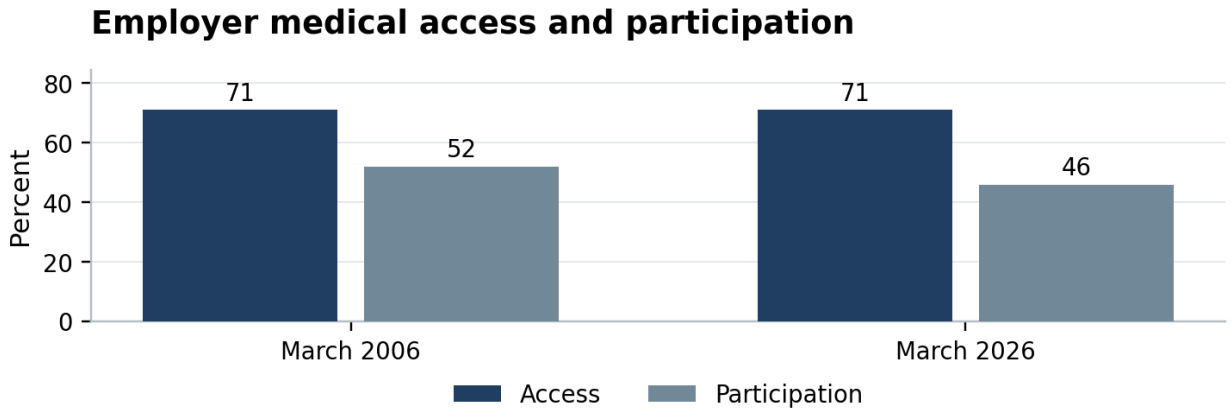
BLS observations from chapter 020. The 2025 annual estimate excludes October because of the government shutdown. Density differs from the number of members. Source definitions and citations Chapter 020.

Retirement and medical benefits

Retirement plan architecture changed substantially even though participation in any retirement plan remained similar. Employer medical access also remained similar while participation declined. These contrasts separate the existence of a benefit from its design and use. The record supports particular institutional changes rather than a uniform disappearance of benefits.



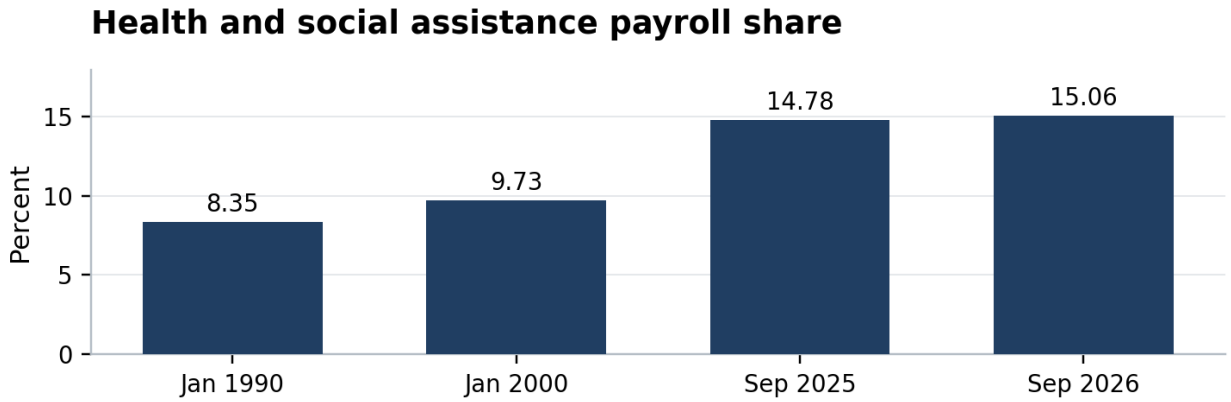
BLS observations from chapter 022. Plan types overlap and should not be added. The comparison shows a change in retirement architecture with similar overall participation. Source definitions and citations Chapter 022.



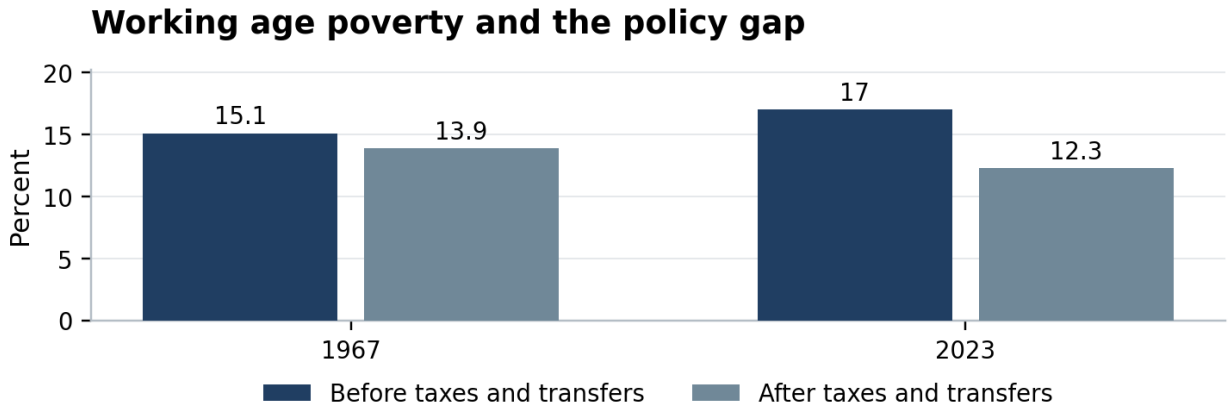
BLS observations from chapter 023. Access and participation measure different events. Stable access is counterevidence to a universal loss of medical benefit availability. Source definitions and citations Chapter 023.

Care employment and household policy

A rising employment share in care can coexist with a larger contribution from taxes and transfers to working age resources. The care chart concerns jobs by industry. The poverty chart concerns the household income distribution under one consistent poverty convention. They cannot be combined as if they counted the same people.



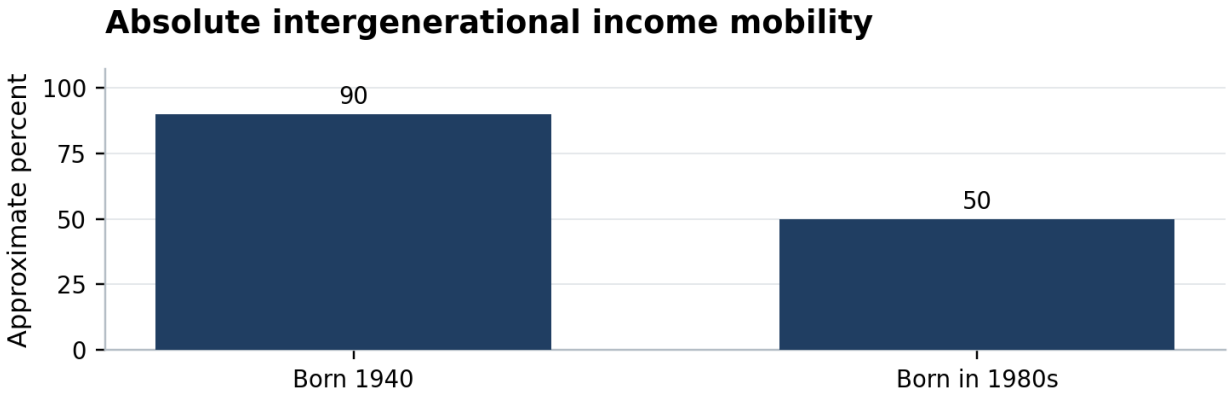
Calculated matched BLS series in chapter 027. September 2026 is preliminary. Employment shares differ from the sector contribution to recent net job growth. Source definitions and citations Chapter 027.



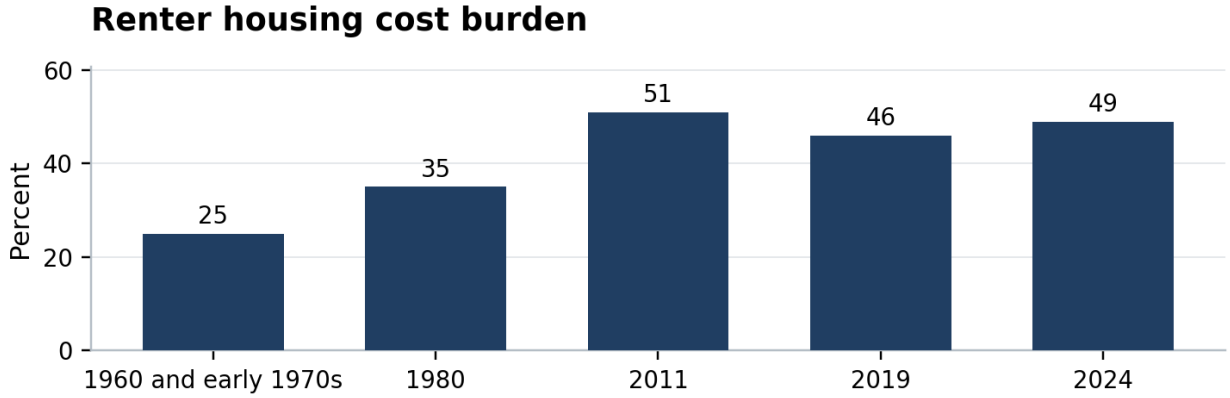
Historical supplemental poverty measure in chapter 035. Both columns use the same poverty convention. Anchored and relative poverty series give different comparisons. Source definitions and citations Chapter 035.

Economic mobility and housing

Economic mobility compares generations at comparable adult ages. Housing burden compares the share of renters facing high recurring housing costs. These measures add information about the capacity of ordinary income to provide advancement and essentials. They do not identify automation as the sole cause of the outcomes.



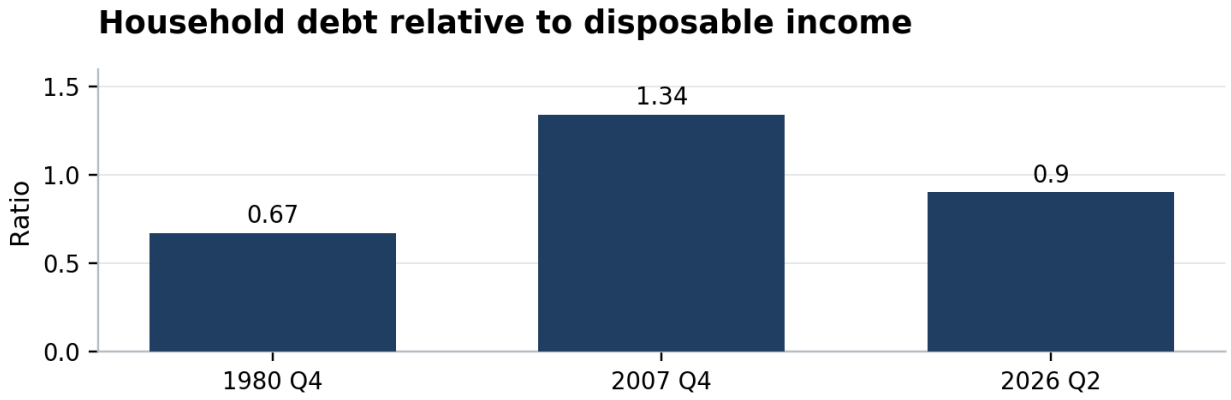
Opportunity Insights cohort comparison in chapter 041. Approximate shares are measured at comparable adult ages. Cohort years are not publication years. Source definitions and citations Chapter 041.



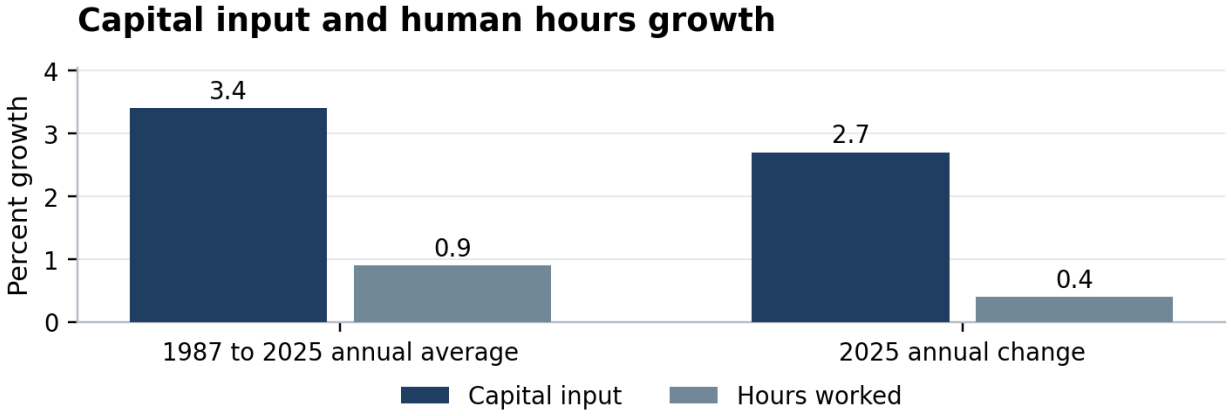
JCHS historical observations in chapter 042. The earliest value is approximate. The full listed checkpoints show both the long rise and the decline after the 2011 high. Source definitions and citations Chapter 042.

Household leverage and production inputs

Household leverage peaked before the financial crisis and subsequently declined relative to that peak. Capital services, meanwhile, have grown faster than human hours over the long production window. A complete post labor account needs both patterns: some indicators of pressure reverse even as production intensity keeps changing.



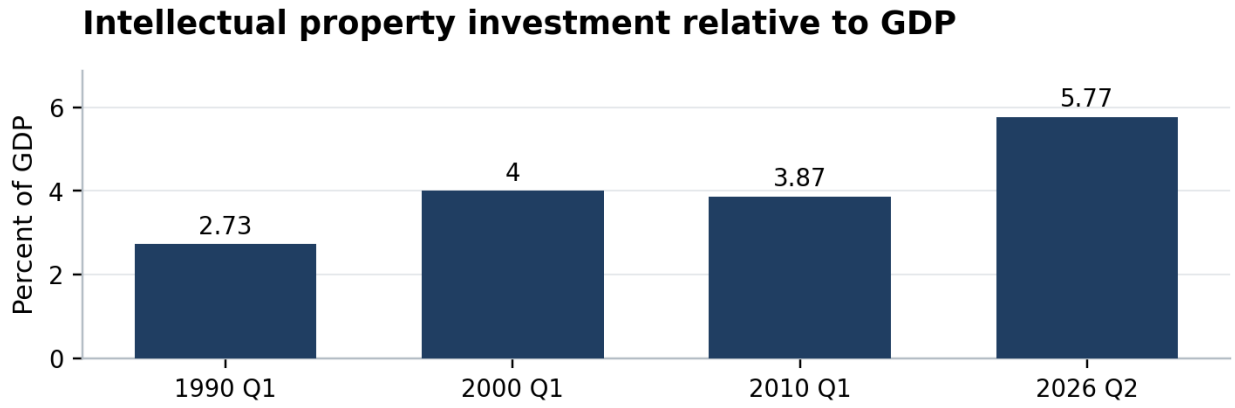
Matched financial account comparison in chapter 045. Debt is a stock and disposable income an annual flow. The post 2007 decline limits a monotonic debt dependence claim. Source definitions and citations Chapter 045.



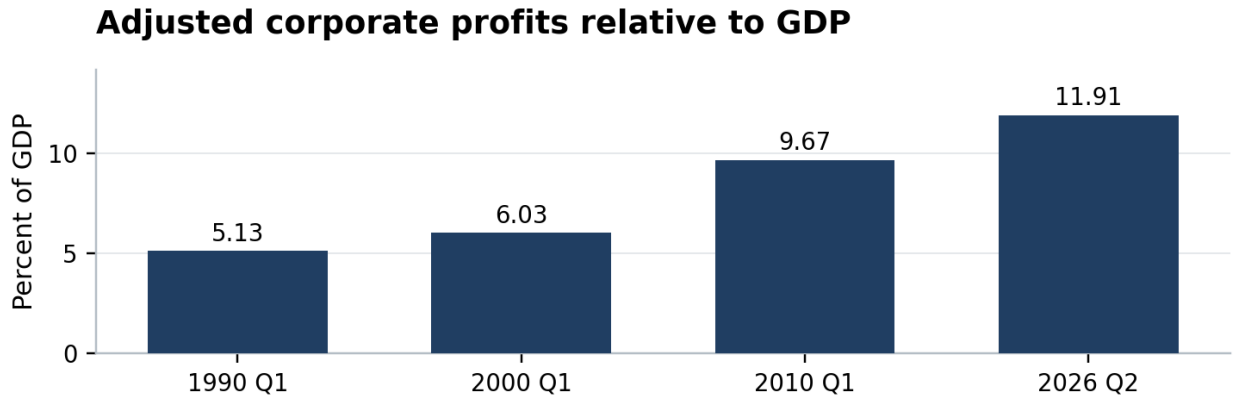
BLS private nonfarm business in chapter 049 using the March 19 2026 release. Capital services and hours are different inputs; this is not a causal estimate of substitution. Source definitions and citations Chapter 049.

Investment and corporate profit shares

The investment chart concerns a spending flow on official intellectual property products. The profits chart concerns an adjusted income flow. Both use compatible current dollar GDP denominators. A higher investment share and a higher profit share describe different processes; neither directly measures the distribution of ownership among households.



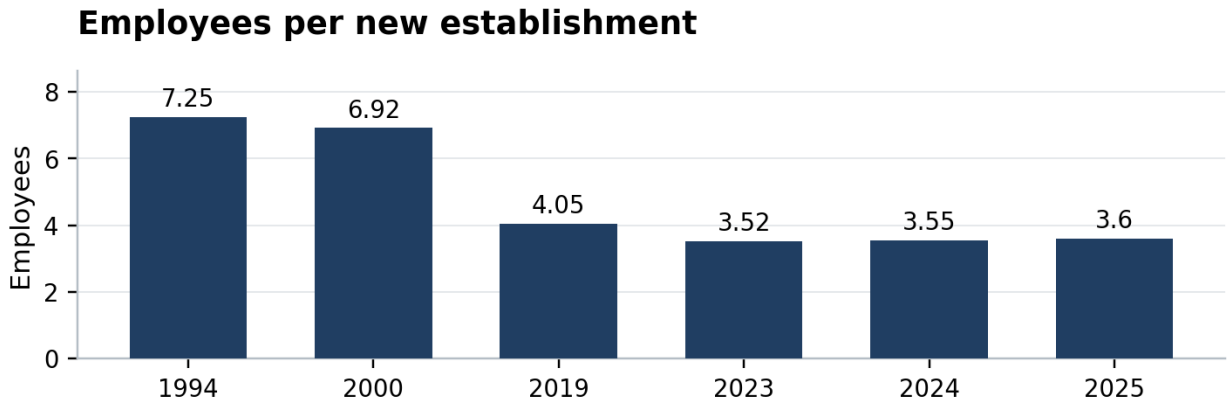
Calculated compatible BEA flows in chapter 057. Software R and D and artistic originals belong to this official category. It does not include every broad intangible asset. Source definitions and citations Chapter 057.



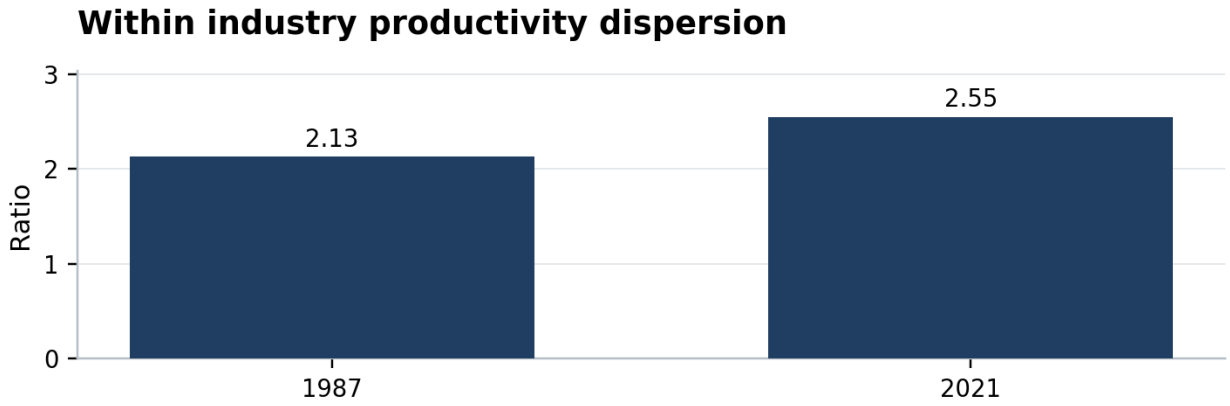
Adjusted after tax corporate profits divided by compatible current dollar GDP in chapter 060. The series boundary differs from unadjusted profits and from household capital income. Source definitions and citations Chapter 060.

Startup size and productivity dispersion

Smaller payroll teams at new establishments and wider productivity dispersion within manufacturing describe different margins of productive organization. The first is a mean among young establishments. The second is a weighted within industry distribution. A common narrative about scalable capital must still respect those different populations and methods.



Calculated BLS March observations in chapter 081. The universe is private establishments under one year old. Owner work and businesses without payroll employment are outside this ratio. Source definitions and citations Chapter 081.



BLS manufacturing dispersion measures in chapter 092. The ratios are exponentiated weighted log gaps. They do not describe a named pair of firms or an economywide average. Source definitions and citations Chapter 092.

Additional metric directory

NEW CHAPTERS IN VERSION TWO

127 Teen labor force participation 666

Mixed evidence · Annual history 1948–2025; observed 2005–2025 comparison; September 2026 monthly context

Teen attachment declined across decades, while schooling and recent rebounds prevent equating that decline with continuously worsening job exclusion.

128 Great Reversal in cognitive task demand 671

Bounded historical supporting evidence; contemporary continuation mixed · United States historical analysis 1979–2011; wage-premium evidence through 2022; separate recent-graduate checkpoint 2026 Q2

A historical reversal in cognitive-task demand offers a mechanism for downward occupational competition, but its continuation must be tested against later employment and wage gains.

129 Private Sector Job Quality Index 676

Supporting evidence for historical job composition; latest release timing qualified · United States private payroll history from 1990; August 2026 labeled release dated 2 October 2026

A relative weekly-pay index reveals how payroll growth can coexist with a less favorable job mix, while leaving benefits, living costs, preferences, and individual wages to complementary measures.

130 Middle-income population and income shares 681

Mixed evidence: long-run middle-tier contraction, upper-tier expansion, and real income gains · United States CPS ASEC population observations 1971–2023; household income reference years 1970–2022

A smaller median-based middle-income tier indicates less concentrated access to a shared income range, but its contraction includes upward expansion and does not independently identify weaker labor demand.

131 Shadow work and unpaid consumer service labor 686

Proposed metric; no verified national secular growth series · Measurement program proposed; ATUS infrastructure from 2003; separate observed teller example 1997–2007

Commercial services can move tasks onto unpaid consumers, but measuring that transfer requires identifying the former paid task, the customer's added time, service quality, and net labor effects.

132 Publicly financed employment 691

Proposed metric with observed financing components · United States; health-financing component history 1960–2024; no completed comparable twenty-year employment-attribution series

The public origin of demand can support private payrolls as well as government payrolls. Measuring that financing channel can complement transfer dependence and sectoral employment absorption, but it does not make wages transfers or establish that the financed work is economically unnecessary.

133 Guard labor 696

Bounded historical evidence with classification-dependent proxies · United States; original broad history 1890–2002 and later reported occupational evidence 1950–2017; no independently reconstructed extension to 2026

Long histories of supervisory and enforcement work raise a distinct question about labor used to manage economic relationships. They do not establish that these jobs lack value, that automation created them, or that every manager's time is spent extracting labor.

134 Superstar firms and the reallocation of labor share 701

Secular historical evidence; causal and distributional interpretation mixed · Economic Census research principally 1982–2012, with manufacturing evidence 1967–2012 and public concentration tables for 2022

Production shifting toward firms with lower labor shares can reduce the aggregate share without a general decline at the typical firm; firm dynamics, prices and worker outcomes determine the post labor interpretation.

135 **OECD social expenditure and the distribution role of public and private systems** 706
Secular evidence · OECD countries: verified public-spending comparison 1980–2007; program histories 1980–2019/2021; current detailed SOCX coverage 1980–2021/23, estimates 2022–2024
Social protection carries a larger long-run distribution role across rich economies, especially through pensions and health; its importance for labor compression depends on age, income adequacy and institutional design.

136 **Saving concentration and the financing of household and government debt** 711
Historical evidence · United States original research 1963–2016; heavily revised July 2025 study 1963–2019; official wealth and interest-rate companions available later under distinct definitions
Concentrated saving and ultimate debt ownership supply a demand-side distribution mechanism beyond jobs, while the historical financing estimates do not establish automation causation or a current official saving series.

137 **China manufacturing employment and labor intensity** 716
Mixed evidence; bounded census checkpoints · 2013, 2018, and 2023 economic censuses; separate 2025 robot installations
China provides an important global test of manufacturing labor compression, but its reported employment path includes an early contraction and a later plateau rather than an uninterrupted decline.

138 **Global labor underutilization and the jobs gap** 721
Mixed evidence; global outcome measures with competing causal accounts · ILO modelled estimates and country surveys; 2024 estimate and 2026 forecast kept separate
The world contains substantial unmet demand for paid work and widespread inadequate employment, but neither level alone identifies automation as its cause or establishes an uninterrupted secular deterioration.

139 **Long-run annual and lifetime paid work** 726
Secular historical evidence; changing statistical coverage and uneven national paths · Annual-hours reconstruction 1870–2000; UK lifetime estimates 1856–1981; modern OECD monitoring kept separate
Industrial history shows substantial reductions in paid working time, but shorter chosen schedules and involuntary exclusion have different meanings and cannot be inferred from the same average.

140 **Hours and employment decomposition** 731
Proposed metric; channel-switch hypothesis untested · Historical reconstruction to be built from comparable household microdata; no verified break date
Hours per person can change through schedules and employment rates; the proposed shift from shared shorter hours toward concentrated nonemployment requires a direct subgroup decomposition and separate causal tests.

CHAPTER 001

Prime age male labor force participation

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN 1948 to 2025 verified annual history with September 2026 release context

Prime age male participation shows a substantial long run decline that predates contemporary AI and survives removal of retirement age populations.

Definition and population boundary

Prime age male labor force participation is the percentage of civilian noninstitutional men ages 25 through 54 who are either employed or unemployed under the Current Population Survey definitions. Its numerator combines working men and men who meet the unemployment criteria. Its denominator includes everyone in that age and sex population who lives outside institutions and is outside active military service. The result is a population attachment rate, expressed in percent. A man searching for employment remains a participant; a man who stops searching generally leaves the numerator. [1]

Restricting attention to prime ages removes most retirement and full time schooling effects that dominate some all age statistics. It does not remove every age effect: the proportions aged 25 to 34 and 45 to 54 can still change. Nor does the restriction imply that every person is medically able to work. Disability, caregiving, illness, education and family circumstances remain relevant within this population. The demographic boundary makes the measure a cleaner starting point, rather than a complete diagnosis of why men withdraw.

Participation differs from employment to population. A recession can shift men from employment into unemployment without initially changing participation. If prolonged difficulty finding a job subsequently leads them to stop searching, participation then falls. These are economically different stages. The participation measure is useful precisely because it can register a loss of attachment after an unemployment episode has ended statistically. The measurement requires keeping employment, unemployment and nonparticipation distinct rather than treating every person outside employment as the same condition. [1]

The count is person based. Two jobs do not produce two participants, and self employment counts as employment. Paid hours, earnings, job stability and whether work fully uses a person's abilities do not determine inclusion. Someone with one hour of qualifying paid work during the survey reference week can count as employed. Consequently, a high participation rate can coexist with poor job quality, while a lower rate can coexist with relatively secure employment for those who remain. The indicator addresses access and attachment, with other chapters supplying intensity and quality.

For a reproducible monitor, use annual averages for the secular chart and seasonally adjusted monthly estimates for recent movements. Publish the precise age interval and population exclusions in the caption. A series for all men aged 16 and older is a different metric, because its denominator changes markedly as society ages. Historical checkpoints below come from a verified BLS annual table rather than a mixture of monthly extrema and annual means. [2]

Long run history and current endpoint

The BLS historical table places prime age male participation at 96.6 percent in 1948, 97.4 percent in several mid 1950s years, 87.9 percent in 2020 and 89.1 percent in 2023. The rise after the pandemic low demonstrates that the long decline contains recoveries. A claim that participation has declined in every year would therefore be inaccurate. The historically important comparison is the distance between strong labor markets separated by decades, together with the trajectory across intervening expansions. [2]

Using the mid 1950s annual high of 97.4 percent and the 2023 annual rate of 89.1 percent gives an 8.3 percentage point decline. This is a subtraction of rates, not an 8.3 percent contraction in the number of participating men. Population growth can raise the number of male participants while the fraction participating declines. Expressing the change as percentage points preserves the distinction between a changing attachment probability and a changing national headcount. [2]

The Council of Economic Advisers investigated this decline using evidence available through May 2016. Its analysis emphasized the concentration among less educated men and patterns across cohorts, while considering labor demand, disability and institutional explanations. The report also compared the United States with other advanced economies. Its historical endpoint should remain visible: an analysis published in 2016 cannot by itself verify conditions in 2026. The report is a source for mechanism and comparison, while BLS supplies subsequent observations. [3]

The education gradient provides a more specific historical test. In the CEA analysis, participation among prime age college educated men moved from 98 percent in 1964 to 94 percent in 2015; for men with a high school education or less it moved from 97 to 83 percent. Rising educational attainment should have raised overall participation by 2.5 percentage points if education specific rates had stayed fixed. Instead, participation fell by 9.0 points over that comparison. This decomposition shows that an increasingly educated population did not offset declining attachment within education groups. It is more informative than attributing the aggregate decline to a growing low education population. The results end in 2015 and are rounded historical estimates. [3] They are consistent with weaker opportunities for less educated men, while health, family circumstances, incarceration and changing selection into education can also affect the same groups. A shift-share result controls the changing educational weights; it does not isolate automation or prove that each nonparticipant lacks an economically valuable role.

The latest annual table reports prime age male participation of 89.4 percent in 2025, compared with 89.1 percent in the 2023 historical report. The 2025 estimate is an eleven month average because October data were not collected during the federal government shutdown. BLS warns that it is not strictly comparable with ordinary annual averages. The September 2026 Employment Situation was released on 2 October, providing the latest monthly context. The verified 2025 annual update confirms a continuing large distance from the mid century participation high, while preserving the recent recovery and the missing month caveat. [4][5]

A compelling chart should show enough years to expose the change in the baseline, the business cycle and the recent rebound. Highlighting only the pandemic would obscure the preexisting decline; stopping at the recession trough would exaggerate its permanence. Conversely, starting in the early 2010s can make a multidecade withdrawal look like a recovery story alone. The full series permits both observations to be true: an enduring lower attachment level relative to the mid twentieth century and meaningful cyclical recoveries within that lower level.

Observation	Prime age male participation annual average
1948	96.6 percent
Mid 1950s high	97.4 percent
2020	87.9 percent
2023	89.1 percent
2025 eleven month average	89.4 percent

BLS ages 25 to 54 civilian noninstitutional men annual averages through 2023 [2]; 2025 excludes October and is not strictly comparable [5]

Connection to labor market compression

The most relevant economic mechanism is declining access to work at a wage and set of conditions that makes participation worthwhile. Automation can reduce demand for the routine tasks once performed in manufacturing, clerical occupations and other established career pathways. A worker might respond by accepting a lower paid role, searching longer, retraining, relying on family support or leaving active search. Participation captures only the last part of that adjustment. It can therefore support a compression account without measuring all its stages or assigning their causes.

The important comparison is between productive capacity and the terms on which human effort can access it. Imagine a locality where factory output rises while the number of stable openings falls. Some former workers take service jobs, some remain unemployed and others stop searching. A falling participation rate records reduced attachment among the final group. The factory's growing output would provide a separate production measure. Combining the two is analytically stronger than using participation alone because it joins the opportunity outcome with a potential source of reduced labor intensity.

Withdrawal can also depress measured unemployment. If a hypothetical labor force contains ninety participants, of whom five are unemployed, unemployment is five divided by ninety. If two unemployed people stop actively searching, the unemployment numerator and denominator both shrink. Participation falls even though no new employment was created. This arithmetic explains why a labor attachment measure belongs in the reference set. It is an illustration of classification, not an estimate of the historical contribution of withdrawal to any reported unemployment rate. [1]

Household institutions affect the response to reduced labor demand. A man with a working spouse, family assets or benefit income may be able to stop searching after persistent disappointment. Another facing the same labor market may accept almost any available job because the household lacks alternatives. The first person changes participation; the second changes job quality. A divergence in observed participation can therefore reflect differences in economic support as well as differences in opportunities. Household resources belong beside occupational and educational breakdowns in serious interpretation.

The post labor contribution is strongest when withdrawal is persistent within prime ages, concentrated among groups whose former tasks were displaced, and associated with growing output or productivity rather than collapse of the entire local economy. This combination describes weaker dependence of production on their labor and weaker access to prosperity through work. The series alone establishes a secular attachment change. Evidence connecting that change specifically to automation requires additional comparisons, task

exposure measures or identified studies that distinguish technological displacement from trade and other causes.

Competing explanations and stronger tests

Several alternatives deserve concrete treatment. Poor health can reduce work capacity independently of automation. Changes in incarceration can affect both labor market outcomes after release and who appears in the survey population while institutionalized. Family structure and caregiving alter the opportunity cost of employment. Geographic immobility can prevent people from reaching available jobs. Education changes the composition of the prime age male population. These mechanisms can coexist with weaker demand and can influence the magnitude of withdrawal rather than replacing it with a single explanation.

A retirement explanation becomes less persuasive for this specific measure because the population stops at age 54. An internal aging explanation remains testable. Calculate participation within narrower five or ten year age groups, then recombine them using fixed population weights. If the decline persists under fixed weights, movement among prime age age bands cannot explain the whole result. This is a standardization exercise with observed subgroup rates; it must not be labeled a causal estimate of automation merely because it removes one composition effect.

Education comparisons need similar care. The proportion without a college degree changes over time, and the remaining group may differ in health, geography and other characteristics. Showing a fall within each education category is informative, but it does not establish that otherwise identical people experienced the same change. A stronger design can follow cohorts, compare local exposure to displaced tasks, and examine whether subsequent work restores employment, earnings and hours. Participation should then be one outcome alongside the worker's wider trajectory.

Labor supply can respond positively to better opportunities. An extended expansion may draw men back into active participation, showing that some apparently permanent withdrawal was reversible. Such a rebound would weaken a claim of uniformly worsening access in that period, while leaving the older secular decline intact. Sustained recovery toward previous expansion highs would be stronger counterevidence. A reference document should preserve that possibility instead of defining any increase as a temporary exception before examining its duration and breadth.

International comparisons provide another test. Advanced economies share many technologies but differ in disability systems, labor institutions, training, health provision and employment policies. Divergent participation trends suggest that technology is filtered through institutions. Matching age boundaries, population exclusions and survey definitions is essential before comparing levels. The useful question is which countries retain attachment under comparable productivity advances, and whether their policies preserve employment access, redistribute hours or support transitions more effectively. The CEA analysis provides a historical starting point for that comparison. [3]

Chart construction and monitoring practice

Build the main chart from annual CPS averages beginning in the 1950s or earlier verified years. Use a percentage axis, label ages 25 to 54 explicitly, and retain recession periods only as contextual shading. Add a separate recent panel containing monthly seasonally adjusted observations and a trailing twelve month

average. Display a missing month as missing. Population control adjustments and historical revisions should be recorded in a source note, with the retrieval date attached to the downloadable data file. [2][4]

Keep the original rates and calculation code with the chart. Record whether each point is a monthly observation, calendar year average or pooled estimate. For change statements, calculate percentage point differences directly. A supplementary panel can show employed men, unemployed men and men outside the labor force as shares of the same prime age population. Those three shares sum to the population total and reveal whether falling participation reflects movement out of unemployment, employment or both. [1]

Review this metric quarterly for changes in the recent direction and annually for the secular assessment. Compare successive strong labor market periods rather than treating every twelve month movement as structural. Pair the result with prime age employment to population, earnings by education, long unemployment spells and local task displacement. Add household income and transfer measures when interpreting the ability to withdraw. The resulting evidence connects attachment, opportunity quality and economic support without asking any single series to carry the entire explanation.

The retained classification is secular evidence of reduced male labor attachment. Its causal attribution remains a separate research question. The indicator earns a place because its long history is clear and economically consequential, while its narrow demographic boundary removes the most obvious retirement distortion. It should be updated with recoveries intact and used alongside positive labor outcomes so that the framework records the actual balance of evidence.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Concepts and Definitions CPS. Employment labor force and civilian noninstitutional population definitions; verified retrieval date 4 October 2026

[2] Bureau of Labor Statistics (2025). Women in the labor force 2023 women and workplace flexibilities. Historical tables contain both sexes and prime age participation from 1948 to 2023; verified retrieval date 4 October 2026

[3] Council of Economic Advisers (2016). The Long Term Decline in Prime Age Male Labor Force Participation. Historical analysis through May 2016; verified retrieval date 4 October 2026

[4] Bureau of Labor Statistics (2026). The Employment Situation September 2026. Released 2 October 2026 household tables and population control notes; verified retrieval date 4 October 2026

[5] Bureau of Labor Statistics (2026). Employment status of the civilian noninstitutional population by age sex and race. Annual table 3 updated 20 February 2026; 2025 estimates are eleven month averages excluding October and not strictly comparable with other annual averages; verified retrieval date 4 October 2026

RELATED CHAPTERS 003 · 004 · 008 · 014

CHAPTER 002

Female labor force participation

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN 1948 to 2025 annual history and September 2026 monthly observation

The end of mass female entry is a secular labor supply change while rising prime age participation contradicts a universal female withdrawal story.

Definition and two necessary age boundaries

Female labor force participation measures the fraction of civilian noninstitutional women who are working or meet the survey definition of unemployment. The standard all age measure begins at age 16. A prime age version restricts both numerator and denominator to ages 25 through 54. Both are percentages of their relevant population rather than percentages of all jobs. Changes in the number of jobs held, hours worked and pay do not enter the rate directly. The Current Population Survey counts a woman once even when she holds multiple jobs. [1]

These age boundaries answer different questions. The all age series describes how much of the adult female population supplies or actively seeks labor. Its evolution incorporates the number of women reaching retirement ages, changes in schooling and changes in behavior within each age group. The prime age series is more closely connected to working age attachment. Using an all age decline as evidence that prime age women are increasingly excluded from employment can therefore produce a wrong inference even when the all age observation is correct.

The historical issue is the exhaustion of a large expansion in participation. During much of the twentieth century, women entered paid employment from a lower initial baseline. That created an additional source of labor force growth even as male attachment weakened. Once participation approached a plateau, that positive contribution could no longer continue at its previous pace. A slower increase is a change in the growth contribution; it does not require a fall in the level. The distinction between a level, a growth rate and a contribution is central to this chapter.

Unpaid household work is outside the employment numerator. A woman performing substantial childcare, eldercare or domestic production may be classified outside the labor force despite doing economically useful work. When that activity moves into paid childcare or home care, survey participation can rise even if the total amount of socially useful work changes little. This boundary matters for a post labor argument about economic production: measured labor attachment partly reflects whether useful activity is purchased through the market. [1]

The practical metric is a paired dashboard rather than one line. Show all age participation, prime age participation and the age composition of the female population. Add employed women as a share of the same populations when measuring actual employment. The dashboard distinguishes women becoming more integrated into paid work from the aggregate consequences of an aging population. It also provides a direct check on any claim that the female employment expansion ended in every demographic group.

Long history and the prime age counterexample

The BLS annual historical table shows all age female participation rising from 32.7 percent in 1948 to 60.0 percent in 1999. It stood at 56.7 percent in 2015, 57.4 percent in 2019 and 57.3 percent in 2023. The rise before the millennium is much larger than subsequent movements around the plateau. These observations support an end to the earlier expansion in the all age rate across more than twenty years. They do not establish that demand for women's labor declined by the same magnitude. [2]

The prime age history is different. Female participation at ages 25 to 54 was 35.0 percent in 1948, 76.8 percent in 1999 and 77.4 percent in 2023. The final annual observation was a series high in the cited BLS report. This is material counterevidence to a generalized withdrawal argument. Prime age women can reach a new participation high while the all age female rate remains below its earlier maximum because older women occupy a larger share of the population. [2]

The latest annual table reports all age female participation of 57.3 percent and prime age female participation of 77.8 percent in 2025. These are eleven month averages excluding October, whose household data were not collected during the federal government shutdown; BLS cautions against strict comparison with other annual averages. The current monthly release reports all age female participation of 56.7 percent in September 2026, seasonally adjusted. Neither the missing month annual value nor the current all age monthly value should replace the historical prime age series without a visible frequency and population label. The updated prime age observation reinforces the counterexample to generalized female withdrawal. [4][5]

The accompanying employment ratios also demonstrate the importance of distinguishing participation from employment. All age female employment to population was 31.3 percent in 1948, reached 57.5 percent in 2000, fell to 51.5 percent during 2020 and recovered to 55.4 percent in 2023. Participation includes unemployment, while the employment ratio includes working people alone. Their gap can widen in a recession without implying that women permanently abandoned paid work. [2]

The BLS analysis of labor force growth published in 2020 describes female entry and population aging as major historical forces. Its observed history ends in 2018; later dates in that publication are projections. Those projections should remain forecasts when reproduced. A secular research record becomes less reliable if older projected observations are silently substituted for subsequently measured outcomes. Historical explanation and updated monitoring can use different sources while remaining part of a consistent narrative. [3]

Annual observation	Women age 16 and over participation	Women age 25 to 54 participation
1948	32.7 percent	35.0 percent
1999	60.0 percent	76.8 percent
2023	57.3 percent	77.4 percent
2025 eleven month average	57.3 percent	77.8 percent

BLS female annual averages within the stated age populations through 2023 [2]; 2025 excludes October and is not strictly comparable [5]

What the plateau contributes to post labor analysis

The plateau matters first as an accounting change. A growing share of women in paid work previously increased aggregate labor input and helped offset declining male attachment. When that share stabilizes,

future labor force growth depends more heavily on population growth, immigration, later retirement and changes in other groups. Slower labor force growth can coexist with rising output if productivity increases. That combination concerns the relationship between production and aggregate labor input, although it does not by itself show exclusion or worsening job quality.

An exhausted entry margin also changes the interpretation of earlier employment gains. Suppose, purely as an illustration, a population of one hundred working age adults initially includes sixty participants, then receives ten additional female participants while five men leave. Aggregate participation rises by five people. The aggregate increase conceals deterioration in one group and substantial improvement in another. Once the additional entry ceases, the same male withdrawal becomes visible in the aggregate. The arithmetic illustrates offsetting contributions without assigning a numerical historical share to them.

The end of mass entry can affect household dependence on employment. Earlier growth in two earner households may have helped families sustain living standards despite weak individual wage growth. If a household already has two earners, adding another earner is usually a limited adjustment margin. Subsequent increases in household income may require higher pay, more hours, better jobs, asset income or transfers. This is a possible bridge to post labor distribution: the expansion of labor supply within households can reach practical constraints even when working remains essential.

Care responsibilities make those constraints uneven. A household with affordable childcare and predictable schedules can respond to employment opportunities differently from one facing high care costs or unstable shifts. A participation increase after an improvement in care provision would indicate that institutional constraints previously suppressed labor supply. A decline after deteriorating care access could look like labor market withdrawal without resulting from automation. The mechanism should be investigated through parenthood, age of children, hours, wages and the cost of care rather than inferred from the aggregate line.

For the post labor framework, female participation is therefore an accounting and diagnostic metric with a mixed interpretation. The all age plateau supports the proposition that a major historical source of additional labor supply has diminished. The prime age high shows continued capacity for paid work to attract women. Together they improve the explanation of aggregate trends. Neither justifies a universal story in which automation progressively removes women from employment, and the positive prime age evidence should remain visible in any presentation.

Composition institutions and alternative readings

Population aging offers a direct competing explanation for the all age decline. Older women participate less on average than prime age women, so increasing their population weight lowers the aggregate even if every age specific participation rate is stable. Calculate a fixed weight rate using a chosen base year's age shares. Compare that standardized series with the observed aggregate. Their difference describes the contribution of changing age composition under the stated formula; it does not measure an economic cause of the within age movements.

Cohorts can differ from contemporaneous age groups. Women who entered professional careers earlier in life may work longer at older ages than preceding cohorts, raising older participation while the society still ages. Cross sectional data can identify the age pattern, but repeated cohort comparisons help distinguish life cycle behavior from generational changes. A fixed age boundary alone cannot resolve this issue. The series

should be accompanied by rates for narrower age intervals when the question concerns the timing of retirement or changing career attachment.

Institutional explanations include paid leave, discrimination, childcare access, flexibility and the treatment of part time employment. These institutions affect whether a household can convert willingness to work into participation. They also shape whether the available employment is financially attractive after work related costs. The all age participation measure does not observe any of these costs. It is especially weak as a direct indicator of women's bargaining power because a household may increase participation precisely when individual wages are insufficient.

A historical international comparison illustrates that the participation margin also depends on policy. Blau and Kahn compare 22 OECD countries between 1990 and 2010. The United States moved from sixth to seventeenth in female participation rank. Their estimates attribute 29 percent of the relative decline to the expansion of parental leave and part time work entitlements elsewhere. The same policies were associated with more part time work and employment in lower level positions, while US women were more likely to hold full time jobs and managerial or professional roles. [6] The finding supplies a twenty year institutional comparison, rather than an updated ranking through 2026 or proof of a policy effect on every woman. It also changes the meaning of exhaustion: the earlier mass entry contribution can diminish without implying that every feasible participation gain has been used. Better care arrangements or employment design can attract additional workers. Compare participation, paid hours, occupational access and earnings together before interpreting a policy that increases attachment as an equivalent increase in accessible good jobs.

Changes in educational attainment can improve women's employment opportunities. A rising average rate may conceal weakness among women with less education, while improving outcomes in one occupation may offset losses in another. Educational comparisons should retain stable definitions and consider changing selection into degrees. The useful test is whether within group employment, pay and hours move together, particularly for groups exposed to routine task substitution. Participation alone can improve alongside deterioration in some job characteristics.

The interpretation would strengthen if age adjusted participation and employment deteriorated persistently in healthy prime age groups while productivity and output continued growing, and if job access rather than care constraints explained the change. It would weaken if within age rates improved broadly, employment grew in accessible occupations and household choice explained lower participation. International comparisons can help identify institutional possibilities, provided they match age intervals and population coverage. The appropriate conclusion depends on that wider evidence, with the historical plateau retained as a factual accounting result.

Reproduction and monitoring

Construct a long annual chart from the BLS historical table, preserving all age and prime age women as separate lines. A second panel can show men on identical age boundaries. Avoid combining an all age female line with a prime age male line without an explicit reason. Use percentage points for changes and annotate the female all age plateau around the turn of the century. Include the prime age record in the chart so that recent improvement is immediately assessable. [2]

Download current CPS estimates and store the source vintage. Record monthly seasonally adjusted observations separately from annual averages, and note population control changes. The September 2026

release supplies the current all age checkpoint; the annual history and its prime age observations use the earlier BLS report. A later update should refresh both boundaries from verified series rather than extending one from the other. [2][4]

For a decomposition, retain age group population counts and participation rates. Multiply each group's rate by fixed base year weights to obtain the standardized line. Publish the base year and age intervals, and check that observed population weights sum to one. A separate table can report changes in age composition, within group behavior and their interaction. This makes the aggregate plateau interpretable without forcing one explanation on it.

Review yearly alongside prime age employment, household earnings, childcare constraints and male participation. The series serves as mixed evidence: the historical mass entry margin has flattened, while prime age attachment has strengthened. That combination helps identify where aggregate labor supply changes originate and prevents demographic change from being mistaken for a universal shortage of work.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Concepts and Definitions CPS. Participation and civilian noninstitutional population definitions; verified retrieval date 4 October 2026

[2] Bureau of Labor Statistics (2025). Women in the labor force 2023 women and workplace flexibilities. Historical annual participation and employment tables 1948 to 2023; verified retrieval date 4 October 2026

[3] Bureau of Labor Statistics (2020). How Women and Aging Affect Trends in Labor Force Growth. Historical observations through 2018 future years in this publication are projections; verified retrieval date 4 October 2026

[4] Bureau of Labor Statistics (2026). The Employment Situation September 2026. Released 2 October 2026 table A1 seasonally adjusted estimates; verified retrieval date 4 October 2026

[5] Bureau of Labor Statistics (2026). Employment status of the civilian noninstitutional population by age sex and race. Annual table 3 updated 20 February 2026; 2025 estimates are eleven month averages excluding October and not strictly comparable with other annual averages; verified retrieval date 4 October 2026

[6] Francine D. Blau and Lawrence M. Kahn (2013). Female Labor Supply: Why Is the United States Falling Behind?. Original twenty year OECD comparison, 1990–2010; policy estimates concern relative participation and associated employment tradeoffs. Verified for version two 4 October 2026.

RELATED CHAPTERS 001 · 003 · 004 · 008

CHAPTER 003

Overall participation and population aging

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN 1970 to 2018 annual historical checkpoints and September 2026 monthly observation

Aggregate participation has declined for more than two decades but aging and the end of mass female entry prevent a direct automation interpretation.

Aggregate participation and its population denominator

Overall labor force participation is the civilian labor force divided by the civilian noninstitutional population aged 16 and older. The labor force includes employed people and unemployed people meeting the Current Population Survey criteria. The denominator includes retirees, students, caregivers and people with health limitations when they otherwise meet the population definition. Active military personnel and people living in institutions are excluded. The rate is expressed as a percentage and measures attachment to the paid labor market across a broad population. [1]

The broad denominator is valuable for understanding the population's relationship with work, but it introduces demographic sensitivity. A country in which a larger share of adults is retired can have lower participation even when employment opportunities for working age people improve. The aggregate rate therefore belongs in the reference collection with its age composition shown. Its interpretation requires separating changes in who is in the population from changes in the behavior and opportunities of people within age groups.

The aggregate can be written as a weighted average of age specific participation rates. Each group's weight is its share of the adult civilian noninstitutional population. If low participation groups gain population weight, the overall rate falls even with unchanged subgroup rates. Conversely, improved participation among older adults can partly offset an aging population. These processes are simultaneous. Describing population aging as a cause does not imply that older people are individually working less; the population composition and within group behavior can move in opposing directions.

The labor force headcount is a different outcome. A falling participation rate with sufficiently strong population growth can still produce an expanding labor force. Slow payroll growth can also reflect slow labor supply growth rather than weak demand for every available worker. A monitor should therefore retain the adult population, labor force and participation rate together. This permits the reader to distinguish a shrinking fraction from a shrinking number, and to calculate how demographic change affects the amount of hiring needed to sustain employment conditions.

Participation also differs from total paid labor input. A worker counts once regardless of weekly hours, so the same participation rate can accompany a shorter workweek or more intensive schedules. The aggregate cannot show whether production requires fewer hours per unit of output. Its role is to describe broad

attachment and help interpret employment growth. Productivity, hours per capita and job quality measures provide additional information about the economic significance of that attachment. [1]

The rise peak and subsequent decline

The BLS historical analysis reports annual aggregate participation of 60.4 percent in 1970 and 67.1 percent during the peak years from 1997 through 2000. By 2018 it was 62.9 percent. The high plateau around the millennium and lower subsequent rate provide a historical change spanning more than twenty years when connected to the current series. The trajectory includes recessions and recoveries; it should be displayed as a full history rather than a straight line between selected dates. [3]

The September 2026 Employment Situation reports participation of 61.8 percent, seasonally adjusted, with a civilian noninstitutional population of 275.554 million and a labor force of 170.262 million. These are observations for the reference month, released on 2 October. The published population is not seasonally adjusted, while the labor force estimate is adjusted. A small discrepancy between a ratio calculated from rounded displayed levels and the displayed rate can result from rounding and the production of the estimates. [4]

The BLS growth analysis highlights the importance of age composition. Between 2008 and 2018, the population aged 65 and older grew much faster than the population aged 16 to 54. Yet participation among people aged 65 and older increased from 11.5 percent in 1988 to 19.6 percent in 2018. Thus a demographic drag on overall participation occurred alongside increased labor attachment among older people. This is a useful empirical demonstration of why the aggregate rate cannot be read as a uniform change in individual behavior. [3]

Female participation supplied another major historical contribution. Its long expansion raised aggregate participation even as prime age male attachment declined. Once the all age female rate flattened around the turn of the century, that upward contribution weakened. The aggregate transition therefore combines at least two large population processes with business cycle effects and changes within demographic groups. A claim that its entire decline directly measures technological displacement would exceed what the statistic identifies. [2][3]

The Federal Reserve's April 2026 analysis links aging and immigration scenarios to slower potential labor force growth and lower breakeven hiring. Its projections are conditional, rather than observations of the full 2026 year. The analytical lesson is that a smaller monthly payroll gain can be consistent with stable employment conditions when labor supply grows more slowly. Current hiring must be evaluated against population and participation changes rather than a fixed historical threshold. [5]

Observation and frequency	Aggregate participation
1970 annual average	60.4 percent
1997 to 2000 annual peak	67.1 percent
2018 annual average	62.9 percent
September 2026 monthly seasonally adjusted	61.8 percent

Age 16 and over civilian noninstitutional population annual history [3] and latest monthly release [4]

Population accounting and the post labor connection

The aggregate decline can support a post labor analysis of how much of the population participates in paid work, particularly when output and living standards continue expanding. An economy can produce more with a smaller participating fraction through productivity growth, capital deepening, technological improvement and changes in the composition of production. That relationship is economically meaningful even if demographic aging drives much of the attachment decline. It describes a lower aggregate labor requirement relative to the adult population without establishing that willing prime age workers lost opportunities.

Aging changes the distribution problem. More households can receive income through pensions, social insurance and accumulated assets while supplying fewer paid hours. The relationship between work performed today and consumption supported today becomes mediated by intergenerational transfers and prior saving. This development may strengthen the importance of institutions distributing production beyond current wages. It should be connected to transfer dependence with careful categories: an earned pension, a means tested benefit and asset withdrawals have different economic meanings.

Demography can also create labor shortages, particularly in services whose demand rises with aging. Health and care work may expand while the aggregate participating fraction falls. A shortage of caregivers would complicate any generalized claim that automation leaves fewer useful tasks. The appropriate question is whether productivity growth elsewhere supports those services, whether wages attract workers and whether households can afford access. The aggregate participation line provides the demographic setting but cannot settle those sectoral questions.

The change in labor supply growth affects the interpretation of weak job creation. Imagine a hypothetical economy where the labor force grows by ten thousand people each month rather than one hundred thousand. Employment growth of thirty thousand could improve employment conditions in the first setting while weakening them in the second. This is accounting, not a forecast. The example explains why slow payroll growth should be paired with labor supply estimates before being classified as evidence of fewer opportunities.

The stronger post labor claim concerns reduced access to prosperity through paid work under continued productive abundance. To assess that claim, separate the part of aggregate participation explained by age weights from the remaining within group movements. Then examine prime age employment, typical pay, hours and the distribution of gains. A demographic explanation and a distributional concern can coexist. The reference should maintain both rather than attributing aging to automation or assuming that an explained aggregate decline has no economic consequences.

A reproducible composition test

A transparent decomposition begins with observed population shares and participation rates for a common set of age groups. Hold the shares fixed at a selected base year and allow each group's participation rate to vary. This standardized rate asks what aggregate participation would have been under the chosen historical age composition. Compare it with the actual aggregate. The choice of base year changes the answer's reference point, so report it explicitly and test whether a nearby base year alters the broad conclusion.

A second calculation holds participation rates fixed and lets age shares change. It isolates the demographic contribution under those initial rates. The two components may leave an interaction term because both weights and rates move. Allocate that interaction symmetrically or show it separately, documenting the choice. Avoid describing the standardized residual as automation. It contains health, education, care provision, retirement decisions, immigration composition and labor demand effects in addition to any technological channel.

Population controls require attention. The CPS periodically incorporates updated estimates of the population, including revisions reflecting immigration and census information. Such revisions can change level estimates and measured month to month growth. Published historical series are not always revised in the same way as current population controls. A chart should mark important breaks and avoid interpreting a January population adjustment as a sudden economic decision by millions of people. The latest Employment Situation explains the control treatment in its technical notes. [4]

Immigration affects both the size and composition of potential labor supply. Newly arriving adults may have different age distributions and participation rates from the existing population. Aggregate aging and immigration can offset each other in some periods. A model using a single population growth number may miss that interaction. The Federal Reserve's 2026 note illustrates the sensitivity of labor force growth and breakeven hiring to assumptions about these flows; its scenario estimates should remain identified as scenarios. [5]

Evidence of labor market compression would strengthen if a falling age standardized rate persisted through strong labor markets and aligned with declining prime age employment or deteriorating job quality. It would weaken if the standardized rate rose, prime age outcomes improved and the aggregate decline followed retirement composition. Either result is informative. The measure's mixed classification preserves a clear secular aggregate fact while keeping its mechanisms open to direct empirical examination.

Chart specification and review schedule

Show annual aggregate participation over at least the period from 1970 to the latest verified year. Pair it with a standardized age composition line and a prime age line. Use the same percentage scale where practical, and label the population boundaries. A small composition panel can display adult population shares for younger, prime age and older groups. This arrangement makes the sources of the aggregate movement assessable without requiring readers to infer them from a paragraph.

Store population counts, labor force counts, group participation rates and the fixed weights used in every calculation. Retain the original downloaded series with its vintage. Keep the latest monthly seasonally adjusted observation separate from the annual chart until a complete annual average is available. Do not substitute projected years from the 2020 BLS publication for observed data. Cite that report for historical interpretation and current CPS releases for subsequent measurements. [3][4]

Monitor aggregate and prime age participation monthly, but revise the secular assessment annually after evaluating population controls and composition. Track the labor force growth rate when interpreting payroll gains. Immigration assumptions and retirement trends can change the breakeven hiring benchmark, making a static threshold inappropriate. Forecasts should be presented in a separate panel with their publication date and stated assumptions. [5]

This entry contributes mixed evidence. More than two decades of lower aggregate participation are real, and they reshape the relationship between current work and income distribution. Aging and the end of female entry account for important parts of that history. The post labor interpretation gains precision when those population changes are shown explicitly and remaining labor demand or job quality effects are measured with the corresponding chapters.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Concepts and Definitions CPS. Participation and civilian noninstitutional population definitions; verified retrieval date 4 October 2026

[2] Bureau of Labor Statistics (2025). Women in the labor force 2023 women and workplace flexibilities. Historical annual participation and employment tables 1948 to 2023; verified retrieval date 4 October 2026

[3] Bureau of Labor Statistics (2020). How Women and Aging Affect Trends in Labor Force Growth. Historical observations through 2018 future years in this publication are projections; verified retrieval date 4 October 2026

[4] Bureau of Labor Statistics (2026). The Employment Situation September 2026. Released 2 October 2026 table A1 seasonally adjusted estimates; verified retrieval date 4 October 2026

[5] Federal Reserve Board (2026). Labor force growth breakeven employment and potential GDP growth. Published 2 April 2026 historical analysis and explicitly conditional 2026 scenarios; verified retrieval date 4 October 2026

RELATED CHAPTERS 001 · 002 · 004 · 007 · 013

CHAPTER 004

Prime age employment to population ratio

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN 1948 to September 2026 monthly series

Prime age employment remains below the 2000 high but its substantial recoveries and recent strong levels limit a generalized secular job scarcity claim.

Definition and connection to participation

The prime age employment to population ratio is the number of employed civilian noninstitutional people aged 25 through 54 divided by the entire civilian noninstitutional population in that age range. The numerator includes wage and salary employment, qualifying self employment and other work counted by the Current Population Survey. The denominator includes employed people, unemployed people and people outside the labor force. The measure is expressed as a percentage of the prime age population and counts individuals rather than payroll positions. [1]

The age restriction removes most conventional retirement and teenage education effects. It also narrows the interpretation: people outside this interval still contribute substantial work, and their outcomes matter elsewhere. Within prime ages, illness, disability, caregiving and further study remain relevant. Internal age composition and educational attainment can change. The ratio is therefore a useful measure of realized employment access across a population with strong expected attachment, while further breakdowns help explain why some people remain outside employment.

Employment to population combines participation and unemployment. When all measures use consistent definitions, employment to population equals participation multiplied by one minus the unemployment rate expressed as a fraction. This identity clarifies possible movements. A participation increase can raise employment to population despite little change in unemployment. A decline in unemployment generated by withdrawal need not raise it. The ratio is consequently useful for checking whether changes in the headline unemployment rate coincide with more people actually working. [1]

The person based numerator gives no weight to how many hours each employed individual works. Someone with a short workweek and someone working extensive overtime each count as one employed person. Nor does the measure require a living wage, employer benefits, a stable schedule or a match with educational qualifications. A high ratio establishes widespread employment within the defined population. Separate hours, earnings and job quality measures are needed to evaluate what that employment provides.

Use the seasonally adjusted BLS monthly series LNS12300060 for recent monitoring. Its long history can be displayed through the Federal Reserve Bank of St Louis, which republishes BLS data. The source table identifies monthly frequency and percent units and currently ends in September 2026. A secular comparison should also use annual averages or averages around expansion peaks to reduce sensitivity to an unusually high or low single month. State every averaging choice beside the chart. [2]

A long history with large recoveries

The verified monthly series reached 81.9 percent in April 2000. It stood at 74.8 percent in December 2009 and again in November 2010 following the financial crisis. The ratio gradually recovered to 80.4 percent in December 2019, then fell to 69.6 percent in April 2020 during the pandemic disruption. By July 2023 it reached 80.9 percent. September 2026 was 80.7 percent. These checkpoints describe setbacks and recoveries across more than two decades rather than continuous deterioration. [2]

The September 2026 observation is 1.2 percentage points below the April 2000 checkpoint. It is also 11.1 percentage points above April 2020. Both calculations are simple differences between monthly rates in the same verified series. The first comparison suggests a lower level relative to the earlier high; the second demonstrates substantial recovery in employment absorption. A reference should include both because each addresses a different historical question. Selecting only the largest decline would conceal the subsequent restoration of employment. [2]

The very early history needs special interpretation. Female entry into paid work raised the combined prime age employment ratio over much of the postwar period. An increase in the combined measure could coexist with declining male employment because women's improvement offset it. Conversely, a flat combined series can conceal different male and female trends. The BLS women's historical report provides sex specific context and shows prime age female participation attaining a high in 2023. Sex specific employment ratios should accompany any claim about who experienced compression. [3]

The financial crisis and pandemic also illustrate the importance of recovery horizons. If a chart ends at a recession trough, it can suggest a permanent loss that later observations reverse. If it begins at that trough, it can suggest improving secular conditions while concealing a higher earlier expansion. Compare expansion averages separated by at least twenty years and keep the entire intervening path. This approach does not erase recessions; it identifies whether their effects persist after labor demand has had time to recover.

The latest Employment Situation was released on 2 October 2026 and reports the current overall employment to population ratio as 59.2 percent. That broad measure differs sharply from the prime age 80.7 percent because its denominator includes all adults aged 16 and older. The figures answer different population questions. Their divergence is another reason to label age boundaries explicitly and avoid replacing a prime age observation with the more prominent all age value in a news summary. [2][4]

Monthly observation	Prime age employment to population seasonally adjusted
April 2000	81.9 percent
December 2009	74.8 percent
December 2019	80.4 percent
April 2020	69.6 percent
July 2023	80.9 percent
September 2026	80.7 percent

BLS series LNS12300060 civilian noninstitutional population ages 25 to 54 [2]

Testing employment absorption under productivity growth

This ratio tests one important part of a post labor argument: whether the economy continues absorbing prime age people into paid employment. Automation can reduce labor requirements in particular tasks, but demand expansion and the creation of complementary tasks can restore employment elsewhere. A persistent fall in the population ratio would indicate that these compensating processes failed to employ the same fraction of prime age adults. A recovered ratio indicates that person based employment absorption remained substantial, although the quality and hours of the replacement work may have changed.

The distinction between productive labor input and employment headcount is critical. A hypothetical economy could double output while retaining the same number of employed people and reducing average hours. Its employment ratio would be unchanged, while hours per unit of output would fall substantially. Another economy could retain hours but shift income toward capital and high earners. Again, the employment ratio could remain stable. The measure therefore places a boundary on a headcount displacement claim while leaving labor intensity and distributional claims available for separate testing.

Compression can occur within a stable aggregate. If fewer well paid occupations are available, workers may move into lower paid roles while continuing to count as employed. University graduates can accept occupations that do not usually require a degree, potentially increasing competition faced by workers without degrees. Employment to population may show no deterioration. To investigate that mechanism, connect the ratio with occupation by education, underemployment, pay distributions and benefits. A high aggregate ratio should be acknowledged while examining whether prosperity is distributed through a narrower set of employment pathways.

The ratio can also respond to household necessity. More adults may seek and obtain work when a household's previous income sources become insufficient. A higher employment rate in that case represents successful labor absorption and potentially greater household strain. Evidence about hours, earnings and disposable income is required to determine which interpretation fits. The ratio itself records employment and should not be assigned a welfare meaning without those complementary outcomes.

Its strongest contribution is as a constraint on the theory. A framework that predicts an inexorable fall in prime age employment faces a substantial challenge from the recovery after 2020 and the high recent level. A framework focused on reduced labor intensity, unequal income distribution or crowding into less attractive work can remain consistent with those observations, but it must present the appropriate evidence. Keeping this chapter as mixed evidence encourages a more precise hypothesis and prevents job quality concerns from being represented as observed collapse in total employment.

Composition cyclical conditions and counterevidence

Business cycle conditions strongly affect prime age employment. Recessions reduce hiring and increase separations; expansions can bring people back into work over many years. A long span alone does not transform every movement into a secular trend. Compare levels during broadly similar labor demand conditions and inspect whether the recovery reaches preceding expansion levels. An endpoint difference of more than twenty years can be informative, but a small difference between two peak months should be tested against annual averages and sampling variation.

Changes in the prime age population can alter the aggregate ratio. The proportion aged 25 to 34 versus 45 to 54 varies, educational attainment changes, and migration affects the population. A fixed weight decomposition across age and sex groups helps distinguish composition from within group changes. Education standardization is useful but introduces selection questions because a degree category may represent a different share of the population over time. Both observed and standardized rates should be retained rather than presenting one as the uniquely correct measure.

Health and caregiving affect the fraction available for employment. Improving medical care can enable employment, while illness or disability can prevent it. Parents may reduce employment when childcare becomes less affordable, and adults may leave work to care for relatives. These circumstances represent real constraints on labor attachment, but their mechanisms differ from declining employer demand. Examine employment outcomes alongside reasons for nonparticipation and the timing of institutional changes before attributing a sustained decline to automation.

Survey measurement also matters. Population controls can introduce level changes, seasonal adjustments can revise recent history and the sample contains uncertainty. The financial crisis and pandemic involved exceptional shocks. A chart should preserve those observations, while interpretation should recognize their particular causes and the subsequent recovery. The CPS concepts documentation and monthly technical notes provide the relevant population and estimation boundaries. A source vintage note makes later revisions understandable. [1][4]

The compression interpretation would strengthen if employment fell within stable prime age groups over several expansions and was accompanied by declining accessible job quality, rising involuntary nonemployment and growing output. It would weaken if employment reached or exceeded earlier expansion levels with broadly improving hours and real pay. Different outcomes across education and geography could support a narrower distributional version. The present evidence supports retaining the measure as mixed rather than forcing a universal negative conclusion from the gap relative to one historical high.

Monitoring employment access

Plot the full monthly seasonally adjusted series from at least 1980 through September 2026, with a twelve month average as a second line. Add recession shading and label the 2000 high, financial crisis low, pandemic collapse and recovery. A separate panel should show men and women on the same age boundary. The chart's caption should say civilian noninstitutional population ages 25 to 54 and identify BLS series LNS12300060. [2]

Save the retrieved monthly observations and create annual averages from available months only when that treatment is appropriate and disclosed. A year missing a survey month should not silently be labeled a standard twelve month average. Retain the original vintage so revisions can be tracked. Calculate percentage point changes directly, and use expansion averages for the secular comparison rather than presenting a single volatile month as a permanent benchmark.

Review current employment absorption monthly and the secular comparison annually. Pair the series with participation, unemployment, involuntary part time work and earnings. If employment is high while underemployment or weak pay rises, investigate quality and allocation. If employment and participation both

fall, examine health, care responsibilities and labor demand before assigning causation. If employment improves across groups, retain that as counterevidence to generalized scarcity.

This measure is a core diagnostic because it places employed people over the entire relevant population. Its recent strength does not answer every distributional question, but it materially limits a claim that fewer prime age adults can find any employment. The post labor argument becomes more credible when it accepts that boundary and identifies the distinct trends in labor intensity, bargaining power and access to well paid work.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Concepts and Definitions CPS. Participation and civilian noninstitutional population definitions; verified retrieval date 4 October 2026

[2] Bureau of Labor Statistics via Federal Reserve Bank of St Louis (2026). Employment Population Ratio 25 to 54 Years LNS12300060. Monthly seasonally adjusted percent January 1948 to September 2026 updated 2 October 2026; verified retrieval date 4 October 2026

[3] Bureau of Labor Statistics (2025). Women in the labor force 2023 women and workplace flexibilities. Historical annual participation and employment tables 1948 to 2023; verified retrieval date 4 October 2026

[4] Bureau of Labor Statistics (2026). The Employment Situation September 2026. Released 2 October 2026 table A1 seasonally adjusted estimates; verified retrieval date 4 October 2026

RELATED CHAPTERS 001 · 002 · 003 · 005 · 010 · 015

CHAPTER 005

Productivity and typical compensation

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN 1948 Q1 to 2026 Q2 with principal comparison from 1979 Q4

Typical worker compensation has risen substantially more slowly than net productivity over several decades showing weaker transmission of productive gains through ordinary work.

The two series and what typical means

This metric compares the growth of economy wide output per hour with the growth of hourly compensation received by workers outside the managerial and supervisory categories used in the source series. The Economic Policy Institute tracker uses net productivity for the total economy and wages plus benefits for production and nonsupervisory workers in the private sector. Its latest verified version was updated on 14 September 2026 and ends in the second quarter of 2026. Typical here is a selected worker group average rather than the median compensation of every employed person. [1]

Labor productivity divides real output by labor hours. Net output subtracts depreciation, the resources required to replace capital that wears out or becomes obsolete. Gross output and net output are different concepts, particularly where capital replacement costs change. Hourly compensation divides labor compensation by the corresponding hours and includes benefits as well as cash wages. A chart should state all of these choices because changing them can alter the size of the displayed gap without changing the underlying observations. [2]

The series are growth indexes, so their starting values are normalized to a common number. Equal index values at the starting date do not imply that one hour of typical worker compensation initially equaled one hour of total output. Normalization compares subsequent growth rates. The gap asks whether compensation kept pace with the economy's productive capacity under the selected definitions. It should not be read as a literal dollar amount that every worker produced and was denied.

Typical and average compensation answer different distributional questions. If compensation grows rapidly among highly paid executives and specialists, economy wide mean compensation can rise while compensation for the broad production and nonsupervisory group grows less. A median measures the middle of a distribution and is less sensitive to very high values, but it requires a consistent underlying worker and hours definition. Keep these concepts separate when comparing sources. A label such as wages is incomplete when the displayed line includes employer benefit costs.

The inflation adjustment is another measurement choice. Workers purchase consumer goods and services, while productivity concerns the price of produced output. Different price indexes can generate divergence between purchasing power and output valued compensation. A rigorous monitor includes the original documented tracker and a matched sector comparison that uses an output deflator. This permits the reader to distinguish a distributional gap from the contribution of relative prices. The BLS industry analysis provides a concrete framework for that distinction. [3]

Verified history and growth calculations

The current EPI tracker reports net productivity growth of 93.7 percent and typical hourly compensation growth of 32.7 percent from the fourth quarter of 1979 through the second quarter of 2026. Productivity grew about 2.9 times as much over that interval. The tracker includes the entire historical path from 1948. These verified endpoint figures replace earlier versions ending in 2014, 2019 or 2024; values from those older versions should retain their own dates when reproduced. [1]

The endpoint comparison describes a large secular divergence across more than forty years. Compensation nevertheless increased in real terms. A statement that typical workers received no gain would contradict the reported 32.7 percent rise. The economically important result is that the gain was much smaller than the increase in net output per hour. Relative distribution and absolute purchasing power can move in different ways, so both must appear in the chapter's conclusion. [1]

An index example makes the comparison transparent. Starting both series at one hundred in the fourth quarter of 1979 gives endpoint indexes of 193.7 for productivity and 132.7 for compensation using the reported cumulative growth. Their difference is 61.0 index points. This is a difference between cumulative growth indexes, not a 61 percent fall in wages and not a dollar wage estimate. Dividing the compensation index by the productivity index gives about 0.685, indicating a lower compensation growth position relative to the common starting relationship. [1]

The longer chart should retain periods when typical compensation increased more quickly and intervals when purchasing power weakened. A secular gap can widen unevenly, and a period of stronger wage growth may narrow it without erasing the historical divergence. Using annual averages or a four quarter average helps separate persistent transmission changes from inflation shocks and quarterly noise. The raw observations remain necessary for replication; smoothing should be a visible analytical overlay rather than replacement data.

The BLS industry study adds an independent government source with a different scope. Over 1987 to 2015, productivity grew faster than consumer price adjusted average compensation in 83 percent of the 183 industries studied. That result concerns industry averages and gross production measures rather than the exact typical pay tracker. It supports the wider importance of examining productivity and compensation together, while its sector definitions and older observation endpoint prevent direct substitution into the EPI time series. [3]

1979 Q4 to 2026 Q2	Cumulative real growth	Index with 1979 Q4 equal to 100
Net total economy productivity	93.7 percent	193.7
Typical hourly compensation	32.7 percent	132.7

EPI original tracker production and nonsupervisory compensation wages plus benefits [1]

Transmission of productive gains through work

Productivity growth increases the amount of output supported by an hour of labor. It can arise from machines, software, better organization, worker skills, infrastructure and many other improvements. The growth creates room for higher compensation, shorter hours, lower prices, larger profits or expanded public resources. Which combination occurs depends on ownership, competition, bargaining institutions and public

policy. The metric evaluates one realized channel: how much typical compensation grew relative to the productive gains.

Automation is a plausible contributor because it changes which tasks require human effort and which workers retain scarce complementary skills. When a task becomes easier to reproduce with equipment or software, the worker's bargaining position may weaken even if total employment remains high. Gains may flow toward capital owners or toward employees who design, manage or complement the new systems. The productivity and typical pay comparison records the aggregate distributional outcome, while task specific evidence is needed to identify automation's contribution.

This is closely related to labor market compression. If more people compete for a limited set of well paid roles, employers may be able to expand output without increasing the compensation of the broader workforce at the same pace. Workers can remain employed in lower paying activities while the economy's productive capacity rises. A gap in growth is therefore compatible with high employment. The hypothesis should be tested against occupation, education, firm sorting and bargaining measures instead of being inferred mechanically from the two lines.

Labor institutions can affect transmission. Collective bargaining, wage floors, competitive recruitment and predictable promotion structures can link productive improvements to broad compensation gains. Outsourcing, fragmented employment relationships and limited mobility can weaken workers' access to a firm's gains. Changes in those institutions may explain part of the same divergence attributed to automation. They are economically important mechanisms in their own right, and evidence distinguishing them makes the post labor account more specific.

The metric also relates to transfer dependence. If market compensation grows slowly relative to national productive capacity, taxes and transfers may become more important for maintaining household living standards or broad access to consumption. That possibility does not follow automatically: lower consumer prices, more earners per household and accumulated wealth can provide other channels. Measure household resources and public support directly. The productivity pay gap supplies the distributional background for asking how households participate in growing abundance when typical work captures a smaller share of the improvement.

What the gap establishes and what remains open

Sector mismatch is the first limitation. Total economy productivity and compensation of a selected private worker group cover different populations and production. The broad comparison is intentionally distributional, but it is unsuitable for estimating a precise labor share from the ratio. A matched nonfarm business productivity and mean compensation comparison answers the aggregate factor distribution question more directly. The typical pay line adds the further question of which workers receive compensation gains.

Deflators require a separate explanation. Consumer prices determine how much a wage can purchase. Output prices determine the real value of production and the cost of compensation relative to it. If consumer prices rise faster than output prices, consumer purchasing power grows more slowly even under a stable labor share. This is a meaningful household outcome, but it does not all represent a transfer of the output share from labor to capital. The BLS analysis separates relative price movements from changes in labor's share. [3]

Benefit valuation also matters. Employer health insurance and retirement contributions count as compensation, yet their cost is not always experienced as immediately spendable household income. Rising medical costs can increase employer benefit spending without delivering proportionate improvement in care. A cash wage series and a total compensation series can therefore both be useful. Publish their definitions rather than choosing whichever gives the largest gap. The distinction helps explain household experience without treating benefit compensation as imaginary.

Causal interpretation needs additional evidence. Trade exposure, education, industry restructuring, bargaining institutions, monopoly profits and capital deepening can all affect the relationship. The chart establishes divergence under its stated definitions; it does not identify the share caused by any one mechanism. A stronger automation argument combines the chart with studies comparing differently exposed tasks or regions and verifies that other plausible channels are addressed. Historical alignment alone is insufficient to establish causation.

A widening historical gap does not imply that productivity ceased to raise pay. Stansbury and Summers' original regressions over 1973–2016 found that one percentage point faster productivity growth was associated with 0.7–1 percentage point faster median and average compensation growth, and 0.4–0.7 point faster production and nonsupervisory compensation growth. Their results describe an association under particular specifications, rather than an experiment that assigns productivity shocks. They also found little support in their tests for the prediction that faster productivity growth systematically widened the labor-share or mean–median pay gaps. [4] For post labor economics, this distinguishes a weakening distribution of realized gains from a claim that additional productive capacity is intrinsically harmful to typical workers. The long gap remains an important outcome, while its proposed automation mechanism must also explain the periods and settings in which productive improvements continue raising compensation.

Evidence would weaken the compression interpretation if typical compensation consistently caught up with productivity across broad worker groups, or if a harmonized sector and deflator comparison explained most of the apparent divergence without deterioration in household purchasing power. Evidence would strengthen it if the gap persisted under multiple transparent definitions and aligned with declining bargaining power, occupational crowding and a reduced labor share. The observed real compensation increase must remain part of the record in either case.

Chart design and reproducible updating

Use the EPI tracker for the displayed typical compensation comparison and preserve its underlying data and methodology links. Rebase both lines to one hundred at an explicitly stated date, preferably the tracker comparison date of 1979 Q4. Show annual or quarterly observations with units marked as indexes. Include a small endpoint table giving cumulative growth and the latest observed quarter. Publication date and observation date should be separate fields in the stored metadata. [1]

Add a companion matched sector chart using BLS productivity and average compensation. Label consumer price adjusted and output price adjusted compensation separately when constructing a decomposition. Gross and net productivity comparisons should also be distinguished. This companion makes clear which parts of the difference reflect factor distribution, the distribution within labor and relative prices. No line should be silently spliced across methodological revisions. [2][3]

Review the quarterly update for revisions, then assess the secular conclusion using multiyear averages. Check periods of rising typical pay and include them in the chart. Store source vintage, normalization date, price index and worker coverage with the calculation script. An older chart embedded in a prior report can serve as a source trail, but the verified current tracker should supply current endpoint figures.

The classification is secular evidence of weaker transmission of productive gains through ordinary compensation. The indicator is particularly relevant to post labor distribution because production can expand while typical work receives a smaller relative improvement. Its explanatory value grows when paired with labor share, median earnings, occupational composition and household income sources, each carrying a distinct part of the argument.

SOURCES AND REPRODUCTION NOTES

[1] Economic Policy Institute (2026). The Productivity Pay Gap. Original tracker updated 14 September 2026 observations 1948 Q1 to 2026 Q2 production nonsupervisory compensation and net total economy productivity; verified retrieval date 4 October 2026

[2] Bureau of Labor Statistics (2026). Handbook of Methods Productivity Measures Business Sector and Major Subsectors Concepts. Output hours capital compensation and sector coverage definitions; verified retrieval date 4 October 2026

[3] Bureau of Labor Statistics (2017). Understanding the labor productivity and compensation gap. Original industry decomposition observed 1987 to 2015; verified retrieval date 4 October 2026

[4] Anna Stansbury and Lawrence H. Summers (2018). Productivity and Pay: Is the Link Broken? PIIE Working Paper 18-5. Original productivity–pay research finds positive compensation associations over 1973–2016, qualifying a claim that productivity ceased to matter for typical pay. Verified for version two 4 October 2026.

RELATED CHAPTERS 004 · 006 · 007 · 008

CHAPTER 006

Productivity and average real compensation

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN 1987 to 2015 industry study and current nonfarm business observations through 2026 Q2

Average real compensation has often lagged productivity over a multidecade horizon with labor share and relative prices explaining distinct parts of the gap.

Matched averages and price concepts

This metric compares labor productivity with average real hourly compensation for a common sector or industry. Productivity is real output divided by hours worked. Average hourly compensation is total labor compensation divided by labor hours, including wages, salaries and employer benefit costs under the source's definitions. Real compensation divides nominal compensation by a price index. The comparison is cleaner for factor accounting than a typical worker series because both quantities can cover the same production boundary. [1]

The word average means total compensation divided by hours rather than the median worker's earnings. High compensation at the top of the labor distribution affects the aggregate. A rising mean can therefore coexist with weak gains among typical workers. This chapter asks how labor compensation as a whole relates to productive output. The typical compensation chapter asks a further distributional question about the broad worker group. Both belong in the reference because shifts between labor and capital and shifts among workers are economically different processes.

Two real compensation concepts are useful. Consumer price adjusted compensation measures purchasing power over household goods and services. Output price adjusted compensation values pay against the prices of the goods and services produced in the sector. The second is the relevant comparison for deriving labor's share from compensation and productivity. The first is relevant for living standards. If the two price indexes move differently, compensation can keep pace in output units while losing ground in purchasing power. [2]

In a matched sector, nominal labor compensation divided by nominal output is the labor share. Dividing nominal hourly compensation by real output per hour and then accounting for the output price level gives the same relationship. This accounting connects the compensation productivity gap with factor distribution. It also clarifies why a consumer price deflator introduces an additional relative price term. A chart without its deflator cannot tell the reader which relationship is being measured.

Sector boundaries must remain stable. Nonfarm business excludes important activities whose output is difficult to measure independently of input costs, including general government and certain nonprofit activities. Industry measures can use sectoral output rather than aggregate value added. Employees, proprietors and unpaid family workers may enter hours and compensation estimates through different

procedures. The BLS handbook explains those choices. A monitor should reproduce the source boundary rather than assuming an economy wide interpretation from a nonfarm business series. [1]

Government evidence across industries

The BLS original study published in 2017 examined 183 industries over 1987 to 2015. Productivity grew faster than consumer price adjusted average hourly compensation in 83 percent of the industries. The observation span is twenty eight years, meeting the secular criterion. The endpoint remains 2015; the publication cannot establish that every industry continued the same pattern through 2026. Its main value is a verified long horizon comparison and a decomposition framework that can guide later updates. [2]

Several sector records show the scale and variation. Manufacturing productivity grew at an average annual rate of 3.3 percent while real hourly compensation grew 0.8 percent. Retail trade recorded 2.8 percent productivity growth and 0.2 percent compensation growth. Information recorded 5.0 percent and 1.4 percent respectively. Mining displayed the opposite pattern, with compensation growth above productivity. Accommodation and food services recorded similar growth in the two measures. Those contrasting outcomes show why a sector specific analysis adds information to an aggregate gap. [2]

The BLS decomposition attributes the consumer price adjusted gap to changes in labor share and differences between output and consumer price inflation. The same study reports a declining labor share in 77 percent of the industries over the historical window. This is additional factor distribution evidence, although industry output concepts and the number of industries should not be interpreted as employment weights. A small industry and a large industry each count once in a percentage of industries. [2]

The latest revised productivity release at this document's cutoff covers the second quarter of 2026 and was released on 3 September. Nonfarm business productivity increased 2.2 percent from a year earlier, while real hourly compensation decreased 0.1 percent. The quarter to quarter annualized figures were 1.4 percent for productivity and minus 3.3 percent for real compensation. These short horizon readings illustrate current divergence but cannot independently establish a secular trend. Annualized quarterly changes should be displayed separately from year over year growth. [3]

The same release reports positive average real compensation growth in 2024 and 2025, 2.5 percent and 1.6 percent respectively for nonfarm business. Those gains are part of the evidence. A long run lag relative to productivity does not imply compensation falls in every period. The historical study and current release therefore support a carefully defined multidecade divergence while preserving periods in which average purchasing power improved. [3]

Sector 1987 to 2015	Average annual productivity growth	Average annual CPI adjusted compensation growth
Manufacturing	3.3 percent	0.8 percent
Retail trade	2.8 percent	0.2 percent
Information	5.0 percent	1.4 percent
Mining	0.5 percent	1.5 percent
Accommodation and food services	0.7 percent	0.7 percent

BLS original industry study sector definitions and consumer price adjustment [2]

Mechanisms connecting production and compensation

A compensation lag can arise when production grows with less additional labor input and workers capture a smaller share of the resulting income. Capital deepening can increase output per hour, while the cost and ownership of additional equipment affect how gains are divided. Task substitution can reduce demand for particular workers. Market power can change the prices firms charge or the wages they offer. Bargaining institutions can affect workers' ability to secure part of a surplus. The aggregate relationship combines these mechanisms without identifying them separately.

A hypothetical accounting example illustrates the difference between absolute and relative gains. If output per hour rises from one hundred to one hundred fifty units and labor compensation in the same output units rises from sixty to seventy five, compensation has increased by one quarter while productivity has increased by one half. Labor's share falls from sixty percent to fifty percent. Workers receive more purchasing capacity over the produced good, while capital and other claims receive a larger share of the expansion. These illustrative numbers describe possible accounting rather than observed national estimates.

The real compensation measure in consumer units adds another possibility. If the sector's output prices fall relative to housing, healthcare or other household purchases, an employee's pay may buy fewer consumer goods than the output based compensation comparison suggests. Highly productive sectors can experience rapid relative price declines. These changes may benefit consumers broadly, yet workers' budgets depend on the mix of goods and services they purchase. The difference between producer and consumer prices is therefore economically meaningful and should be reported alongside the factor share change.

The post labor connection is that productive improvements need not automatically arrive as proportionate average compensation gains. A society can become more capable of producing goods while wages and benefits distribute a smaller share of the improvement. That concern extends beyond the disappearance of jobs. Employment can remain stable, and compensation can rise, while ownership becomes more important for receiving the marginal gains from growth. Labor share and household asset ownership provide separate measures of that distribution.

Within labor, the average comparison may understate the experience of workers whose compensation lags the mean. If high paid workers receive much larger gains, total average compensation can track productivity more closely than typical pay. Compare both chapters before drawing a conclusion about ordinary households. The matched average establishes the aggregate factor relationship; the typical and median measures reveal whether that relationship is broadly shared among employees.

Sector composition and causal limits

The aggregate can change because individual industries change or because economic activity moves among industries with different compensation and labor intensity. An expansion of sectors with low labor shares can reduce the aggregate even when every industry's share is stable. Conversely, stable aggregate compensation growth may conceal deterioration within several industries offset by expansion elsewhere. A decomposition using industry value added weights should separate within industry changes from reallocation and document how weights are calculated.

Outsourcing can alter the measured boundary. A manufacturer that purchases services previously produced internally moves some workers and costs into another industry. Its measured productivity and compensation relationship may change even if the same people perform similar work. Aggregate nonfarm business measures can reduce some boundary issues, while industry measures are more exposed to reclassification and intermediate purchase changes. The source's sectoral output concept and industry definitions must therefore accompany any inference about task elimination.

Benefit costs complicate the household interpretation. Total compensation includes resources employers spend on insurance and retirement arrangements. The cost can rise without an equivalent increase in immediately usable cash. A robust presentation includes wages alone as a supplementary line and examines benefit access and outcomes. It should also avoid deleting benefits merely because they are less visible. They remain a real component of the labor compensation accounting, even when their value to workers differs from their employer cost.

The relative price contribution should be measured rather than waved away. A price index appropriate for producers answers a factor distribution question; a consumer index answers a purchasing power question. If the gap largely reflects relative prices, the explanation of reduced living standard transmission changes. If it persists in output valued compensation, a declining labor share becomes more central. Neither result independently identifies automation. Empirical identification requires comparisons that separate task substitution from capital costs, trade, industry restructuring and market power.

The interpretation would weaken if matched output price adjusted compensation kept pace with productivity across broad sectors and typical compensation also improved proportionately. It would strengthen if divergence persisted under stable boundaries and was associated with declining labor shares and increasing ownership concentration. Recent positive compensation growth should remain visible. The secular classification rests on the historical divergence and factor accounting, while individual contemporary observations supply an update rather than a universal forecast.

Building a decomposition chart

Create three matched sector growth indexes: labor productivity, hourly compensation deflated by output prices and hourly compensation deflated by consumer prices. Rebase all to one hundred at the same date. The distance between productivity and output valued compensation corresponds to changing labor share under the matched accounting. The additional distance between the two compensation lines shows the relative price contribution. Add a separate typical compensation chart to represent distribution within labor. [1][2]

For the historical sector table, retain the original 1987 to 2015 endpoint and BLS industry identifiers. A current reconstruction should use updated classifications and explain any bridges across revisions. Do not extend the published study by inserting current aggregate growth rates into old industry lines. The second quarter 2026 release can supply a separate current panel with annualized quarterly and year over year figures clearly labeled. [3]

Save source vintages, the price indexes, hours definitions, compensation coverage and normalization calculations. Review quarterly data after scheduled revisions and assess secular changes with annual or cycle averages. Report both growth rates and factor shares where available; a falling share can accompany rising

compensation levels. Pair the chart with output and hours so the reader sees whether productivity increased through output expansion, reduced labor input or both.

The retained contribution is secular evidence of a weaker aggregate compensation link in many sectors, with meaningful exceptions and price effects. The chapter provides an accounting bridge between productive capacity and labor distribution. Its explanatory strength comes from separating those components and showing which mechanisms require additional causal evidence.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Handbook of Methods Productivity Measures Business Sector and Major Subsectors Concepts. Output hours capital compensation and sector coverage definitions; verified retrieval date 4 October 2026

[2] Bureau of Labor Statistics (2017). Understanding the labor productivity and compensation gap. Original industry decomposition observed 1987 to 2015; verified retrieval date 4 October 2026

[3] Bureau of Labor Statistics (2026). Productivity and Costs Second Quarter 2026 Revised. Released 3 September 2026 nonfarm business productivity compensation labor share and technical notes; verified retrieval date 4 October 2026

RELATED CHAPTERS 005 · 007 · 008

CHAPTER 007

Labor income share

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN 1947 Q1 to 2026 Q2 nonfarm business history

The nonfarm business labor share has fallen over several decades and reached a verified series low in 2026 Q2 while remaining compatible with rising real wages.

Labor share and the accounting boundary

Labor income share measures labor compensation as a fraction of the income or output generated within a defined production boundary. For the BLS nonfarm business measure, the numerator is compensation accruing to workers and the denominator is nominal output in that sector. The share is a percentage. It describes factor distribution, separating the labor compensation claim from other claims on production. It is different from the share of households receiving wages or the wage share of personal income. [1]

Compensation includes employer costs of benefits as well as wages and salaries. Proprietors create a measurement challenge because self employment income can combine payment for labor, returns to capital and entrepreneurial surplus. A statistical agency needs a convention for attributing part of that income to labor. Different conventions can alter levels and trends. The BLS productivity handbook documents the treatment of labor input and compensation, and a reference should preserve the agency's convention rather than calling every proprietor receipt either labor or capital. [1]

The denominator also matters. Gross output, value added, national income and net income are distinct quantities. Depreciation is a claim on gross production needed to replace capital. A gross labor share can fall if depreciation rises, even when labor's fraction of net income changes less. Housing and government production introduce further accounting questions. Comparisons across sources should identify the sector, depreciation treatment, taxes and proprietor income allocation before judging whether their differing shares reflect an empirical disagreement.

The BLS series republished in FRED as PRS85006173 is an index with 2017 equal to one hundred. It is not a percentage level. A value of 93.446 indicates a share below the 2017 reference relationship; it does not mean workers received 93.446 percent of output. The latest BLS release separately provides a percentage level of 52.8 percent for the second quarter of 2026. Using index and percent labels correctly prevents a serious interpretation error. [2][3]

Labor share is especially relevant to post labor distribution because it can change while employment remains widespread. More people working does not guarantee that compensation retains the same fraction of production. A falling share can coexist with higher wages if output per hour rises sufficiently. The metric therefore measures the relative importance of labor as a distribution channel, while compensation levels, employment and household income sources supply the corresponding absolute outcomes.

Long run checkpoints and a current low

The verified BLS index begins in the first quarter of 1947. It was 111.472 in the fourth quarter of 1979, 112.828 in the first quarter of 2000 and 99.588 in the fourth quarter of 2019. It rose during the initial pandemic disruption, then stood at 93.446 in the second quarter of 2026. All values use the same index base of 2017 equal to one hundred and are seasonally adjusted quarterly observations. The overall history contains cyclical increases but a lower recent baseline than several decades earlier. [2]

The revised second quarter 2026 Productivity and Costs release, published on 3 September, reports the labor share at 52.8 percent, the lowest level in the series beginning in 1947 Q1. An earlier preliminary release reported 52.9 percent. The revised value should be used for the current checkpoint, while the earlier value can remain in a vintage archive. The change illustrates why a source dated only by its observation quarter is insufficient: release vintages can revise the result. [3]

Comparing the fourth quarter 1979 index with the second quarter 2026 index yields a ratio of about 0.838. Under the same index definition, that corresponds to a relative decline of about 16.2 percent in the share. This calculation is a percentage change in a share index, distinct from a 16.2 percentage point decline in the underlying level. Computing a level difference requires percentage levels at both dates. The chapter uses the verified index to express relative change without inventing a historical level. [2]

Independent industry evidence shows the breadth and variation of earlier changes. The BLS study of 183 industries over 1987 to 2015 reports labor share declines in 77 percent. Software publishing's share fell from 53 percent to 30 percent, while newspaper and periodical publishing's share increased. These are industry records using their own output and compensation boundaries. The number of industries is not weighted by employment or value added, so the breadth result should not be interpreted as the fraction of workers experiencing the same decline. [4]

The historical criterion is clearly met for the aggregate series. Its current low adds timely evidence, but the long run conclusion does not depend on a single quarter. An annual or four quarter average should accompany the quarterly record, allowing the reader to see persistent changes and short lived spikes. The most useful comparison examines successive expansion periods with consistent accounting rather than simply selecting the highest and lowest quarterly observations. [2][3]

Quarter	Labor share index 2017 equal to 100
1979 Q4	111.472
2000 Q1	112.828
2019 Q4	99.588
2026 Q2	93.446

BLS nonfarm business seasonally adjusted share index percentage level for 2026 Q2 separately reported as 52.8 percent [2][3]

Why a smaller labor share matters

The labor share links technological production and income distribution through a direct accounting quantity. If a larger part of output can be produced with capital and fewer labor hours, capital owners may receive a larger relative claim. Workers can still be essential in complementary tasks, but their compensation need not grow proportionately with the output supported by those tasks. The share records how the resulting

production is distributed between labor compensation and the remaining claims under the source convention.

A hypothetical example helps separate share and level. Suppose total output rises from one hundred to two hundred, while labor compensation rises from sixty to one hundred. The labor share falls from sixty percent to fifty percent, although labor compensation rises substantially. This outcome supports a relative distribution shift without demonstrating falling wages. If the number of workers also changes, compensation per worker can move differently again. A labor share chart should therefore be paired with real compensation per hour and employment.

Ownership determines who receives the nonlabor claim. Workers can own capital through retirement accounts, homes, businesses and financial assets. Some compensation recipients therefore benefit from a falling labor share through another channel. Those assets are unevenly distributed, so an aggregate labor share decline may still increase household inequality. The interpretation depends on asset ownership, taxes and transfers, rather than assuming every worker belongs permanently to a separate class from every owner.

Market power offers another route. A firm may increase profits because it charges a higher markup, pays less competitive wages or captures scarce intangible assets. Its labor share can fall without an identifiable reduction in the physical need for labor. Automation, monopoly rents and bargaining changes can also interact: technology may allow expansion at low marginal labor cost, while market structure determines the income claim. The statistic is an outcome of those forces, and identifying their separate contributions requires additional evidence.

The post labor relevance is strongest on the distribution side. Compensation may become a smaller proportional route through which the population receives the benefits of production, even while employment continues to organize everyday life. This creates a reason to examine asset income and public transfers alongside wages. A lower share alone does not prescribe an institution or demonstrate that work is obsolete. It documents a structural change in the relationship between labor compensation and productive output that the framework must explain.

Depreciation profits and sector reallocation

Depreciation is a major competing accounting explanation. Some forms of capital, including equipment and intangible assets, may require substantial replacement spending. If the gross output denominator grows partly to finance replacement, a lower gross labor share need not translate one for one into higher net income for owners. Construct a net income comparison where the necessary data are available and preserve the gross measure as well. The difference answers how much of the production claim is tied to replacing capital.

Reallocation can change the aggregate without uniform declines within firms. If production shifts toward industries or firms with lower labor shares, the economy wide share falls even when each producer's share remains unchanged. A within and between decomposition can distinguish changes within production units from shifts in their weights. Firm level productivity and wage data are particularly useful when the mechanism involves highly productive firms expanding market share. The aggregate statistic identifies the result, while this decomposition clarifies how it was generated.

Self employment attribution and housing treatment can produce differing trend estimates. A business owner's earnings mix labor and capital returns, while owner occupied housing produces imputed services

with limited associated current labor. A broad national income denominator can include those services. The BLS nonfarm business boundary removes important nonbusiness activities and uses its own compensation procedures. The source must be named precisely so that a change in coverage is not confused with an economic reversal. [1]

A current international comparison supplies a different pattern under a different boundary. OECD's September 2026 report charts employee compensation divided by gross value added, using three-year moving averages through 2024. Its OECD and EU averages are shown from 1995 and remain roughly constant over the following three decades, while the United States and Australia show more sustained declines. The figure does not allocate unincorporated business income between labor and capital: all of it enters the nonlabor remainder, which can bias levels and affect countries differently. [5] This comparison cannot replace the BLS nonfarm business labor share, which has its own sector and proprietor treatment. It does rule out presenting every rich country as following the same recent path. A cross-country post labor assessment should ask whether similar production changes lead to different distributional outcomes under different institutions, rather than require the US record low to describe the entire OECD.

Business cycles affect factor shares. Profits can fall rapidly in a recession while compensation adjusts more slowly, producing a temporary labor share increase. During recovery, output and profits can recover ahead of payroll compensation. The pandemic introduced further composition and measurement disturbances. A spike in labor share during a collapse is not automatically evidence of improving worker bargaining power. Comparing expansion averages and examining compensation levels helps prevent that inference.

The interpretation would weaken if net labor share remained stable after defensible accounting adjustments and household wages broadly captured productive gains. It would strengthen if declines persisted across gross and net definitions, within sectors and over comparable cycle periods, with nonlabor gains concentrated among owners. The current series low is important evidence within its definition. It should be presented alongside the accounting sensitivities, real compensation increases and distribution among asset holders that determine its household significance.

Charting shares without mixing units

Display the BLS nonfarm business percentage share when a verified level series is available. If using PRS85006173, title the axis labor share index 2017 equal to one hundred. Keep the current reported percentage level in a clearly separate annotation or table. Never join indexed historical values to a percentage endpoint as if they formed one line. Include quarterly values and a four quarter average, with observation and release dates recorded. [2][3]

Archive the raw source file, sector boundary, proprietor compensation convention and any transformations. If constructing a net share, retain the depreciation and income series used and explain the formula. For a sector decomposition, store value added weights and industry classification bridges. Update the record after benchmark revisions, and label a current value as revised or preliminary according to the release.

Assess the secular pattern annually and monitor quarterly movements for context. Pair the chart with productivity, average real compensation, typical pay and income concentration. A supplementary household panel can show asset ownership and transfers, revealing whether nonlabor claims reach broad groups. This prevents a factor share outcome from being treated as a complete household welfare measure.

The classification is secular evidence of reduced labor compensation share in the verified nonfarm business measure. It provides one of the framework's clearest distributional observations, while its causal meaning remains open to capital costs, reallocation, market power and technological substitution. The most informative presentation preserves the falling share and rising production together, then asks who receives the gains through compensation, ownership and public institutions.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Handbook of Methods Productivity Measures Business Sector and Major Subsectors Concepts. Output hours capital compensation and sector coverage definitions; verified retrieval date 4 October 2026

[2] Bureau of Labor Statistics via Federal Reserve Bank of St Louis (2026). Nonfarm Business Sector Labor Share for All Workers PRS85006173. Quarterly seasonally adjusted index 2017 equal to 100 observations 1947 Q1 to 2026 Q2 updated 3 September 2026; verified retrieval date 4 October 2026

[3] Bureau of Labor Statistics (2026). Productivity and Costs Second Quarter 2026 Revised. Released 3 September 2026 nonfarm business productivity compensation labor share and technical notes; verified retrieval date 4 October 2026

[4] Bureau of Labor Statistics (2017). Understanding the labor productivity and compensation gap. Original industry decomposition observed 1987 to 2015; verified retrieval date 4 October 2026

[5] OECD (2026). Financing of Social Protection, Chapter 3: Securing the Revenue Base for Social Protection. OECD employee-compensation comparisons are not adjusted for self-employment and show country differences; US business-sector labor share cannot stand for every economy. Verified for version two 4 October 2026.

RELATED CHAPTERS 005 · 006 · 008

CHAPTER 008

Real median earnings

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN 1979 Q1 to 2026 Q2 weekly series and 1960 to 2025 annual earnings history

Median earnings show long periods of weak growth alongside meaningful recent gains and different male and female histories requiring a relative rather than universal stagnation claim.

Median purchasing power and worker coverage

Real median earnings measure the inflation adjusted earnings of the worker at the middle of a specified distribution. Half of covered workers earn less and half earn more, subject to survey estimation. The median is less sensitive to very high earnings than the mean. It is not total compensation divided by hours and does not automatically include employer benefit costs. A reference should identify whether the measure concerns weekly earnings, annual earnings or hourly wages before treating them as interchangeable. [1]

The BLS usual weekly series covers full time wage and salary workers aged 16 and older. Full time refers to the survey's usual hours classification. The earnings measure is before taxes and deductions and includes usual overtime pay, commissions and tips. It concerns the main job for multiple jobholders and excludes self employed people from this earnings series, including incorporated business owners. The measure therefore describes a substantial employed population while leaving people outside full time wage and salary work outside the distribution. [1][2]

Weekly earnings combine an hourly pay rate with usual hours and other earnings components. A person can receive higher weekly earnings by working more hours even if the hourly wage is unchanged. Annual earnings also depend on weeks worked, interruptions and the number of jobs. The Census full time year round measure narrows those intensity differences but does not remove them completely. For understanding labor market compression, compare hourly pay, weekly pay and annual earnings together when the data allow.

Real means divided by a price index to express purchasing power in a chosen year's dollars. BLS's long quarterly series here uses 1982 to 1984 CPI adjusted dollars. The 2026 Census annual report expresses history in 2025 dollars and uses chained CPI from 2000 onward with a historical retroactive consumer index before 2000. Different inflation methods can generate different real growth estimates. This is a documented measurement choice, so keep the deflator visible and avoid splicing constant dollar values from the two sources. [2][3]

A median for employed workers is conditional on employment. If low earning workers lose employment, the observed median can rise even though their circumstances worsen. Conversely, successful entry of lower earning people can depress the employed median while improving their household income. The population employment rate must accompany this indicator. The metric evaluates the purchasing power associated with work among covered earners; its interpretation as a welfare outcome depends on who remains in that population.

Long stagnation intervals and later improvement

The verified BLS quarterly real weekly series was 335 dollars in the first quarter of 1979 and 334 dollars in the first quarter of 2000, measured in 1982 to 1984 CPI adjusted dollars and seasonally adjusted. It was again 334 dollars in the fourth quarter of 2013. Those checkpoints illustrate long periods in which the covered worker median changed little in purchasing power. They do not imply every intervening quarter was flat or that every worker experienced an unchanged wage. [2]

Subsequent observations show improvement. The median reached 362 dollars in the fourth quarter of 2019 and 378 dollars in the second quarter of 2026. The latter is about 12.8 percent above the first quarter 1979 value, calculated within the same verified series. It is about 13.2 percent above the first quarter 2000 value. These gains should remain explicit counterevidence to a claim of uninterrupted real earnings decline. The series supports historically weak growth relative to productive advances while preserving the observed increases. [2]

The pandemic spike is a composition warning. The series reached 393 dollars in the second quarter of 2020, then fell as employment conditions and worker composition changed. This occurred during an extraordinary employment collapse. It should not be interpreted automatically as a sudden improvement for the typical continuing worker. The level of a median among those still employed can change when the population of earners changes. A chart should show employment alongside earnings to make that possibility assessable. [2]

The latest weekly earnings release at the cutoff was published on 21 July 2026 and covers the second quarter. The nominal median was 1,251 dollars for full time wage and salary workers, not seasonally adjusted, 4.6 percent above a year earlier while CPI increased 3.9 percent. The seasonally adjusted nominal median was 1,258 dollars. These nominal observations should be displayed separately from the long real series, with adjustment status visible. [4]

The Census report published on 15 September 2026 provides annual full time year round earnings through 2025. Its figure shows male median earnings of 72,380 dollars and female median earnings of 60,760 dollars in 2025 dollars. Women's real median increased 3.2 percent from 2024 while the male change was not statistically significant. The female to male ratio reached 83.9 percent. Different sex histories make a universal stagnation statement inappropriate, and the annual worker boundary differs from the weekly BLS series. [3]

Quarter	Real usual weekly median seasonally adjusted
1979 Q1	335 dollars
2000 Q1	334 dollars
2013 Q4	334 dollars
2019 Q4	362 dollars
2026 Q2	378 dollars

BLS full time wage and salary workers age 16 and over 1982 to 1984 CPI adjusted dollars [2]

The middle worker and access to prosperity

Median earnings address how much purchasing power the middle of the covered employed distribution receives. A society can experience strong productivity growth while the median rises only modestly if gains are concentrated at the top, accrue to capital or appear as lower prices unevenly across goods. This is a direct connection to post labor distribution. The question is whether ordinary paid work remains an effective path to sharing productive gains, rather than whether any employment remains available.

Competition over good jobs can affect the middle through occupational shifts. If stable middle paying occupations shrink and replacement work offers lower wages, workers may remain employed while their earnings growth weakens. Highly educated people taking occupations previously accessible without degrees can intensify competition farther down the distribution. The median alone cannot identify these transitions, but education by occupation and longitudinal earnings records can test whether employment preserved purchasing power or involved lasting downward movement.

Households adjust when one worker's purchasing power grows slowly. They may add earners, increase hours, move to cheaper housing, reduce consumption, borrow or rely on transfers. Those responses can maintain household income while individual earnings remain weak. A household income chart may therefore look stronger than a worker earnings chart without either being wrong. Tracking both clarifies whether prosperity increasingly requires more labor supplied per household or support from sources outside current wages.

Costs of necessities can differ from the average consumption price index. Housing, childcare or healthcare may become more expensive relative to a worker's budget even when CPI adjusted earnings rise. That issue should be examined through explicit expenditure and price data. It would be inaccurate to label every increase in real median earnings illusory, but equally incomplete to assume the average index describes every household's constraints. A transparent purchasing power record can include both the general real series and specific affordability ratios.

The post labor relevance is consequently mixed. The historical plateau helps explain perceptions that work did not deliver gains proportionate to national productive capacity. Recent real growth demonstrates that labor markets can still improve the purchasing power of covered workers. The stronger framework asks which groups benefited, whether gains came with adequate hours and security, and how median work income compares with output, assets and transfers. It accepts the measured improvement while investigating the distribution of the wider economic expansion.

Selection education and survey limitations

The most important selection problem is exclusion of people without earnings in the covered worker population. A loss of employment among low earners can raise the median mechanically. A population earnings measure that assigns zero to nonworkers addresses a different question but can be useful alongside the conditional median. Longitudinal records following the same people offer another perspective, showing how earnings evolve through displacement, reemployment and job changes rather than comparing different cross sections.

Education and age composition can also raise the aggregate median. A workforce with more experienced or highly educated workers may earn more even when pay within each category stagnates. Fixed composition

comparisons can identify how much of the aggregate improvement reflects changing characteristics. They remain descriptive unless a causal design addresses selection into education, occupation and employment. Report both raw and adjusted results, because society's actual workforce composition is itself economically consequential.

Survey methods have changed over the long series. BLS notes that the earnings reporting question changed in January 1994, allowing respondents to select a reporting period that was then converted to a weekly equivalent. Population controls, seasonal adjustments and missing survey periods also affect current comparisons. The verified quarterly series has a missing observation in 2025 Q4. That gap should be preserved rather than interpolated into an apparently observed wage value. [2]

Annual earnings reports include statistical uncertainty and nonsampling issues. Census compares changes using significance tests and discusses nonresponse and weighting. A finding that a male median change was not significant does not establish that the true change was exactly zero. Likewise, a statistically significant increase for one group and an insignificant change for another does not automatically establish a significant difference between their changes. The report's tested comparisons should guide the wording. [3]

The compression account would strengthen if median purchasing power weakened within comparable worker groups over several expansions while productivity increased, and if displacement produced enduring earnings losses. It would weaken if broad groups enjoyed sustained real gains with improving employment and hours. Divergence between mean and median would identify distribution within labor, while divergence between total compensation and output would identify a separate factor distribution issue. These comparisons keep the chapter's conclusion specific to the observed worker population.

A median earnings monitoring system

Use the BLS real usual weekly quarterly series as the main consistent long run chart, with its price base and seasonal adjustment in the caption. Add separate male and female lines and, where verified, education group lines. Keep the missing 2025 Q4 point blank. A companion annual Census chart can show full time year round earnings through 2025, using that report's deflator and population definition. The two charts should remain separate rather than being joined. [2][3]

Store nominal earnings, the price index and the supplied real observations with their retrieval vintage. If recomputing real earnings, document the formula and check it against the published series. Present percentage changes within a consistent source, and identify whether annual or quarterly averages are used. The current nominal weekly checkpoint belongs in a separate table because its adjustment and units differ from the historical real line. [4]

Review quarterly wage data and annual earnings releases, then compare expansion periods separated by at least twenty years. Pair medians with employment to population, hours, benefit coverage and productivity. If the median increases during an employment collapse, investigate composition. If employment expands while the median weakens, examine entry of lower paid workers and occupational shifts before concluding that continuing workers all lost purchasing power.

The indicator remains mixed evidence. Decades of weak middle earnings growth are meaningful, but recent gains and stronger female outcomes are also substantive. Its contribution is to measure the rewards of

covered work directly and connect them to the economy's productive capacity, with employment selection and household adaptation visible.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Earnings CPS. Usual earnings definitions full time wage and salary coverage and inflation adjustment; verified retrieval date 4 October 2026

[2] Bureau of Labor Statistics via Federal Reserve Bank of St Louis (2026). Employed full time Median usual weekly real earnings Wage and salary workers 16 years and over LES1252881600Q. Quarterly seasonally adjusted 1982 to 1984 CPI adjusted dollars 1979 Q1 to 2026 Q2 missing 2025 Q4 updated 21 July 2026; verified retrieval date 4 October 2026

[3] United States Census Bureau (2026). Income in the United States 2025. Released 15 September 2026 annual earnings table 12 and figure 6 observed 1960 to 2025 inflation adjustment uses chained CPI after 2000; verified retrieval date 4 October 2026

[4] Bureau of Labor Statistics (2026). Usual Weekly Earnings of Wage and Salary Workers Second Quarter 2026. Released 21 July 2026 nominal and real weekly medians with demographic and education breakdowns; verified retrieval date 4 October 2026

RELATED CHAPTERS 004 · 005 · 006 · 007 · 009

CHAPTER 009

Real minimum wage

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN Federal statutory history 1968 to September 2026 with price observations through August 2026

The federal wage floor has lost substantial purchasing power over decades but higher state floors and market wages prevent treating that decline as the wage path of all low paid workers.

A legal floor expressed in purchasing power

The real minimum wage is a legally specified nominal hourly wage divided by a consumer price index and expressed in a chosen period's dollars. The numerator is a statutory rate rather than the earnings of the average low paid worker. For the federal nonfarm series, the verified history is republished by the Federal Reserve Bank of St Louis from the Department of Labor. The denominator for purchasing power is the selected price index, with its geography, coverage and seasonal adjustment identified. [1][2]

The metric describes the purchasing power protected by a particular legal floor. It does not measure the wage actually received by every covered worker. State and local requirements can be higher, collective agreements can set other rates and market wages can exceed the applicable minimum. Coverage, exemptions, tipped worker rules and enforcement also affect the relationship between the statutory number and observed pay. A federal series belongs in a wider institutional dashboard rather than being labeled the effective national low wage.

A second useful measure is the minimum wage relative to the median wage. This ratio describes the floor's position within the pay distribution. It answers a different question from inflation adjusted purchasing power. The real floor can increase while its ratio to the median falls if the median grows faster. Conversely, a floor can become more binding during a downturn even without a nominal increase. A monitor should retain both measures where a consistent earnings denominator is available.

Annual and monthly calculations require care. When a statutory increase occurs during a year, an annual nominal average differs from the rate in force at year end. Dividing a year end rate by an annual price index mixes timing conventions. A monthly calculation should use the rate in effect for that month and its monthly price index, documenting any midmonth legal change. For broad secular comparisons, annual averages provide a less volatile record if the nominal averaging method is disclosed.

The appropriate interpretation is institutional. A falling real federal floor shows that the protection provided by one wage policy has weakened relative to consumer prices. It may contribute to labor market compression when workers with limited bargaining power cannot obtain higher pay elsewhere. The statistic alone does not show that technology caused the policy choice or that every employer used the lower real floor. Actual earnings distributions and the jurisdictions where workers live provide the necessary connection to realized outcomes.

Verified nominal history and real calculations

The verified federal monthly series records 1.60 dollars in February 1968 and 7.25 dollars beginning in July 2009, with 7.25 dollars continuing through September 2026. These rates describe the headline federal nonfarm floor in the source series. Historical statutory coverage broadened over time, so comparisons should retain the source's coverage notes rather than assuming exactly the same worker population was legally covered in every decade. The current nominal freeze is more than seventeen years long; the broader real erosion comparison extends over several decades. [1]

Using the verified seasonally adjusted CPI series, February 1968 has an index of 34.2 and August 2026 has 334.131, with 1982 to 1984 equal 100. Expressing the February 1968 rate in August 2026 purchasing power gives about 15.63 dollars per hour:1.60 multiplied by 334.131 divided by 34.2. The unchanged current federal 7.25 dollars is about 53.6 percent below that particular historical month's price adjusted value. This calculation is explicitly monthly and uses the stated CPI, rather than an annual average estimate of the 1968 peak. [1][2]

The same method measures erosion since the last increase. July 2009's verified CPI is 214.726. A7.25 dollar rate then would require about 11.28 dollars in August 2026 to retain the same purchasing power. The current 7.25 dollars is about 35.7 percent lower in real terms under that comparison. These are author calculations from official nominal and price observations. A different consumer index or annual timing convention can change the exact figure, so the method should accompany every claim. [1][2]

Observed worker data limit how broadly the legal series can be applied. The BLS 2024 report records 80.3 million hourly paid workers, of whom 82,000 earned exactly 7.25 dollars and 760,000 reported wages below it. About 1.0 percent of hourly paid workers were at or below the federal minimum, compared with 13.4 percent in 1979. Tips and other earnings are not included in this hourly rate comparison. Some below minimum observations concern workers subject to exemptions or measurement error, so they should not all be called illegal pay. [3]

The lower share paid at the federal threshold can reflect a less binding federal floor, higher state floors and rising market wages. It therefore combines potential institutional erosion with possible wage improvement. The federal real series supplies a clear long run policy observation, while the worker report cautions against inferring that an increasingly large fraction of workers is paid at that declining floor. Those two records should appear together. [1][3]

Comparison using August 2026 CPI	Historical nominal rate	Equivalent August 2026 purchasing power
February 1968	1.60 dollars	About 15.63 dollars
July 2009	7.25 dollars	About 11.28 dollars
Current federal rate	7.25 dollars	7.25 dollars

Author calculations nominal federal series [1] and seasonally adjusted CPI February 1968 34.2 July 2009 214.726 August 2026 334.131 [2]

The floor bargaining power and economic support

A wage floor can influence the terms available to workers who have weak outside options. Its real erosion permits legally covered pay to buy less than earlier protected pay, unless another institution or market competition raises the wage. This can matter in an economy where productive capacity grows and routine labor becomes easier to substitute. The policy floor and labor demand interact, but the legal trend should be treated as an institutional mechanism rather than a direct measure of automation.

Compression can increase the relevance of a floor. If workers displaced from middle paying occupations compete for lower paid service roles, employer recruitment may face a larger pool of applicants. A statutory floor can limit how far the resulting competition affects hourly pay. When the floor loses purchasing power, household resources may depend more on hours, additional earners or public support. This mechanism is plausible, but evidence requires actual occupational movement and earnings data in the affected jurisdictions.

Income support can offset weak market earnings. Tax credits, nutrition support, housing assistance and other programs can increase disposable resources while hourly wages remain low. The minimum wage measure concerns the employer paid hourly channel; transfer dependence concerns the household's overall resource mix. Tracking both helps identify whether public institutions increasingly supplement work income. It also distinguishes a household working extensive hours at low pay from a household outside paid work, two circumstances with different labor attachment implications.

The market can raise wages above a weak legal floor. Strong labor demand, recruitment competition and worker mobility may improve pay even when legislators leave the statutory rate unchanged. That outcome would be positive evidence about realized wages and would reduce the immediate relevance of the federal floor for many workers. It would not restore the legal protection if labor demand later weakened. The institutional series and observed earnings series therefore should be assessed separately and then connected through evidence on how binding the floor is.

The post labor contribution is a measure of the rules governing distribution through the lowest paid work. Production can grow while the legally protected purchasing power of an hour weakens. That relationship may help explain why employment alone does not guarantee access to prosperity. The framework should also retain jurisdictions that strengthen wage protections and periods when low paid workers experience strong gains, because those outcomes demonstrate how institutions and labor demand can modify the distribution of technological gains.

State variation hours and employment effects

State and local wage floors are the first limitation of a federal only chart. A worker in a jurisdiction with a higher applicable rate is protected by that higher requirement. An employment weighted effective floor can summarize this variation, provided the weights and worker coverage are explicit. A population weighted average answers a different question from an employment weighted one. Neither replaces the legal federal line; both show how much practical exposure to it remains.

Employment effects require separate causal evidence. A higher minimum can increase earnings for continuing workers while potentially changing hiring, hours, prices, profits or firm entry. A lower real floor

can permit lower pay without necessarily creating more employment. The statutory time series cannot identify these responses because wage changes occur alongside business cycles and other policies. A serious study compares affected and less affected workers or jurisdictions under a design that addresses those simultaneous changes.

Hourly pay is only one part of annual resources. Workers can receive a higher rate and fewer hours, or a low rate with substantial overtime and multiple jobs. A minimum wage chart should therefore be paired with hours and annual earnings when assessing household adequacy. Scheduling stability, benefit eligibility and unpaid work expenses also affect the value of employment. These issues add dimensions to the analysis rather than changing the meaning of the hourly legal floor.

Coverage and enforcement complicate observed below minimum wages. Tipped employees can report an hourly cash rate below the general floor while receiving additional tips. Some occupations or workers are exempt from particular requirements. Survey respondents may misreport pay or hours. BLS explicitly notes that its hourly rate data exclude tips and do not establish violations of wage law. The report provides a statistical profile, while enforcement records answer a separate legal compliance question. [3]

Evidence would strengthen a compression interpretation if the real effective floor and actual lower wage percentiles weakened over twenty years, especially among workers losing access to better occupations, with rising reliance on supplementary income. It would weaken if state policy and competitive hiring raised broad low wage purchasing power and improved hours and security. The current evidence supports a strong federal policy erosion finding with a mixed national worker interpretation. This distinction preserves both the legal history and the limits of what it says about realized pay.

Reproducing the real wage floor

Download the nominal federal monthly series and a documented monthly consumer price series. For a base month b, calculate the real rate in month t as the nominal rate in t multiplied by the price index in b divided by the price index in t. Store the base month, adjustment status and legal timing convention. This chapter's worked comparisons use August 2026 purchasing power and seasonally adjusted CPI observations, with the latest price release available at the cutoff. [1][2]

Show nominal and real federal rates in separate panels. The nominal line has steps at statutory increases; the real line generally erodes between increases when prices rise. Add state effective floor or median wage comparisons only from verified data with explicit coverage. Do not fill historical jurisdiction records by assuming current laws applied earlier. A worker exposure panel should show the share at or below the federal floor and retain the BLS exclusion of tips. [3]

Update prices monthly and legal rates when enacted changes take effect. Assess secular changes using annual or expansion comparisons and distinguish the 17 year current freeze from the much longer historical real erosion. Keep calculated values separate from source observations and record the formula in the chart caption. Revisions to the price series should trigger a reproducible update.

This metric is mixed evidence because the federal protection has weakened substantially while actual national wages depend on stronger state laws and market pay. It connects post labor distribution to an

institutional boundary on low paid work. Its strongest use pairs the legal floor with observed lower wage earnings, hours and household transfers.

SOURCES AND REPRODUCTION NOTES

[1] United States Department of Labor via Federal Reserve Bank of St Louis (2026). Federal Minimum Hourly Wage for Nonfarm Workers for the United States FEDMINNFRWG. Monthly statutory wage history February 1968 1.60 dollars July 2009 7.25 dollars unchanged through September 2026; verified retrieval date 4 October 2026

[2] Bureau of Labor Statistics via Federal Reserve Bank of St Louis (2026). Consumer Price Index for All Urban Consumers All Items in US City Average CPIAUCSL. Monthly seasonally adjusted price index 1982 to 1984 equal 100 observations through August 2026 updated 11 September 2026; verified retrieval date 4 October 2026

[3] Bureau of Labor Statistics (2025). Characteristics of minimum wage workers 2024. Observed 1979 to 2024 hourly paid workers at or below federal minimum technical notes state wages tips and exclusions; verified retrieval date 4 October 2026

RELATED CHAPTERS 005 · 008 · 010 · 011

CHAPTER 010

Broad underemployment and headline unemployment

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN U3 from 1948 and U6 from 1994 through September 2026

Broad underutilization captures missing work beyond headline unemployment but its long history is strongly cyclical and does not show uninterrupted secular worsening.

The numerator and denominator of each rate

Headline unemployment, U3, is unemployed people divided by the civilian labor force. Unemployed people generally have no employment, are available for work and actively searched during the preceding four weeks, with a specific treatment for temporary layoffs. Broad underutilization, U6, adds marginally attached people and employed people working part time for economic reasons to the numerator. Its denominator is the civilian labor force plus marginally attached people. Both are percentages, but they represent different combinations of labor market circumstances. [1]

Marginally attached people want a job, are available and searched at some point in the preceding twelve months, yet do not meet the recent search criterion. People working part time for economic reasons are employed, want and are available for full time work, and have settled for shorter hours under the survey criteria. The U6 numerator therefore combines unemployment, a specific form of nonparticipation and inadequate work hours. It does not include every person outside employment or every worker dissatisfied with pay or qualifications. [1]

The denominator changes as well as the numerator. U6 is not simply U3 plus a rate calculated on the same population. Adding marginal attachment to the denominator provides a labor force like population that incorporates those additional people. Involuntary part time workers are already employed members of the labor force, so they enter the extra numerator without requiring another denominator addition. A calculation that adds all component percentages from unrelated denominators will not reproduce the published U6 rate.

A useful interpretation is unmet labor supply within a bounded set of survey definitions. Each person in the numerator represents a different adjustment margin. An unemployed person lacks employment. A marginally attached person remains near the labor market but is outside current search. An involuntary part time worker has employment but fewer hours than desired. Combining them provides a wider indicator while the components reveal which circumstances drive a movement. The combined rate should be retained alongside those component records.

Underemployment has broader ordinary meanings than U6. A graduate working below educational qualifications, a low paid full time worker and someone assigned little useful work may all describe themselves as underemployed while being outside this numerator. Label the chart broad labor underutilization U6 to prevent the official measure from being mistaken for a complete measure of poor job quality. College underemployment, real earnings and workplace utilization belong in separate entries with their own definitions.

Three decades of cycles and low expansion readings

The verified U6 series begins in January 1994 at 11.7 percent. It reached 6.8 percent in October 2000 and again in December 2019. During the pandemic disruption it rose to 22.9 percent in April 2020. It fell to 6.6 percent in December 2022 and was 7.6 percent in September 2026. These observations span more than thirty years and demonstrate that broad underutilization can return to low levels after major disruptions. The existence of a long series does not establish a secular increase. [2]

The matched U3 observations provide the narrower context. Headline unemployment was 3.9 percent in October 2000, 3.6 percent in December 2019, 14.8 percent in April 2020 and 4.2 percent in September 2026. The broad and narrow rates moved sharply during the pandemic and subsequently recovered. The gap between them is informative about the additional categories, but it should not be described as a hidden count of unemployed people because U6 includes employed part time workers and uses an expanded denominator. [2][3]

September 2026 U6 was 3.4 percentage points above U3, calculated from 7.6 minus 4.2. This difference describes the distance between the published measures. It does not directly give the fraction of adults outside full employment or the number of excess workers. To obtain component counts, use the household tables. Those show part time for economic reasons, marginal attachment and unemployment separately, preserving each group's status and seasonal adjustment. [4]

The current release was published on 2 October 2026. Its table A15 identifies the seasonally adjusted rates and provides recent month comparisons. Annual averages and monthly rates should be displayed separately. Earlier revisions can alter monthly historical values, so a reproduced chart should preserve the source vintage. Missing October 2025 observations should remain missing where a series records that survey interruption. A smooth chart must not imply that an unobserved point was measured. [2][3][4]

The long history currently provides mixed evidence for post labor. Broad underutilization establishes persistent unmet work and includes channels absent from headline unemployment. Its recovery to low expansion rates limits a claim that those channels worsened continuously for decades. [2][3] A nonzero floor nevertheless remains economically consequential: some people can face inadequate hours or exclusion even when aggregate employment performs well. Persistence of that burden is different from evidence that its prevalence is rising. The latest September 2026 seasonally adjusted U 6 reading is 7.6 percent, with headline unemployment at 4.2 percent; the numerator includes employed part time workers and marginally attached people, so it is not a percentage of workers who are all unemployed or discouraged. [5] To investigate compression beneath a stable aggregate, retain subgroup rates, spell persistence, unmet hours and subsequent earnings. A claim that hardship has intensified should rest on those observations rather than the existence of a gap between U 6 and U 3. Comparing similar cycle conditions can test an elevated structural baseline, while actual improvements in rates and hours should count as improvements. This preserves the persistent-floor hypothesis without treating every outcome as evidence of a secular rise.

Month	U3 headline unemployment	U6 broad underutilization
October 2000	3.9 percent	6.8 percent
December 2019	3.6 percent	6.8 percent
April 2020	14.8 percent	22.9 percent
September 2026	4.2 percent	7.6 percent

BLS seasonally adjusted rates U3 denominator civilian labor force U6 adds marginal attachment [2][3]

Adjustment margins under labor market compression

The metric maps several ways workers respond when full employment opportunities weaken. Employers can reduce hours, eliminate positions or reduce hiring. Workers can continue searching, accept part time employment or stop current search while retaining willingness to work. Automation might contribute to these responses in exposed tasks, but demand shocks and institutional constraints can generate the same classifications. U6 captures the resulting labor supply shortfall within its definitions rather than identifying the initiating cause.

Involuntary part time work is especially relevant when employment headcounts remain high. A firm can retain employees but schedule fewer hours, distributing a fixed workload among more people or adjusting to variable demand. The employment rate might look stable while workers cannot obtain the hours needed for income. U6 registers part of that intensity problem. A more complete account would measure desired and actual hours, scheduling predictability, hourly pay and annual household income.

Marginal attachment can reflect prolonged difficulty finding work. Some workers stop recent search after repeated rejection, making their absence invisible to U3. Others pause for care responsibilities, illness or transport difficulties while retaining a desire and availability for employment. The component therefore broadens the view of attachment while requiring reasons for nonsearch to assess mechanisms. An increase tied to displaced occupations and weak reemployment would support a compression interpretation more strongly than an increase explained by a short temporary obstacle.

A hypothetical example shows why components matter. Suppose a labor market has one hundred participants, including four unemployed and five involuntary part time workers, plus one marginally attached person. U3 is 4 percent. U6 is ten divided by one hundred one, about 9.9 percent. If the five part time workers gain full hours, U6 falls substantially while U3 remains unchanged. If the marginally attached person begins searching without finding a job, the classification changes but the underlying unmet employment remains. This is illustrative arithmetic rather than a reported estimate.

The post labor contribution is diagnostic. The framework predicts that production may increasingly require fewer human inputs while households still need work income. U6 tests whether unmet employment and hours become more persistent under that transition. Current low expansion readings limit the strongest version of that prediction. A weaker transmission of productive gains through pay can occur without a rising U6, so compensation and factor share evidence must carry that distinct distributional argument.

Cycles composition and the limits of a broad measure

Business cycles dominate many movements in both rates. Recessions increase unemployment and involuntary part time work, while sustained expansions can restore employment and hours. Comparing a recession endpoint with a prior expansion will exaggerate structural deterioration. A secular test should compare averages around similar expansion conditions over at least twenty years and verify that the conclusion survives alternative windows. The recovery path matters because a prolonged recession effect can still produce lasting harm even if the final rate eventually returns to its earlier level.

Demographic composition can change the rates. Groups differ in participation, unemployment and part time preferences. An aging workforce, more schooling or shifts in education can lower or raise an aggregate

independently of within group opportunities. Publish demographic breakdowns and, where useful, fixed composition rates. Such standardization is descriptive; it does not isolate automation from health, care provision or institutional change within the groups.

The marginal attachment definition imposes a search history boundary. Someone wanting work who has not searched for more than a year can be outside U6. A sustained deterioration could therefore move people beyond the measure's boundary rather than keeping them in its numerator. The broader population outside the labor force who want a job supplies an important companion. At the same time, counting every retiree or student as underutilized would abandon the measure's intended distinction between desired work and other circumstances. [1]

Part time measurement also has limits. Desired full time work is a survey response, and constraints can affect what respondents view as feasible. A caregiver may prefer full time employment under affordable childcare yet report otherwise under current arrangements. A worker with unstable hours can experience financial stress even if reference week hours exceed the part time threshold. These issues motivate complementary measures rather than a claim that the published U6 is erroneous.

A useful additional comparison holds the headline unemployment rate approximately constant and asks whether the broad rate differs across expansions. That comparison tests whether inadequate hours and marginal attachment are more prevalent under similar headline conditions. It remains descriptive because population composition, institutions and the mix of employment can differ. If the broad gap is stable across those windows, the evidence favors persistent bounded underutilization rather than a new secular expansion of it. If the gap rises, inspect the component counts and their population shares before assigning the change to a particular mechanism.

The secular compression interpretation would strengthen if expansion U6 levels rose persistently, its gap with U3 widened after composition adjustments, and increases aligned with task displacement and weak earnings. It would weaken if expansions restored both rates, hours improved and attachment broadened. The observed long history currently supports the latter counterexample in several periods. Retaining mixed status ensures that this metric can test the theory and record deterioration when it occurs without assigning a predetermined result.

A component dashboard and update procedure

Plot U3 and U6 from January 1994 onward so both lines share a common observed history. Show their percentage point difference in a second panel and identify the different denominator. Add component counts or population shares for marginal attachment and involuntary part time employment, each with consistent adjustment status. An expansion comparison table should summarize multiyear averages rather than only the pandemic peak. [1][2][3]

Archive monthly observations with source vintage, seasonal adjustment and missing values. Reproduce U6 from component counts only when all required estimates use compatible procedures; the published adjusted rate can differ from a reconstruction using separately rounded or adjusted components. Keep the official rate as the reference and describe any reconstruction as a check. Current table A15 provides the definitions and September 2026 checkpoint. [4]

Review monthly changes for current labor demand and reassess the secular conclusion annually. Pair the dashboard with prime age employment, long unemployment spells, real earnings and people outside the

labor force who want a job. A decline in U6 alongside weak pay identifies a distributional concern rather than unmet hours. A rise in U6 while output grows motivates investigation of labor absorption and scheduling.

This entry remains mixed evidence. It broadens labor market monitoring in a precise and useful way, while its recovered expansion lows resist a narrative of steadily increasing underutilization. Its value for post labor economics lies in distinguishing the available work, hours and attachment channels and allowing the historical evidence to constrain the claim.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Concepts and Definitions CPS. Unemployment employment marginal attachment and part time for economic reasons definitions; verified retrieval date 4 October 2026

[2] Bureau of Labor Statistics via Federal Reserve Bank of St Louis (2026). Alternative measure of labor underutilization U6RATE. Monthly seasonally adjusted percent January 1994 to September 2026; verified retrieval date 4 October 2026

[3] Bureau of Labor Statistics via Federal Reserve Bank of St Louis (2026). Unemployment Rate UNRATE. Monthly seasonally adjusted percent January 1948 to September 2026; verified retrieval date 4 October 2026

[4] Bureau of Labor Statistics (2026). The Employment Situation September 2026. Released 2 October 2026 tablesA1 A8 A15 A16 and technical notes; verified retrieval date 4 October 2026

[5] Bureau of Labor Statistics (2026). Table A 15 Alternative Measures of Labor Underutilization—September 2026. September 2026 official underutilization table, released 2 October; U6 components and expanded denominator, with seasonally adjusted rates. Verified for version two 4 October 2026.

RELATED CHAPTERS 004 · 008 · 011 · 012 · 013 · 014

CHAPTER 011

Involuntary part time employment

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN 1955 to September 2026 monthly counts with 1994 to 2016 comparable subgroup study

Involuntary part time work measures inadequate desired hours but large cyclical swings and subsequent recoveries prevent an automatic secular worsening conclusion.

Actual hours and the desire for full time work

Involuntary part time employment is the Current Population Survey category called part time for economic reasons. It includes people at work one to thirty four hours during the reference week who want and are available for full time work but have a shorter schedule under the survey criteria. Reasons include slack work or unfavorable business conditions and inability to find full time employment. The headline series is a count of people, normally reported in thousands or millions, rather than the percentage of all workers. [1]

The category concerns actual hours in the reference week. It includes some people who usually work full time but have reduced hours for an economic reason. It differs from the narrower group who usually work part time and would prefer full time work. The distinction matters when using historical studies. A table describing involuntary usual part time workers cannot be inserted directly into the all industry actual hours series. Each boundary should be retained in its own chart or table. [3][4]

Part time for noneconomic reasons is another category. School, retirement, family obligations and other circumstances can explain an intentionally shorter schedule. Some of those circumstances reflect constrained choices, but they do not automatically meet the economic reasons definition. A parent unable to arrange childcare might want more paid work under different conditions while reporting part time for a noneconomic reason. The official measure therefore captures a specific unmet hours channel and should not be presented as every worker whose hours are below an ideal.

The appropriate denominator depends on the question. Dividing the involuntary count by all employed people gives the fraction of employment affected. Dividing by the labor force gives its contribution to a broader underutilization perspective. Dividing by all part time workers asks how much part time work is involuntary. These percentages are different. Population growth can increase the count while the fraction of employment falls, so both count and an explicit rate belong in a secular dashboard.

The measure is closely connected to earnings adequacy. A worker can have a reasonable hourly rate but insufficient weekly or annual hours. Employment headcounts treat that person as employed, while involuntary part time identifies a shortfall in desired labor input. It is therefore a valuable counterpart to participation and employment to population. Pairing hourly wages with hours and schedule stability explains whether paid work supplies adequate resources, rather than relying on employment status alone.

Long history and distinct published populations

The verified seasonally adjusted all industry count was 3.208 million in January 2000 and 4.134 million in December 2019. It reached 10.880 million in April 2020 during the pandemic disruption and subsequently fell. September 2026 recorded 4.501 million. These are monthly observations from BLS seriesLNS12032194, republished by FRED. The comparison shows a count above the turn of the century level, but population and employment also changed over that span. A higher count is not sufficient evidence of a higher involuntary part time employment rate. [2]

The latest Employment Situation was released on 2 October 2026. Table A8 records 4.501 million part time for economic reasons in all industries, seasonally adjusted. Its components include 2.896 million associated with slack work or business conditions and 1.267 million who could only find part time work. Separately adjusted components and rounded published figures do not necessarily sum exactly to the adjusted total. Keep the official total as the reference rather than forcing a reconciliation by altering a component. [4]

Using total employed people of 163.152 million from the same release gives an illustrative employment share of about 2.76 percent for September 2026, calculated as 4.501 divided by 163.152. The denominator is all employed civilian noninstitutional people, and both estimates are seasonally adjusted. This rate is an author calculation from the release, not a separately published BLS headline. Labeling it clearly allows future comparisons to use the same denominator and prevents counts from being mistaken for prevalence. [4]

The BLS 2018 article provides a long comparison for the narrower usual part time population. The involuntary usual part time share of total employment was 2.8 percent in 1994, 1.5 percent in 2000, 2.0 percent in 2007, 5.0 percent in 2010 and 3.1 percent in 2016. These observations meet the twenty year span from 1994 to 2016 while showing strong cyclicality. The 2016 endpoint was above 1994, but the decline after 2010 and changing cycle position make a generalized secular conclusion premature. [3]

The latest monthly series also contains a missing October 2025 observation from the survey interruption. Preserve that absence rather than interpolating a reported count. An annual calculation based on eleven observed months should be labeled accordingly. The historical record is useful precisely because it reveals temporary demand shocks, slow recoveries and possible baseline changes. The mixed classification retains all of those possibilities without treating the pandemic peak as a permanent structural state. [2][4]

Month	Actual part time for economic reasons all industries
January 2000	3.208 million
December 2019	4.134 million
April 2020	10.880 million
September 2026	4.501 million

BLS seasonally adjusted monthly person counts LNS12032194 actual reference week hours [2]

Hours compression within continuing employment

Involuntary part time work represents labor market compression on the hours margin. Employers can reduce the amount of labor purchased without eliminating every employment relationship. A schedule reduction preserves the worker in the employment numerator while lowering earnings and labor input. That makes the

measure particularly useful when employment remains high but households struggle to secure enough work. It identifies a specific way productive or demand adjustments can be distributed across employees.

Automation can contribute if a firm needs fewer hours to produce a given volume. It may respond by reducing headcount, shortening schedules, expanding output or reallocating employees to complementary tasks. The involuntary part time measure captures only one possible response. A fall in hours accompanied by a stated preference for more work would support a compression account, while voluntarily shorter hours with maintained income could indicate improved welfare. The direction of hours alone cannot distinguish those outcomes.

Demand volatility and staffing models can produce the same survey result. Retail, hospitality and other services may vary schedules to align labor with customer traffic. Software can help employers forecast demand and assign hours more precisely, potentially reducing slack from the firm's perspective while making worker income less predictable. The official count does not measure scheduling notice or variability across weeks. A monitoring system should examine those characteristics separately rather than assuming every economic part time worker experienced the same technology driven adjustment.

Household consequences depend on hourly pay and available alternatives. A worker with a high rate and a modest desired hours gap can be financially secure; another with low pay and severe hours limits may require several jobs or public assistance. The count weights them equally. Connecting the measure to earnings, benefits and household transfers clarifies whether the unmet hours problem reduces access to prosperity. This is one reason transfer dependence can add a useful distributional perspective beyond labor market status.

The strongest post labor contribution combines rising involuntary hours shortfalls with expanding output or productivity and persistent difficulty obtaining better schedules. That combination suggests production becoming less dependent on desired human labor while households remain dependent on its compensation. A cyclical spike during falling output carries a different explanation. The current historical evidence supports monitoring the channel carefully but does not establish an uninterrupted rise over the full series.

Preferences classifications and baseline comparisons

The stated desire for full time work is central. Preferences can be shaped by care access, health and expected job quality. Someone may report wanting a shorter schedule under existing childcare constraints but would choose more paid hours with affordable care. The official definition remains valid for the reported circumstance, yet its boundaries should be acknowledged. Supplementary questions about preferred hours under alternative conditions would address a broader labor supply question.

The reference week is another limitation. A usual full time worker with reduced hours in one week can enter the actual economic part time category. A worker facing repeated unstable schedules may move in and out of it. Annual person level information could show how many people experience the condition at least once and for how long, which differs from the average monthly count. Without that information, a point in time estimate should not be called the number of people who ever experienced involuntary part time during the year.

Population growth and sector composition affect counts. More service employment can raise the number of part time jobs, and changing age or student composition can alter voluntary part time prevalence. The correct secular test uses rates with consistent denominators, demographic and industry breakdowns, and

comparisons around similar expansion conditions. A fixed composition calculation can identify whether the aggregate change arises within industries or through shifts toward industries where shorter schedules are common.

The 1994 CPS redesign and distinctions among actual hours, usual hours and desired full time work require consistent historical treatment. The BLS article starts its main comparable subgroup analysis in 1994 for a reason. The headline FRED series extends earlier, but a chart spanning its full history should retain source notes on measurement changes. The length of the data record should not be mistaken for perfect comparability across every observation. [1][2][3]

The severity of the hours shortfall is another dimension. Two workers can both meet the definition while one wants five additional weekly hours and the other wants twenty. The published count treats their unmet labor supply equally. A desired hours survey could calculate the gap for each person and aggregate it, but that estimate should be labeled separately from the official count. Following the same workers over several weeks would also distinguish a brief reduction from persistent inadequate schedules. These additions would test compression more directly while preserving the official series as the common historical benchmark.

A research alternative measures net desired hours across employed people. Bell and Blanchflower distinguish additional hours desired by underemployed workers from reductions desired by overemployed workers, including full timers and people classified as voluntary part timers. Their European analysis illustrates why a count of involuntary part timers can miss part of the hours gap. The authors state that the United States lacks those fuller desired-hours data; their US analysis instead uses part time for economic reasons as a percentage of employment and follows wage data through 2017. [5] Accordingly, their post Great Recession findings must not be presented as an updated 2026 US net-hours estimate. A companion survey could report weighted desired increases, weighted desired reductions and their difference separately. The gross shortfall remains important even when offsetting reductions make the net gap small. Retain the official part time count as the historical anchor. No verified twenty year rising US net desired-hours series is established here; this is a measurement improvement and historical research mechanism, not an additional established secular deterioration.

The interpretation would strengthen if the employment share rose over several strong labor markets, durations lengthened and workers' preferred hours remained unmet despite productivity gains. It would weaken if the share returned to earlier lows, actual hours and pay improved and shorter schedules increasingly reflected preference. The difference between a count and a rate is particularly important here. The verified current count and recovery are informative, while a secular prevalence claim requires the corresponding denominator record.

Charting unmet hours and monitoring recovery

Plot the seasonally adjusted all industry count and its share of total employment in separate panels. Use the same compatible monthly employment denominator for every rate. Add a twelve month average and retain recession shading. A separate panel can show the narrower usual part time series from the published historical study, clearly labeled and ending in 2016. Do not join that rate to the actual hours monthly count. [2][3]

Archive the raw counts, denominator, population control notes and adjustment status. Calculate rates reproducibly and label them author calculations when not directly published. Preserve missing observations.

For current movements, use table A8 to distinguish slack work from inability to find full time employment while respecting independently adjusted component totals. The September 2026 observation is 4.501 million, released 2 October. [4]

Review monthly changes and annual expansion comparisons. Pair the result with weekly earnings, benefits, multiple jobholding and schedule predictability. A reduction in involuntary part time alongside improving earnings is positive evidence about labor absorption. A stable employment rate with a rising involuntary part time share indicates deterioration on an intensity margin that the headcount misses.

This entry is mixed evidence. It captures a concrete unmet labor supply problem and can reveal hours compression within continuing employment. Its long history also records large cyclical spikes and subsequent recoveries. The metric should remain in the framework as a testable channel, with population denominators and desired hours preserving the distinction between more part time work and more inadequate work.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Concepts and Definitions CPS. Unemployment employment marginal attachment and part time for economic reasons definitions; verified retrieval date 4 October 2026

[2] Bureau of Labor Statistics via Federal Reserve Bank of St Louis (2026). Employment Level Part Time for Economic Reasons All Industries LNS12032194. Monthly seasonally adjusted thousands of people May 1955 to September 2026 current 4501 thousand; verified retrieval date 4 October 2026

[3] Bureau of Labor Statistics (2018). Who chooses part time work and why. Original analysis observed 1994 to 2016 usual part time population narrower than all actual part time for economic reasons; verified retrieval date 4 October 2026

[4] Bureau of Labor Statistics (2026). The Employment Situation September 2026. Released 2 October 2026 tablesA1 A8 A15 A16 and technical notes; verified retrieval date 4 October 2026

[5] David N. F. Bell and David G. Blanchflower (2018). Underemployment in the US and Europe. Authors own explanation of desired hours methods and US data limits; original NBER abstract cross checked. Historical results through 2017. Verified for version two 4 October 2026.

RELATED CHAPTERS 004 · 008 · 010 · 012 · 013

CHAPTER 012

Marginal attachment to the labor force

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN 1994 to September 2026 monthly record and 2024 to 2025 annual detail

Marginal attachment reveals available people with a recent search history outside headline unemployment but its measured trend is cyclical and bounded by the twelve month search rule.

A specific boundary near the labor force

Marginally attached people are outside the labor force, want a job, are available to work and searched for employment during the preceding twelve months, but did not look during the preceding four weeks. They fail the recent active search requirement for unemployment while retaining a defined connection to work. People with a previous job must have searched after that job ended under the relevant survey rule. The measure is normally a person count, with rates requiring an explicitly selected denominator. [1][3]

This definition separates marginal attachment from several nearby categories. All people outside the labor force who want a job include those unavailable now or without search in the previous year. Discouraged workers form a subset of marginal attachment, giving a labor market related reason for stopping current search. Other marginally attached people may cite family responsibilities, education, illness, transport or other reasons. The subsets should remain distinct because their mechanisms differ even when their employment status is the same. [1]

The twelve month search condition is economically consequential. A person who continues wanting employment but has not searched for more than a year can move outside marginal attachment without finding work. The measured count can therefore fall because people gained employment, resumed active search, became unavailable or crossed the search history boundary. A falling count is not by itself evidence of successful reemployment. Follow the destination categories or use longitudinal transitions when judging whether labor market attachment improved.

For a prevalence rate, divide the count by the civilian noninstitutional population or by the labor force plus marginally attached people, depending on the question. The first describes how much of the adult population is in this state. The second corresponds more closely to the expanded labor supply denominator used in broad underutilization. Do not use the share of all nonparticipants as though it measured the same exposure; that denominator includes a large and changing retirement population.

The metric is useful for post labor research because repeated difficulty obtaining work can interrupt active search while leaving willingness to work intact. It can identify a near labor force response to weak opportunities that headline unemployment excludes. Its narrow definition also creates limits: durable withdrawal can extend beyond it, and temporary nonsearch can reflect constraints independent of employer demand. Retaining the measure with its broader parent population makes those possibilities visible.

Verified checkpoints and reason detail

The verified monthly not seasonally adjusted series begins in 1994. September observations were 1.858 million in 1994, 1.166 million in 2000, 1.299 million in 2019 and 1.485 million in 2026. Comparing the same month reduces obvious seasonal mismatch, although it does not remove sampling variation or differences in business cycle position. The endpoints show neither a continuous rise nor a collapse toward zero. A secular conclusion should use annual averages and matched expansion comparisons alongside these checkpoints. [2]

The current Employment Situation was released on 2 October 2026. Its table A16 reports 1.485 million marginally attached people in September, not seasonally adjusted. Of these, 394,000 were discouraged workers and 1.091 million were other marginally attached people. The discouraged group is therefore only part of the total. Describing the entire 1.485 million as people who gave up because no jobs existed would ignore the survey's reason categories and overstate a demand specific interpretation. [4]

Annual table 35 reports 1.558 million marginally attached people in 2024 and 1.716 million in 2025. Discouraged workers numbered 408,000 and 509,000 respectively. The 2025 annual estimates are averages of eleven months because October was not collected during the government shutdown. BLS warns they are not strictly comparable with ordinary twelve month annual averages. The annual rise is informative but should retain that caveat and should not be called a multidecade secular increase. [3]

The same annual table provides detail on other marginal attachment reasons. In 2025, these included family responsibilities, school or training, ill health or disability and a residual category containing such issues as childcare and transport. The categories identify reported reasons for not searching in the preceding four weeks. They do not measure the causal effect of each constraint on employment or tell whether removing it would lead immediately to a job. That distinction guides use of the table in mechanism research. [3]

The historical record meets the minimum observation span for evaluating a secular hypothesis. Its actual pattern remains mixed and cyclical. A count above the 2000 observation but below 1994 can support concern about a particular comparison while defeating a simple monotonic rise claim. Population growth further requires rates for a prevalence interpretation. The chapter keeps the series as evidence about labor market boundaries, with the source definitions and multiple historical comparisons constraining how strongly it can be used. [2]

September observation	Marginal attachment not seasonally adjusted
1994	1.858 million
2000	1.166 million
2019	1.299 million
2026	1.485 million

BLS seriesLNU05026642 person counts outside labor force want available and searched within twelve months [2]

Discouragement interrupted search and compression

Repeated rejection can change a worker's search behavior. A person may remain willing to work while deciding that current search is unlikely to succeed. If availability and search history meet the definition, marginal attachment records that state. This is a plausible response to declining demand for a formerly

valuable task or qualification. The metric captures a behavioral boundary near employment, while occupation histories and reasons for stopping search are needed to establish a connection to technological displacement.

The discouraged subset is more directly tied to perceived job opportunities than the overall category. Reported reasons can include believing no work is available, failing to find work, lacking training or anticipating discrimination. These are worker perceptions recorded under survey criteria. They can be economically consequential even when openings exist elsewhere, because access depends on location, skills, schedules and employer selection. A rigorous analysis asks whether the worker's available opportunities improved and whether subsequent employment restored earnings.

Other marginal attachment can reflect the interaction between labor opportunities and household constraints. A weak wage offer may make childcare or transportation costs difficult to cover, leading to an interruption in search. The immediate reported reason can be care or transport while the available compensation is part of the underlying problem. Conversely, an acute family obligation can interrupt search even in a strong labor market. The category alone cannot distinguish these causal pathways, but detailed household and local labor demand evidence can.

A household's resources influence how long interrupted search is feasible. Asset income, a partner's wages and public benefits can support someone outside paid work. A household without those resources may accept lower quality employment quickly. The same deterioration in good job availability can therefore produce marginal attachment in one group and occupational downgrading in another. Comparing attachment alone across households can miss this difference. Transfer dependence and household income sources help interpret how people sustain consumption during transitions.

The post labor relevance lies in weakened access to employment rather than an immediate reduction in socially useful work. A persistent available population near the labor force can indicate that productive opportunities are not translated into adequate work access. The causal case becomes stronger when their former tasks are displaced, output remains high and reemployment fails to restore income. It becomes weaker when nonsearch is brief, institutional constraints explain it and broad employment recovery draws people back into work.

Flow measurement and alternative outcomes

Stocks can conceal very different transitions. A constant marginally attached count could reflect the same people remaining disconnected or rapid movement among unemployment, employment and nonparticipation. The first implies persistent exclusion; the second may reflect ordinary transitions. Longitudinal CPS matching can estimate those flows, subject to matching and sample limitations. Duration in the state and subsequent earnings would make the metric more informative for a compression account than a point in time count alone.

The search window can create apparent improvement without economic improvement. Someone who searched eleven months ago and wants work today qualifies if other conditions hold. One month later, with no renewed search, the person can leave the category. The count falls even if willingness and job access do not change. Compare marginal attachment with all nonparticipants wanting a job and with reasons for

inactivity. This broader view tests whether a decline indicates employment recovery or movement farther from the labor market. [1][3]

Availability can also shift. Illness, education or care responsibilities may move someone outside the available group while maintaining a desire for employment. A change in care provision could restore availability and increase the marginally attached count before any employment is obtained. In that case a rising count might reflect expanded feasible labor supply, rather than worsening employer demand. The interpretation should follow the sequence of availability, search and employment instead of assigning a single welfare direction to the stock.

Monthly samples are relatively small for detailed subgroups. Fluctuations in the discouraged subset can be noisy, so annual averages or pooled windows are useful. The main series is not seasonally adjusted; compare the same month or use explicit seasonal methods rather than mixing adjusted and unadjusted counts. Population controls and the missing October 2025 survey month should be documented. These choices affect the precision of short horizon changes and the validity of secular comparisons. [2][3][4]

The interpretation would strengthen with a rising population share across comparable expansions, longer nonsearch spells and weak transitions into adequate employment after routine task displacement. It would weaken with falling shares, successful reentry and improved real earnings. A change concentrated in care or health constraints could support a broader institutional explanation while weakening a demand only account. The mixed classification keeps this series available for those tests and avoids turning a precisely bounded category into a claim about every nonparticipant.

A boundary and transition dashboard

Plot annual marginal attachment counts and a rate using a documented population denominator. Show discouraged workers and other marginal attachment as components on the same adjustment basis. Add the broader number outside the labor force who want a job, making the search and availability boundary visible. Monthly observations can appear in a separate panel with same month year comparisons or a trailing average. The September 2026 current count is not seasonally adjusted. [2][4]

Archive source observations, population controls and the annual averaging treatment. Label 2025 as an eleven month average excluding October. If constructing flow estimates, store matching rules, sample restrictions and weights, and present them separately from official stocks. A destination table can identify movement into employment, active unemployment, unavailability or no search within a year. This prevents category exits from being treated automatically as successful job acquisition.

Review the monthly record for current attachment changes and reassess the secular comparison annually. Pair it with prime age employment, long unemployment duration, involuntary part time work and household support. If marginal attachment falls while the broader want job group rises, investigate movement beyond the search window. If both fall and employment rises, the evidence is more consistent with improved access.

This metric contributes mixed evidence about interrupted attachment near the labor market. Its long history establishes a meaningful population and permits a secular test, while the observed pattern and classification rules limit a simple worsening narrative. Its value increases when reasons, duration and subsequent

employment show whether the boundary reflects displaced opportunities, household constraints or ordinary transitions.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Concepts and Definitions CPS. Unemployment employment marginal attachment and part time for economic reasons definitions; verified retrieval date 4 October 2026

[2] Bureau of Labor Statistics via Federal Reserve Bank of St Louis (2026). Not in Labor Force Want a Job Now Marginally Attached Searched for Work in Previous Year Available to Work Now LNU05026642. Monthly not seasonally adjusted thousands January 1994 to September 2026; verified retrieval date 4 October 2026

[3] Bureau of Labor Statistics (2026). People not in the labor force by desire and availability for work age and sex. Annual table 35 observations 2024 and 2025 2025 is eleven months excluding October; verified retrieval date 4 October 2026

[4] Bureau of Labor Statistics (2026). The Employment Situation September 2026. Released 2 October 2026 tablesA1 A8 A15 A16 and technical notes; verified retrieval date 4 October 2026

RELATED CHAPTERS 001 · 004 · 010 · 011 · 013 · 014

CHAPTER 013

People outside the labor force who want a job

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN 1994 to September 2026 monthly history

The broader want job population captures unmet interest beyond recent search rules but its long record and demographic denominators do not establish a universal secular rise.

Desire for work beyond the search boundary

This measure counts civilian noninstitutional people aged 16 and older who are outside the labor force but report that they currently want a job. They are neither employed nor classified unemployed under the Current Population Survey definitions. The group is broader than marginal attachment because it can include people unavailable now or without job search in the preceding twelve months. The unit is people, often shown in thousands or millions. A rate requires an explicitly chosen population denominator. [1]

The question concerns present desire rather than current search behavior. Someone can want work while pausing search for care, illness, transport, study or repeated disappointment. The desire does not establish immediate availability or qualification for a particular vacancy. Those distinctions are the reason the group remains separate from unemployment. The measure is useful for identifying an employment interest that is absent from the active labor force, while reasons and availability describe how readily that interest could become paid work.

It also differs from all nonparticipants. Retirees, students and other adults who do not currently want employment make up most of the outside labor force population. Counting all of them as people unable to find work would introduce a major interpretive error. The desire subgroup narrows the analysis to those expressing a current work preference. It still includes varied circumstances, so its members should not all be labeled discouraged workers or assumed to have left search because employers rejected them.

Several denominators are useful. Dividing by the civilian noninstitutional adult population measures the prevalence of this state across adults. Dividing by all nonparticipants describes how much of that larger group wants work. The latter is particularly sensitive to population aging because the retirement denominator grows. Dividing by the labor force plus the want job group constructs a broader potential labor supply measure, but that is an analytical choice rather than the official unemployment denominator. Name each rate precisely.

The metric complements marginal attachment because it retains people beyond the twelve month search window. A person can remain in this broader group after leaving marginal attachment through lack of recent search. It can therefore help assess whether an apparent improvement in narrow underutilization reflects employment recovery or movement farther from active participation. Together, the measures map desire, availability, search and employment without treating each boundary as the same economic condition.

Verified history and the current population size

The verified seasonally adjusted series records 6.723 million people outside the labor force who wanted a job in January 1994, 4.302 million in January 2000 and 4.853 million in December 2019. It rose to 9.904 million in April 2020 during the pandemic disruption. The current BLS September 2026 release records 5.790 million. These checkpoints span more than thirty years and contain both contraction and expansion of the group. A count above the 2000 observation but below 1994 cannot substantiate a simple continuous secular increase. [2][4]

The current release was published on 2 October 2026 and reports 105.292 million people outside the labor force in total, seasonally adjusted, with 5.790 million currently wanting a job. It also reports the adult civilian noninstitutional population as 275.554 million. The want job count is therefore a small subset of total nonparticipation, not an alternative description of all 105.292 million. The distinction should be visible in every chart and headline. [4]

Using the same release, 5.790 divided by 275.554 gives about 2.10 percent of the adult civilian noninstitutional population. Dividing by 105.292 gives about 5.50 percent of nonparticipants. These are author calculations using rounded published figures. They answer different prevalence questions and should not be compared as though one contradicted the other. The denominator choice changes the meaning even when the numerator is identical. [4]

Annual table 35 reports 5.590 million outside the labor force wanting a job in 2024 and 6.018 million in 2025. The 2025 estimate is an eleven month average excluding October because data were not collected during the shutdown. BLS explicitly warns against strict comparability with ordinary twelve month averages. The rise supplies recent context, while the long monthly history supplies the broader test. A single annual increase is insufficient evidence of a secular change lasting two decades. [3]

The annual detail separates people who did not search in the previous year from those with a search history, and separates unavailable people from marginal attachment. These categories are especially useful for understanding why the broad count differs from U6. A complete historical dashboard should retain them where comparable data exist. The mixed classification reflects the measure's diagnostic importance and its actual nonmonotonic pattern, with population growth and changing composition requiring additional rate comparisons. [1][3]

Monthly observation	Outside labor force currently want a job seasonally adjusted
January 1994	6.723 million
January 2000	4.302 million
December 2019	4.853 million
April 2020	9.904 million
September 2026	5.790 million

BLS current desire for employment among nonparticipants historical FRED series [2] and latest release [4]

A broader test of unrealized labor supply

Labor market compression can push people beyond current search without removing their desire for employment. After repeated failure to secure acceptable work, a person may reduce search effort or pause while retraining. If the interruption continues long enough, marginal attachment can cease under its search history rule. The broader want job group can retain that person and therefore reveal unmet interest that narrower measures lose. This is a relevant diagnostic for a transition in which production requires less of some kinds of labor.

The relationship to automation remains conditional. Task substitution can reduce openings in an exposed occupation, making search less rewarding. Yet health shocks, unavailable care or poor transport can also leave someone wanting employment without active search. The measure records the result of those circumstances. A stronger interpretation links changes to work histories, local task exposure and the availability of suitable jobs, and verifies whether removing a constraint or improving labor demand leads to employment.

Household support affects the response. Someone with family income or benefits can remain outside paid work while seeking a better fit. Someone without support may accept poor work quickly and disappear from this numerator through employment. The count can therefore underrepresent job quality compression among households with the least ability to wait. Pair it with underemployment and earnings to assess both unmet work and constrained acceptance of lower quality work. Transfers can sustain consumption during a transition while also making the nonemployment state economically feasible.

A rising count can sometimes indicate a more positive change in willingness. If a group previously reported no desire for paid work and begins wanting employment after improved health or changing household circumstances, the want job count can increase before jobs are found. The increase represents additional potential labor supply as well as unmet interest. Its welfare meaning depends on the transition's origin and destination. A survey stock should be interpreted with those flows rather than assigned a uniformly negative direction.

The post labor contribution is a population based view of unrealized work preference. It helps test whether high productive capacity coexists with a larger group unable to translate desire into paid employment. The verified history does not establish a universal secular rise, so the measure should remain mixed evidence. Its value is strongest when it distinguishes desire from current availability and tracks whether people ultimately obtain work with adequate earnings, hours and security.

Desire availability and durable withdrawal

The meaning of wanting a job can change with expectations and feasible alternatives. Respondents may envision different hours, occupations or conditions. Someone who has repeatedly failed to obtain suitable work may eventually report no desire even while willing to work under different circumstances. The category can therefore miss discouraged preferences that have adapted to long term exclusion. A broad want job count and a participation measure should be interpreted together rather than expecting either to reveal every form of withdrawal.

Availability is the central distinction from immediate labor supply. A person wanting work but unable to start because of care or illness cannot fill a vacancy at once. Policy changes that improve availability might increase marginal attachment or active unemployment before raising employment. This sequence would represent movement closer to work, even if a narrow underutilization count temporarily rose. Monitoring the internal categories helps distinguish expanded feasible labor supply from declining job access. [1][3]

Aging complicates all adult counts and ratios. Older adults may have different desires and constraints from prime age adults. A larger population can produce a larger count with no change in within age prevalence. Standardize age and sex weights or present subgroup rates to assess a secular opportunity claim. A rate among nonparticipants is especially composition sensitive because retirement changes its denominator. The population share and prime age breakdown should receive equal prominence.

Survey uncertainty and population controls matter for recent changes. Monthly subgroup estimates can fluctuate, while annual population revisions can affect level comparisons. Seasonal adjustment and missing survey months require documented treatment. The 2025 annual estimate excludes October; a historical chart should preserve that fact. A difference between an annual count and a current monthly count can reflect seasonality, averaging and revisions rather than a contradiction between sources. [2][3][4]

Repeated observations of the same household would improve interpretation of desire. A person moving from no current work interest into the want job group has a different history from someone who remains there after years of unsuccessful search. Linking survey waves, where permitted by the data design, can identify those origins and destinations. It can also show whether a return to employment restores desired hours and earnings. Such analysis requires matching rules and sample weights, and it should be presented as a distinct longitudinal result rather than inferred from the difference between two national monthly stocks.

The compression account would strengthen with a persistent increase in age standardized prevalence across expansions, weak transitions into employment and a rise in people with long search interruptions after displacement. It would weaken with improved employment, falling desire related nonparticipation and restored earnings among returners. A rise concentrated in care or health constraints could support an institutional access problem without identifying automation. The metric's role is to keep that broader pool visible while evidence determines the mechanism.

Charting the wider employment interest group

Plot the seasonally adjusted monthly count from 1994 onward and a rate against the adult civilian noninstitutional population. Use a second panel for prime age and demographic groups where verified data are available. A composition chart can divide the broad group into no search within a year, unavailable after prior search and marginally attached. Those categories should use a common source period and adjustment basis so their relationship is clear. [1][2][3]

Keep current all nonparticipation and current want job counts beside each other with explicit labels. The September 2026 values are 105.292 million and 5.790 million respectively. Store counts, denominator, source vintage and calculation code for population shares. If the FRED historical extract lags the current BLS release, add the verified current observation with its source note rather than assuming the extract's update date covers a later month. [4]

Review monthly movements for current labor access and assess secular prevalence annually. Pair the measure with marginal attachment, prime age participation, health, care constraints and real earnings. If narrow underutilization falls while this broader group grows, inspect the search history boundary. If the broader group falls while employment and earnings rise, the evidence is more consistent with improved access.

The retained classification is mixed evidence. The series broadens the view beyond active search and provides a long record of expressed desire for work. Its present level and historical path do not support continuous secular worsening. Its contribution is to make unrealized employment interest measurable and connect it with the specific constraints and transitions that determine access to paid work.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Concepts and Definitions CPS. Nonparticipation desire for work unemployment and availability definitions; verified retrieval date 4 October 2026

[2] Bureau of Labor Statistics via Federal Reserve Bank of St Louis (2026). Not in Labor Force Want a Job Now NILFWJN. Monthly seasonally adjusted thousands beginning January 1994 historical checkpoints verified through current BLS September 2026 release; verified retrieval date 4 October 2026

[3] Bureau of Labor Statistics (2026). People not in the labor force by desire and availability for work age and sex. Annual table 35 observations 2024 and 2025 with search and availability detail 2025 eleven months; verified retrieval date 4 October 2026

[4] Bureau of Labor Statistics (2026). The Employment Situation September 2026. Released 2 October 2026 tableA1 outside labor force currently want job 5790 thousand seasonally adjusted; verified retrieval date 4 October 2026

RELATED CHAPTERS 001 · 003 · 004 · 010 · 012 · 014

CHAPTER 014

Unemployment duration and long term unemployment

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN Long term counts 1948 to 2026 median 1967 to 2026 with mean measurement break 2011

Unemployment spells have a higher recent median than around 2000 and a substantial long term tail but recession dynamics composition and a mean series break require careful interpretation.

Elapsed duration and the long term tail

Unemployment duration measures how long currently unemployed people have been looking for work or on temporary layoff under Current Population Survey rules. It is elapsed duration at the survey date, not the final length of a completed spell. The mean averages reported elapsed weeks; the median identifies the middle of the current unemployed distribution. Long term unemployment counts people unemployed for 27 weeks or more. A long term share divides that count by all unemployed people under the corresponding published procedures. [1]

Elapsed spells are incomplete. Someone interviewed after eight weeks may find work the next week or remain unemployed for many more months. The current stock also overrepresents long spells because those people appear in unemployment for more survey periods. It is therefore inaccurate to describe the stock median as the typical completed job search time for every person who becomes unemployed. A completed spell study requires longitudinal follow up or an appropriate duration model, with exits to employment distinguished from exits out of the labor force.

The long term share answers a different question from the long term count. The count describes the number experiencing an extended spell. The share describes how concentrated current unemployment is in those spells. A shrinking flow of newly unemployed people can raise the share even if the long term count is unchanged. Conversely, a wave of layoffs can initially reduce the share by adding many short spells, despite deteriorating labor conditions. Both count and share belong in the dashboard.

Median and mean respond differently to the tail. A small number of very long spells can increase the mean while leaving the median almost unchanged. BLS changed the maximum recorded duration from two years to five years beginning in 2011, creating a mean series break. It reports that the median and unemployment duration distributions were unaffected by that collection change. A secular comparison should therefore prioritize median and 27 week distribution measures or use an explicitly harmonized mean. [4]

This metric addresses the difficulty of regaining work after separation or entry. It is particularly relevant to a post labor account of compression because displacement can matter through prolonged search and reduced reemployment quality even when aggregate employment ultimately recovers. Duration alone does not establish automation, but it adds the time dimension missing from a headline unemployment rate.

Verified history and recent tail size

The verified seasonally adjusted median duration was 5.8 weeks in January 2000, 25.2 weeks in June 2010, 9.1 weeks in December 2019 and 11.5 weeks in September 2026. The current median is substantially below the financial crisis aftermath yet above the earlier expansion checkpoints. This supports concern about a higher baseline over a span exceeding twenty years, while the large rise and recovery demonstrate strong cyclicality. A peak month should not be treated as the permanent search duration facing all unemployed workers. [2]

The long term count was 721,000 in January 2000 and 1.188 million in December 2019. September 2026 recorded 1.944 million, seasonally adjusted. Population growth and changing total unemployment make counts insufficient for a prevalence claim. The corresponding current published long term share was 27.1 percent. Its source table warns that separately adjusted duration categories do not necessarily sum to total unemployment in tableA1, so use the published distribution rather than reconstructing it from incompatible rounded totals. [3][6]

The current release, published on 2 October 2026, reports a mean elapsed duration of 24.8 weeks and median 11.5 weeks. The gap indicates a substantial right tail under the current measurement convention. It should not be read as evidence that every unemployed person waited about six months. Half the current distribution is on each side of the median, and very long spells influence the mean. A distribution chart communicates that heterogeneity more clearly than a single average. [6]

Annual table 30 reports 1.449 million people unemployed 27 weeks or more in 2024, 21.4 percent of unemployment, and 1.696 million in 2025, 23.2 percent. Mean duration increased from 21.6 to 23.0 weeks and median from 9.6 to 9.9 weeks. The 2025 averages exclude October because survey collection was interrupted. These recent increases add context but are short horizon movements; the chapter's secular question rests on the longer median and distribution record. [5]

The pandemic illustrates stock dynamics particularly clearly. In April 2020 the median fell to 2.2 weeks as a large inflow of newly unemployed people entered the stock, even though unemployment surged. The long term count was only 910,000 then and increased later as spells aged. A falling median at the beginning of a severe shock can therefore reflect newly created short spells rather than improving job access. Interpret the duration path together with unemployment inflows, counts and the recovery horizon. [2][3]

Month	Median elapsed unemployment duration
January 2000	5.8 weeks
June 2010	25.2 weeks
December 2019	9.1 weeks
April 2020	2.2 weeks
September 2026	11.5 weeks

BLS current unemployed population seasonally adjusted elapsed weeks [2]

Displacement matching and the cost of waiting

Automation can change the match between a worker's skills and available jobs. If a task previously supported a stable occupation and is subsequently performed with less labor, an experienced worker may need to search outside the former occupation, acquire new skills or accept lower pay. A prolonged unemployment spell can reflect the difficulty of that adjustment. The connection is stronger when occupation specific displacement and subsequent earnings are measured, rather than inferred from the national duration average.

Competition over good jobs can lengthen search even when jobs exist. Workers may reject inadequate pay, unstable schedules or roles that do not use their experience while seeking a better opportunity. Employers may select among a larger pool of qualified applicants for the remaining attractive positions. A duration increase can therefore reflect a narrower set of acceptable matches. To test that explanation, measure offered wages, application outcomes, occupation transitions and whether eventual employment restores previous earnings and hours.

Long spells can create additional barriers. Skills may become less current, professional contacts may weaken and employers may treat a long gap as information about a candidate. Those mechanisms can amplify an initial displacement or demand shock. Their presence would make temporary losses more persistent, but the duration series itself cannot establish the size of each effect. Identified employer or worker studies are needed to distinguish causation from differences among workers with long and short spells.

Income support influences the ability to search. Unemployment benefits, family income and savings can allow a worker to wait for a better match. Someone without support may accept low quality employment quickly, generating a shorter unemployment spell while suffering a lasting earnings loss. Duration is therefore not a complete welfare ranking. A longer search can represent exclusion, supported matching or both. The result should be assessed alongside disposable resources and the quality of subsequent employment.

The post labor relevance concerns transition costs and persistent access. Growing productive capacity can coexist with workers unable to regain adequate employment after their previous tasks lose value. The duration measure adds evidence about how long that process lasts. A framework focused on labor compression should connect it to earnings recovery and occupational mobility, while preserving the possibility that institutions supporting longer search improve eventual outcomes rather than simply producing unnecessary inactivity.

Composition search incentives and measurement breaks

A changing unemployed population can alter duration without identical workers experiencing longer searches. Older workers, workers with different education and people entering from nonparticipation may have different spell distributions. The mix of temporary layoffs, permanent job losses and labor force entrants also changes with the cycle. Publish group specific duration and reason for unemployment where possible, and compare standardized distributions to identify how much of the aggregate shift reflects composition.

The beginning of a recession generates many new short spells, while later stages contain more people whose spells have aged. This creates timing effects even if job finding probabilities are unchanged within groups.

Examine unemployment inflows and outflows along with duration stocks. A model of the job finding rate can help separate fewer new entrants from slower exits. Exits to nonparticipation require particular attention because they end measured unemployment without restoring paid work.

Benefit eligibility and duration can affect search behavior and household feasibility. A longer supported search can improve matching, while weak labor demand can prolong spells independently of benefits. The national series cannot distinguish these mechanisms through correlation alone. Causal studies of policy changes require comparison groups and controls for concurrent economic conditions. The reference should avoid attributing every long spell to either benefits or automation before examining that evidence.

The 2011 mean break is a concrete data issue. The longer recorded upper bound raised measured average duration, with the full transition becoming evident after the survey sample rotated through the new procedure. BLS produced temporary comparisons under the old and new bounds. Public use microdata also apply top coding, which differs from the published mean treatment. A chart reconstructed from microdata may therefore fail to reproduce the official mean even when the analyst follows a reasonable procedure. State the data source and upper bound. [4]

A more direct measure of search difficulty is the probability of finding employment during the next period among people already unemployed. Compare that transition probability by elapsed spell length, education and prior occupation. A lower rate for otherwise comparable groups would support a matching or demand problem more directly than a longer stock median alone. The comparison must also track exits to nonparticipation and changes in the composition of unemployed people. It remains important to observe earnings after the transition, since faster job finding can coincide with acceptance of substantially less rewarding work.

The secular compression interpretation would strengthen if median and long term shares rose within comparable groups across expansions, job finding slowed and reemployment involved lasting pay losses after identifiable task displacement. It would weaken if transitions accelerated, earnings recovered and the apparent increase arose mostly from composition or measurement. The current evidence supports a higher recent median relative to 2000 and a significant tail, with recoveries and methodological limits preventing a universal continuously worsening conclusion.

A duration distribution chart

Show median elapsed weeks, the long term share and the long term count in separate panels. Begin the median chart with its verified history and preserve the mean as an optional line marked with a January 2011 break. Recession shading and unemployment inflows help interpret changes in the age of spells. A stacked duration distribution can show less than five weeks, intermediate spells and 27 weeks or more on the same population basis. [2][3][4]

Archive official counts and published distribution percentages rather than forcing separately adjusted totals to match. Record whether observations are monthly seasonally adjusted or annual averages. The 2025 annual record excludes October. The September 2026 current release supplies 1.944 million long term unemployed, 27.1 percent of the distribution, mean 24.8 weeks and median 11.5 weeks. Keep the release date 2 October distinct from the observation month. [5][6]

Monitor monthly for changing search conditions and assess secular comparisons annually across similar expansions. Pair the series with prime age participation, marginal attachment, job to job mobility and real earnings after reemployment. A falling long term count accompanied by growing nonparticipation deserves a different interpretation from a decline accompanied by employment gains. A successful reemployment outcome should include earnings and hours rather than employment status alone.

This entry remains mixed evidence with a meaningful historical warning. The time required to regain work can rise even when headline unemployment is low, but stocks, composition and measurement affect the observed duration. Its strongest contribution connects prolonged search to occupational transition and the lasting income consequences that make labor market compression economically significant.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Concepts and Definitions CPS. Nonparticipation desire for work unemployment and availability definitions; verified retrieval date 4 October 2026

[2] Bureau of Labor Statistics via Federal Reserve Bank of St Louis (2026). Median Weeks Unemployed UEMPMED. Monthly seasonally adjusted weeks July 1967 to September 2026; verified retrieval date 4 October 2026

[3] Bureau of Labor Statistics via Federal Reserve Bank of St Louis (2026). Number Unemployed for 27 Weeks and over UEMP27OV. Monthly seasonally adjusted thousands January 1948 to September 2026; verified retrieval date 4 October 2026

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[5] Bureau of Labor Statistics (2026). Unemployed total and full time workers by duration of unemployment. Annual table 30 observed 2024 and 2025 duration counts medians means shares 2025 eleven month average; verified retrieval date 4 October 2026

[6] Bureau of Labor Statistics (2026). The Employment Situation September 2026. Released 2 October 2026 tableA1 outside labor force currently want job 5790 thousand seasonally adjusted; verified retrieval date 4 October 2026

RELATED CHAPTERS 001 · 004 · 008 · 010 · 012 · 013

CHAPTER 015

College graduate underemployment

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN 1990 to 2026 Q2 national monitoring with original study through 2012

Degree holders have persistently worked in jobs not typically requiring degrees and current recent graduate mismatch is high but the history is cyclical and some nondegree jobs are economically valuable.

Occupational requirements and the employed denominator

College graduate underemployment measures employed degree holders working in occupations that typically do not require a bachelor's degree. The New York Fed's national dashboard defines recent graduates by ages 22 to 27 and includes bachelor's degrees and higher qualifications. The rate is a share of covered employed graduates, so it differs from the unemployment rate, whose denominator is the labor force. A high mismatch rate can coexist with low unemployment because the affected people are working. [1]

The occupational requirement is based on O*NET's Education and Training Questionnaire rather than the individual's judgment that a job feels pointless. The classification concerns the education normally needed to perform an occupation. It does not establish the economic value of the work or whether a particular graduate uses knowledge acquired in college. The original historical study excludes people currently enrolled in school. A reproduction should check current chart notes and maintain the same age, education and enrollment boundaries. [2][3]

This definition differs from employer credential requirements in a vacancy. An employer may ask for a degree even when the occupation's tasks do not normally require it. Conversely, a particular job within an occupation may use advanced skills despite the occupation's broader classification. The metric describes occupational allocation at a statistical level. A separate vacancy based credential measure can investigate whether employers raise educational screens without changing tasks, but the two should not be combined into one observed series.

The denominator excludes unemployed graduates and people outside employment. A graduate unable to find any job is absent from the employed mismatch rate, while someone accepting a nondegree occupation enters it. A rise in underemployment can therefore indicate that graduates obtained jobs but of a different occupational type, rather than simply a worsening of all employment access. Track unemployment, participation and earnings alongside the mismatch rate to identify which adjustment occurred.

Nondegree work ranges from skilled trades and technical roles to lower paid service employment. Some occupations can provide a secure career and good earnings without a bachelor's requirement. The metric should therefore be understood as educational allocation, with job quality assessed separately. Its relevance to post labor arises when the supply of educated workers exceeds the accessible demand for degree intensive tasks and graduates compete for roles elsewhere in the occupational structure.

A persistent problem with changing cycle levels

The original New York Fed study places recent graduate underemployment around 46 percent during the 1990 to 1991 recession, 34 percent by 2001 and roughly 44 percent in 2012. It emphasized that the later high represented a return toward early 1990s levels rather than an unprecedented condition. These observations cover more than twenty years and establish persistence and cyclicality. They do not establish an uninterrupted increase over the entire historical window. [2]

The current dashboard extends monitoring from 1990 to the present. Its latest quarterly highlights cover 2026 Q2 and report recent graduate underemployment of about 42 percent and unemployment of about 5.6 percent. Earlier 2026 Q1 figures should retain their date when reproduced rather than appearing as the latest observation. The current mismatch rate is high, yet remains below the approximate early 1990s checkpoint reported in the original paper. Different source vintages and smoothing conventions should be checked before calculating a precise historical endpoint difference. [1][2]

A long run conclusion requires comparing expansion periods and the quality of nondegree employment. The same underemployment rate can have different implications if the occupations involved become lower paid, less stable or more difficult to leave. A graduate in a skilled nondegree role may have a satisfactory match, while another with equivalent educational mismatch may have poor hours and wages. The occupation classification alone cannot distinguish those circumstances. Earnings and transition data should therefore be presented as separate outcomes.

The history also raises an age question. Early career workers often move through provisional jobs while finding a longer term fit. A cross sectional comparison between younger and older graduates cannot establish that today's young graduates will follow the same transition, because cohorts and economic conditions differ. Following a cohort or linking repeated observations can test whether mismatch declines, persists or leads to earnings penalties. A rising share that persists into midcareer would support a stronger compression interpretation than a short initial placement.

The metric meets the observation span requirement but receives mixed status. Persistent mismatch is meaningful evidence that a degree does not guarantee access to degree intensive work. Its cyclical history and the value of some nondegree occupations limit a generalized deterioration claim. The current 42 percent observation supplies timely concern, while the full 1990 onward series and occupational quality evidence determine whether today's condition represents a lasting compression of good job access. [1][2]

Observation	Recent graduate underemployment
1990 to 1991 recession	About 46 percent
2001	About 34 percent
2012	About 44 percent
2026 Q2	About 42 percent

Original study checkpoints [2] and current dashboard [1] retain source vintage and classification notes before exact comparisons

Educated competition and downward occupational movement

College education expands the supply of workers capable of performing many complex tasks. Automation can reduce demand for some of those tasks while complementing others. If degree intensive openings grow

more slowly than the number of qualified applicants, some graduates may take occupations farther down the credential structure. That is a plausible labor market compression mechanism. The underemployment rate measures the resulting allocation, while task demand and graduate supply data are required to establish why it happened.

Downward competition can affect workers without degrees. An employer choosing among applicants for a nondegree role may prefer a graduate, whether because of useful skills, a perceived signal or a convenient screening rule. A displaced graduate can therefore retain employment while reducing opportunities available to another applicant. Aggregate employment may remain high despite intensified competition over positions with adequate pay and progression. To verify this channel, examine occupation by education, employer screens and changes in noncollege workers' access, rather than assuming every underemployed graduate displaced someone.

A distinct historical account of this cascade comes from Beaudry, Green, and Sand. Their author-hosted 2013 analysis uses 1979–2011 CPS data and identifies a reversal around 2000 in the earlier expansion of cognitive-task demand. Their proposed mechanism distinguishes the skilled work required to build organizational capital from the smaller flow required to maintain it. The separate chapter on the Great Reversal examines that hypothesis alongside later evidence; the publication date does not extend the observations to the present. [4]

This connection changes the relevant test. A graduate’s occupational downgrading is a worker outcome, while a reversal in cognitive demand is a proposed explanation that requires occupation, task, wage, and supply evidence together. Underemployment can also arise from career entry, preferences, recession, or changing classification. Conversely, a narrower cognitive-job ladder can affect noncollege workers without producing an immediate rise in graduate unemployment. Track whether access to better-paid occupations contracts for several educational groups in the same market, and whether later expansion restores that access. The cascade interpretation gains force when these outcomes align; a single graduate-underemployment percentage cannot establish it.

Education can remain individually valuable under mismatch. A degree may improve access, promotion, earnings or flexibility even in an occupation without a standard degree requirement. It can also provide nonmarket benefits. The economic question is whether the private and social return changes as the supply and allocation of qualifications evolve. An underemployment chart does not establish that college is worthless, nor does a positive college wage premium guarantee that every graduate finds a suitable role. Both outcomes can coexist.

Household resources affect early career choices. Graduates with financial support may search longer for degree intensive work, while others accept available nondegree employment to meet expenses or debt payments. The same demand environment can generate unemployment in the first group and underemployment in the second. Earnings, student debt, family support and subsequent mobility help interpret these responses. A mismatch count alone cannot rank the welfare of people who remain unemployed against those who accept a job.

The post labor contribution concerns access to economically rewarding task bundles. Production can expand while fewer accessible jobs use the qualifications people acquired to obtain good work. The resulting competition can compress occupational ladders and weaken the degree's role as an entry ticket. A strong version of the argument requires persistent mismatch, deteriorating nondegree job quality and weak upward

transitions under growing productive capacity. The metric provides one measurable part of that combined test.

Classification quality and a stronger longitudinal test

Occupational classifications average over heterogeneous jobs. A broad category can include positions with different responsibilities, technology and training requirements. Requirements can also change as tasks evolve. Updating O*NET data can alter whether an occupation counts as requiring a degree, producing a classification effect separate from worker movement. Retain the classification vintage and examine whether results survive a fixed requirement map as well as updated requirements. The questionnaire source identifies the relevant measurement instrument. [3]

Selection into college changes over time. As more people obtain degrees, graduates can differ in field, preparation, location and family background from earlier cohorts. An aggregate mismatch increase can reflect changes in composition as well as changing demand. Compare fields and stable demographic groups, but recognize that standardization does not remove unobserved selection. A causal education or automation claim needs a design addressing those differences rather than a simple regression adjustment presented as proof.

Job quality is essential. Divide nondegree occupations by observed earnings, security, hours and progression where data permit. A nondegree role with strong pay is a different outcome from a low paid unstable service job. The New York Fed historically provided additional underemployment job type data, but that component was discontinued. Its older endpoint should remain visible when cited, and a current headline rate should not be used to extend an old quality series automatically. [1]

Longitudinal follow up should distinguish temporary mismatch from a durable trajectory. Track whether initially underemployed graduates move into degree intensive work, whether their earnings recover and whether skills depreciate or transfer. Compare cohorts entering under different economic conditions, with field and location considered. Persistent penalties after a weak entry period would support concern about scarring. Successful transitions and adequate earnings would weaken a claim that the initial mismatch demonstrates permanent compression.

Consider a hypothetical graduate who chooses a skilled nondegree occupation with good earnings, predictable hours and a clear progression path. The statistical mismatch is real under the requirement map, yet the job can offer a successful economic outcome. Another graduate in the same broad mismatch category may face low pay and repeated temporary work. Reporting the common classification together with those quality differences prevents a credential based judgment from substituting for observed welfare. It also permits the framework to identify which kinds of mismatch represent compressed opportunity and which reflect productive alternatives to degree intensive employment.

Evidence would strengthen the secular interpretation if expansion mismatch rates rose within stable classifications over at least twenty years, low quality nondegree work increased and upward mobility weakened. It would weaken if rates fell, job quality improved and graduates moved successfully into suitable careers. The present long record establishes persistence and a current difficult entry environment, while its cyclical levels and heterogeneous occupations justify mixed status. The framework should preserve those limits and use the metric to investigate allocation rather than economic pointlessness.

An occupational allocation dashboard

Plot the New York Fed national recent graduate underemployment series from 1990 onward, with unemployment in a separate panel because the denominators differ. Retain the source's smoothing and age definitions. Add earnings and a comparison with all degree holders when verified. Keep the current 2026 Q2 checkpoint distinct from earlier quarter values. A historical job quality panel must end when the relevant source data end rather than being extended with the headline rate. [1]

Store downloaded observations, occupation mappings, degree coverage and enrollment exclusions. If reconstructing from CPS or ACS data, document the survey, weights, occupation crosswalks and O*NET requirement vintage. Check that the denominator includes employed covered graduates and that unknown occupations are treated consistently. A degree requirement map should be reproducible independently of the observed worker education so that a change in graduate presence does not itself redefine the job. [2][3]

Review the headline quarterly and job quality and cohort outcomes annually. Pair the chart with college wage premiums, educational attainment, noncollege occupational access and job to job mobility. A rising mismatch rate with improving earnings carries a different implication from rising mismatch with poor hours and lasting penalties. Employment access and educational allocation should remain separate in the presentation.

The metric contributes mixed evidence of persistent qualification mismatch and current entry difficulty. Its strongest post labor use examines whether educated workers increasingly crowd into less rewarding roles as productive task demand changes. Its long cyclical record and the economic value of many nondegree jobs constrain any claim of universal occupational deterioration.

SOURCES AND REPRODUCTION NOTES

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[2] Jaison Abel Richard Deitz and Yaqin Su Federal Reserve Bank of New York (2014). Are Recent College Graduates Finding Good Jobs. Original Current Issues volume 20 number 1 historical underemployment 1990 to 2012 current enrolled excluded; verified retrieval date 4 October 2026

[3] National Center for ONET Development United States Department of Labor (2026). ONET Questionnaires. Education and Training Questionnaire primary occupational requirements instrument; verified retrieval date 4 October 2026

[4] Paul Beaudry, David A. Green, and Ben Sand (2013 working paper; final journal publication 2016). The Great Reversal in the Demand for Skill and Cognitive Tasks. Author-hosted January 2013 analysis uses 1979–2011 observations; mature-stage demand falls from its installation peak but remains above the pre-technology level. Verified for version two 4 October 2026.

RELATED CHAPTERS 004 · 008 · 010 · 011 · 014

CHAPTER 016

Youth not in employment education or training

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN Global modeled comparisons 2005 to 2025 and US observed comparison 2015 to 2025

Youth disconnection is a useful access measure but global and high income rates improved over twenty years while regional differences and recent reversals prevent a universal secular worsening claim.

A population measure of youth disconnection

The NEET rate is the share of a specified young population neither employed nor engaged in education or training under the source's definitions. Its numerator combines nonworking young people outside formal learning, including some unemployed people and some outside the labor force. Its denominator is the entire covered young population. It therefore differs from youth unemployment, which divides unemployed youth by the youth labor force and can include people enrolled in education. The age boundary must appear in the title and caption. [1][4]

Common boundaries include ages 15 to 24, 18 to 24 and 15 to 29. They cover different stages of schooling and early career development. Including younger teenagers generally adds people still in school, while including the late twenties adds more adults facing parenting and labor market transition. A rate for 18 to 24 cannot be joined directly to a 15 to 24 rate. Country comparisons should use a common boundary and identify whether surveys include formal training, informal courses or particular educational arrangements.

The measure intentionally treats participation in education as an alternative form of attachment. A young person studying without paid employment is outside the numerator. This makes it more useful than a youth employment ratio when longer schooling is a constructive choice. At the same time, enrollment can remove a person from NEET without guaranteeing useful skills, completion or subsequent employment. The metric records access to one of the covered activities, while quality and outcomes of that activity require separate evidence.

Unpaid caregiving and other useful activity can occur within NEET status. The term is a statistical classification rather than a judgment that the person contributes nothing. A young parent performing substantial care may be outside both paid employment and formal learning. Health limitations, family obligations, search difficulties and a temporary gap between programs can generate the same category. Breaking the numerator into unemployed and inactive groups, with reasons and duration, improves interpretation.

The measure contributes to post labor research by identifying youth outside the main paid work and qualification pathways. If entry jobs become less available or require more credentials, young adults can face a difficult transition. A persistent rise in comparable NEET rates would support concern about access, but the

series also responds to schooling, care provision and demographic change. The population definition and the actual historical direction must determine its classification.

Twenty year evidence with substantial counterexamples

The ILO's 2026 report provides modeled global NEET rates for ages 15 to 24 from 2005 through 2025, with later years explicitly projected. TableA3 reports a global rate of 22.7 percent in 2005 and 20.0 percent in 2025. High income countries declined from 13.5 to 10.9 percent over the same twenty years. Upper middle income countries increased from 22.9 to 27.9 percent. These records meet the secular span criterion and show divergent directions rather than universal deterioration. [3]

The same report records the global rate at 19.7 percent in 2023 before a rise to 20.0 percent in 2025. The recent reversal deserves monitoring but spans two years, so it should not be substituted for the twenty year result. Its 2026 and 2027 values are projections and must remain separate from the historical estimated observations. Publication in 2026 does not make a 2026 modeled forecast an observed annual outcome. [3]

For the United States, the OECD's 2026 country note reports about 14 percent of 18 to 24 year olds as NEET in 2025, down from about 16 percent in 2015. This is a ten year comparison, below the user's secular threshold, and its age population differs from the ILO global 15 to 24 series. It supplies current country context and counterevidence to recent generalized deterioration. It does not independently verify a twenty year US trend under that same definition. [2]

The international results demonstrate why aggregate global and country histories should remain separate. A global rate can improve while a particular income group worsens because population weights and within group trends differ. An income group itself contains countries with different institutions and economic structures. Its pooled result should not be described as the outcome of every member. Country level standardized rates and changes provide a stronger basis for assessing whether a technological mechanism is widespread.

The retained status is mixed evidence. NEET supplies a direct population access measure and identifies serious persistent disconnection, yet the verified global and high income twenty year changes are improvements. The upper middle income increase and the recent global reversal are important opposing observations. A post labor framework should include those differences and investigate their causes rather than treating a large level as proof that the level has been rising for decades. [2][3]

Population ages 15 to 24	2005 NEET rate	2025 NEET rate
World	22.7 percent	20.0 percent
High income countries	13.5 percent	10.9 percent
Upper middle income countries	22.9 percent	27.9 percent

ILO tableA3 modeled estimates November 2025 vintage later 2026 and 2027 columns are projections [3]

Entry pathways and compression of accessible work

Young adults usually possess less work experience and weaker employer networks than established workers. If accessible entry tasks decline, they may find it harder to obtain the initial job that develops skills and opens

a career pathway. Automation can affect those tasks while creating others that demand experience or specialized qualifications. A rising NEET rate could capture part of this entry problem, particularly if education and training alternatives also fail to provide a route into employment.

The mechanism differs from displacement of an established worker. A job that never becomes available can leave no layoff record. A young person may remain in education longer, undertake informal projects, rely on family support or leave active search. NEET records only the subset outside paid employment and covered learning. It can therefore miss compression that appears as prolonged schooling or poor quality employment. The broader framework needs entry hiring, qualification mismatch and earnings progression to capture those responses.

Education can protect against immediate disconnection while delaying exposure to the labor market. If longer study builds valuable capabilities and produces good subsequent outcomes, a lower NEET rate is meaningful improvement. If enrollment mainly postpones a difficult job search and produces little progression, the immediate rate can improve without resolving access to prosperity. Follow completion, employment and earnings rather than judging the effect from enrollment alone. The same statistical decline can accompany different long term pathways.

Care responsibilities can constrain young women differently from young men, while weak occupational pathways can affect young men particularly strongly in some settings. These patterns depend on institutions and should be measured directly. Affordable care, transport and flexible education can change feasible participation without altering production technology. A technology driven hypothesis becomes stronger when a NEET rise persists after these constraints are addressed and is concentrated in groups exposed to disappearing entry tasks.

The post labor contribution is therefore a transition test. It asks whether the society's productive system and learning institutions provide routes through which young adults acquire income and capability. The verified improvement in high income countries shows that widespread automation can coexist with lower measured disconnection. The worsening in another country group raises a narrower question about institutions, development and demand. The metric is useful precisely because those outcomes can support or challenge a particular mechanism.

Duration informality and international comparability

Duration changes the meaning of NEET status. A brief gap between graduation and a job differs from several years outside work and learning. A point in time rate weights those circumstances equally, although their later consequences can differ greatly. Longitudinal data should identify repeated episodes, cumulative duration and transitions into stable employment or education. A secular compression claim becomes more persuasive when duration and failed transitions worsen, rather than relying on the size of a single annual stock.

Informal employment and unpaid production are important international boundaries. Survey definitions of employment can change, and international standards distinguish paid or profit oriented employment from some own use production. A person performing subsistence activity may be classified differently across historical standards. The ILO methods discussion explains that changes in employment concepts affect NEET

classification. A rise resulting from a new statistical boundary should not be described as newly created inactivity without a harmonized comparison. [4]

Modelled estimates and direct survey observations are different data products. The ILO combines information under a statistical estimation framework to produce comparable histories and fill gaps. OECD country measures can rely on different survey periods and age definitions. Neither should be mislabeled as an identical raw survey count. Keep the modeling vintage, survey reference period, age boundary and forecast status in the chart metadata. Historical revisions can change estimated rates even when no new event occurred in the earlier year.

Population composition can shift results. Migration, educational attainment, young parenthood and the size of successive birth cohorts affect the distribution of youth circumstances. A count can increase while a rate falls if the youth population expands. An aggregate rate can change because countries with different rates gain weight. Show counts and rates separately and use fixed population weights for a descriptive decomposition where suitable. Do not treat the residual as a causal automation estimate.

A policy comparison can help distinguish institutional access from task demand. Examine groups gaining access to training, care support or transport against similar groups without that change, while tracking both NEET status and later employment quality. A decline through useful education is different from a decline through unstable low paid work, although both lower the headline numerator. Such comparisons should report the intervention, follow up horizon and observed destination. They can show whether the barriers are reversible and which institutions preserve youth pathways when technology and employer requirements change.

The interpretation would strengthen if comparable rates and durations rose over at least twenty years in technologically exposed groups while output increased, and if weak entry opportunities explained the change. It would weaken if rates fell broadly and transitions into adequate work improved. The current evidence includes substantial long run improvement and regional deterioration. Those facts support a mixed assessment and motivate research into institutional conditions that preserve youth attachment under changing task demand.

Monitoring youth pathways consistently

Choose one age boundary for each chart and preserve it through the full historical span. A global ILO panel can show 2005 to 2025 estimated rates with projections displayed separately. A US OECD panel can show the verified 2015 and 2025 comparison, labeled as ten years rather than secular evidence. Include sex and country group breakdowns only on matching definitions. The denominator is the relevant youth population, not the youth labor force. [1][2][3]

Archive the underlying series, modeling vintage, survey reference periods and education and training coverage. Preserve classification breaks and do not silently join age 15 to 24 with 18 to 24. A supplementary transition panel can distinguish unemployment outside education, inactivity with care responsibilities and other inactivity where reliable data exist. Duration and destination records should be treated as additional observed outcomes rather than inferred from the headline rate.

Update annual observations when the relevant agencies release them. Review current reversals but assess the secular claim using at least twenty observed or explicitly modeled historical years. A report released in 2026 can contain 2025 estimates and 2026 projections; the chart must retain those statuses. Pair the measure with entry hiring, college underemployment, real early career earnings and education completion.

The entry remains mixed evidence. Youth disconnection is a consequential access problem, yet the verified long run global and high income rates improved. Regional differences and recent deterioration deserve monitoring. Its value to post labor economics is to test whether changing production still provides workable routes into employment and learning, with the results allowed to constrain the theory.

SOURCES AND REPRODUCTION NOTES

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[3] International Labour Organization (2026). Global Employment Trends for Youth 2026 Back to the future. Published 11 August 2026 tableA3 age 15 to 24 NEET2005 and 2016 to 2025 modeled estimates 2026 and 2027 are projections; verified retrieval date 4 October 2026

[4] International Labour Organization (2025). Measuring what matters NEET versus youth unemployment. Published 12 August 2025 definition labor force distinction and current international employment boundary use updated 2026 report for numerical endpoints; verified retrieval date 4 October 2026

RELATED CHAPTERS 004 · 008 · 010 · 015

CHAPTER 017

Independent contracting

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN February 1995 to July 2023

Main job independent contracting increased modestly from 1995 but the 2023 share equaled 2005 and most contractors preferred their arrangement.

The relationship being measured

Independent contracting measures how people sell their work. The core official U.S. measure is the percentage of employed people whose sole or main job is independent contracting, consulting, or freelancing. In the Current Population Survey supplement, respondents can be classified as contractors even when the basic monthly survey identifies them as wage and salary workers. The supplement also distinguishes contractors from self-employed business operators such as restaurant owners. Its numerator therefore cannot be substituted with all self-employment or all businesses without employees. The denominator is employed people, rather than the labor force, population, or payroll positions. [2]

The main job restriction matters. Someone employed by a hospital who also designs websites independently can appear in a broad survey of freelance activity while remaining a traditional employee in the main job series. The 2023 supplement added separate questions about second jobs. An increase in secondary contracting can coexist with little change in the main job rate. Surveys asking whether someone performed any independent activity over a month or year will capture more people than a main job measure tied to a reference week. Differences between these totals reflect different economic questions. [2]

Contracting is an organizational category with several possible welfare implications. A consultant may negotiate high fees, diversify clients, and control working hours. A delivery worker may face volatile demand and a price set by a platform. Both supply labor outside a conventional employee relationship. Consequently, the meaningful additions to a contracting rate are net hourly earnings, hours volatility, client concentration, insurance, retirement saving, and the worker's preference. A fee should be reduced by expenses and unpaid business time before comparison with an employee wage.

Contractual language also differs from legal classification. The survey records a reported arrangement; it does not audit whether each respondent is correctly classified under tax or employment law. A reference using this metric should avoid assigning legal consequences to every survey observation. The statistical contribution is to reveal the boundary across which work is purchased, and the accompanying redistribution of commercial risk. It becomes evidence of structural deterioration when that boundary change accompanies demonstrably weaker livelihoods or bargaining power.

An intermittent and modest historical change

The official historical record begins in February 1995 and extends to July 2023 in the verified published tables. The main job contractor share was 6.7 percent in 1995, 7.4 percent in 2005, 6.9 percent in 2017, and 7.4 percent in 2023. Those observations cover twenty eight years, yet the shape provides little support for a

continuously expanding main job contractor economy. The latest value matches a value eighteen years earlier. [1]

The 2023 count was 11.9 million people. A rising count can coexist with a nearly stable percentage when total employment expands. For post-labor analysis the share is normally the more useful first indicator because it asks whether the employment relationship is changing in prevalence. The count remains important for the scale of benefits and protections needed by affected people. A million additional contractors does not by itself show a million former employee positions converted into contracts. Establishing conversion requires following individuals or jobs through the transition. [1, 2]

The survey dates are unevenly spaced and occur in different months. Earlier waves took place in February, the 2017 wave in May, and the 2023 wave in July. Seasonal work, industry classification changes, survey questions, and population controls can influence comparisons. There are no observed annual contractor rates between these checkpoints in this particular series. A smooth line drawn through them should be described as a visual connection between surveyed observations, without suggesting annual measurements. [2]

Preferences provide substantial counterevidence to treating the category as universally involuntary. In July 2023, 80.3 percent of main job contractors preferred their current arrangement, while 8.3 percent preferred a different arrangement. Those percentages describe current contractors, whose experience and feasible alternatives differ. They do not establish that everyone could obtain the same autonomy by leaving an employee job. They do establish that a chapter about contracting should explain successful independence as well as insecurity. [3]

Broader gig questions provide a complementary window. The Federal Reserve's 2024 survey covered short tasks, selling goods, and other income activities; some participants also held conventional jobs. Its questions about flexibility, pay consistency, and work life balance describe economic experience beyond contractual labels. Because definitions differ, these observations belong alongside the official contractor share rather than being spliced into it. [4]

Reference month	Main job contractor share
February 1995	6.7 percent
February 2005	7.4 percent
May 2017	6.9 percent
July 2023	7.4 percent

BLS historical CWS table; denominator all employed people. [1]

How contracting could alter labor economics

The post-labor connection concerns who bears the costs of organizing productive activity. An employer hiring a worker normally assumes some responsibility for idle time, administration, training, equipment, and employment benefits. A client buying a completed task can transfer several of those costs to the supplier. Digital coordination can make that transfer easier by reducing search, specification, payment, and monitoring costs. This is a plausible organizational mechanism; the contractor share alone cannot identify how much technology caused it.

The distinction between a wage and a task price becomes economically important. Employees can sometimes share organizational productivity gains through pay scales, promotions, or negotiated benefits. Contractors may instead repeatedly compete for an externally specified output. If the output becomes easier to produce, clients can obtain it at a lower price even while capable contractors complete more tasks. Increased personal productivity then need not translate into greater annual income. Competition, access to customers, reputation, and the ownership of distribution channels determine how gains are divided.

Consider a hypothetical designer paid one thousand dollars for a project requiring twenty hours. Software reduces production time to ten hours. At the original price, the designer can double gross hourly revenue. If competition reduces the project price to four hundred dollars and client acquisition still takes five hours, gross revenue per total working hour falls. Neither outcome follows automatically from technical improvement. The example identifies the observations needed: actual prices, production time, unpaid time, and total demand.

Contracting can also create opportunity. A specialist who previously depended on one local employer can reach multiple customers and keep more of the return to expertise. Portable insurance and retirement institutions can make independent work easier without weakening security. The same coordination technology may increase worker bargaining power when it improves outside options. An accurate account therefore asks whether workers own valuable customer relationships or are interchangeable suppliers facing a concentrated buyer.

This metric has a limited but useful role in the evidence map. It can reveal changes in employment institutions and the location of risk. It provides weak independent evidence for declining total human labor demand because the purchased work can remain entirely human. Its strongest post-labor relevance arises when combined with falling task prices, missing employer benefits, concentrated clients, or reduced earnings stability.

Tests that separate opportunity from pressure

A convincing deterioration claim would show contracting becoming more common among people who would prefer employee jobs, accompanied by lower net pay or weaker security. Useful comparisons follow the same person before and after a transition, retain workers who fail to find enough clients, and include unemployment or inactivity. Studying only successful contractors can make entry look more rewarding than it was for the original cohort. Studying only workers displaced from employee jobs can make independence look uniformly forced.

Voluntary preference is informative but conditional. A person may value schedule control because childcare is unavailable, or prefer contracting because employee opportunities are poor. That does not make the reported preference false. It means preferences should be reported with the alternatives available. Conversely, a person dissatisfied with contracting may still earn more than in the previous job. Choice, earnings, benefits, and stability are separate dimensions whose combination determines the economic interpretation. [3]

Composition matters as well. Contractors differ in age, industry, occupation, and education from other workers. Changes in retirement patterns, professional services, construction, or small business ownership can move the aggregate rate without widespread conversion of payroll jobs. Comparing contractors and employees with the same observable characteristics helps, but does not remove unobserved differences in

risk tolerance, client networks, health, or ability. A causal estimate requires a stronger design than a raw earnings gap.

The main job measure may miss platform tasks and incidental freelance income, while broader surveys can overstate the scale of primary employment replacement. The solution is a layered presentation. Show main job contracting, secondary contracting, any task income, and dependence on that income as separate denominators. A change in survey wording or recall period should be marked as a break. This prevents a large broad total from being mistaken for a sudden transformation of the entire workforce. [2, 4]

Administrative tax records reveal a separate participation margin. Collins and coauthors identify firm-facing nonemployee compensation and receipts from identified labor platforms, rather than counting every form 1099. From 2000 to 2016, this annual 1099 workforce increased by 1.9 percentage points to 11.8 percent of the tax-defined workforce. Almost all its post 2007 growth came from labor platforms, while traditional 1099 participation plateaued. The increase mainly involved supplemental earnings; the researchers found no corresponding evidence that full time traditional employment was being supplanted. [5] These are annual tax earners, not a main job survey share in one reference week, and this particular 2000–2016 growth comparison falls short of twenty observed years. The paper therefore helps reconcile different measures without overriding the longer official history. Gross receipts also differ from net labor earnings, and changed reporting can reveal previously informal activity. Follow primary dependence and income after expenses alongside any annual participation total before concluding that more people are being compelled to replace employee careers with contracting.

A plateau in contracting need not mean that the earlier organizational change has disappeared. One hypothesis is saturation: activity that is readily contractible may already have moved outside employee relationships, leaving a stable stock under prevailing technology, institutions and customer preferences. Another is steady replacement, with entries and exits offsetting each other. These are possible interpretations, not demonstrated explanations of the official rate. The BLS main job measure and its separate second job estimates describe arrangements; they do not measure an economy-wide contracting ceiling. [6] Test saturation by tracking transition flows, duration, occupational conversion, primary income dependence and the barriers keeping work internal. Continuing benefit loss or squeezed earnings would require their own evidence even if incidence stayed flat. Conversely, stable shares accompanied by improved net pay, security, portability and meaningful choice would weaken a broader deterioration claim. The long series remains mixed evidence: a flat or modestly changing stock limits continuous expansion of main job contracting, while leaving historical reorganization and other measured risk channels open to investigation. Saturation should make distinct, revisable predictions rather than protect the framework from every possible observation.

A reproducible contracting dashboard

The primary chart should display the official main job contractor percentage at each surveyed date from 1995 through 2023. Use visible point markers and an axis beginning at zero. Label reference months directly or in a note. Keep the series distinct from all self-employment, digitally mediated tasks, and independent work over a calendar year. Archive the published table and technical note together so subsequent revisions can be traced. [1, 2]

A second panel can show arrangement preferences for contractors and other work arrangements. A third should compare net earnings and benefit access after aligning populations. Medical insurance from any source differs from coverage through the current employer. Retirement access differs from participation. Expenses and unpaid hours should be included in an independent worker's earnings denominator where the data permit.

For monitoring, record the latest released observation rather than the date a survey was fielded or promised. At the research cutoff, the verified historical table remained July 2023. Later published supplements can update the chart once their definitions and seasonal comparability are checked. Federal Reserve and platform surveys can provide more frequent experience measures, but need their own labels and metadata.

The practical interpretation is a conditional organizational indicator. Contracting adds evidence about the form in which people seek income and the risks transferred to them. It should connect to contingency, domestic outsourcing, benefits, good job coverage, and earnings recovery after displacement. Those connections preserve its distinctive contribution without treating overlapping categories as separate people. A stable contractor share also belongs in the final dashboard: it limits the claim that every dimension of labor has deteriorated in the same way.

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[3] U.S. Bureau of Labor Statistics (2024). Table 9. Preference for arrangement by contingent status and alternative work arrangement on sole or main job, July 2023. Main job preferences; contractors 80.3 percent prefer current arrangement. Verified retrieval 4 October 2026.

[4] Board of Governors of the Federal Reserve System (2025). Economic Well-Being of U.S. Households in 2024: Employment and Gig Work. October 2024 SHED; supplemental income activities and motivations. Preserved for specific gig questions rather than treated as latest overall SHED. Verified retrieval 4 October 2026.

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RELATED CHAPTERS 018 · 019 · 023 · 024 · 026

CHAPTER 018

Contingent and alternative employment arrangements

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN February 1995 to July 2023

Contingency increased after 2017 but its 2023 prevalence was below 1995 and alternative arrangements show divergent long run paths.

Expected continuity and employment structure

Contingent employment measures whether a job is expected to continue. The BLS concept concerns jobs that are temporary or expected to last only a limited period and lack an implicit or explicit arrangement for ongoing employment. A worker planning to leave a durable job for personal reasons is not necessarily contingent. A position lasting only until a project ends can be contingent even when the person wants permanent work. The distinction places expected continuity at the center of the numerator. [2]

Alternative employment arrangements classify the relationship through which work is supplied. BLS separately identifies independent contractors, on call workers, temporary help agency workers, and employees provided by contract firms. A contractor can have a durable business relationship, while a conventional employee can hold a temporary position. Contingency and an alternative arrangement can occur on the same job. Their percentages cannot be added to produce a unique population exposed to insecurity. [2]

BLS published several contingent estimates historically, differing in restrictions involving tenure and expectations. The broad historical comparison used here follows the official synthesis showing 4.9 percent in 1995 and 4.3 percent in 2023. Analysts reproducing earlier releases should retain the same definition across observations. Combining the strictest historical estimate with the broadest recent estimate would create an apparent increase through a change in measurement. [1]

The relevant unit is an employed person in a sole or main job. The measure excludes someone without employment altogether and does not directly assess income adequacy. A permanent low wage position may provide little livelihood security despite its expected continuity. A well paid six month contract can provide substantial resources while remaining contingent. The metric measures one dimension of employment, so the analysis should show pay, benefit access, and preferences alongside it.

An expected job ending is also different from an actual separation probability. Respondents may reasonably expect ongoing employment and still be laid off. Another person may label work temporary yet repeatedly receive assignments. A longitudinal panel can measure realized continuity and earnings volatility; the supplement captures workers' descriptions at a point in time. Both are valuable, but they answer different questions about employment risk.

What the long record actually shows

The broad contingent share fell from 4.9 percent in February 1995 to 4.1 percent in February 2005 and 3.8 percent in May 2017, before rising to 4.3 percent in July 2023. The latest increase is meaningful for that interval, but the full twenty eight year record does not establish a secular rise. Its endpoint remains below the first observation. Reporting only 2017 and 2023 would suppress evidence necessary to evaluate the long-run hypothesis. [1]

The four alternative arrangements also move differently. Independent contracting reached 7.4 percent in 2023, matching 2005. On call work was 1.7 percent in both 1995 and 2023. Temporary help agency employment declined from 1.0 to 0.6 percent, and workers provided by contract firms were 0.5 percent at both endpoints. The narrow contract firm definition requires a usual assignment to one customer and work at the customer's site, so its stable share cannot rule out broader outsourcing. [1, 2]

These are intermittent survey observations. Different reference months introduce possible seasonal differences; changed population controls and industry or occupation classifications can affect detailed comparisons. Small group estimates also have sampling error. It would be misleading to present the table as an annual monitoring series or to infer that an unsurveyed year had the rate shown by a straight line joining two waves. [2]

Preference data identify a sharper insecurity concern within the broad categories. Among contingent workers in July 2023, 44.8 percent preferred a different arrangement and 40.8 percent preferred the current arrangement. Among on call workers, the comparable shares were 41.6 and 40.6 percent. This differs substantially from the strong preference for current arrangements among independent contractors. Pooling the groups would erase economically important variation. [3]

The proper historical finding is therefore mixed. Certain groups face clear insecurity, and the contingent rate increased in the recent comparison, yet the survey does not validate a general claim that all alternative work has grown for decades. Retaining this result improves the wider reference: a multidimensional thesis is stronger when each constituent measure retains its own direction and evidentiary limits.

Arrangement	1995 share	2023 share
Contingent jobs	4.9 percent	4.3 percent
On call work	1.7 percent	1.7 percent
Temporary help agency	1.0 percent	0.6 percent
Contract firm workers	0.5 percent	0.5 percent

BLS CWS main job historical table; arrangements can overlap with contingency. [1]

Income continuity as an economic institution

Employment distributes resources through a sequence of payments. Expected continuity allows households to plan rent, debt service, childcare, and saving. When payment becomes conditional on a succession of short assignments, the household must buffer the gaps. The same annual gross income can produce different welfare when one schedule is predictable and the other alternates between intense work and unpaid waiting. The contingent metric helps identify the employment arrangements in which this issue may arise.

The economic relevance extends to training and bargaining. A worker expecting a long relationship can invest in employer specific skills, while an employer may train someone who is likely to stay. A temporary relationship can shorten both parties' investment horizon. It can also provide a route into permanent work or enable workers to test employers. The empirical question is whether assignments build a career or produce a repeated sequence of insecure positions without cumulative gains.

Automation can change continuity through several mechanisms. Standardized workflows make assignments easier to specify and replace. Demand forecasting allows a business to purchase labor close to the time needed. Software can absorb peak workloads that previously justified additional staff. These mechanisms could reduce permanent recruitment without necessarily increasing the official contingent share: an employer may retain fewer permanent workers while outsourcing tasks beyond the survey's narrow categories. The relevant hypothesis therefore requires linked information about assignments, recruitment, and production.

A hypothetical firm illustrates the boundary. It needs one hundred labor hours every week and another one hundred during a seasonal surge. Better scheduling might distribute the surge across on call workers, creating flexibility for the firm and uncertainty for workers. Machinery might remove the surge instead, leaving a stable core workforce and lowering the measured contingent share. Both involve reduced reliance on a broad permanent payroll, but their employment arrangement indicators move differently. A falling contingent share cannot settle the production question by itself.

For the post-labor framework, the contribution is institutional rather than a direct estimate of technological substitution. The metric describes whether access to income comes with an expectation of continuity. Combined with wages, hours adequacy, benefit access, and repeated transitions, it can reveal a weakened employment settlement. Its stable long-run prevalence limits a sweeping numerical claim of increasingly temporary main jobs across the whole economy.

Distinguishing vulnerability from useful flexibility

A contingent position may fit a student's schedule, a retiree's preferences, or a specialist's project work. Such examples are economically meaningful and should appear in the interpretation. The prevalence of a category is insufficient to infer a loss of welfare. An arrangement becomes stronger evidence of deterioration when workers report unwanted temporary status and repeatedly face insufficient income, involuntary gaps, or limited access to protection. The survey's arrangement preference questions help locate that margin. [3]

Health insurance comparisons provide an additional dimension. BLS Table 10 separates insurance from any source from employer provided insurance. The latter measure excludes independent contractors and self-employed people from the employee-based comparison. Someone lacking current employer coverage may be insured through a spouse, a public program, or an individual policy. A chapter should distinguish loss of an employment benefit from absence of medical coverage entirely. [4]

Contingency can also be associated with age and education. Young workers often enter through short assignments; seasonal industries use temporary labor by design. Comparing the unadjusted contingent rate across populations risks interpreting a change in industry or age composition as a change in employment practices. Age standardized rates, comparisons within occupations, and measures of repeated temporary

work are better tests. They should supplement rather than replace the total rate, which still describes the number of households facing the arrangement.

Survey classification misses some forms of uncertainty. A permanent employee facing unpredictable scheduling can have an ongoing job yet unstable earnings. A subcontractor employed indefinitely by a service firm can face loss of a client contract. An online worker can combine many small tasks without viewing the business as temporary. These cases motivate direct measures of income and hours volatility. Expanding definitions after observing a flat official series would undermine comparability unless the broader construct has its own consistent history.

Evidence supporting the post-labor interpretation would include increasing involuntary contingency within comparable worker groups, poorer transitions into secure work, and increased volatility despite growing output. Evidence weakening it would include stable shares, improved preferred flexibility, rising earnings, stronger benefit portability, and greater movement into durable employment. The reference should preserve both sets of predictions so future results can change the assessment.

Keeping overlapping categories visible

Build a chart with separate panels for contingent jobs and each alternative arrangement. Use the same surveyed dates, percentage denominator, and visible markers. Place the July 2023 observation next to the full history rather than assigning an annualized growth path. The title should specify sole or main job. A note should explain that second job questions were added in 2023 and cannot be appended as though they existed in prior waves. [1, 2]

A companion table should show arrangement preferences and benefit coverage by category. Include missing or conditional responses when reproducing preference totals. This matters because a forced binary comparison can exaggerate both satisfaction and dissatisfaction. Preserve the exclusion of self-employed respondents from employer insurance measures. [3, 4]

For a better prospective dashboard, follow cohorts from temporary work into ongoing employment, repeated assignments, unemployment, and inactivity. Calculate annual net earnings and months without paid work. A transition rate should retain everyone initially entering the arrangement, including those no longer working when surveyed again. Compare these outcomes with conventional employees of similar age, education, industry, and prior employment history.

This entry connects to independent contracting, outsourcing, job quality, benefits, and displacement recovery. Each connection concerns a distinct property of work. They should be treated as corroborating dimensions of the same people and institutions rather than summed into a single total of insecure workers. The chapter's final use is to distinguish a well-established issue of vulnerability from an unsupported claim of continuous national expansion. That distinction keeps the broader structural assessment empirically accountable.

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RELATED CHAPTERS 017 · 019 · 023 · 024 · 026

CHAPTER 019

Domestic outsourcing and fissured employment

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN 1995 to 2019 in OECD comparisons with supporting national studies

Domestic outsourcing grew across several advanced economies and can separate workers from the rents and employment institutions of lead firms.

Following work across the employer boundary

Domestic outsourcing occurs when an organization purchases work from another domestic business that could previously have been performed by its own employees. Examples include cleaning, security, food service, logistics, and back office functions. The client remains the organization benefiting from the service, while another firm becomes the legal employer. The worker can continue performing substantially the same task at substantially the same location. This makes outsourcing a change in the distributional organization of production rather than an automatic disappearance of human work.

No single public series captures every outsourced task. A practical cross-country proxy is the share of total employment in administrative and support services. Another is the percentage of a particular occupation employed by specialist service suppliers rather than other industries. Purchased service expenditure provides a third perspective. Each has a different denominator and coverage: workers, occupational employment, or intermediate purchases. Together they can distinguish an organizational shift from an industry becoming larger because demand for unrelated services expanded.

The boundary matters for interpreting output per payroll worker. Suppose a manufacturer transfers one hundred cleaners to a service supplier while physical output and cleaning hours remain unchanged. Its own employment falls and measured output per employee rises. Total human hours across the production system remain the same. The manufacturer's productivity calculation is still valid within its stated boundary, but the broader conclusion requires the supplier's work to be counted. Imported services add a further geographic boundary and need separate treatment.

Fissured employment describes the broader separation of commercial control from direct employment responsibilities. Franchising, subcontracting chains, temporary staffing, and contracting can place several organizations between workers and the ultimate customer. The extent of separation and the allocation of authority vary. A supplier can be a high productivity specialist with strong employment practices, or a price competing intermediary with little capacity to share client profits. The empirical object therefore includes both prevalence and worker outcomes.

This chapter uses a verified OECD history as evidence of a secular organizational trend. It uses original German and U.S. research to explain mechanisms and wage consequences in specific settings. Those studies should not be combined into a numerical estimate of all workers outsourced worldwide. Their strength is that they reveal what aggregate payroll counts leave unresolved.

A long shift toward specialist service employers

The OECD comparison shows administrative and support services rising from 3.6 percent of employment in 1995 to 4.9 percent in 2005 and 6.3 percent in 2018. Occupational comparisons extend to 2019: the share of guards in that industry rose from 38 to 54 percent, and the share of cleaners from 16 to 31 percent. These are broad proxies; country reference years differ, including a 1998 starting observation for the United States. [1]

These observations satisfy the twenty year criterion for the pooled comparison, with endpoints that should remain explicit. They do not supply a 2026 outsourcing level. The employment proxy covers activities beyond outsourced cleaning or security, and some outsourced work falls outside the industry. Its interpretation becomes stronger when the occupational share shows the same organizational movement. Neither share establishes that every transferred job had lower compensation.

Goldschmidt and Schmieder follow German jobs moving from lead employers to contracting businesses. Their event study finds wages in outsourced jobs falling approximately 10 to 15 percent relative to similar jobs that were not outsourced. Their interpretation emphasizes loss of firm specific rents. The study documents a historical German mechanism; it is not a universal wage discount for every supplier or country. [2]

US evidence supplies an occupational counterpart. Dube and Kaplan study janitors and security guards during the 1980s and 1990s, identifying outsourced service work through occupation and employer-industry codes. Across their specifications, estimated outsourcing wage penalties range from 4 to 7 percent for janitors and 8 to 24 percent for guards, with health benefit findings moving in the same direction. Their analysis tests explanations based on skill differences, hours, benefits and the industries that outsource, and interprets the remaining penalty as a loss of labor market rents. [4] The ranges depend on specification and occupation; they are not a single causal discount for all outsourced employees. Together with the German event evidence, this shows a concrete route by which a productive client can stop sharing its wage premium with complementary service workers. The relevant long-run outcome is the persistence of lower compensation after employer separation, rather than merely a change in the company name on a paycheck. Any current extension should observe worker transitions and benefits instead of applying these historical percentages mechanically to 2026.

Teresa Fort's U.S. research links communication technology adoption during 2002 to 2007 with increased production fragmentation, particularly domestic sourcing and electronically codifiable specifications. This supports a pathway in which better coordination makes contracting feasible. The observational setting and historical technology differ from contemporary generative AI, so it cannot establish the present contribution of AI to contracting. [3]

Taken together, the evidence supports a long organizational shift and identifies plausible distributional effects. The appropriate conclusion depends on the production boundary. For total human work, outsourcing may simply relocate employment. For access to the prosperity of highly productive firms, a transfer can be consequential even when the task survives. That difference gives this metric a distinctive role alongside automation measures.

OECD proxy	Earlier observation	Later observation
Administrative and support employment share	3.6 percent in 1995	6.3 percent in 2018
Guards employed in support services	38 percent in 1995	54 percent in 2019
Cleaners employed in support services	16 percent in 1995	31 percent in 2019

OECD Employment Outlook 2021 chapter 4; industry and occupational proxies with country year exceptions. [1]

Why the employer can determine the wage

A worker's compensation can depend on the organization as well as the task. A successful firm may share profits, pay internal minimums, offer career ladders, or maintain common benefit standards. A specialized supplier bidding for a cleaning contract may be paid only enough to meet the client's specification and compete on cost. Moving the same worker across that boundary can remove access to the lead firm's compensation practices without changing the social usefulness of cleaning.

This creates an important route through which labor's role can weaken while production expands. Owners and highly paid specialists remain inside the organization controlling valuable intellectual property, customer relationships, or scarce assets. More standardized support functions become external purchases. The service workers continue contributing, but their claim on the lead firm's success becomes indirect. A contract price replaces their participation in internal pay setting, promotion, and benefit institutions.

Technology can facilitate this separation through documentation, remote monitoring, electronic payments, and common data systems. Lower coordination costs make a supplier's performance easier to specify and inspect. The organizational changes can then survive after the initial technology deployment. This is an analytical mechanism whose scale must be measured; cheaper coordination does not compel every employer to outsource. Regulation, quality concerns, tacit knowledge, and the need for trusted relationships can keep work internal.

There are also productive reasons to use specialists. A security company may train staff better, match them to sites more efficiently, and offer advancement across many clients. A supplier serving several customers may stabilize employment when one client's demand falls. Such gains can support better pay or lower consumer prices. The distribution of gains depends on competition, the supplier's bargaining position, and whether workers have alternatives or collective representation.

The post-labor relevance therefore lies in the weakening linkage between contributing work and access to organizational surplus. A rising outsourcing proxy, by itself, measures the separation. Lower subsequent wages, reduced benefit access, and limited advancement establish its distributional significance. If total supplier hours grow while the lead firm's payroll contracts, the evidence should be classified as an employment boundary change. If combined hours decline as output rises, outsourcing and automation may jointly reduce labor intensity.

Identifying transfers and avoiding false productivity

The best research follows the same jobs or workers through an outsourcing event. Administrative records can identify a cluster of employees moving together from a client to a service firm while preserving occupation and location. Comparing their subsequent wages with a suitable control group helps separate the effect of the transfer from general economic weakness. A simple cross-sectional comparison between cleaners at factories and cleaners at specialist firms can reflect worker differences, geography, or client mix.

The client's accounts should also be inspected. Employee compensation can fall while purchased services rise. A revenue per employee ratio will then increase mechanically even if the production system uses identical hours. Supplier costs are imperfect substitutes for hours because prices include profit, equipment, administration, and materials. A robust system-wide estimate needs employee hours, vendor hours, and service imports on a compatible basis. Where those details are unavailable, the unresolved boundary should be stated plainly.

Industry reclassification creates another complication. A logistics operation spun into a separate firm can move workers from manufacturing to transport or support services. An apparent sectoral employment decline can partly reflect that reporting change. The occupational perspective helps because the task category may remain stable across the employer change. Matched establishment data provide a further check on whether a new company represents a genuinely new productive activity or a reorganized existing one.

Competition and institutions can alter outcomes. Supplier specialization may raise productivity and wages. Sectoral bargaining can apply common standards across direct and outsourced employment. Client contracts can require benefit provision or training. A country with strong coverage could experience more outsourcing without the German wage penalty identified in a different setting. Those differences are informative tests of the mechanism rather than exceptions to conceal.

Evidence strengthening the post-labor account would include persistent separation of support workers from high rent firms, reduced compensation after transfers, and growing supplier competition despite expanding client output. Evidence weakening the distributional interpretation would include improved supplier careers, equivalent benefits, higher total compensation, and stronger portability. The metric should retain the secular prevalence finding while allowing outcomes to vary across institutional settings.

A boundary aware monitoring system

Use three aligned charts. The first shows the employment share of administrative and support services, with the OECD observation years and country exceptions preserved. The second shows cleaners and guards by employer industry. The third follows compensation and benefits before and after identifiable outsourcing events. Each chart should carry its own denominator; aggregate industry shares cannot be treated as the percentage of all employment that is definitively outsourced. [1]

For U.S. monitoring, combine national accounts purchases of business services, employment by service industry, and occupational employment by industry. Obtain consistent industry classifications before extending the history. Keep domestic and imported services separate. Where company disclosures are used, retain the consolidated reporting scope, contractor categories, acquisitions, and fiscal dates.

A particularly useful research extension is total human input per unit of client output. Add direct employee hours to attributable supplier hours and document the allocation method. If precise supplier hours are unavailable, report a range rather than converting expenditure into an exact worker count. Track whether pay and insurance changed for transferred workers, including those who subsequently leave the supplier.

Outsourcing connects to productivity per payroll position, independent contracting, bargaining coverage, workplace wage segregation, and good job coverage. Its contribution is to explain why a productive economy can distribute gains unevenly among people performing complementary tasks. It also acts as a measurement control for stronger automation claims: tracing purchased labor prevents an organizational transfer from being mistaken for the elimination of human effort.

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RELATED CHAPTERS 017 · 018 · 020 · 021 · 024

CHAPTER 020

Union membership density

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN 1983 to 2025

The U.S. union membership rate approximately halved over four decades although membership and density increased modestly in 2025.

Membership as organized worker capacity

Union membership density is the percentage of employed wage and salary workers who belong to a labor union or a similar employee association. The U.S. BLS measure is drawn from the Current Population Survey. Its numerator is members, while its denominator is the eligible employed wage and salary population. The published union estimates exclude incorporated self-employed people from that wage and salary classification. A percentage of all adults or all workers including self-employment would answer a different question. [1]

Membership and representation are separate measures. A worker can be covered by a union contract without belonging to the union. Membership indicates the reach of an organization that workers actively sustain or formally join; representation indicates the reach of collectively negotiated terms. Both matter for bargaining power, but adding their totals would double count union members. The companion chapter addresses representation directly. [1]

Density is useful because an expanding employed population can dilute institutional reach even when membership counts grow. Ten million members in a workforce of fifty million implies more widespread participation than the same membership in a workforce of one hundred million. Conversely, density can rise during a recession when nonunion employment falls faster. Changes in the numerator and denominator should therefore be shown together, particularly around shocks.

A union can affect pay, benefits, training, grievance procedures, scheduling, safety, and the terms under which technologies are adopted. The density metric measures the availability of this organized channel, rather than directly estimating its economic effects. Contract quality and enforcement can vary among unions. Some nonunion employers maintain strong employment standards, while some unionized workplaces operate under severe commercial constraints. Density remains an institutional measure, whose welfare significance depends on what bargaining actually obtains.

Its contribution to a post-labor reference is the distribution of leverage. Labor may remain essential to a particular process while individual employees have limited capacity to claim productivity gains or negotiate restructuring. Organized workers can sometimes convert their collective importance into compensation and protections. A long decline in membership indicates that this channel reaches a smaller share of employed people, regardless of whether every affected job has been automated.

Four decades of decline and a recent increase

The comparable BLS series begins in 1983, when 20.1 percent of wage and salary workers belonged to unions and the member count was 17.7 million. In 2025 density was 10.0 percent and membership was 14.7 million. The decline is 10.1 percentage points, approximately half the original rate. It is a long institutional change rather than an inference from a recent strike, election, or technology release. [1]

The endpoint should be presented with its recent movement. Density increased slightly from 9.9 percent in 2024 to 10.0 percent in 2025, and the number of members increased. A long downward history does not imply every new observation must be lower. Annual estimates for 2025 exclude October because the federal shutdown prevented collection of the usual monthly household survey. The comparison therefore uses eleven month annual averages rather than the usual twelve. [1]

Public and private employment differ sharply. In 2025, public sector membership density was 32.9 percent and private sector density was 5.9 percent. The aggregate blends those institutional environments and their changing employment shares. A trend attributed entirely to technology would need to explain why similar technologies can coexist with different rates under different legal and organizational arrangements. Sectoral patterns also matter within private employment. [1]

Age differences indicate where membership is concentrated. BLS reports 4.7 percent among workers ages sixteen to twenty four and 12.6 percent among those ages forty five to fifty four in 2025. Those are current age group comparisons, rather than proof that each cohort has become less unionized as it ages. To study cohort change, researchers should follow birth groups at comparable ages and account for sector, education, and geography. [1]

International histories also differ. OECD data document declining density in many countries alongside variation in bargaining institutions and the role of unions in social insurance. The U.S. history is therefore a strong secular finding about institutional reach, with national design determining much of its shape. It provides supporting evidence about labor's capacity to share gains, while leaving automation's causal contribution open. [2]

U.S. membership measure	1983	2025
Members as share of wage and salary workers	20.1 percent	10.0 percent
Union members	17.7 million	14.7 million

BLS Union Members 2025 release; 2025 averages exclude October. [1]

The mechanism linking organization to distribution

An individual employee typically bargains over a personal outside option. A union can bargain over a coordinated workforce whose absence disrupts an operation. It can reduce the employer's ability to replace one worker with another on separately negotiated terms. That capacity can influence how productivity gains are distributed between compensation, prices, investment, and owners. Declining density removes access to collective bargaining for a growing share of workers, although other labor protections can partly substitute for it.

Technology interacts with organization in several ways. Automating tasks can reduce the number of workers needed in a strategically important operation. Standardization can make workers easier to replace. Outsourcing can move work beyond the boundaries of an established bargaining unit. At the same time, new technologies can create scarce technical skills, make organizing easier, or increase the importance of particular maintenance and coordination workers. The effect on bargaining depends on where replacement options and production bottlenecks emerge.

Labor law, enforcement, employer behavior, and industry structure also shape density. A decline concentrated in manufacturing can partly reflect movement toward sectors where organizing is more difficult. A national decline within the same industries can reflect changes in bargaining rules or employer resistance. These channels may operate jointly with automation. Assigning the whole density trend to machines would omit institutional decisions that can be changed independently of technology.

The Treasury's research review describes unions as a mechanism affecting wages, benefits, and middle class economic security. This is a source synthesis rather than a new randomized national experiment. Its usefulness for this chapter is to connect the membership measure to concrete employment terms while directing readers toward underlying research. Any observed union versus nonunion wage gap still requires adjustment for worker and job composition before it is interpreted causally. [3]

The structural implication is that production and distribution can increasingly separate. A worker may become more productive while lacking a channel to negotiate a proportional share of gains. Ownership of equipment, software, or customer access can then carry more bargaining weight than participation in the task. Union density measures one historical institution that formerly counterbalanced that separation. It should be assessed with labor share and compensation measures to determine whether declining institutional reach actually accompanied weaker distribution to workers.

Composition policy and counterevidence

Raw union and nonunion median earnings cannot establish the union wage premium. Union members differ in occupation, age, region, full time status, and industry. Some unionized jobs have licensing or public sector pay systems that would raise earnings independently of membership. Comparisons within similar workplaces and longitudinal studies of organizing events offer stronger evidence. This chapter retains the simple density series as a prevalence measure and leaves effect estimation to the relevant original studies.

The denominator can also generate temporary changes. If a shock destroys large numbers of nonunion hospitality jobs, union density may rise without successful organizing. A later reopening can reverse the percentage. A member count, employment count, and sector decomposition make those movements visible. The 2025 increase should likewise be examined through counts and sectors, with its eleven month averaging note retained. [1]

Membership measures omit many forms of worker voice. Works councils, professional associations, consultation procedures, sectoral wage standards, and statutory protections can influence employment terms without increasing union membership. International comparisons need to describe these institutions. A country with low membership and high contract coverage can have substantially broader negotiated protection than density alone suggests. This is why bargaining coverage deserves a standalone chapter. [2]

Public approval and election petitions measure sentiment or organizing attempts, while density measures realized membership among current employees. Favorable attitudes can rise while legal or practical barriers keep membership low. That divergence is an institutional finding, but it should not be collapsed into a single index. Likewise, the success of organizing at a small set of prominent companies does not automatically change the national rate materially.

Evidence strengthening the post-labor interpretation would include declining density within comparable productive sectors, weaker compensation gains, reduced ability to influence restructuring, and lower benefits after outsourcing. Evidence weakening a technological explanation would include major effects of legal reforms independent of automation or stable density in equally automated countries. Stronger worker institutions alongside rising capital intensity would show that the distributional consequences are partly governed by institutional design. The metric establishes historical decline in one source of leverage, while remaining open about its cause and reversibility.

A chart that shows institutional reach

Plot annual union membership density from 1983 through 2025 with a percentage axis beginning at zero. Show public and private sector lines in a separate panel, since their scales and institutions differ. Pair density with the membership count and eligible employment count. Preserve BLS comparability notes and mark the eleven month 2025 average. A current release can change future endpoint values, so retain the retrieval vintage. [1]

Use a separate series for union representation rather than labeling it membership. Add earnings and benefit measures only after specifying the worker population. A side by side raw comparison can be useful description if it is clearly distinguished from a causal premium. For international work, use the OECD database and keep country coverage and definitions consistent rather than merging unmatched national sources. [2]

A useful research extension decomposes national density changes into industry composition and changes within industries. A second decomposition separates public and private employment. These calculations can distinguish the effect of a shifting economy from declining union reach among comparable jobs. Observations before the comparable CPS series should be displayed separately if their historical source or denominator differs.

The chapter connects to collective bargaining coverage, benefits, labor share, outsourcing, and good job coverage. The common question is whether participation in production still provides an effective claim on its gains. Union membership is a long-standing, directly observable institutional component of that claim. Its recent uptick should remain visible because a credible structural reference must allow renewed organizing to change the trajectory.

SOURCES AND REPRODUCTION NOTES

[1] U.S. Bureau of Labor Statistics (2026). Union Members — 2025. Release 18 February 2026; 1983 and 2025 comparisons, sectors, ages, representation; 2025 annual averages exclude October. Verified retrieval 4 October 2026.

[2] OECD (2025). Membership of unions and employers' organisations, and bargaining coverage: Standing, but losing ground. International institutional definitions and long historical comparisons through 2024. Verified retrieval 4 October 2026.

[3] U.S. Department of the Treasury (2023). Labor Unions and the U.S. Economy. Official research synthesis accompanying Labor Unions and the Middle Class report; not used as a standalone causal design. Verified retrieval 4 October 2026.

RELATED CHAPTERS 019 · 021 · 022 · 023 · 024

CHAPTER 021

Collective bargaining coverage

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN 1983 to 2025 for the United States and 1985 to 2024 for OECD comparison

Collectively negotiated employment terms cover a substantially smaller share of workers than four decades ago with large differences across national institutions.

The reach of negotiated terms

Collective bargaining coverage measures the percentage of employees whose employment terms are governed by a collective agreement. In the United States the BLS representation measure includes union members and nonmembers whose jobs are covered by a union contract. The numerator therefore exceeds membership, and the denominator is employed wage and salary workers in the survey's scope. A membership chart cannot stand in for contract coverage when assessing the reach of negotiated wages or benefits. [1]

The distinction becomes larger internationally. Sectoral agreements can cover workers at firms whose employees do not belong to unions. Governments can extend an agreement to other employers in the sector. Employer associations may negotiate on behalf of many firms. In such settings, relatively few union members can sustain standards applying to a broad workforce. International comparisons need a coverage definition, an eligible employee denominator, and the rules through which agreements apply. [3, 4]

Coverage is an institutional input to the distribution of economic gains. It indicates whether wages, hours, benefits, and restructuring are set through a collectively negotiated process. The measure does not tell the reader whether a particular contract is generous, current, enforced, or capable of protecting workers in financial distress. Bargaining level, legal extension, coordination, and enforcement should therefore accompany the percentage when explaining national differences.

The numerator also has time boundaries. A contract can expire while negotiations continue, and administrative data may classify coverage differently from a worker's survey response. Some employees may not know the status of an agreement. A consistent national series remains useful, but its methodological notes should be retained rather than presenting all countries as if the same questionnaire measured them. The OECD database provides institutional metadata that help interpret these differences. [4]

For the post-labor framework, coverage addresses the reach of an organized claim on production. Employers can adopt labor saving processes while a collective agreement determines notice, redeployment, training, compensation, or sharing of gains. Where coverage declines, fewer workers participate through that channel. This can weaken distribution through employment even if production remains strong. The direct empirical claim concerns contract reach; attribution to automation requires separate evidence about technology and institutional change.

National and international historical checkpoints

U.S. union representation covered 23.3 percent of wage and salary workers in 1983. In 2025 it covered 11.2 percent, equivalent to 16.5 million workers. The historical reduction is 12.1 percentage points, with the latest rate slightly above 11.1 percent in 2024. Membership accounted for 14.7 million represented workers in 2025, with approximately 1.8 million covered nonmembers. The 2025 annual averages exclude October because of the federal shutdown. [1, 2]

The OECD's 2025 report presents an employee weighted collective bargaining coverage comparison of approximately 47 percent in 1985 and 33.6 percent in 2024. Country histories and starting years differ. The report also notes strong variation linked to multi employer bargaining and legal extension. This supplies broader historical context rather than a claim that every advanced economy followed the U.S. path. [3]

These observations describe a long decline in the reach of negotiated employment standards. They should be read alongside the possibility of stabilization or renewal. A single year increase does not erase a four decade reduction; the reduction does not justify projecting future decline automatically. Contract coverage can respond to organizing, legal reform, employer association changes, and sectoral restructuring.

The choice of weighting matters. An unweighted average asks about the typical country, giving a small country the same weight as a large one. An employee weighted average asks about the typical employee within the included countries. Neither is intrinsically better, but mixing them can create contradictory claims about a common international trend. A reproduction should state the weighting and use the same countries where possible. The published OECD comparison has its own data availability conventions. [3, 4]

The U.S. main finding is especially relevant because bargaining largely follows individual employers and workplaces. Outsourcing can move a worker to a different employer and outside a previous agreement. Countries with broader sectoral standards can limit that effect. This comparison identifies an institutional mechanism worth testing: employment boundaries may determine the economic consequences of similar productive changes. Coverage therefore adds information beyond density and beyond the quantity of work.

Coverage measure	Earlier observation	Latest verified endpoint
United States representation	23.3 percent in 1983	11.2 percent in 2025
OECD employee weighted comparison	47 percent in 1985	33.6 percent in 2024

BLS and OECD denominators differ in institutional treatment; OECD country year conventions apply. [1, 2, 3]

Coverage and the allocation of productivity gains

Collective agreements can establish common wage floors and reduce individual competition over terms. If employers can substitute among workers with similar skills, bargaining separately may leave each worker with little influence over the allocation of gains. A common agreement shifts the negotiation toward the workforce's collective contribution. It can also limit the advantage a firm obtains by paying less than competitors, depending on coverage and enforcement.

Sectoral coverage has a distinctive relationship with outsourcing. A client may transfer cleaning or logistics to a supplier, but common sectoral standards can preserve compensation requirements. Without such

standards, suppliers can compete partly through lower labor costs. The same organizational innovation can then have different effects across countries or industries. This is an analytical link among coverage, outsourcing, and worker outcomes; the coverage percentage alone does not estimate the size of the wage effect.

Technology can reduce the number of people performing a task, but negotiated arrangements can determine whether the benefits arrive through higher pay, shorter hours, severance, or retraining. Coverage therefore helps distinguish technical substitution from the terms of adjustment. A country can become more automated while preserving broad access to economic security. Conversely, weak coverage can allow even modest productivity gains to be distributed narrowly.

Coverage can also constrain firms in ways that have costs. Agreements may make adjustment slower, limit entry, or protect incumbents differently from new workers. Institutions can respond through flexible implementation, coordinated wage setting, or training systems. The relevant comparison examines employment, productivity, distribution, and access together. Treating every covered contract as an unqualified benefit would conceal the potential tradeoffs between incumbent protection and opportunity.

The metric contributes a specific historical claim: fewer employees are governed by collective standards in the observed aggregate histories. This can make labor's claim on prosperity more dependent on individual skill scarcity and outside options. Its connection to post-labor becomes stronger when accompanied by weaker labor share, growing wage dispersion, or poorer adjustment after displacement. If broader coverage sustains good job access in equally capital intensive economies, it demonstrates an institutional route capable of modifying the transition.

Comparability and competing causal accounts

Declining coverage can result from changes in law and enforcement, declining union membership, weaker employer associations, privatization, sectoral shifts, or outsourcing. These channels operate alongside automation and trade. A causal analysis should compare places or sectors facing different institutional changes while accounting for productive conditions. The existence of a broad secular decline does not identify one shared technological cause.

The denominator should include only workers for whom bargaining is a relevant possibility under the chosen definition. Some databases adjust for employees legally excluded from bargaining. Others report a share of all wage and salary workers. These conventions can move rates materially, especially across public and private employment. The database metadata should be retained with each extracted series. It is safer to reproduce an official comparison than silently reinterpret its denominator. [4]

Coverage also does not measure compliance. A collective agreement can formally apply while workers fail to receive the promised terms, particularly along subcontracting chains. Enforcement measures, grievances, and benefit or pay records can strengthen the interpretation. Conversely, an employer may voluntarily match union standards without formal coverage, so the effects of organized bargaining can extend beyond its measured numerator.

A high contract coverage rate can coexist with low membership if agreements are extended. A rising membership rate can coexist with little change in coverage if new members already worked under contracts.

These combinations clarify why separate membership and coverage chapters are required. They should be presented together in a dashboard, but neither should be counted as an independent number of people affected when consolidating totals.

Evidence strengthening the post-labor account would include persistent coverage loss in sectors where output rises while compensation falls behind, or demonstrably weaker terms after an employment boundary change. Evidence weakening a deterministic account would include sustained coverage and broadly shared gains under similar automation exposure. The institutional history establishes that labor's leverage can change across decades; its variability shows why policy and organizational choices remain part of the explanation.

An agreement can also shape the pace of adjustment rather than only wages. Advance notice gives households time to change plans, while negotiated redeployment can preserve accumulated skills inside an organization. Measuring those provisions across contract renewals would reveal whether formal coverage still provides meaningful influence over technological change. This is a proposed extension of the dashboard, not a result established by the historical coverage percentage.

Monitoring negotiated protection over time

The core U.S. chart should show representation from 1983 to 2025 and a separate membership line. Use the same wage and salary denominator and retain annual averaging notes. A public versus private split should accompany the total because bargaining environments differ. The international panel should use OECD country series with explicit eligible worker denominators, weighting, and source years. [1, 2, 4]

A useful companion figure maps coverage against productivity and compensation growth. This is a descriptive comparison, so the chart caption should avoid treating the slope as a causal effect. Add outsourcing and sector composition to investigate whether organizational boundaries explain changes. Country panels are generally clearer than a single ranking that hides the histories.

For updating, archive the extracted data, metadata, and retrieval date. Compare revisions before extending a previous graph. A report's publication year does not necessarily equal the latest national observation, and the pooled OECD endpoint may contain country exceptions. Mark gaps rather than manufacturing annual values. Review legal extension and bargaining level when an abrupt coverage break appears.

Coverage connects to membership, wage setting, employer benefits, domestic outsourcing, and the distribution of productivity gains. Its value in the reference is to show whether broad groups of employees retain a coordinated mechanism for claiming economic value. The secular history supplies evidence of contraction in that mechanism, while cross-country variation helps identify institutions that can preserve it.

SOURCES AND REPRODUCTION NOTES

[1] U.S. Bureau of Labor Statistics (2026). Union Members — 2025. Union representation 11.2 percent in 2025; eleven month averages exclude October. Verified retrieval 4 October 2026.

[2] U.S. Bureau of Labor Statistics (historical table through 2008). Table 38. Union affiliation of employed wage and salary workers by sex, annual averages, 1983–2008. 1983 membership and representation denominators; representation 23.3 percent. Verified retrieval 4 October 2026.

[3] OECD (2025). Membership of unions and employers' organisations, and bargaining coverage: Standing, but losing ground. Executive summary 47 percent to 33.6 percent; report text also shows 33.5 in one figure discussion, so quoted executive comparison retained. Verified retrieval 4 October 2026.

[4] OECD and AIAS (2025 version 2). OECD/AIAS ICTWSS database. Definitions and institutional metadata for collective bargaining coverage. Verified retrieval 4 October 2026.

RELATED CHAPTERS 019 · 020 · 022 · 023 · 024

CHAPTER 022

Defined benefit retirement participation

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN March 2006 to March 2026 with longer administrative plan histories

Private industry participation in defined benefit plans fell from 20 to 9 percent while participation in any employer retirement plan remained approximately stable.

An income promise earned through work

A defined benefit plan promises retirement benefits through a formula, commonly reflecting earnings, years of service, and retirement age. A defined contribution plan establishes an individual account whose value depends on contributions and investment returns. These arrangements allocate risk differently. The defined benefit participation rate measures the percentage of workers participating in the first type; it does not measure all retirement saving or the percentage of retirees receiving a pension. [3]

The BLS National Compensation Survey distinguishes access, participation, and take up. Access means a plan is available for the employee's use. Participation means the employee satisfies the survey's enrollment or contribution requirements. Take up is participation among those with access. The participation denominator includes all workers within the specified survey scope, so a nine percent participation rate is different from nine percent of workers eligible for a pension. [3]

Scope must also be preserved. The private industry series excludes self-employment and several other groups. BLS publishes state and local government separately and combines those sectors with private industry for civilian estimates; federal workers are excluded from that civilian combination. Public and private rates should not be compared as though occupational composition and employment institutions were identical. [2]

A worker can participate in both plan types. Adding defined benefit and defined contribution participation rates can therefore exceed participation in any retirement plan. Similarly, counting plans differs from counting people. Administrative filings can include retirees, separated vested participants, and people enrolled in more than one plan. The BLS worker share is preferable for describing current job access, while administrative plan data help explain the system's longer institutional history. [2, 4]

The post-labor relevance is an employment based promise extending beyond the current paycheck. A pension can convert decades of work into predictable later income. Moving toward accounts makes the relationship more dependent on contributions, investment performance, and individual decisions. That change does not automatically reduce retirement wealth for every person. It changes how employment connects workers to long-term security, providing a concrete dimension of labor's evolving economic meaning.

A twenty year transfer in retirement structure

Among private industry workers, defined benefit participation was 20 percent in March 2006 and 9 percent in March 2026. Participation in defined contribution plans rose from 43 to 49 percent. Participation in any retirement plan was 51 percent in 2006 and 52 percent in 2026. Those observations show a substantial shift in plan type alongside broadly stable overall participation, rather than a general disappearance of retirement plans. [1, 2]

The decline is eleven percentage points, equivalent to a fifty five percent reduction relative to the initial participation rate. That calculation refers to rates, not the number of people losing a pension between the endpoints. Workers entered, retired, changed employers, and moved between sectors over the period. Following a cohort would be required to measure individual losses or replacement by an account plan.

The March 2026 data were released in September 2026. At that endpoint 14 percent of private industry workers had access to defined benefit plans. State and local government participation in defined benefit plans was 75 percent, emphasizing how strongly retirement institutions differ across sectors. The public comparison should be interpreted with BLS's warning about different occupations and activities, rather than assigned entirely to bargaining power or automation. [2]

The Department of Labor's private pension bulletins supply an administrative history extending to the 1970s and distinguish defined benefit from defined contribution arrangements. Their Form 5500 participant totals are a different object from BLS worker participation shares. They are especially useful for examining active versus retired or separated participants and plan structure, provided reporting changes and multiple participation are handled. [4]

The evidence qualifies as secular because the comparable checkpoint window reaches twenty years. The stronger conclusion concerns risk allocation within employment benefits. A negative account would be incomplete if it omitted the stable overall participation rate and greater portability possible under individual accounts. A favorable account would be incomplete if it treated every account participant as having adequate balances or access to lifetime income.

Private industry participation	March 2006	March 2026
Defined benefit	20 percent	9 percent
Defined contribution	43 percent	49 percent
Any retirement plan	51 percent	52 percent

BLS NCS worker participation; people may participate in both plan types. [1, 2]

Risk portability and the employment settlement

A formula pension can pool longevity and investment risk across participants and the sponsor. An individual account makes balances more visible and potentially more portable, while placing greater responsibility on saving, investment allocation, and converting wealth into retirement income. Employers may contribute substantially in either system. The question is how the combination of contributions and risk produces reliable economic security after work ends.

The shift matters when careers become less continuous. A pension formula designed for long tenure can penalize workers moving among employers, while a portable account can better accommodate contracting or frequent job changes. Conversely, repeated low paid spells can make voluntary contributions difficult, and a worker who loses a high quality employer may also lose a generous match. Plan type therefore interacts with labor market mobility and earnings recovery. Neither arrangement guarantees adequacy without examining its terms.

Automation enters through the financing and bargaining environment rather than being identified by the participation series. Employers facing competition can seek to reduce uncertain long-term obligations. A workforce with less leverage may have limited influence over those changes. Technology and outsourcing can alter the composition of employers and jobs that historically sponsored pensions. Tax rules, funding regulation, accounting, and demographic changes also shape the trend, so the pension series cannot isolate a technological cause.

A hypothetical comparison shows why contribution levels matter. One employee receives an account contribution worth fifteen percent of pay and a portable balance; another receives two percent of pay and no employer match. Both count as defined contribution participants. Another employee's formula pension may be generous after thirty years but provide little after a short tenure. A participation percentage deliberately abstracts from those provisions. The chapter's mechanism therefore calls for replacement rates, accrued wealth, vesting, and portability as companion measures.

Within the post-labor evidence map, the shift represents the narrowing of one durable guarantee historically attached to work. Workers become more dependent on personal capital accumulation and market returns to secure retirement. This connects employment quality to wealth ownership, even when current job counts are unchanged. The interpretation is strongest when declining pension access accompanies inadequate account saving and greater household exposure to risk.

What participation cannot establish

A lower defined benefit rate can reflect plan closures, freezes, sector changes, or replacement with account plans. BLS defines soft frozen plans as closed to new entrants while existing participants can continue accruing benefits, and hard frozen plans as stopping further accrual. Depending on the measure, legacy participation can persist after the route has closed to new workers. A study of entry opportunities should examine plan status and accrual, rather than relying solely on the participation stock. [3]

Participation also says little about solvency or the value of the promise. A plan can provide a formula benefit while facing funding pressures, and an account can accumulate substantial assets. Comparing retirement income needs a common discounting and price basis, realistic tenure, and assumptions about retirement timing. A dollar of reported account wealth cannot be compared directly with a promised annual payment without converting them to a compatible economic measure.

The choice of denominator changes interpretation. Current workers, active plan participants, all beneficiaries, households, and retirees form distinct populations. A rising administrative count of people receiving defined benefit payments can coexist with falling current worker participation as an older cohort retires. An asset total can rise because markets appreciate even while new workers have less access. These are coherent combinations whose boundaries should be explained rather than described as conflicting statistics. [2, 4]

Tax incentives and distribution matter. Higher earners may be better able to contribute and claim tax advantages. Workers with low or volatile earnings can participate nominally yet save little. The reference should inspect participation and balances across wage groups, full time status, and employment arrangements. The current BLS data provide differences in access across groups, while household wealth surveys can supply balances under distinct units.

Evidence supporting structural deterioration would include weaker accrued retirement claims for comparable workers, less employer financing, and greater shortfall risk after displacement. Evidence favoring a successful redesign would include broader portability, adequate contributions, rising replacement rates, and effective lifetime income options. The verified plan shift is secular; its net welfare effect remains conditional on those outcomes. That distinction preserves the observation without forcing an identical conclusion for every participant.

The household perspective requires distinguishing an individual account balance from total retirement resources. Social insurance, a spouse's benefits, home ownership, and other assets can compensate for weaker employer provision. Conversely, a household may depend heavily on one worker's job. Reporting those complements separately allows the reader to assess employment's contribution without assigning every retirement outcome to a single plan type.

Showing the change without losing the replacement

The primary chart should show private industry participation in defined benefit, defined contribution, and any retirement plan on separate lines. Retain the common worker denominator and explain overlap. Display the verified 2006 and 2026 checkpoints before extending with annual data from the BLS historical tables. Public sector results belong in a separate panel with the survey's scope and occupational differences noted. [1, 2]

A second figure can show access, participation, and take up for each plan type. A third should track plan generosity: employer contributions, vesting, benefit formulas, and whether new entrants can accrue benefits. These details help distinguish a disappearing guarantee from a well-financed replacement. Participation alone should never be labeled retirement adequacy.

For administrative histories, download the Department of Labor tables and retain the distinction between active participants and all participants. Check reporting changes and avoid treating plan enrollments as unique people. Use consistent inflation adjustment for assets or contributions. The date a bulletin was released should remain separate from the filing year it summarizes. [4]

This metric connects to bargaining coverage, good job coverage, household wealth, contracting, and displacement recovery. Its distinctive contribution is the link between today's work and tomorrow's security. The evidence documents a large decline in formula based participation within private employment, while the stable overall retirement participation rate requires the reference to assess what replaced that promise.

SOURCES AND REPRODUCTION NOTES

[1] U.S. Bureau of Labor Statistics (2006). National Compensation Survey: Employee Benefits in Private Industry in the United States, March 2006. Table 2 participation; all plans 51 defined benefit 20 defined contribution 43 percent. Verified retrieval 4 October 2026.

[2] U.S. Bureau of Labor Statistics (2026). Employee Benefits in the United States — March 2026. Release 25 September 2026; retirement participation and access in summary and table 1. Verified retrieval 4 October 2026.

[3] U.S. Bureau of Labor Statistics (2026). National Compensation Survey: Glossary of Employee Benefit Terms. September 2026 definitions of access participation defined benefit defined contribution and frozen plans. Verified retrieval 4 October 2026.

[4] U.S. Department of Labor Employee Benefits Security Administration (2025). Private Pension Plan Bulletin Historical Tables and Graphs: 1975–2023. Form 5500 administrative plan and participant series; primary indexed publication verified; no additional exact counts used. Verified retrieval 4 October 2026.

RELATED CHAPTERS 017 · 020 · 021 · 024 · 026

CHAPTER 023

Employer health insurance and benefit access

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN March 2006 to March 2026 with 2025 household coverage context

Medical plan access remained stable over twenty years while participation declined and benefit quality requires separate measurement of costs and coverage.

Access enrollment and protection

Employer health insurance should be measured through several separate quantities. Access is the share of employees permitted to use an employer's plan. Participation is the share enrolled under the survey definition. Take up is enrollment among employees with access. BLS reports those measures in its National Compensation Survey. The medical benefit denominator is workers within the specified private industry, state and local government, or combined civilian scope. These percentages do not describe all residents or all households. [1, 2, 3]

Population coverage is a different object. Census estimates employment based insurance for people who may be insured through their own job or a family member's employment. Its annual measure can count coverage for some or all of the calendar year. A worker without current employer participation may have coverage through a spouse, Medicaid, Medicare, or an individual policy. Employer benefit participation can decline even while the population's insurance coverage improves through other institutions. [4]

Insurance quality also has multiple components. Premium contributions reduce available cash income. Deductibles, copayments, and coinsurance determine payments when services are used. Networks, covered services, and authorization requirements affect practical access. An employer offering a plan with a large deductible and limited network counts as offering access, just as one offering generous protection does. The binary access measure therefore captures an institutional link while leaving generosity and affordability unresolved.

An employer contribution is part of compensation, but its cost does not translate one for one into worker welfare. Higher medical prices can raise employer spending without improving protection or take-home purchasing power. Conversely, a plan can improve access through better care arrangements without a large spending increase. Compensation comparisons should distinguish the resources paid for coverage from the services and financial security received.

The post-labor relevance concerns employment's role in financing essential protection. A traditional good job often supplied both a wage and a mechanism for absorbing medical risk. Weaker enrollment, higher employee burdens, or poor access among marginal jobs can reduce that function. A stable access rate is also substantive evidence: it prevents this metric from being presented as a general secular collapse in employer offers. The correct assessment follows all dimensions together.

A stable offer and changing participation

Private industry medical plan access was 71 percent in March 2006 and 71 percent in March 2026. Participation declined from 52 to 46 percent. The twenty year comparison therefore shows stable availability with lower enrollment among the full worker population. These endpoints should be retained on the same private industry basis. Combining an old private series with a new civilian series would create a misleading trend. [1, 2]

The gap between access and participation can reflect cost, alternative coverage, eligibility conditions, or worker preferences. It is not a direct count of people unable to obtain insurance. A person declining an employer plan because a spouse has better coverage differs economically from someone declining because premiums are unaffordable. The published rates reveal the gap; explaining it requires household information and reasons for nonparticipation. [3]

The March 2026 split by work status is especially important. BLS reports medical access for 87 percent of full time private workers and 23 percent of part time private workers. Those are contemporaneous groups with different occupations and earnings, rather than estimates of the causal effect of cutting an individual's hours. They reveal that expanding headcount in jobs with few hours can leave employer protection much less extensive. [2]

Census's latest annual report shows employment based insurance covering 53.5 percent of the U.S. population for some or all of 2025. This is useful current context and has a different denominator from BLS benefit access. It includes dependents and can overlap other insurance types. It should appear in a separate population panel rather than extend the employee access line. [4]

KFF's 2025 employer survey provides costs and plan details. It reports average family premiums of 26,993 dollars and worker contributions of 6,850 dollars. Its 2025 sample covers nonfederal employers with at least ten workers, compared with a broader small firm scope in previous years. Historical comparisons need that methodological change noted. These are nominal costs rather than a direct measure of declining real protection. [5]

The evidence is mixed because the long access series is stable while participation and plan burdens require deeper analysis. It contributes to the report by identifying which part of the employment benefit promise has changed, and which has persisted.

Private medical plan measure	March 2006	March 2026
Access	71 percent	71 percent
Participation	52 percent	46 percent

BLS NCS private industry worker denominator; access and enrollment are different concepts. [1, 2]

The connection between jobs and medical security

Employment tied insurance creates an additional cost of changing or losing jobs. A household may value continuity of coverage enough to accept lower wages or avoid a risky career transition. A displaced worker can lose both current income and the employer's contribution at the same time. Other insurance institutions

can soften that coupling, so job loss need not lead to uninsurance. The economic question is how reliably essential protection remains available when the labor relationship changes.

This matters for a labor market moving toward contracting, part time work, or specialist suppliers. Some arrangements provide less access to employer medical plans. The household must then finance coverage independently or rely on other eligibility routes. If broader employment remains high while more jobs supply little protection, a jobs count can overlook a weakening distributional function. The BLS work status split gives a concrete reason to examine hours and benefits jointly.

Automation can influence the composition of jobs and the employers providing them, but the benefit history does not isolate that mechanism. Medical prices, insurance regulation, public eligibility, family employment, and plan design can alter participation independently. A firm adopting efficient software might preserve its plan, while a firm facing rising medical premiums might shift costs without any automation. A source-grounded chapter should distinguish those mechanisms rather than assigning every change to reduced human labor requirements.

The wider post-labor link is the possibility that employment becomes a less sufficient gateway to necessities. An adequate wage accompanied by portable public insurance may provide better security than a higher employer insurance contribution coupled with large out-of-pocket exposure. Conversely, loss of employer protection without adequate replacement can leave workers more dependent on family resources, public transfers, or debt. The final outcome requires examining the complete financing system.

An illustrative household comparison clarifies the measurement. Two workers receive the same hourly wage. One pays a small premium and has predictable expenses; the other pays a larger premium and must meet a substantial deductible before coverage begins. Both can be classified as enrolled. Their usable purchasing power and exposure to shocks differ. Benefit access should therefore be interpreted as the first stage of a chain leading through affordability, enrollment, and actual protection.

Testing deterioration rather than assuming it

A secular deterioration test should use a constant worker population and comparable plan measures. Medical access, take up, employee premium contributions as a share of pay, and expected out-of-pocket costs provide distinct tests. Inflation adjustment is necessary for dollar series, while burden relative to earnings can reveal affordability more directly. A rising nominal premium may reflect general prices, more expensive care, or broader coverage; it cannot alone establish lower job quality.

Enrollment gaps are especially sensitive to household alternatives. Dual-earner couples may choose one employer's plan, leaving the other worker recorded as a nonparticipant. Public coverage eligibility can also change take up. Survey reasons for declining a plan, linked household coverage, and earnings data can help identify affordability problems. The worker access series and population uninsurance series should therefore be interpreted together instead of substituting one for the other. [3, 4]

Benefits differ across full time status, wages, establishment size, occupation, and union affiliation. Cross-sectional differences describe where protection is concentrated. A claim that scheduling practices caused benefit loss would need to follow hours and eligibility around an actual change. A claim that outsourcing

caused deterioration would need worker and employer records before and after a transfer. Matching these events to benefit data creates a stronger test than comparing unrelated current groups.

International comparisons require particular care. Countries with universal health protection can have little employer medical insurance while employment provides adequate security through other channels. Labeling those jobs inferior because an employer does not offer a U.S.-style medical plan would confuse institutional form with protection. A comparative good job index should use access to necessary care and financial risk, then identify who finances it.

Evidence supporting structural decline would include rising medical burden relative to wages, involuntary nonenrollment, coverage disruption after job changes, and weaker access among an expanding share of jobs. Evidence weakening that interpretation would include stable offers, affordable portable replacement, declining uninsurance, and better financial protection. The verified access stability belongs in the latter set. It keeps the chapter focused on actual dimensions of change rather than a predetermined negative conclusion.

A dashboard for the benefit chain

Use an access and participation chart for private industry from 2006 through 2026, followed by a full time and part time panel. Obtain intermediate observations from BLS historical files rather than interpolating annual values from the two checkpoints. Show the worker scope, March reference period, and release vintage. A separate population panel can show employment based, public, individual, and uninsured coverage using Census definitions. [1, 2, 4]

For costs, chart employee premiums as a share of earnings and deductible exposure in real dollars. Keep family and single coverage separate. Retain KFF sample changes and plan definitions; an employer percentage and a covered worker percentage have different weighting. A burden chart should include the income denominator and avoid presenting a nominal cost line as a welfare index. [5]

A prospective research file should connect employment changes to coverage continuity and actual out-of-pocket spending. Include workers who become unemployed, contract independently, or leave the labor force after a separation. Restricting analysis to people with a new employer plan would exclude those most exposed to benefit loss.

This chapter links to contingent work, contracting, good job coverage, retirement benefits, and transfer dependence. It adds the institutional relationship between earnings and medical protection. Its historical classification remains mixed: the employer offer share is stable, enrollment is lower, and the final security outcome depends on cost and replacement coverage. That differentiated finding strengthens the report's ability to explain what labor still provides and what must increasingly be obtained elsewhere.

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RELATED CHAPTERS 017 · 018 · 022 · 024 · 026

CHAPTER 024

Good job coverage

EVIDENCE STATUS **Historical evidence** · OBSERVATION SPAN 1979 to 2010 for the verified historical composite with current component data through 2026

A historical pay and benefits composite declined despite workforce upgrading and motivates an updated direct measure of access to adequate employment.

Defining a job that provides prosperity

Good job coverage is a composite share: people meeting a stated set of employment criteria divided by a stated population. CEPR's historical U.S. measure required pay of approximately 18.50 dollars per hour in constant 2010 dollars, employer health insurance, and a retirement plan. It covered employees ages eighteen to sixty four working at least twenty six weeks and averaging at least twenty hours weekly. [1]

The purpose of a composite is to assess whether desirable employment features occur together. A worker with adequate pay but no benefits differs from a worker with benefits but inadequate hours. Separate national averages can conceal that division. The joint measure asks how much of the population receives a coherent package. Its definition should be published before interpreting a historical trend, because changing criteria after seeing the data can manufacture either deterioration or improvement.

There are several defensible denominators. The share among employed people measures job composition. The share among working-age residents measures access, including those unable to obtain employment. The share among entrants measures opportunities at the beginning of a career. A current worker quality series can improve because low quality workers leave employment, while population access worsens. Showing both job composition and population coverage avoids that selection problem.

Thresholds also require a philosophical choice. A fixed real pay threshold measures improvement relative to a constant purchasing standard. A threshold linked to median wages or living costs asks whether employment meets an evolving social or local standard. An adequate income threshold can reflect household needs, while an individual hourly threshold measures the job. Both should be separated from productivity so readers can see whether improved productive capacity has translated into broader access to adequate terms.

The post-labor contribution is unusually direct. Many other measures identify mechanisms or consequences; good job coverage asks whether work supplies the combination of income and protection that made it a route to prosperity. The historical CEPR index is one operational definition. This chapter treats it as a verified predecessor and explains how an updated dashboard can retain comparability while adding security, hours adequacy, and portability.

The historical evidence and its endpoint

The CEPR composite declined from 27.4 percent in 1979 to 24.6 percent in 2010. Reweighting 2010 outcomes to the 1979 age and education distribution gives 17.1 percent. These results indicate deterioration within

that historical definition despite an older, more educated workforce; they do not provide a current 2026 composite level. [1]

The demographic adjustment answers a specific question: what would the measured share be if the distribution of observed groups had remained fixed? It can separate changes within groups from a shift toward groups historically more likely to hold good jobs. It is an accounting exercise, not a forecast of a world where education had failed to expand. Education affects labor supply and demand, so holding composition fixed does not hold the rest of the economy causally unchanged.

The endpoint also matters. A measure ending during the aftermath of a severe recession can combine structural and cyclical effects. A careful update would include several expansion peaks and recessions, use the same thresholds, and examine whether a broad decline persisted through subsequent tight labor markets. The existence of a historical thirty one year comparison satisfies the duration criterion, while the older endpoint prevents it from settling the latest trajectory.

The Private Sector Job Quality Index provides a different complementary measure: the ratio of production and nonsupervisory payroll positions in industry groups with weekly cash pay above the covered employment-weighted mean to positions below that mean. Its separate chapter examines the long historical job mix and the monthly release program. This is a relative distribution measure, whereas CEPR’s good-job threshold combines a specified real wage with health and retirement benefits. Neither is a substitute for the other. [5]

A growing number of jobs can therefore accompany a lower JQI without showing that every job’s purchasing power has fallen. The ratio can also improve while too few workers receive benefits. The strongest comparison uses both instruments on their own terms: report the JQI’s covered positions and classification vintage beside the fixed-threshold share, and add population-based coverage where available. CES counts jobs rather than unique people, so multiplying its ratio by the employed population would mix denominators. A worker with multiple payroll positions can enter more than once. [6]

Current official component data provide context without recreating the joint index. In March 2026, BLS reported retirement participation for 52 percent of private industry workers and medical participation for 46 percent. Those populations and concepts differ from the CEPR sample. Multiplying those percentages would assume an independence that is unlikely, and adding them would ignore overlap. The composite must be measured in data containing the criteria for the same people or through a clearly specified linked estimate. [2]

Subjective job improvement is another complementary measure. The Federal Reserve reports that 60 percent of people changing jobs in 2025 considered the new job better overall, below 72 percent in 2022. This describes completed transitions and includes workers' evaluation of features beyond pay. It is a short recent comparison, with a different denominator from the historical composite, and cannot replace a twenty year good job coverage series. [3]

Historical composite observation	Share
1979 actual	27.4 percent
2010 actual	24.6 percent
2010 outcomes with 1979 age and education composition	17.1 percent

CEPR historical CPS analysis; reweighted result is an accounting counterfactual. [1]

Absorption into prosperity rather than any position

The metric can reveal a labor market's capacity to absorb people into adequate livelihoods. A productive industry may add few positions yet offer excellent terms to those hired. A labor intensive industry may add many positions with poor pay or security. Total headcount combines those outcomes. A quality threshold linked to population asks whether the economy generates enough opportunities for people to participate in the gains of production.

This becomes important when automation changes occupational demand. New high paying specialties can expand without absorbing many displaced people. Personal services can absorb labor while paying less because customers have limited budgets and many workers compete. A joint quality measure tracks whether those transitions preserve income, insurance, retirement provision, and sufficient hours. It does not require every worker to remain in the same occupation or industry.

A hypothetical economy illustrates the denominator issue. There are one hundred working-age residents, eighty of whom work, and thirty hold jobs meeting the criteria. Good job coverage is thirty percent of residents and thirty seven and a half percent of workers. If ten low quality workers lose employment while the thirty good jobs remain, the employed-worker share rises to about forty three percent. Population coverage remains thirty percent. Reporting only the first can make labor market exclusion appear as improving quality.

A second example illustrates compaction within growth. Real output rises while the number of qualifying jobs stays constant and the working-age population grows. Existing good jobs may pay more, yet access narrows. The resulting decline in coverage describes an opportunity constraint that revenue per worker and average wages can miss. An employer can become more successful while providing fewer entry routes relative to the number of people seeking them.

For the post-labor narrative, the strongest proposed extension is qualifying jobs per working-age resident and per unit of real output. The first measures social absorption; the second measures the employment intensity of prosperity. These are proposed calculations requiring transparent criteria and matching data, rather than currently verified national headline series. They connect technical efficiency to distribution without assuming that every increase in productivity damages workers.

Thresholds selection and institutional differences

A good job definition always embeds a standard. One index can prioritize wages, benefits, and hours; another can include schedule control, safety, meaningful work, or advancement. Adding more requirements generally lowers the measured share even if underlying jobs do not change. A historical dashboard should retain a stable core definition and present added criteria as separate versions. This preserves the ability to observe change rather than merely redefine goodness.

Medical and retirement criteria are particularly institutional. A country providing universal insurance need not attach coverage to employment. Workers can obtain retirement security through public pensions, personal assets, or household sharing. A U.S. employer benefit composite is informative about the employment relationship, but international quality comparisons should evaluate protection received and

distinguish its financing source. Otherwise a successful public alternative could make jobs look worse on paper.

Hourly pay and annual adequacy can diverge. A person may earn a high rate but obtain too few paid hours, or earn moderate wages through an exhausting schedule. Irregular hours and unpaid business time also matter. A comprehensive update should include annual earnings, desired versus actual hours, and predictable scheduling while retaining the simple wage threshold for historical reproduction. Reporting a few well-defined components is more useful than a composite whose inputs cannot be inspected.

Composition adjustments require restraint. Age and education standardization can reveal within-group change, but industry adjustments might remove the very structural movement the research aims to study. If good jobs disappear from one sector and workers move to weaker positions elsewhere, treating industry as a nuisance control can hide the phenomenon. Report the raw total, age and education standardized total, and industry decomposition separately. Each answers a different question.

Evidence strengthening the post-labor framework would include persistent decline in population coverage through expansion peaks, weaker entry into qualifying jobs, and declining qualifying employment per output after controlling for outsourcing. Evidence weakening it would include broadly rising access, adequate portable protection, and strong recovery among displaced cohorts. The historical composite supplies a credible starting point, while its old endpoint makes reproduction and updating a priority.

Reproducing and extending the composite

Reproduce the historical CEPR series before changing it. Obtain the relevant CPS annual microdata, preserve sample restrictions, reconstruct hourly pay, use the stated inflation method, and apply the health and retirement indicators to the same observations. Archive code and document missing responses. The reproduced historical endpoint should agree within explained differences before extending past survey redesigns. [1, 4]

For a current reference, publish three versions: a fixed real standard, an evolving adequacy standard, and a job features dashboard without a single cutoff. Add a working-age population denominator and entrant cohort coverage. Do not infer joint quality by multiplying published benefit averages. The overlap should come from individual records or an explicitly validated model.

Plot the qualifying share over time with recessions marked and expansion peaks visible. Pair it with real output and workforce education so readers can inspect whether rising capacity and qualifications translated into wider access. A table should state each criterion, threshold, population, and break in measurement. Sensitivity analysis can show how modest changes in criteria affect the direction.

This chapter connects to pay productivity divergence, benefits, career entry, displacement recovery, and transfer dependence. Its distinctive role is to test the combined employment package directly. The historical evidence deserves inclusion, and an updated direct index would help evaluate the wider framework more decisively than relying only on separate averages.

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RELATED CHAPTERS 017 · 018 · 022 · 023 · 025 · 026

CHAPTER 025

Early career hiring and entry opportunities

EVIDENCE STATUS **Short history** · OBSERVATION SPAN Historical career entry research from 1982 to 1999 and current observations through June and second quarter 2026

Recent evidence identifies pressure on entry into some exposed occupations, while a nationwide secular decline in entry opportunities remains unestablished.

What counts as a career entry opportunity

An entry opportunity is a route into paid work that gives an inexperienced worker a chance to acquire skills, credentials, responsibility and a sustainable income. Its measurement needs more precision than counting young employees. A hire is a flow into a job during a period. Employment is the stock remaining after hires, separations, aging and occupational changes. A lower stock among young workers can reflect fewer entrants, faster exits, a smaller cohort or longer education. The most direct indicator is new hires into specified entry roles divided by the population qualified and seeking those roles.

Age provides an observable proxy for experience, but the mapping is imperfect. A worker aged 24 may have six years of experience, while a 40 year old changing careers may be a genuine entrant. Separate an age based series, a years since graduation series and a first job or first occupation series wherever records allow. An employer's description of a position as entry level also requires checking: a vacancy that demands several years of experience does not offer the same access as a trainee position. The definition must remain stable as titles and recruiting practices change.

Three outcomes belong together. The entry hiring rate measures access. Starting compensation and benefits measure the quality of access. Subsequent wage growth and promotion measure the developmental value of the initial match. College graduate underemployment is useful context, because a graduate may obtain work without accessing an occupation associated with the qualification. The New York Federal Reserve's dashboard measures this mismatch using occupational education requirements, rather than directly measuring hiring into trainee jobs. Its recent graduate series should therefore remain a distinct indicator. [3]

For the Post Labor framework, the distinctive question is whether firms increasingly produce and expand without opening the first rung of a career ladder. This can happen through automation of routine junior tasks, outsourcing, hiring experienced specialists, or changing training arrangements. A credible monitoring design records actual hiring and task changes rather than treating every exposed occupation as automated. It also includes apprenticeships, vocational pathways and workers without degrees. A college only measure would miss much of the population whose access to an economically valuable career is in question.

What the historical and recent evidence establishes

The latest Stanford study available at the cutoff uses ADP payroll records through June 2026. Its August 2026 revision reports employment among workers aged 22 to 25 in highly AI exposed occupations about 19 percent below a relative less exposed benchmark. The pattern comes primarily from reduced hiring. The authors describe the analysis as descriptive, acknowledge preexisting differences and show that education controls reduce the gap. The result is larger in their payroll data than in national survey comparisons. It is a relative employment shortfall within a particular design, rather than a count of people directly dismissed by AI. [1]

A separate Federal Reserve paper, published in March 2026, examines coder employment. It finds continuing employment growth alongside a marked slowdown after ChatGPT's introduction and explores industry shocks as an alternative explanation. This provides an independent reason to examine entry opportunities in a prominent exposed occupation, while leaving the magnitude and cause of the change open. The occupational and industry boundaries differ from the Stanford study, so the two results cannot be added together. [2]

The New York Federal Reserve reports recent college graduate unemployment near 5.6 percent and underemployment of 42 percent in the second quarter of 2026. The dashboard's long history supplies context for cyclical and structural comparisons. These outcomes describe graduates' employment status and occupational matching; they do not isolate AI or show that every underemployed graduate failed to receive an entry offer. They also need comparison with earlier recessions and changes in the composition of graduates. [3]

Longer historical research establishes that the circumstances of career entry can have persistent consequences. Oreopoulos, von Wachter and Heisz study Canadian graduates using records spanning 1982 to 1999 and examine the effects of entering during a recession. Their analysis shows why initial opportunities can affect later earnings and employer matching. It does not establish that entry has deteriorated continuously for twenty years or that current automation reproduces the same shock. The historical finding supplies a mechanism for concern about foregone starts, rather than a long trend in the recent AI indicator. [4]

Accordingly, the current entry compression evidence belongs in the short history category. A measured change concentrated in a few recent years can matter greatly without satisfying the document's secular criterion. The appropriate historical claim is that entry conditions can shape careers; the current claim is that some exposed occupations show a hiring gap requiring continued investigation.

Record	Observation endpoint	Interpretation
Stanford ADP analysis	June 2026	Relative young worker employment gap of about 19 percent
Federal Reserve coder study	March 2026 publication	Employment growth slowed rather than universally reversed
New York Fed graduate dashboard	Second quarter 2026	5.6 percent unemployment and 42 percent underemployment
Canadian graduate research	1982 to 1999 records	Initial labor market conditions can affect later outcomes

Sources [1] to [4]. Publication dates and observation endpoints are deliberately separated.

Why fewer starting positions can matter before layoffs

A firm can compress entry employment without making a large round of dismissals. Consider a hypothetical department that formerly recruited ten juniors each year to replace exits and support growth. If a new workflow requires only four recruits, its incumbent workforce can decline gradually as employees leave. The immediate effect falls on people who never receive an offer. Payroll records eventually reveal a smaller young cohort, but there may be few identifiable automation related separations. This arithmetic explains why gross hires are an especially important complement to employment stocks.

Junior tasks often serve two functions: they produce today's output and teach the next generation. If drafting, checking, basic coding or research preparation becomes cheaper to automate, the productive reason for assigning those tasks can weaken. A training reason may remain. Whether employers preserve paid learning opportunities then depends on who captures the future return to training, how long workers stay and whether senior skills can be acquired through another route. The possibility of a disrupted training ladder is an economic mechanism to test, not an inference that every junior task will disappear.

A narrower entry channel can also alter competition among applicants. More candidates per opening may permit employers to demand higher credentials, prior internships or unpaid preparation. The resulting burden can show up in delayed starts, extra education, geographic moves or lower accepted compensation. These effects need direct measurement because application counts can inflate when online applications become easier. A hundred automated applications are not equivalent to a hundred distinct qualified jobseekers competing for one position. Candidate level records and offer acceptance data would be more informative.

The connection to Post Labor economics becomes strongest when output or revenue grows while real entry hiring falls, the change persists across business cycles and the task record documents declining human work per valid unit. Without those links, reduced entry can reflect a temporary investment slowdown or an industry correction. A firm that outsources junior work abroad may reduce domestic opportunities while still depending heavily on labor elsewhere. A firm that automates clerical preparation but creates paid apprenticeship pathways may improve career development despite eliminating a familiar title.

Entry opportunities also interact with distribution. Families able to finance a longer search, additional study or an unpaid placement can absorb a delayed start more easily. If access increasingly depends on that support, inherited resources become more consequential for career formation. Establishing this connection requires tracking family background and opportunity quality, rather than assuming that a lower age specific headcount has already produced a particular distributional outcome.

Tests that distinguish structural compression from other changes

The first test compares entrants with appropriate contemporaneous controls. Highly exposed and less exposed occupations can differ in industry, geography, education, remote work, prior hiring booms and seasonality. An exposure index describes which tasks technology could affect; actual deployment may differ substantially. Researchers should examine preperiod trajectories, alternative occupation groupings, firm

specific adoption dates and the sensitivity of estimates to controls. An apparent effect that begins before adoption weakens a simple causal interpretation.

The second test follows hiring opportunities outside the observed payroll sample. A payroll provider may underrepresent some firm sizes or sectors, and its client mix can change. National household and establishment records provide valuable checks, although they often have less detail on entry hires. Graduate surveys, apprenticeship records and recruiting data measure other aspects of the pathway. Agreement across independently collected outcomes is more persuasive than several indicators drawn from the same underlying payroll database.

The third test examines quality and later progression. Lower starting employment combined with higher pay, faster skill acquisition and broader alternative entry routes could reflect a redesigned career structure. Lower starting employment combined with longer job search, falling starting compensation and weaker subsequent advancement would indicate a more damaging compression. Follow graduates and other entrants over several years, recording occupational moves and education changes. A short panel can otherwise mistake temporary postponement for permanent exclusion.

Business cycles and cohort size need explicit treatment. Entry hiring tends to be adjustable when demand weakens, and young workers have less accumulated employer attachment. A sector that recruited unusually heavily during an earlier boom can normalize hiring without representing a decades long change. Compare current outcomes with similarly weak demand periods and normalize by the relevant entrant population. Changing immigration and graduation patterns can alter that denominator even when the number of openings stays constant.

Finally, a secular interpretation requires time. The present AI specific evidence covers a much shorter window than twenty years. A future historical series could combine consistent entry hiring records with earlier computerization, offshoring and task change measures. Such a series would need to preserve definitions across generations of technology. Until then, the chapter supports an early warning instrument and a plausible career formation mechanism, with an explicit limit on claims about the duration of the observed trend.

A reproducible entry opportunity dashboard

Build separate panels for entry hires, young worker employment, starting compensation and subsequent progression. Put the employment stock and hiring flow on different axes or charts. Index exposed and comparison occupations to the same preperiod, publish the underlying levels and show their prior trajectories. Annotate the Stanford endpoint as June 2026 and the graduate dashboard endpoint as the second quarter of 2026. These dates cannot be silently advanced to the October retrieval date. [1][3]

For each series, retain the age or experience definition, occupational classification, sample coverage, seasonal treatment and denominator. Show hiring per thousand qualified entrants alongside the absolute count. Where qualification cannot be observed, label the population proxy. Report sample uncertainty and revisions, and preserve archived vintages so a revised estimate does not masquerade as new deterioration.

A second dashboard layer should examine task content and quality. Record paid training availability, experience requirements, starting real wages, benefits, time to first stable job and three or five year earnings.

These are proposed complementary measurements rather than a claim that a complete national series already exists. Disaggregate by education, sex, geography and family resources only where cell sizes support credible estimates.

Read this metric with college graduate underemployment, job tenure, avoided hiring, freelance postings and automation task reinstatement. Entry hiring can contract while incumbents remain employed, and new occupations can reopen opportunities elsewhere. The overall assessment should ask whether replacement pathways preserve access to skill formation and income growth. That is the substantive test of career compression, and it gives the indicator a clear role even before a twenty year comparable history becomes available.

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RELATED CHAPTERS 015 · 048 · 077 · 078 · 084 · 085

CHAPTER 026

Earnings recovery after displacement

EVIDENCE STATUS **Historical evidence** · OBSERVATION SPAN Administrative earnings research 1974 to 2008 and displacement cohorts 2021 to 2025 observed in January 2024 and January 2026

Job loss can leave persistent earnings losses, but existing evidence does not establish a continuous nationwide deterioration in recovery.

Defining recovery and the population at risk

Earnings recovery asks how much of a worker's former earning capacity returns after an involuntary job loss. Several measures answer different versions of that question. One compares current weekly pay with pay on the lost job. Another compares annual labor earnings before and after displacement. A third estimates the difference from the earnings the worker would have received without displacement. The first is easy to interpret but can miss lost weeks and inflation; the counterfactual measure is more demanding and better suited to estimating the economic cost of losing a match.

The Bureau of Labor Statistics Displaced Worker Supplement identifies workers who lost jobs because an establishment closed or moved, insufficient work was available, or a position or shift was abolished. Its long tenured group worked at the lost job for at least three years. The latest release covers losses during 2023 to 2025 and reports status in January 2026. Displacement is narrower than every separation and broader than a verified automation induced layoff. The reason recorded in the survey does not identify which technology, trade shock or management decision caused the loss. [1]

The earnings restoration percentage has a particularly selective denominator. BLS compares earnings for people who lost full time wage and salary jobs, regained full time wage and salary employment and reported earnings on the old job. People still unemployed, outside the labor force, working part time or self employed are outside that comparison. A favorable restoration percentage can coexist with substantial losses among excluded workers. A responsible presentation therefore places reemployment status next to the conditional pay comparison. [1]

Recovery should also be separated into hours, hourly pay, employment duration and benefits. A higher weekly wage can reflect longer hours. Restoring nominal pay after several years does not restore purchasing power. A new job with the same salary can provide weaker insurance or retirement contributions. Conversely, a lower cash wage can accompany a preferred schedule or reduced commuting expense. Recording these components makes the economic interpretation more useful than assigning every pay reduction the same meaning.

Within the Post Labor reference, this indicator measures resilience of labor income after a job match breaks. It tests whether workers can restore access to earnings when an employer no longer needs their previous position. It does not directly measure national automation intensity or prove that displaced jobs vanished permanently.

Long lasting losses and the latest survey comparison

The August 2026 BLS release counts 3.3 million long tenured workers displaced during 2023 to 2025. In January 2026, 66.1 percent were reemployed, 18.3 percent unemployed and 15.7 percent outside the labor force; rounding prevents an exact total of one hundred. The unemployed percentage here is a share of the displaced cohort, rather than the conventional unemployment rate. Among the qualifying full time wage and salary reemployed group, 49 percent earned as much as or more than on the lost job. [1]

The preceding survey, published in August 2024, examined displacement during 2021 to 2023 and status in January 2024. Reemployment among long tenured displaced workers was 65.7 percent, while 62 percent of the qualifying full time group restored or exceeded previous earnings. The latest conditional restoration result is therefore weaker even though the reemployment fractions are close. Two cohorts are insufficient to identify a secular trend: their industries, displacement timing, inflation experience and stage of economic recovery differ. [1][2]

Industry detail can reverse the impression created by an older release. In January 2026, 76.8 percent of long tenured workers displaced from the information industry were reemployed, and BLS identifies that rate as an increase from January 2024. [1] Thus, the earlier low information-sector recovery should not be combined with the latest national displacement count as if both describe the same cohort outcome. The improvement is important counterevidence to a claim that recovery in that sector has continuously worsened. It does not establish that workers returned to the same industry, restored real earnings or avoided later losses. The overall conditional earnings comparison simultaneously worsened, illustrating that obtaining a job and recovering the prior economic position are distinct results. Outcomes are measured in January after job loss at any point during the preceding three calendar years, rather than a uniform one or two year follow-up. This timing variation can affect comparisons when displacement clusters late in one survey window. Retain cohort dates, industry classifications, reemployment and earnings restoration together.

Long administrative studies provide stronger evidence about persistence. Davis and von Wachter use Social Security earnings histories spanning 1974 to 2008 and study mass layoffs. For displaced men, their estimated present value earnings losses over twenty years equal roughly 1.4 years of predisplacement earnings when national unemployment is below 6 percent and 2.8 years when it exceeds 8 percent, using their 5 percent discount rate. These estimates demonstrate large sensitivity to macroeconomic conditions and prolonged costs. They do not represent today's average worker or a direct estimate of automation damage. [3]

Earlier research by Jacobson, LaLonde and Sullivan studies high seniority Pennsylvania workers using administrative earnings records. Its evidence of lasting losses helped establish that recovery needs a multiyear perspective. The administrative setting and historical period are specific, so the result should be carried forward as evidence that a durable employment relationship can contain valuable earning capacity, rather than as a current national forecast. [4]

The historical category captures that distinction. Several decades of research support persistent displacement costs. The research does not by itself show that those costs have risen monotonically during the whole period. The survey adds an updated snapshot, and its latest deterioration supplies a question for subsequent cohorts rather than a completed twenty year trend.

Sources [1] to [4]. Restoration percentages exclude workers outside the qualifying full time wage and salary comparison.

Displacement cohort or study	Outcome	Verified reading
2021 to 2023 BLS cohort	January 2024	65.7 percent reemployed; 62 percent conditional earnings restoration
2023 to 2025 BLS cohort	January 2026	66.1 percent reemployed; 49 percent conditional earnings restoration
Davis and von Wachter histories	1974 to 2008 records	Twenty year losses larger when displacement occurs in high unemployment
Jacobson LaLonde and Sullivan	Historical Pennsylvania administrative records	Losses can persist beyond the initial job search

Why a lost job match can destroy earning capacity

An employment relationship can contain several kinds of capital. A worker learns the firm's procedures, develops trusted relationships and accumulates knowledge specific to customers, equipment or coworkers. The firm learns what the worker can do and may assign responsibility accordingly. A separation can destroy some of this combined value even when the person's general skills remain intact. A new employer may require time to assess the worker or may have little use for the previous firm's specialized knowledge.

The prior job can also contain a wage premium supported by profitability, bargaining arrangements or internal pay rules. Losing that job may place a worker in a lower paying firm. This is relevant to Post Labor economics because changes in which employers distribute productive surplus can matter independently of how many positions remain. Yet it would be inaccurate to assume that every loss consists of foregone employer rents. Skills, occupation, location, hours and match quality also affect the observed change. The recovery record needs to distinguish these channels where possible.

Automation can make recovery harder if the eliminated tasks were central to an occupation and equivalent openings contract across employers. A worker can search widely and still encounter a smaller market for the previous skill package. If automation instead removes an unpleasant task while complementary demand expands, the worker may find a better match. The proposed mechanism must be tested using task change and vacancies, rather than assigning technological causation to the survey's broad category of abolished positions.

Longitudinal earnings also reveal compounding. Consider a clearly hypothetical worker who loses six months of work and accepts a job paying ten percent less. An eventual return to the previous nominal wage does not erase the unemployment period or the foregone wage growth. Lower retirement contributions during the transition can carry a cost beyond the measured recovery window. This is why the time path of earnings, rather than a single restored or not restored classification, is economically important.

The connection to transfer dependence is similarly specific. Unemployment insurance, household support, health coverage and disability programs can cushion a shock while labor earnings recover. Rising reliance on those sources after displacement indicates weaker self insurance through employment, but transfer receipt alone cannot identify its cause. The chapter's contribution is to show how the destruction of a job relationship may expose households to an income gap that job counts and one date reemployment measures cannot fully describe.

Selection inflation and alternative explanations

The most important measurement risk is selection into the reemployed sample. Suppose, in a hypothetical cohort, only the strongest earners regain full time work. Their pay restoration rate can improve while the cohort's total earnings fall. A broader comparison should include zero earnings spells and part time outcomes, reporting the full distribution. Survey users should also identify missing earnings reports and the treatment of self employment, where labor and business income can be hard to separate.

Nominal comparisons need an inflation adjustment. Workers displaced at different dates within a three year window face different cumulative price changes and different elapsed recovery time. Restoring nominal pay from an early loss can imply a larger real shortfall than restoring pay from a recent loss. Where exact dates are unavailable, present the limitation and show sensitivity to plausible timing rather than inventing a precise real loss. The BLS categorical comparison is a valuable official statistic, but it does not supply all the inputs for a definitive purchasing power calculation. [1]

Counterfactual earnings require a credible comparison group. Workers who keep their jobs may differ from displaced workers before the event. A decline already underway can exaggerate estimated displacement damage if treated as an effect of job loss. Administrative studies commonly use preevent earnings trajectories and define mass layoffs to reduce some selection problems. Their results still depend on sample restrictions, employer event definitions and the assumed counterfactual. A causal estimate from one historical setting should retain those boundaries.

Cohort composition can change substantially. Age, tenure, sector, local opportunities and the balance between plant closures and individual positions affect recovery. The latest BLS release uses updated 2022 Census industry classifications, adding another consideration for detailed industry comparisons across surveys. Small subgroup estimates can be unstable even when the national total is useful. A striking result from one professional occupation should not be generalized to all displaced workers without checking counts and uncertainty. [1]

Evidence of a structural deterioration would consist of weaker real recovery across comparable cohorts, after accounting for business conditions and observed characteristics, together with persistent contraction in demand for their prior skills. Evidence against that interpretation would include recovery when demand normalizes, successful movement into new tasks or improvements concentrated in younger and more recently displaced cohorts. Both outcomes help clarify the conditions under which labor remains a reliable route back to economic security.

Charting the recovery path rather than a single outcome

Create a first panel showing the displaced cohort's reemployed, unemployed and outside labor force shares. In a second panel, display conditional earnings restoration and label its restricted denominator prominently. Use the January observation date and three year displacement window in each point label. The 2024 and 2026 releases are different cohorts, rather than repeated measurements of the same people. Archive their tables before adding a later release. [1][2]

For administrative data, plot real annual earnings from several years before displacement through as many years afterward as the records support. Include a comparison path and uncertainty around the estimated gap. Show outcomes both including workers with zero earnings and conditional on employment. A

cumulative loss panel can then connect the path to household resources, using an explicit discount rate if presenting a present value.

Useful additional panels separate hourly pay, weeks worked, hours, benefits and occupation changes. Report time to a stable job and the share moving to lower paying employers. All estimates should preserve the displaced worker definition and specify whether the event is a mass layoff, closure or broader involuntary loss. Causal technology claims require an additional identification design.

Read this chapter with job tenure, good job coverage, earnings segregation, union coverage and transfer dependence. Those measures describe what may be lost and what cushions the transition. The main monitoring question is whether a worker whose previous job disappears can rebuild sustainable real earning capacity, and how long that rebuilding takes. A durable loss strengthens the labor security dimension of the framework even when the evidence does not establish a secular increase in the loss itself.

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RELATED CHAPTERS 008 · 014 · 024 · 033 · 048 · 087

CHAPTER 027

Concentration of job growth in health and care

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN January 1990 to September 2026 with a separate September 2025 to September 2026 growth comparison

Health care and social assistance have gained a substantial share of payroll employment over decades, while recent net growth concentration needs separate interpretation.

An industry share and a contribution to net growth

Two different measures describe concentration in health and care. The first is the share of payroll jobs in health care and social assistance: employment in that industry divided by total nonfarm employment. The second is the industry's contribution to net job growth over a specified interval: its change in employment divided by the total nonfarm change. The share describes the composition of the employment stock. The contribution describes where the net increase occurs and can fluctuate sharply when other industries contract.

This chapter uses the Bureau of Labor Statistics Current Employment Statistics series for health care and social assistance, NAICS sector 62, together with total nonfarm employment. The monthly series count payroll jobs, including full time and part time positions. A person with two payroll jobs can appear twice. Self employed caregivers and unpaid household care are outside these payroll counts. The health and care industry series is in the private service providing classification; government hospital and related government jobs require separate treatment when constructing a broader care economy total. [1][2][3]

Industry classification follows the establishment's activity, rather than each employee's occupation. A hospital accountant belongs to the health industry, while a nurse employed by a school or manufacturer can appear elsewhere. Social assistance also extends beyond clinical medicine. A broad claim about all caring occupations therefore needs occupational data and a reconciliation with industry records. Adding industry totals and occupational totals would double count many workers. The boundaries chosen here favor a reproducible long series rather than an expansive but inconsistent estimate.

The net contribution measure needs especially careful wording. If health and care adds 500 jobs while all other industries lose 100, national net growth is 400 and the contribution is 125 percent. This hypothetical arithmetic does not mean that every hire occurred in care or that care employed most workers. Gross hiring, replacement hiring and gross job creation can be large in industries whose net employment barely changes. A near zero national denominator can also make the contribution enormous or undefined.

For Post Labor economics, the long share asks whether employment increasingly concentrates in a set of activities with distinct demand, funding and productivity characteristics. It provides evidence about the changing location of labor demand. The growth contribution adds a current diagnostic of the breadth of expansion, with its cyclical nature displayed explicitly.

The verified long history and current concentration

The matched October 2026 vintage of the BLS series shows health care and social assistance payrolls of 9.116 million in January 1990, compared with 109.196 million total nonfarm jobs. By January 2000, the corresponding levels were 12.7495 million and 131.011 million. In September 2026 they were 23.9586 million and 159.044 million. Dividing the paired series yields shares of about 8.35 percent, 9.73 percent and 15.06 percent. These are calculations from the published seasonally adjusted levels, rather than independently published share estimates. [1][2]

The thirty six year comparison establishes a substantial rise in the industry's share. It does not describe a continuous increase in every month or identify a single cause. Population aging, changes in treatment, financing, household arrangements and economic growth can all affect the series. The increase nevertheless meets the twenty year criterion for a secular compositional shift. Its interpretation is more secure than a claim that a recent monthly employment surprise establishes a new economic regime.

Recent net growth is unusually concentrated in the same vintage. Between September 2025 and September 2026, health care and social assistance increased by 520,400 payroll jobs, while total nonfarm employment increased by 496,000. The industry's contribution was therefore about 104.9 percent of national net growth; the rest of nonfarm employment combined fell by about 24,400. These values are arithmetic differences of matched seasonally adjusted endpoints. September 2026 is preliminary and later revisions can change both the total and the ratio. [1][2][4]

The September 2026 Employment Situation release, issued on October 2, reports total monthly payroll growth of 29,000, with approximately 16,700 in health care and 6,300 in social assistance. That short interval illustrates the concentration but should remain separate from the multidecade share. A monthly net increase is sensitive to sampling error, seasonal adjustment and revisions. It adds timeliness rather than historical depth. [4]

BLS projections for 2025 to 2035 provide a forward looking demand context, including aging related needs. They are model based projections issued in 2026, rather than observations extending the historical line into the future. Plotting their projected values in a different style would preserve that distinction. The observed secular shift ends in September 2026 in this chapter. [5]

Date	Health and social assistance jobs millions	Total nonfarm jobs millions	Calculated share
January 1990	9.1160	109.196	8.35 percent
January 2000	12.7495	131.011	9.73 percent
September 2025	23.4382	158.548	14.78 percent
September 2026 preliminary	23.9586	159.044	15.06 percent

Sources [1] and [2], BLS series mirrored by Federal Reserve Bank of St Louis; seasonally adjusted matched vintage retrieved 4 October 2026. Shares calculated from levels.

What a care centered employment structure can mean

A rising care share can coexist with strong productivity growth elsewhere. If producing manufactured goods, moving information or handling routine transactions requires fewer hours per unit, expenditure and employment can shift toward other services. Care often involves interaction, physical assistance,

responsibility for another person's condition and coordination across uncertain needs. Those activities can support continuing demand for workers even as technologies automate some documentation, diagnosis or scheduling. The employment composition can therefore change without requiring that care itself becomes technologically static.

Baumol's framework gives this composition pattern a testable production interpretation. If real output in an industry is Y and labor productivity is A, required hours are H = Y/A. Faster productivity growth lowers hours for a given output, but output demand can expand enough to offset that saving. Industries with slower measured productivity can gain employment share when their demand remains strong despite rising relative costs. Thus rising care employment is compatible with technical progress elsewhere without proving that care absorbs displaced workers. The mechanism depends on demand, relative prices and financing, rather than following automatically from the industry's name.

Nordhaus's original U.S. industry study for 1948–2001 finds that slower-productivity activities generally have rising relative prices and that faster-productivity industries tend to have slower hours growth. Importantly, the hours relationship reverses within manufacturing, where more productive detailed industries tend to expand labor input. The study therefore supports a composition mechanism while showing that productivity need not reduce employment in every competitive market. It is historical industry evidence, not a study of current care workers' employment transitions. [6]

A separate measured comparison supports the secular composition claim: ADP Research's original analysis of BLS QCEW reports that private education and health services rose from 13% of private employment in January 2000 to nearly 20% in January 2025. That broader supersector and private-only denominator differ from the health-care-and-social-assistance share of all nonfarm jobs used here. The two series should remain separately labeled. ADP emphasizes aging as a demand explanation rather than attributing the change to automation. [7]

An absorption test should consequently add industry hours, real service output, relative prices and worker destinations to the employment-share chart. Decompose aggregate productivity into changes within activities and changes in employment composition; compare entrants and displaced workers with the skills and earnings of expanding roles. If care grows mainly because population needs rise, the evidence supports demographic demand. If labor released elsewhere repeatedly enters accessible care jobs, with sustained output and decent pay, the absorption interpretation strengthens. If the growing activities exclude displaced workers or provide poor earnings recovery, national employment growth can conceal continuing labor-market compression. A service's rising employment share establishes neither technological stagnation nor low economic value.

Demography provides another channel. An older population can demand more medical treatment and support, while the number of people available to provide unpaid family care changes with household size and employment arrangements. Public insurance and other financing institutions translate part of that need into paid demand. These mechanisms would operate even in an economy experiencing little automation. The care share is consequently compatible with the Post Labor framework, but its causal content is weaker than a direct measure of output per labor hour.

There is also a distributional connection. If market income becomes less broadly distributed through other industries, publicly financed health and care can remain an important source of both household services and

employment. That possibility links job composition with the fiscal system. It requires separate evidence on funding sources, compensation and household access; the payroll series alone cannot show that care jobs exist to absorb displaced workers or that welfare programs are their principal cause.

The quality of the new employment matters. Registered nurses, physicians, technicians, administrative staff and home care aides occupy different pay ranges, training pathways and working conditions. A growing industry may create valuable professional opportunities alongside jobs with unstable schedules and modest compensation. Counting all these positions as interchangeable would obscure the framework's concern about access to good work. Use occupation specific pay, hours and benefits to examine who benefits from the expansion.

Care activities also produce substantial human value. Employment growth in these sectors is not evidence that jobs lack economic utility. A society can rationally allocate more resources to longer life, recovery, independence and support. The empirical question is whether an increasingly narrow set of industries supplies employment growth, and whether those jobs sustain broadly accessible earnings. Answering that question keeps the compositional evidence useful without turning a positive social demand into an assumed symptom of economic failure.

Interpretations that the aggregate series cannot settle

An industry share can rise because its numerator grows, because other employment declines or because both processes occur. The verified long endpoints show strong growth in care payrolls as well as overall employment, so the historical share gain is not simply an arithmetic product of a shrinking national total. Yet particular recent intervals can be dominated by weakness elsewhere. Present levels and changes alongside the share to distinguish expansion in care from contraction in other industries.

Spending shares and employment shares also answer different questions. Higher health spending can reflect prices, treatment intensity, pharmaceutical costs or administrative complexity, rather than more workers. A higher employment share can reflect slower measured labor productivity, greater service volume or a shift from unpaid to paid provision. Quality adjustment is difficult in many health services: improved outcomes can be valuable even when the count of procedures does not increase. The payroll data therefore cannot establish whether the sector is inefficient or whether its productivity is unchanged.

Institutional classifications create further limits. Outsourcing hospital cleaning, billing or information services can move jobs to another industry without changing the underlying work. Conversely, insourcing can raise care industry payrolls even if service volume and total human input are unchanged. A broader sector analysis should identify contractors and purchased services where records permit. It should also distinguish nonprofit and for profit providers, because their financing and investment decisions can respond differently to policy and demand.

The Post Labor interpretation would strengthen if the long care share increase accompanies measured declines in human input per unit elsewhere, weak growth of other well paid occupations and rising fiscal financing of household needs. It would weaken if broad employment growth resumes outside care, real job quality improves widely or the share shift is predominantly explained by changing age composition and paid substitution for previously unpaid family work. These explanations can coexist, and estimating their relative importance is more informative than declaring one exclusive cause.

International comparison can help. Countries differ in age structure, public financing, migration, care provision and industrial composition. A similar shift across otherwise different systems would suggest a broad demand or productivity mechanism. A shift concentrated in a particular financing arrangement would point toward institutions. Comparable data must preserve the sector boundary and treatment of public employment. An international chart assembled from unmatched private and public categories would create an apparent difference partly from accounting choices.

Reproducing the share and preserving the growth denominator

Download CES6562000001 and PAYEMS in the same vintage, retaining their BLS producer attribution, seasonal adjustment and units of thousands. Align monthly dates before dividing care employment by total nonfarm employment. Multiply by one hundred for the share. Save the raw endpoints and the extraction date. For the historical panel, show the full monthly or annual average line rather than connecting only the selected checkpoints in the table as though intermediate observations were estimated. [1][2]

In a separate panel calculate twelve month net changes for both series. Display care, the rest of nonfarm employment and the total as job counts. Only then show the contribution ratio, with periods of a very small or negative national denominator clearly marked. A ratio above one hundred percent is arithmetically legitimate when other industries shrink. It should be described as a share of net growth rather than a share of gross hires.

Add an industry-diffusion companion to the net-growth contribution panel. BLS diffusion indexes count the share of industries increasing employment plus half the share unchanged; 50 marks balance between expansion and contraction. The 1-, 3- and 6-month versions use seasonally adjusted private-industry series, while the 12-month version is unadjusted. [3] A high care contribution can coexist with many other industries expanding modestly, or with widespread declines. Diffusion distinguishes those cases without letting a small national net-growth denominator dominate the story. It remains a measure of the breadth of net employment changes, not gross hires, vacancies or worker transitions. Compare the same horizon and seasonal convention over time and retain the underlying job counts so that a concentration measure can be interpreted alongside the magnitude of growth.

Add industry detail and job quality in supplementary panels: hospitals, ambulatory care, residential care and social assistance, plus relevant occupation wages and benefits. Keep nested subsectors from being summed twice. Broader care estimates need a separately documented treatment of government providers, contractors, unpaid care and self employment.

Read this metric with manufacturing and information output versus employment, sector productivity, good job coverage, demographic dependency and transfer dependence. The long share documents where employment is relocating. The recent net contribution shows how widely growth is distributed across industries. Together they supply a useful compositional dimension of Post Labor economics, while output, financing and job quality evidence determine how that shift affects prosperity and economic security.

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RELATED CHAPTERS 024 · 033 · 065 · 066 · 067 · 071 · 099

CHAPTER 028

Deaths of despair

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN Mortality components 1999 to 2024 with original midlife research 1999 to 2013

Several mortality components rose over a multidecade period, but recent declines and distinct causal channels prevent treating them as a direct automation index.

A family of mortality outcomes with explicit cause boundaries

Deaths of despair is an interpretive label for a collection of mortality outcomes, commonly including suicide, drug overdose and alcohol related disease. Death certificates record causes and circumstances; they do not diagnose an economic condition called despair. The label can organize an inquiry into deteriorating social and economic security, but the underlying indicators must retain their medical and statistical definitions. A person dying from an overdose may have experienced dependency, accidental exposure, severe pain or several interacting circumstances that cannot be inferred from the cause code alone.

The primary unit is deaths per one hundred thousand people in the relevant population and year. Counts show the absolute burden. Crude rates divide by the actual population and are affected by its age composition. Age adjusted rates apply age specific death rates to a fixed standard population, allowing more useful comparison across years. The NCHS overdose and suicide reports use the 2000 United States standard population. Age specific rates remain necessary when examining working age exposure or a particular cohort. [1][2][3][4]

A composite requires mutually exclusive causes. The CDC overdose definition includes intentional drug poisonings classified as suicides, alongside unintentional poisonings and other intents. Adding all overdose deaths to all suicide deaths would count those intentional poisonings twice. Either present separate panels or define a union of underlying cause codes so each death appears once. Likewise, a chronic liver disease and cirrhosis category is broader than alcohol induced liver disease. A mortality dashboard must explain which version it uses and avoid assuming that every liver death reflects harmful drinking. [2][4][7]

The population boundary matters as much as the cause boundary. Original deaths of despair research highlighted particular midlife, race and education groups. A national all age rate is a different estimand. Changes in the number of people without a degree can alter the composition of that group over time, and older ages within a broad band can have higher mortality. Narrow age bands, cohort tracking and fixed educational definitions improve interpretation.

This chapter treats mortality as a potential consequence and feedback measure in the Post Labor framework. It asks whether the erosion of income security, valued roles and opportunity can accompany poorer health outcomes. A mortality increase can support concern about the social consequences of economic change, while requiring independent evidence before attributing that increase to automation or shrinking labor demand.

The long rise and important recent reversals

The age adjusted drug overdose death rate was 6.1 per one hundred thousand in 1999. Final NCHS data show 32.6 in 2022, 31.3 in 2023 and 23.1 in 2024. The last decline was 26.2 percent, and the final 2024 count was 79,384. The 1999 to 2024 endpoint remains substantially higher, satisfying a twenty five year comparison, but a description of uninterrupted acceleration would be incorrect. Earlier provisional counts differ from these final figures and should not be mixed into the same series without labeling their status. [1][2]

Suicide has a different trajectory. Its age adjusted rate rose from 10.5 in 1999 to 14.0 in 2017. The latest NCHS brief, published in September 2026 with final 2024 observations, reports 13.7 in 2024 compared with 14.1 in 2023. It finds no significant overall trend from 2017 to 2024, following the earlier increase. Several sex and age groups experienced declines in the latest year. A multidecade elevation is therefore compatible with a recent plateau and reduction. [3][4]

Chronic liver disease and cirrhosis accounted for 52,274 deaths in 2024 according to CDC FastStats. Its displayed rate of 15.4 is deaths per one hundred thousand population and should not be inserted beside age adjusted component rates as if the measures were identical. The broader category also requires a further alcohol specific breakdown before being used in a tightly defined despair composite. This chapter retains the verified current burden without asserting an unverified alcohol specific historical endpoint. [7]

Case and Deaton's 2015 original study documents rising midlife mortality and morbidity among white non Hispanic Americans during 1999 to 2013, with substantial educational differences and contributions from suicide, poisonings and liver disease. That fourteen year study window is historically important but does not alone meet this reference's twenty year rule. The longer component series supplies the additional history. The paper's population and period should remain attached to its findings rather than being generalized to everyone. [5]

A separate provisional layer extends the monitoring window. In its 13 May 2026 release, NCHS estimated 69,973 overdose deaths during 2025, almost 14 percent below its predicted 2024 comparator of 81,313. These observations were incomplete and subject to revision. [10] They should not be spliced into the final annual series or used to calculate a percentage change from the final 2024 count of 79,384. [2] The two 2024 numbers have different vintages and estimation status. The provisional release supports continued recent improvement while leaving the final component chart at its verified endpoint. Report the release date, whether the count is reported or predicted, and the twelve month window. A decline can coexist with substantial remaining preventable mortality and enduring economic vulnerability. It nonetheless constrains a simple claim that national social damage has been increasing continuously. Explaining the improvement requires evidence about supply, treatment and other conditions; a national count alone cannot assign the contribution of each intervention or establish a change in labor market compression.

These observations justify a mixed evidence classification. They establish serious long run public health deterioration in particular outcomes and populations, followed by meaningful improvements in some recent data. They leave open how much of the burden arises from labor market change, drug supply, health care institutions, household conditions or other causes. The reversal is part of the evidence and belongs in the central account.

Sources [1] to [4] and [7]. Rates per 100,000 standard population for overdose and suicide. Liver count is intentionally not presented as a comparable age adjusted rate.

Component	Historical age adjusted rate	Latest age adjusted rate or burden
Drug overdose	6.1 in 1999	23.1 in 2024; 79,384 deaths
Suicide	10.5 in 1999	13.7 in 2024
Chronic liver disease and cirrhosis	No historical rate asserted here	52,274 deaths in 2024; broader than alcohol specific deaths

Economic insecurity as one possible health pathway

Employment can influence health through income, insurance, daily structure, social interaction and exposure to work hazards. Losing a job or receiving unstable earnings can disrupt treatment, increase household stress or constrain access to safer housing and nutrition. The effect can extend beyond the person directly displaced if family members supply care or financial support. These pathways give a reason to examine health alongside earnings and job quality in a comprehensive account of economic security.

Original research by Sullivan and von Wachter links administrative employment and earnings records with death records to study mass layoffs. It finds elevated mortality following displacement over a long period and uses controls to address sorting and selection. This provides a more direct empirical connection between an employment shock and health than a correlation between national job trends and national deaths. The historical design still concerns specified displaced workers, rather than estimating what fraction of the contemporary overdose epidemic was caused by automation. [6]

A persistent loss of occupation or local economic role may also affect social organization. If a region loses a source of stable employment, household formation, community participation and expectations about the future can change. Mortality could be one downstream outcome. Testing that sequence requires timing: the opportunity shock should precede the health deterioration, and comparable places without the shock should provide a useful counterfactual. A high death rate in a poor area alone cannot establish the proposed chain.

Health can also move in the opposite direction. Dependency, serious illness or mental distress can reduce attendance, impair work capacity and weaken employment prospects. The resulting income loss can then worsen health, producing a reinforcing process. A cross sectional association between labor withdrawal and mortality risk mixes these directions. Longitudinal records of health before job loss and changes in treatment access can help distinguish them.

For Post Labor economics, the strongest use is as a measure of human consequences in places and groups where labor income and opportunities have demonstrably weakened. The health record can show that economic adjustment has costs extending beyond a wage chart. It contributes less to identifying the production mechanism that caused the adjustment. Capital deepening, declining labor intensity and displaced earnings require their own evidence; mortality can then test whether the transition is accompanied by reduced wellbeing or whether social institutions successfully cushion it.

Why mortality cannot identify a single macroeconomic cause

Drug potency, availability and treatment are central competing explanations for overdose mortality. Ruhm examines county drug deaths from 1999 to 2015. In his preferred estimates, measured economic conditions

explain less than one tenth of the rise in drug and opioid mortality; allowing modest remaining confounding can eliminate the relationship. The study instead emphasizes changes in the drug environment. [8] This limits a national economic-decline explanation without establishing that employment shocks never matter. Pierce and Schott find relative fatal-overdose increases, specifically among whites, in counties more exposed to a plausibly exogenous trade-policy change. Their results survive checks for earlier mortality trends and controls for state opioid and health policies, and coincide with worsening labor conditions and increased disability receipt. [9] These findings can coexist: an identified local labor shock may cause harm while explaining only a limited portion of the national epidemic. Neither study identifies a national mortality share caused by automation. The final 2024 decline also requires an independent health explanation rather than a presumption that deaths must rise as labor dependence weakens. [2] Pair cause-specific outcomes with identified shocks, and retain drug supply and treatment as competing channels. Mortality establishes severe harm; it does not by itself establish why human labor has become less necessary to production.

Suicide also depends on multiple factors, including mental health, social connection, access to lethal means and treatment. Alcohol related disease often reflects exposures accumulated over many years. These components need not respond to the same short run conditions or to the same intervention. Combining them can improve a summary of preventable mortality, but it can also hide a decline in one cause and an increase in another. A composite should always accompany its component charts.

Educational and racial comparisons require careful population construction. As degree attainment expands, people remaining without a degree can become more selected on family resources, health and earlier disadvantages. Their mortality trend can partly reflect that changing composition. Race and ethnicity classification on death certificates may differ from survey or population records, and some groups are especially vulnerable to misclassification. Use official comparability guidance and avoid reading small subgroup changes as precise measures of economic exclusion.

Age adjustment solves one problem rather than every problem. An all age standardized rate can still conceal a changing pattern among young adults, midlife adults and older people. A broad age band also changes internally as cohorts pass through it. Report narrower age specific results when relating outcomes to career conditions. For local analysis, small counts and suppressed cells can create volatility; pooling years may improve reliability but makes the timing of economic shocks harder to identify.

The labor based interpretation would strengthen with identified employment shocks, measured persistent earnings loss and subsequent cause specific mortality changes that survive controls for drug supply and health institutions. It would weaken if mortality responds mainly to supply or treatment changes while labor conditions remain similar. A disciplined reference can retain deaths of despair as a major social outcome without requiring that every movement confirm a predetermined economic thesis.

A component dashboard with honest causal labels

Use three component panels before constructing any aggregate: overdose, suicide and a clearly defined alcohol related mortality category. Show age adjusted annual rates and separate age specific working age panels. Keep final and provisional observations visually distinct and record the date of each release. The final series presented here ends in 2024, despite publication and retrieval during 2026. A more current provisional series is a separate monitoring layer. [2][4]

For a composite, publish the underlying cause code list and a rule that prevents overlapping deaths. Retain counts and denominators along with rates, the standard population for adjustment and any changes in racial classification. Link the chart to the official downloadable tables so that another analyst can reproduce the result without relying on a narrative estimate.

Add local labor and household panels only after specifying the hypothesis. Compare displacement, real earnings, transfers and health outcomes with appropriate lags. Label raw correlations as associations. For causal work, document the employment or supply shock, preperiod trends and comparison population. A national line chart cannot substitute for that design.

Read this entry with earnings recovery, chronic pain, opioid exposure, disability and county transfer dependence. Together they describe interacting vulnerabilities, with substantial overlap in the affected populations. They should not be counted as five independent confirmations of the same cause. The distinctive contribution of mortality is the severity of the outcome and its long history; the recent improvements show that health conditions can change even when deeper questions about the distribution of prosperity remain unresolved.

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RELATED CHAPTERS 026 · 029 · 030 · 031 · 034

CHAPTER 029

Chronic pain and labor force withdrawal

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN Selected NHIS observations 2016 2019 2023 and 2025 with a 2019 survey break

Pain is a substantial functional constraint associated with labor withdrawal, while a short and nonmonotonic comparable history limits secular claims.

Pain prevalence functional limitation and work status

Chronic pain prevalence measures the share of people reporting pain frequently over a specified reference period. High impact chronic pain adds frequent limitation of life or work activities. These are related but different outcomes. A person can experience recurring pain while maintaining substantial employment, and a limitation of life activities does not necessarily imply complete inability to work. The functional impact measure is often more relevant to labor attachment than pain occurrence alone.

The 2023 National Health Interview Survey defines chronic pain from reports of pain on most days or every day during the past three months. High impact chronic pain requires that pain also limit life or work activities on most days or every day during that period. Its denominator is adults aged 18 and older in the civilian noninstitutionalized population. The measure excludes people in institutions and does not directly identify a physician's diagnosis or an employer's assessment of work capacity. It is a household survey of lived symptoms and limitations. [1]

The 2016 survey used a six month reference period. The NHIS was redesigned in 2019, with changes in questionnaire structure and weighting. The earlier and later estimates therefore need a visible comparability warning. A line that connects the 2016 and 2019 values without a break would suggest a consistent instrument that did not exist. Even identical headline prevalence values would not establish that the underlying burden was unchanged. [2][3][4]

For labor analysis, define the relevant conditional measures. Pain prevalence among people outside the labor force is different from the share of people with pain who are outside the labor force. Both can be informative, but reversing the denominator changes the question. Separately measure employment, participation, desired work, hours and reasons for inactivity. An all adult pain rate includes many retired people and should not be used as a direct estimate of prime age labor withdrawal.

Pain contributes to the Post Labor framework through work capacity and the quality of available matches. If physically demanding jobs disappear or become harder to sustain, people with limitations may face fewer suitable alternatives. If technology makes tasks more accessible, their opportunities can improve. The metric therefore examines an interaction between health and labor institutions rather than automatically assigning every pain report to declining demand for human work.

The observed burden and the limits of its history

CDC's analysis of 2016 NHIS data estimated chronic pain among 20.4 percent of adults and high impact chronic pain among 8.0 percent. The report found higher prevalence in several groups, including older adults, people living in poverty and people previously but not currently employed. These are cross sectional differences, so they do not establish that leaving work caused pain or that pain was the sole reason for leaving work. The six month question window remains important when comparing with later surveys. [2]

For 2019, NCHS reported chronic pain among 20.4 percent of adults and high impact chronic pain among 7.4 percent, using the redesigned survey and three month reference period. For 2023 the corresponding estimates were 24.3 percent and 8.5 percent. The dedicated 2023 report was published in November 2024; those values are historical observations rather than 2026 estimates. [1][3]

NCHS released final 2025 public use files before this reference cutoff. Our calculation from those records, using the final annual weight and the same symptom definitions, gives approximately 20.7 percent chronic pain and 7.1 percent high impact chronic pain. These are author calculated point estimates from final microdata, rather than a separately published NCHS headline, and no survey confidence interval is asserted here. Unknown frequency responses are excluded; for high impact, known nonchronic cases are retained while unknown impact among chronic cases is excluded. The lower 2025 values show that the recent history is nonmonotonic. They do not alone identify the cause or statistical significance of the decline. [6][7]

The 2023 report also shows a pronounced age gradient: chronic pain affected 12.3 percent of adults aged 18 to 29 and 36.0 percent of those aged 65 and older. High impact pain similarly varies with age. This makes age standardization necessary when relating national prevalence to changes in participation. A population that grows older can produce a higher all adult prevalence without the same increase within every working age group. [1]

Alan Krueger's 2017 original labor force study examines pain and pain medication among prime age men outside the labor force and explores local prescribing patterns. It provides evidence that health limitations are central to understanding a group often discussed only through employment statistics. Its survey and county associations do not assign a causal share of contemporary withdrawal to automation. The pain findings should also remain distinct from the paper's opioid calculations, which received a separate erratum. [5]

The record supports a substantial health burden and a meaningful relationship with labor attachment. The postredesign comparison now spans six years, from 2019 to 2025; the selected 2016 to 2025 observations span nine and include a measurement change. The rise to 2023 and lower 2025 point estimates do not establish a steady secular increase. This entry belongs in supporting evidence rather than as an independently established two decade national pain trend.

Observation year	Chronic pain	High impact chronic pain	Instrument boundary
2016	20.4 percent	8.0 percent	Six month reference period
2019	20.4 percent	7.4 percent	Redesigned survey; three month period

Observation year	Chronic pain	High impact chronic pain	Instrument boundary
2023	24.3 percent	8.5 percent	Three month period; dedicated report published 2024
2025 final microdata	20.7 percent author calculation	7.1 percent author calculation	Three month period; final annual weights

Sources [1] to [4] and [6]. Percent of civilian noninstitutionalized adults aged 18 and older. The 2019 redesign prevents an unqualified splice; 2025 is an author weighted calculation with no confidence interval asserted.

How health and job opportunities can reinforce each other

Pain can reduce the set of tasks a person can perform comfortably and reliably. Standing, lifting, repetitive movements, driving or prolonged sitting may become difficult. Employers differ in whether they can redesign tasks, offer flexible hours or accommodate periods of reduced capacity. A health limitation therefore interacts with job design: the same person may be unable to sustain one position and able to perform another effectively. Measuring pain without available work conditions misses that interaction.

Loss of work can also change pain management. Income and insurance affect treatment access, while a job's schedule can determine whether someone can attend appointments or rehabilitation. A stressful transition may affect sleep and coping. Those mechanisms can produce a cycle in which poor health weakens attachment and weaker attachment makes recovery harder. They are plausible pathways requiring longitudinal evidence, rather than conclusions available from one survey's association between pain and employment status.

Physical wear accumulated over a career is a different pathway. A worker can develop limitations after years in demanding employment even if aggregate labor demand remains strong. If the economy then offers mainly jobs requiring different credentials or a geographic move, the person may struggle to find a suitable match. This can resemble labor market compression from the household's perspective while arising from occupational mismatch and health constraints. Record work histories and required capabilities to distinguish it from a general shortage of jobs.

Automation can operate in both directions. Mechanized lifting, improved equipment or remote collaboration can reduce physical demands and open work to people with limitations. Conversely, eliminating a familiar occupation can remove a match that the worker had learned to perform despite pain. Faster output targets or intensified remaining tasks may create different burdens. These are specific propositions about task design that need observation; the national pain prevalence series cannot establish which process dominates.

The Post Labor connection is thus about the reliability of labor as an income mechanism for people with imperfect health. A system that requires sustained employment to secure housing and treatment can expose them to substantial risk when suitable work is scarce. Transfers and accessible services may cushion that risk. A reduction in pain related exclusion would be evidence that institutions and technology are preserving opportunity, while persistent exclusion alongside shrinking suitable jobs would strengthen the framework's worker security concern.

Causal direction measurement and competing explanations

Self reported pain is economically relevant because people experience and respond to it, yet reporting can vary with expectations, diagnosis and survey context. A rising prevalence could reflect greater recognition as well as worsening symptoms. The high impact measure helps by identifying functional consequences, but its life or work wording still covers a broad range of activities. Ideally, combine symptom frequency with clinically informed functioning measures, work requirements and treatment records rather than treating any one measure as complete.

The NHIS redesign is a concrete statistical limitation. NCHS's official evaluation explains how questionnaire and weighting changes can affect comparisons. Its analysis includes chronic pain among the evaluated measures. Researchers should review the bridge results and exact question wording before extending an older series. Adjusting the graph with an assumed correction factor would be inappropriate without a defensible design. A documented break is more honest than a visually smooth but uncertain history. [4]

Nonresponse and sample coverage require attention. People with severe symptoms may be less able or willing to participate, and household samples omit institutionalized populations. Changes in interview conditions can alter who responds. The survey's published weights address known dimensions of representation, but they do not guarantee that every health related participation difference has vanished. Confidence intervals describe sampling uncertainty and should not be mistaken for a complete account of these possible biases.

Reverse causality is especially important in labor comparisons. Pain may precede withdrawal, appear after an injury on the job, worsen after a separation or simply coexist with another condition that affects both outcomes. Baseline health and a dated work history can distinguish some of these cases. Comparisons of employed and inactive people at one date cannot do so. A study of a treatment or accommodation change may offer a clearer test of whether improving function strengthens attachment.

A structural labor interpretation would strengthen if working age pain or functional limitation rises within comparable groups, suitable job access falls and the interaction predicts persistent withdrawal. It would weaken if age composition explains the aggregate trend, better treatment improves attachment, or accommodations broaden employment despite stable pain prevalence. The framework should also track workers who remain employed under high strain. Withdrawal alone can miss deterioration in the conditions of those who continue to work.

Monitoring symptoms alongside capacity and suitable work

Chart chronic pain and high impact pain separately, with an explicit break before the redesigned NHIS series. Show official confidence intervals where published and label the 2025 values as author calculated final microdata point estimates. The selected endpoints are 2016, 2019, 2023 and 2025; do not interpolate missing years. Preserve the symptom window, questionnaire and weights for each year. The final 2025 calculation uses PAIFRQ3M_A, PAIWKLM3M_A and WTFA_A, with codes 3 and 4 denoting most days and every day. Document exclusions and structural skips, and use the survey design variables when adding confidence intervals. [1][2][3][4][6]

Add working age panels and finer age groups rather than relying on the all adult total. Then examine pain by employment status and employment status by pain, labeling their different denominators. For longitudinal analysis, show transitions into and out of work with symptoms measured before the transition. The relevant outcome includes stable hours and real earnings as well as participation.

A third layer should record suitable job requirements, accommodations, treatment access and financial support. These proposed complements would help distinguish health constrained supply from limited access to manageable work. They can also identify improvements when technology reduces physical demands. Do not classify every person with pain as unable to work or every inactive person as involuntarily excluded.

Read the chapter with prime age participation, opioid exposure, disability, employer insurance and earnings recovery after displacement. Their overlap requires care: pain, medication use and disability receipt can describe the same person through different records. The distinctive contribution here is the functional burden that affects matching and sustained work. Its short comparable history gives useful supporting evidence while leaving the secular national trend as an open research question.

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RELATED CHAPTERS 001 · 023 · 026 · 030 · 031 · 113

CHAPTER 030

Opioid exposure and labor market outcomes

EVIDENCE STATUS **Mixed evidence** · OBSERVATION SPAN Overdose history 1999 to 2024 and retail dispensing 2019 to 2024 with original labor outcome studies

Opioid exposure can impair employment and increase disability reliance, while supply institutions and divergent prescribing trends challenge a simple labor distress explanation.

Exposure treatment misuse and mortality are different measures

Opioid exposure can mean receiving a prescribed analgesic, using a medication outside its intended purpose, living in an area with high dispensing, receiving treatment for opioid use disorder or encountering illicit drugs. These are different populations and different economic situations. A single opioid exposure rate needs an explicit definition before it can enter a macroeconomic argument. Legitimate treatment can improve function, while harmful use can impair it. Medication used to treat dependency should not be counted as though it were equivalent to the exposure that produced the disorder.

CDC's retail dispensing series measures projected prescriptions per one hundred resident persons per year. A prescription is a new or refilled dispensing event, so one person can contribute several events. The series is not the percentage of people taking opioids. Its IQVIA based coverage excludes mail order prescriptions and methadone dispensed through treatment programs. County location follows the prescriber, which can differ from the patient's residence. These boundaries matter when comparing local dispensing with local employment. [1]

Opioid involved overdose mortality is another measure. It counts deaths with overdose as the underlying cause and opioid codes among the substances involved. Multiple substances can be recorded in one death. The total for synthetic opioids, heroin and other opioid categories cannot be added as if the categories were mutually exclusive. A mortality rate captures the joint effect of exposure, potency, combinations of drugs, treatment and emergency response, rather than measuring drug consumption directly. [2]

Labor outcomes should be specified equally carefully. Employment, participation, hours, earnings and disability applications can respond differently. A person might remain attached to work while reducing hours, or leave employment before applying for benefits. Disability receipt depends on eligibility and adjudication as well as health. A complete analysis therefore tracks several outcomes with timing and appropriate denominators, rather than reading any one movement as the whole labor supply effect.

In the Post Labor framework, the metric belongs among health consequences and feedback processes. It may help explain why some workers struggle to sustain employment after economic or health shocks. It also provides a test of competing explanations for withdrawal. The history of the opioid epidemic should not be treated as a direct measure of how much production has become automated.

A changing epidemic and a declining prescribing series

The long overdose history shows a major increase in mortality since 1999, followed by a substantial recent decline. The detailed final NCHS data for opioid involved deaths report an age adjusted rate of 24.0 per one hundred thousand in 2023 and 16.0 in 2024, with 79,358 and 54,045 deaths respectively. Synthetic opioids other than methadone accounted for rates of 22.2 and 14.3 in those years. These overlapping categories describe involvement in deaths rather than exclusive causes. [2]

The current CDC retail dispensing series moves in a different direction: the national rate declined from 46.8 prescriptions per one hundred persons in 2019 to 35.4 in 2024. The page was updated in August 2026, but its observations still end in 2024. This short series does not establish a twenty year prescribing trend. It does show why a contemporary description of steadily rising prescription dependence would be misleading, even while overdose mortality remains far above earlier historical levels. [1]

Krueger's 2017 original study relates local opioid prescribing patterns to labor participation. Its later erratum corrects a postestimation logarithm calculation in an illustrative attribution exercise. The corrected exercise suggests a larger possible contribution than the earlier published calculation, but it remains model dependent and does not identify a contemporary causal fraction. The present reference does not repeat the headline attribution percentage as a settled fact. The correction illustrates why source versions and identification need checking. [3][4]

Other original research offers distinct causal accounts. Currie and Schwandt emphasize prescription marketing, provider behavior and health care institutions, finding weak contemporaneous relationships with measured labor opportunity and more limited lagged economic effects. Park and Powell exploit geographic exposure to OxyContin reformulation to study substitution toward illicit drugs; their analysis finds reductions in several labor outcomes and increases in disability claiming. These studies examine different directions of causation and should be read together rather than collapsed into one estimate. [5][6]

The evidence is therefore mixed in the framework's terms. There is a long health crisis and evidence that drug supply shocks can affect employment. The recent mortality reduction and declining retail dispensing complicate any monotonic exposure claim. Research also challenges the assertion that economic distress was the main driver of the epidemic. Those findings help determine which part of a labor decline account is supported and which needs another explanation.

Measure	Earlier verified endpoint	Later verified endpoint
Retail opioid prescriptions per 100 persons	46.8 in 2019	35.4 in 2024
Age adjusted opioid involved overdose rate per 100,000	24.0 in 2023	16.0 in 2024
Opioid involved overdose deaths	79,358 in 2023	54,045 in 2024

Sources [1] and [2]. Dispensing events, mortality rates and death counts have different denominators and cannot be combined.

Two directions of causation and the possibility of feedback

One proposed pathway begins with economic insecurity. A worker loses earnings, experiences an injury or faces deteriorating prospects, and turns to medication or harmful substance use. Another begins with drug supply and prescribing. Greater exposure creates dependency or other impairment, which then reduces sustained employment. The two pathways can reinforce each other, but a county with high opioid mortality and weak employment does not reveal which came first or how much each contributed.

Treatment and work interact through practical constraints. Symptoms, withdrawal, appointments and recovery can affect attendance and scheduling. Employer flexibility, access to health coverage and transportation can determine whether treatment is compatible with a job. A well designed treatment pathway can improve the ability to work, making increased treatment medication dispensing a potentially favorable signal. Interpreting every opioid related prescription as deterioration would erase that distinction and could reverse the meaning of an improving response.

The transition between prescription and illicit markets further separates exposure from recorded dispensing. Reducing availability of an abusable product can have different effects depending on whether people receive effective treatment, switch substances or stop use. Park and Powell's reformulation design provides evidence relevant to that transition. Its results should retain the particular supply shock and comparison structure; they do not imply that every prescription restriction has the same employment effect in every setting. [6]

For Post Labor economics, harmful exposure may increase dependence on income support when labor income becomes harder to sustain. It can also reduce the effective supply of workers in a region where employers report hiring difficulties. That latter possibility is a competing explanation for weak attachment rather than evidence of too little demand for labor. Disentangling supply impairment from demand compression is essential if the framework is to explain observed outcomes rather than merely associate several unfavorable trends.

Economic change can still be relevant even when the epidemic's principal origin lies in drug supply. Income security, workplace injury, insurance and social connection can influence vulnerability and recovery. A careful account can examine those interactions without claiming that automation created the epidemic. The distinctive empirical contribution is to connect a health exposure mechanism to hours, earnings and benefit reliance, while preserving independent evidence about how the exposure itself arose.

What would establish a labor related mechanism

A useful test begins with a dated change that plausibly affects either economic opportunity or opioid access. For a labor demand shock, compare affected and appropriate unaffected groups before and after the event, record prior health and examine whether harmful use follows the employment loss. For a supply shock, examine whether exposure changes first and employment outcomes follow. Each design needs a reason the comparison group's trajectory provides a credible counterfactual and a check for other simultaneous changes.

The reformulation research is one example of a supply oriented design; it uses variation in prior exposure rather than simply comparing high and low mortality counties. The economic distress critique asks whether timing and measured opportunity account for the scale of the epidemic. These approaches illustrate why

causal direction is a research question. Neither a national participation line nor a map of prescriptions can independently resolve it. [5][6]

Local data pose additional challenges. Prescriber location can differ from patient location, commuting links local employment markets and people can move in response to health or work conditions. A county rate can also reflect a small population and a limited number of providers. Use patient residence where available, broader labor market areas where appropriate and sensitivity analyses for geographic boundaries. Geographic association should remain labeled as association when those problems cannot be resolved.

Composition matters within labor outcomes. A fall in average earnings could reflect people working fewer weeks, lower hourly pay or different people remaining employed. Disability applications can rise without an equal rise in awards, and awards can depend on processing capacity and rules. Show the sequence of applications, determinations and current beneficiaries, along with employment and hours. A change in the transfer system should not be assumed to measure the health exposure directly.

The Post Labor interpretation would strengthen if independently identified labor demand compression increases harmful use or makes recovery harder, after accounting for supply and treatment. It would weaken if exposure changes largely follow prescribing institutions and illicit supply while employment opportunities remain similar. Evidence that treating dependency improves attachment would identify a remediable health constraint. These distinctions make the indicator useful for diagnosis and policy rather than a general purpose confirmation of economic decline.

A dashboard that keeps prescribing and harm separate

Create separate panels for retail opioid analgesic dispensing, treatment medication access, overdose mortality and labor outcomes. Label prescriptions per one hundred persons distinctly from deaths per one hundred thousand. Keep drug categories separate unless the dataset provides a deduplicated total. The current dispensing endpoint is 2024 and the final mortality endpoint is 2024; release dates in 2026 do not extend the observations. [1][2]

For the long mortality panel, retrieve a consistent official historical series and preserve cause codes, standard population and final data status. For prescribing, check coverage changes before attaching older series to the current 2019 to 2024 records. Save source versions, including the Krueger erratum, when reproducing published exercises. Do not translate a model based possible contribution into a known number of people who left work. [3][4]

Labor panels should display participation, employment, real earnings, hours and disability applications, with the same geographic and age boundaries. Add treatment availability and prior health where records permit. For causal comparisons, publish the event, exposure definition, preperiod fit and alternative explanations; aggregate charts should remain descriptive.

Read this chapter with chronic pain, deaths of despair, disability, employer insurance and transfer dependence. These indicators overlap and can show a feedback loop rather than independent corroboration. Opioid exposure contributes a specific health and supply mechanism that can weaken labor income. It also supplies counterevidence to overly broad economic explanations, helping distinguish problems of work demand from problems that impair the ability to participate in available work.

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RELATED CHAPTERS 001 · 023 · 028 · 029 · 031 · 033

CHAPTER 031

Disability and labor force attachment

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN Social Security disabled worker records 1960 to 2024 and CPS disability employment 2009 to 2025

Disability is closely related to labor attachment, but declining beneficiary stocks and improved working age employment complicate a general claim of rising exclusion.

Three disability concepts and their denominators

Disability can describe a reported functional limitation, a medical condition or eligibility for a public benefit. These concepts overlap but have different boundaries. The Current Population Survey identifies disability through questions about difficulties with specified functions and activities. Social Security Disability Insurance uses a legal definition linked to the inability to perform substantial gainful work, along with work history requirements. Someone can meet the survey definition while working and never applying for benefits; another person's benefit eligibility depends on more than the existence of a diagnosis. [1][3]

For labor attachment, the main survey indicators are the employment to population ratio and labor force participation rate among people with a reported disability. The former divides employed people by the relevant disabled population. The latter includes both employed people and unemployed jobseekers in the numerator. Age boundaries matter: an all age group beginning at 16 includes many retired people, while a working age group such as 16 to 64 excludes most of them. These denominators should never be silently exchanged. [1]

For the insurance program, distinguish current disabled worker beneficiaries from all beneficiaries linked to disability. Administrative tables can include disabled widow beneficiaries, disabled adult children and nondisabled dependents. A chart of disabled workers should use that specific column. Current beneficiary stocks also differ from applications, awards and terminations during the year. The stock reflects previous inflows and continuing duration, so a change cannot automatically be interpreted as the same year's newly lost work capacity. [2]

A preferred prevalence rate divides disabled worker beneficiaries by the disability insured population rather than the whole population. Age and sex standardization can further improve historical comparison. Insured status depends on covered work, making the denominator itself related to labor history. When only the beneficiary count is presented, its interpretation should remain a count and avoid a claim about the probability that an otherwise comparable worker becomes disabled.

The Post Labor question concerns the relationship between functional capacity, suitable work and income security. A person with a limitation may work effectively when tasks and schedules fit, yet struggle when available jobs demand incompatible capabilities. Disability indicators can describe the resulting attachment and support needs. They do not directly reveal how many jobs technology eliminated, and benefit receipt should not be treated as proof that a person is voluntarily refusing suitable work.

Long administrative growth followed by a substantial decline

The Social Security administrative record provides a long history with clear changes in direction. Disabled worker beneficiaries numbered 5,035,840 in December 2000, rose to 8,954,518 in December 2014 and fell to 7,231,147 in December 2024. The 2024 count remains above the 2000 level but substantially below the peak. A chart beginning in 2000 and showing only its final endpoint would conceal a decade of decline. The report's broader total includes other beneficiaries and dependents and should not replace this worker series. [2]

The CPS functional disability employment record has a shorter history. Questions were introduced in June 2008, making 2009 the first full calendar year for annual averages. By the October 2026 cutoff, this definition has not produced twenty full years of observations. It therefore cannot independently satisfy the secular criterion, even though other disability and program records extend much further back. Retaining the shorter series is useful if its duration is stated accurately. [1]

In 2019, BLS reported a working age disabled employment to population ratio of 30.9 percent. In 2025 it was 38.1 percent, while the comparable nondisabled ratio was 74.8 percent. The latest disabled participation rate for ages 16 to 64 was 41.8 percent. The employment difference remains large, but the working age disabled employment ratio is higher than its prepandemic benchmark. This is substantive counterevidence to a claim of uniform recent deterioration in attachment. [1][4]

For all people aged 16 and older with a disability, the 2025 employment ratio was 22.8 percent. Its much lower value partly reflects the group's older age profile. Mixing that figure with the working age 38.1 percent would create an artificial change. The 2025 annual estimates also average eleven months, excluding October because data were not collected during the federal government shutdown. BLS states that these estimates are not strictly comparable with ordinary annual averages. [1]

These records support a mixed classification. Disability continues to mark substantial differences in access to employment, while the program stock and recent working age employment move against a simple rising dependence narrative. The multidecade administrative history requires institutional and demographic interpretation, and the functional survey history is shorter than the reference's twenty year benchmark.

Sources [1], [2] and [4]. Administrative beneficiary counts and survey employment percentages are separate indicators with separate populations.

Measure	Date	Verified value
Disabled worker beneficiaries	December 2000	5,035,840
Disabled worker beneficiaries	December 2014	8,954,518
Disabled worker beneficiaries	December 2024	7,231,147
Disabled employment ratio ages 16 to 64	2019 annual average	30.9 percent
Disabled employment ratio ages 16 to 64	2025 eleven month average	38.1 percent
Disabled employment ratio ages 16 and older	2025 eleven month average	22.8 percent

Suitable work and the income support connection

Work capacity depends partly on the environment. A limitation in mobility, hearing, concentration or self care can interact with task requirements, transport and scheduling. A workplace that adjusts equipment or communication can allow productive employment that a rigid arrangement would prevent. The economic question is therefore whether the set of available and accessible jobs supports a sustainable match, rather than whether a disability label implies zero productive capacity.

Technology can improve accessibility by reducing physical exertion, allowing remote participation or supporting communication. It can also remove roles that accommodated a worker's established skills and limitations, or impose new performance demands on remaining jobs. Which effect dominates is an empirical question requiring task and accommodation records. A national beneficiary count cannot reveal the direction of that technological effect because it combines health, program rules and past work histories.

Disability insurance supplies income when a qualifying medical condition prevents substantial work. The program's work credits connect support to prior covered employment, and benefits convert to retirement benefits at full retirement age. SSA also provides work incentive rules intended to support transitions back to employment. Those provisions mean that beneficiary status has a specific institutional life cycle. A fall in the disability stock can occur when beneficiaries reach retirement age without any restoration of health or employment. [3]

Households can experience an economic gap before adjudication or outside eligibility. Someone with limitations may have too little qualifying work history, experience a temporary condition or remain capable of some work below what would meet household expenses. These cases show why survey disability, benefit receipt and earnings need to be read together. A low beneficiary count can reflect limited eligibility, while a high survey disability employment ratio can still conceal low earnings or unstable hours.

For Post Labor economics, disability contributes to the assessment of how broadly labor distributes resources when people have differing capabilities. If appropriate work is scarce, income support and accessible services become more important. If accommodations and new tasks improve attachment, labor can remain a viable route to prosperity for more people. The metric therefore tests the inclusiveness and reliability of employment rather than serving as a one direction proxy for the advance of automation.

Demography eligibility and selection in the observed trend

Population aging can raise disability prevalence and change beneficiary stocks. Growth in covered work among groups previously less likely to be insured can also increase eligibility without a corresponding deterioration in health. Rules, adjudication, mortality and retirement conversion influence the administrative series. Researchers should examine age specific incidence and termination flows before attributing a larger stock to economic withdrawal. A stock increase can result from longer duration even when new awards do not rise proportionately.

The later decline in disabled worker beneficiaries admits several explanations that need investigation. It could reflect fewer new qualifying cases, changes in eligibility or processing, cohort movement into retirement, improved work opportunities or other developments. The count alone cannot distinguish them. Similarly, recent gains in survey employment among disabled people do not identify remote work or any other single

cause without an appropriate design. Keeping causal claims modest permits these favorable movements to be included honestly.

Survey composition can change as different people report limitations. A higher employment ratio may reflect improved opportunities, a change in the severity mix or shifts in who remains in the survey disability group. A person whose health improves may leave that denominator even if employment also rises. Follow individuals where records permit and separate functional domains and severity, while respecting sample limitations. The observed group is not necessarily a fixed cohort over time.

The large disabled versus nondisabled employment gap is also influenced by age, education, health severity and other characteristics. Age restrictions improve comparison but do not remove every difference. Adjusted analyses can clarify particular mechanisms, yet an adjusted gap should not be presented as the exact number of people prevented from working by discrimination or insufficient demand. The unadjusted rate remains a meaningful description of lived attachment, with a different interpretation from a causal estimate.

A structural exclusion interpretation would strengthen if comparable working age groups face fewer suitable opportunities, weaker real earnings and increased involuntary withdrawal after identified demand shocks. It would weaken if stable or improving work quality accompanies rising attachment and program reliance falls for reasons consistent with recovery. The current evidence contains elements in both directions. The framework should preserve the distinction between health constrained supply, institutional access and changes in employer demand.

A paired survey and administrative dashboard

Use one panel for CPS employment and participation by disability status and age, and a separate panel for Social Security disabled worker beneficiaries. Label 2025 CPS values as eleven month averages. Avoid combining monthly September 2026 observations with annual points as though their seasonal treatment and precision were identical. Preserve the June 2008 start of the survey definition and the first full annual year of 2009. [1]

For the administrative panel, show the entire available history, including the 2014 peak and subsequent decline. Retrieve the disabled worker column from the official table and retain the December reference date. Add insured population rates, age and sex standardized measures, applications, awards and terminations where compatible records exist. These additional measures are necessary to diagnose the stock's movement rather than merely redescribe it. [2]

A third layer should report earnings, hours, job stability, accommodations and desired work among people with limitations. Compare survey disability with benefit participation only after explaining their different criteria. The SSA National Beneficiary Survey provides a separate perspective on program participants and their work experiences; its selected population cannot stand in for all people reporting a disability. [5]

Read the metric with chronic pain, opioids, transfer dependence, job quality and demographic dependency. Their interaction can reveal how health and institutions mediate access to labor income. The recent improvement in working age disabled employment and decline in the beneficiary stock are essential parts of that record. They keep the chapter useful as a diagnostic of inclusion rather than a predetermined claim that every disability indicator must worsen.

SOURCES AND REPRODUCTION NOTES

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[2] Social Security Administration (2025). Annual Statistical Report on the Social Security Disability Insurance Program, 2024 — Disabled Beneficiaries and Nondisabled Dependents. Table 1 disabled worker column December 1960 to 2024; 2000 2014 and 2024 checkpoints Verified retrieval 4 October 2026.

[3] Social Security Administration (2026). Disability Benefits | How Does Someone Become Eligible?. Current legal eligibility work credits work incentives and automatic retirement conversion; no projected beneficiary count used Verified retrieval 4 October 2026.

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[5] Social Security Administration (2021). DI & SSI Program Participants: Characteristics & Employment, 2021. National Beneficiary Survey perspective; selected program population and employment definitions Verified retrieval 4 October 2026.

RELATED CHAPTERS 001 · 028 · 029 · 030 · 033 · 099

CHAPTER 032

Employee engagement and meaningful work

EVIDENCE STATUS **Counterevidence** · OBSERVATION SPAN United States engagement 2000 to first half 2026 and global engagement 2009 to 2025

Engagement is low and below its recent peak, but the long United States endpoint is higher than in 2000 and does not establish secular growth in meaningless work.

Engagement purpose and economic usefulness

Employee engagement describes a person's relationship with work and the workplace. It is distinct from job satisfaction, perceived social usefulness, objective economic value and actual productive output. Someone can find a useful job frustrating because of poor management, and someone can be highly involved in work whose social value is contested. A reference on Post Labor economics needs these distinctions before using workplace attitudes as evidence about the economy's demand for labor.

Gallup measures engagement through its Q12 instrument, a set of items about workplace experiences and needs, and groups respondents into engaged, not engaged and actively disengaged categories. The provider describes engagement in terms of involvement and enthusiasm. The classification is a composite, so the headline percentage does not equal the percentage answering a direct question about whether their job benefits society. Nor is the complement of engaged a count of people whose work produces nothing. [1][2][4]

Meaningful work can be measured more directly through questions about purpose, contribution, autonomy or the importance of the activity to the worker. Each question has its own response scale and denominator. Strong agreement with a purpose item is a high threshold; everyone below it may include people who moderately agree, are uncertain or disagree. Treating all of them as believing their work is meaningless would change the definition. Publish the full response distribution where possible rather than replacing a nuanced scale with a dramatic binary.

Objective usefulness is harder to measure and requires a different design. An activity can have value through risk reduction, coordination, reliability or future options that an individual employee does not directly observe. It can also impose costs that privately profitable organizations fail to internalize. A worker's belief is evidence about experience and perceived purpose, while an assessment of economic value needs output, costs and a relevant counterfactual. Neither measure can automatically validate the other.

The Post Labor connection is potentially about the declining ability of employment to provide purpose, agency and social participation alongside income. That is a meaningful dimension of work quality. The hypothesis becomes empirically useful when a consistent attitude measure deteriorates over a long period and connects to changes in tasks and institutions. Low engagement at one date establishes a problem in workplace experience, with a separate question about whether the problem is worsening secularly.

The long endpoint and the recent decline tell different stories

Gallup's United States engagement record begins in 2000 with 26 percent classified as engaged. The series reached 36 percent in 2020 and was 31 percent in 2025. Its July 2026 update reports 31 percent during the first half of 2026, unchanged from 2025. These checkpoints show a decline from the recent peak but a level above the start of the twenty six year record. They do not support a simple claim that engagement has steadily deteriorated throughout that span. [1][2]

The global record has a different observation window. Gallup reports 12 percent engaged in 2009, a peak of 23 percent in 2022 and 2023, and 20 percent in 2025. The 2026 report contains data collected during 2025. This sixteen year endpoint comparison falls short of the reference's twenty year secular rule. It nevertheless again shows improvement from the starting point alongside a recent setback. Missing survey years should be retained as missing rather than filled with invented observations. [3]

The present level can still indicate a substantial workplace problem. A minority classified as engaged suggests that many employees do not experience the full combination captured by the instrument. That has a different meaning from a demonstrated increase in pointless jobs. The distinction matters because the user specifically questioned whether a growing economy would create more employment with no economic utility. Engagement data can describe detachment without establishing that claim.

Recent subgroup changes may be more informative than the national average for particular hypotheses. Younger workers, managers or workers in changing arrangements can have a different trajectory from the aggregate. Any subgroup analysis should preserve the same survey definitions and compare like periods. A short decline among one group can be important for career development or management, while remaining too recent to serve as independent two decade evidence.

This entry is therefore counterevidence to the broad proposition that workplace attitudes already demonstrate a secular rise in meaninglessness. It is not counterevidence to every Post Labor dimension. Labor income share, job quality, work intensity and access to opportunity can change while engagement improves or fluctuates. The contribution of this series is to constrain an overly expansive narrative and identify a separate, measurable concern about employees' experiences.

Population	Observation	Engaged share
United States	2000	26 percent
United States	2020	36 percent
United States	2025	31 percent
United States	First half 2026	31 percent
Global	2009	12 percent
Global	2022 and 2023	23 percent
Global	2025	20 percent

Sources [1] to [3]. United States and global series have different windows; the first half 2026 value is a partial year observation.

How work organization can affect meaning and attachment

Employment supplies more than pay. It can provide competence, routine, relationships and recognition. A work arrangement that removes autonomy, obscures contribution or weakens opportunities to learn can reduce those benefits even if the employee remains productive. Engagement and purpose measures can identify that experience. They add information about the quality of work that a wage or headcount series cannot supply, while requiring their own interpretation.

Automation can reshape this experience in several directions. Removing tedious preparation may give a worker more time for decisions and human interaction. A redesigned process may instead leave only repetitive monitoring, difficult exceptions or little authority over outcomes. The same reduction in human time per unit could therefore accompany improved or worsened perceived meaning. Task records and worker responses should be linked at the level where work actually changes, rather than assuming the direction from technology adoption alone.

Organizational management offers another mechanism. Clear expectations, recognition, support and developmental opportunities can influence whether workers understand their contribution. Poorly coordinated work can feel purposeless even when the intended output is valuable. Improvements in management may raise engagement without changing national labor intensity or capital ownership. These factors are reasons to measure the workplace directly and to avoid treating an attitude composite as a pure measure of macroeconomic restructuring.

Engagement can also diverge from bargaining power. A worker may value colleagues and tasks while accepting weak pay or unpredictable hours. Another may secure high compensation but feel detached from the activity. A hypothetical improvement in recognition combined with a decline in retirement benefits could raise one aspect of workplace experience while reducing economic security. An aggregate framework should preserve those dimensions rather than expecting a single sentiment measure to track them all.

For Post Labor economics, a sustained loss of meaningful participation would be a consequential social outcome even if production remained efficient. But the evidence must establish that sustained loss. The current long United States record shows a higher engaged share than at its beginning, so it does not supply that confirmation. It remains valuable for examining how changing work arrangements affect human experience and whether organizations can preserve agency and purpose as tasks become less labor intensive.

Why low engagement is insufficient evidence of useless employment

Survey categories depend on thresholds and combinations of answers. A change in one item can move respondents across a composite boundary without producing the same change in every aspect of work. Analysts should examine item level distributions and the consistency of scoring over time. Public headline data may not expose all the information needed to independently reconstruct a proprietary classification. That limitation should be stated without replacing the reported measure with an assumed alternative.

Employee surveys also condition on having employment. People who left unsatisfying jobs or could not secure work may be absent from the denominator. If that selection changes, average engagement among remaining employees can improve while access to work deteriorates. Conversely, hiring many new employees into challenging transitions can temporarily reduce average engagement. These are possible

selection effects to examine, not explanations that can be imposed whenever the aggregate moves against a preferred thesis.

Cross country comparisons can reflect work cultures, response styles, translation, industry mix and institutional differences. A lower reported engaged share in one region is not automatically a lower fraction of economically useful work. Compare the same question and period, review sampling and weighting and examine within country changes alongside levels. A global average can also move with country weights, so aggregate composition deserves attention when interpreting its history.

Perceived uselessness is a separate metric in this reference. It asks more directly whether workers believe their activity contributes to society, and its evidence must retain the wording and response categories of each survey. Even that measure cannot establish the economy's objective amount of wasted labor without additional assessment. Engagement should not be used to fill missing historical observations for usefulness, because the constructs differ. The absence of a suitable long series is a research gap rather than evidence that the underlying trend must exist.

The structural meaninglessness interpretation would strengthen with a stable twenty year purpose or usefulness measure that declines within comparable groups, alongside documented task fragmentation and diminished agency. It would weaken with improvements in those direct measures or successful redesign that increases autonomy and perceived contribution. The present engagement history supplies the latter kind of restraint at the broad endpoint level, while recent declines indicate areas that warrant attention and further monitoring.

An attitude dashboard that can preserve counterevidence

Plot the complete United States engagement series from 2000, marking 2020, 2025 and the partial first half of 2026. Display the global series separately from 2009 to 2025 and preserve its missing years. Label publication dates separately from the years of data collection. Keep the provider's definitions and source versions attached to the series, so later updates do not silently change the observed history. [1][2][3]

Add item level panels for purpose, role clarity, development, recognition and autonomy where data are available. Retain the original response scale and show more than the strongest agreement category. A new direct meaningful work series should start with its own baseline and definition. It should never be extended backward using engagement as a substitute.

Connect the attitude record to real pay, schedules, benefits and task change in a separate analytical layer. Individual or establishment panels can test whether changes in work organization precede changes in experience, with attention to turnover and selection. Claims about productivity costs require a distinct model and should be labeled estimates rather than observed losses implied directly by an engagement percentage.

Read this entry with perceived socially useless jobs, good job coverage, early career opportunities and workforce health. It contributes a measure of work experience and a clear guardrail: a low current engaged share and a decline from a recent peak do not establish secular growth in economically pointless employment. Preserving that counterevidence strengthens the reference's ability to distinguish specific structural changes from a generalized account in which every dimension is assumed to worsen.

SOURCES AND REPRODUCTION NOTES

[1] Gallup (2026). Global Indicator: Employee Engagement. Original survey provider; United States annual history from 2000 and distinction between engagement and item level responses Verified retrieval 4 October 2026.

[2] Jim Harter Gallup (2026). Employee Engagement Remains Flat as AI Adoption Accelerates. Published 21 July 2026; first half 2026 United States engagement 31 percent; 2020 peak and 2025 comparison Verified retrieval 4 October 2026.

[3] Gallup (2026). State of the Global Workplace | 2026 Global Data Summary. Report published April 2026 with 2025 collection; global engagement history 2009 to 2025 and missing years Verified retrieval 4 October 2026.

[4] Gallup (2026). Gallup's Q12 Employee Engagement Survey. Original instrument provider; Q12 composite workplace experience measurement rather than an objective usefulness test Verified retrieval 4 October 2026.

RELATED CHAPTERS 024 · 025 · 096 · 113

CHAPTER 033

National transfer dependence

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN United States annual government transfer share 1970 to 2022 with separately defined August 2026 context

Government transfers became a much larger source of personal income over five decades, demonstrating a structural expansion of public support while aging and medical costs limit its use as evidence of weakening working age earnings.

The public share of personal income

National transfer dependence measures the share of personal income received through government benefits rather than current compensation or asset income. A broad version divides government social benefits by total personal income. The numerator includes retirement, medical, unemployment and other benefits. The denominator combines income from labor, business ownership, property and transfers, with national accounting adjustments. The resulting percentage describes the government's role in supporting household resources at the national level. It does not directly measure how many people could survive without a job or the median household's reliance on public payments. [1][2]

The word dependence is a descriptive label here. A higher share can represent more effective insurance, population aging, expanded eligibility, rising health costs, reduced earnings or several mechanisms together. The statistic does not assign a moral meaning to receiving benefits. Social insurance can reflect rights earned through earlier employment and contributions, while other benefits support children, people with disabilities or households with low incomes. These institutional purposes matter when connecting a transfer share to an argument about the present distributional capacity of work. [2]

Cash and medical benefits must be distinguished. Social Security or unemployment compensation can support general spending directly. Medicare and Medicaid primarily finance health services, so their recorded value cannot be treated as unrestricted cash available for rent or groceries. BEA's government social benefits include medical benefits within the income accounting boundary. A rise in their cost can raise measured transfer income without giving recipients an equivalent increase in discretionary purchasing power. A cash only companion and a service inclusive measure answer different questions. [2]

The broader BEA category personal current transfer receipts includes payments from both government and business for which no current service is performed. That category differs from government transfers alone. Published personal income also contains accrued and imputed items and subtracts contributions for government social insurance. Accordingly, neither a three category chart nor a cash household ledger should silently substitute a broader transfer numerator or treat all accounting income as spendable receipts. The desired concept determines which official lines belong in the ratio. [2][3][4]

Five decades of expansion and a current comparison

The Economic Innovation Group's original analysis of BEA data finds government transfers increasing from 8.2 percent of U.S. personal income in 1970 to 17.6 percent in 2022. The study was published in September

2024, and 2022 remains its observation endpoint. It identifies aging and medical costs as major contributors, with weak local earnings also relevant. The finding establishes a long expansion of public support; it does not isolate automation as the cause. [1]

For current context, BEA's August 2026 personal current transfer receipts were 5,198.2 billion dollars at a seasonally adjusted annual rate, and personal income was 27,626.9 billion on the same basis. Dividing the two gives approximately 18.82 percent. Both observations were updated on 30 September 2026. This calculation uses all personal current transfer receipts, including the business component, rather than the government only numerator in the historical study. It should appear as a separately defined current observation, not an appended point on an allegedly identical 1970 to 2026 line. [3][4]

The monthly annual rate convention does not mean that this amount was paid during August alone. It expresses the month's flow at an annualized pace after seasonal adjustment. Using numerator and denominator from the same month and treatment allows a valid ratio, but a comparison with annual averages still needs care. A long annual government transfer chart should be reconstructed with one consistent definition and data vintage before claiming an updated secular endpoint. BEA's September release also incorporated an annual update revising estimates from January 2021 onward. [5]

A two decade criterion is comfortably satisfied by the verified historical comparison, although that does not imply every year increased. Transfers respond to recessions and extraordinary policy interventions as well as slower structural forces. The relevant secular claim is a substantially larger role over a prolonged span, supported by the full history, rather than monotonic movement without interruption. For monitoring, show ordinary expansion years alongside recession periods and exceptional pandemic support; temporary spikes should not become the only basis for interpreting the long run. [1][5]

Observation	Share	Numerator boundary
1970 annual	8.2 percent	Government transfers
2022 annual	17.6 percent	Government transfers
August 2026 monthly rate	18.82 percent calculated	All personal current transfer receipts

Historical government only shares from EIG analysis of BEA; current broader ratio calculated as 5,198.2 divided by 27,626.9. The last row is definitionally distinct. [1][3][4]

Why public support belongs in post labor economics

The indicator addresses an important distributional question: through which institutions do households obtain access to economic output? Employment is one channel, ownership another and public support a third. If household living standards increasingly rely on benefits, the welfare state carries more of the task of maintaining access. That is relevant to post labor economics even where the production of goods and services continues to require substantial work. The indicator focuses on distribution rather than trying to infer technology adoption from benefit expenditure.

The strongest post labor interpretation concerns households of working age whose earnings alone become less sufficient. Transfers may supplement low pay, replace income after displacement or insure unstable hours. A sustained rise in such support after accounting for population composition would strengthen the argument that jobs distribute security less effectively. National totals include many retirees and medical

payments, so the broad ratio is a starting point. Working age poverty before and after taxes and transfers supplies a closer test of whether public intervention increasingly bridges an earnings related resource gap.

There is a second mechanism even when recipients' individual earnings do not deteriorate. A larger elderly population receives income outside current employment, and the economy becomes more dependent on institutions that distribute output across the life cycle. This is a secular shift in the architecture of household support. It belongs in the post labor reference as evidence of the growing importance of distribution beyond a current paycheck, while its cause should be described as demographic when the evidence supports that account. Demographic support cannot automatically be converted into evidence of technological displacement.

The share also helps frame fiscal resilience. A society relying more heavily on benefits needs durable financing and reliable eligibility rules. The relevant analytical questions include whether benefit income follows essential costs, whether households can anticipate payments, and whether financing remains viable as the sources of taxable income change. The transfer ratio itself does not answer those fiscal questions, but identifies the scale of the institution whose resilience matters. It connects household resource composition with tax base composition and the distribution of gains from productivity.

Transfers can increase security rather than merely reveal insecurity. If public insurance prevents a temporary earnings shock from becoming material deprivation, a higher transfer share can represent successful adaptation. Conversely, a falling share caused by benefit cuts can coincide with worsening household outcomes. The framework should therefore pair source dependence with adequacy: disposable resources relative to needs, poverty reduction and continuity of support. Dependence measures where resources originate; adequacy measures what those resources enable people to obtain.

Separating aging prices and labor market pressure

An age decomposition is the first safeguard. Report support received by working age households and retirees separately where possible, then examine whether within group transfer reliance changes. An age standardized estimate holds demographic weights fixed, preventing the growing number of older recipients from carrying the entire interpretation. The method requires actual age specific data; subtracting all retirement benefits from a national total is an imperfect proxy because household members differ in age and some programs support survivors or disabled working age recipients. [2]

A practical extension reports two companion shares: transfers received by a consistently defined working age household group divided by that group's matched resource total, and the same share among households with employed members. State whether employment means any paid work during the income year, full-year work, or status at the survey date; these selections describe different kinds of support. Publish cash support separately from medical services and keep age-specific recipient shares distinct from program labels. Children, disabled adults and older adults can share a household, so assigning whole programs to one age category cannot reproduce the same household statistic. Medicaid enrollment proportions should not be substituted for expenditure proportions; MACPAC supplies separate exhibits and a technical guide. [6] CPS ASEC offers household income and annual poverty-resource information, whereas the Federal Reserve DFA distributes wealth, assets and liabilities and cannot alone provide the required annual income denominator. [7][8] These are proposed companion constructions until a reconciled historical series is actually produced.

Medical program values require a second decomposition into recipient coverage, quantities of care and prices or cost per recipient. A rise driven by healthcare expenditure can indicate a larger public role in financing care without suggesting that earnings replacement has risen equally. Government cost is also not necessarily identical to the benefit's household income equivalent. This distinction is especially relevant when comparing a broad personal income share with the cash Capital Allocation Ratio or a poverty measure that treats medical costs differently. Each should retain its own valuation rule. [2]

Program design creates a third channel. Eligibility, benefit generosity, refundable credits and take up can change independently of technology. A more inclusive safety net may raise transfers even where the labor market becomes stronger. Conversely, tighter eligibility may suppress observed payments despite greater need. To interpret the ratio, compare policy changes and beneficiary composition with earnings distributions, rather than assume the numerator passively records an underlying automation process. Causal attribution requires a credible design linking technological exposure to household earnings and subsequent support.

The denominator deserves equal attention. Capital income growth can lower the transfer share even when transfer amounts rise, while weak earnings can raise it without a new benefit policy. Report real per person transfer levels and nontransfer income alongside the share. A ratio alone can conceal very different paths of total income. Hypothetically, 20 units of transfers in income of 100 gives a 20 percent share; the same 20 in income of 80 gives 25 percent with no additional public payment. This arithmetic explains why the ratio must be read with levels.

Evidence would strengthen the labor compression interpretation if working age reliance rose across comparable groups, market earnings became less adequate relative to needs and public support increasingly prevented poverty. It would weaken if the national increase were explained largely by aging and medical valuation while working age earnings and security improved. Both outcomes can coexist across populations. The chapter's secular status describes the verified growth of government support, while the more specific claim about automation remains a hypothesis to test.

Reproducing a consistent national chart

Build the principal chart from BEA government social benefits divided by personal income using the same annual frequency, accounting boundary and vintage. Label the percentage axis and annotate major exceptional periods. Preserve the 1970 to 2022 EIG result as a verified historical comparison until a consistent updated government only series is reconstructed. Present the August 2026 broader transfer ratio in a separate note or panel, with its numerator explicitly named. [1][2][3][4]

Download levels as well as ratios. Store table and series identifiers, units, release date and extraction date. Monthly seasonally adjusted annual rates should not be combined with an unannualized denominator. Keep the 30 September 2026 annual revision notice in the record so changes in earlier data can be distinguished from new observations. [3][4][5]

The companion chart should distinguish cash benefits, medical benefits, working age recipients and older recipients as far as available data permit. A further panel can show real nontransfer income per person. These comparisons help identify whether a larger share reflects more coverage, higher costs or weaker earnings, rather than forcing all three into a single interpretation.

Read this metric beside county transfer dependence, working age poverty, refundable credit supplementation and household income composition. The broad share establishes that public distribution

has become structurally more important. The companion indicators determine whether that shift supports the narrower post labor claim that good employment has become a less sufficient route to security for working age households.

SOURCES AND REPRODUCTION NOTES

[1] Kenan Fikri Sarah Eckhardt and Benjamin Glasner Economic Innovation Group (2024). The Great “Transfer”-mation: How American communities became reliant on income from government. Original BEA analysis September 2024; annual government only share 1970 through 2022, pages 3 to 6 and Appendix I; verified retrieval 4 October 2026

[2] U S Bureau of Economic Analysis (2019). Appendix: Summary National Income and Product Accounts. NIPA Handbook appendix updated May 2019; Account 3 transfer receipts government social benefits and personal income definitions; verified retrieval 4 October 2026

[3] U S Bureau of Economic Analysis via Federal Reserve Bank of St Louis (2026). Personal Current Transfer Receipts (PCTR). BEA code A577RC; August 2026 5,198.2 billion dollars seasonally adjusted annual rate, updated 30 September 2026; verified retrieval 4 October 2026

[4] U S Bureau of Economic Analysis via Federal Reserve Bank of St Louis (2026). Personal Income (PI). BEA code A065RC; August 2026 27,626.9 billion dollars seasonally adjusted annual rate, updated 30 September 2026; verified retrieval 4 October 2026

[5] U S Bureau of Economic Analysis (2026). Personal Income and Outlays, August 2026. Released 30 September 2026; annual update revisions begin January 2021; verified retrieval 4 October 2026

[6] Medicaid and CHIP Payment and Access Commission (2026). MACStats: Medicaid and CHIP Data Book and current exhibits. MACPAC provides separate Medicaid enrollment and spending exhibits; an age group’s recipient share cannot substitute for its expenditure share. Verified for version two 4 October 2026.

[7] Board of Governors of the Federal Reserve System (2026). Distributional Financial Accounts Overview. Official wealth distribution starts in 1989 Q3, with survey interpolation and forecasting; wealth holdings do not supply household income-flow shares. Verified for version two 4 October 2026.

[8] U.S. Census Bureau (2026). Poverty in the United States: 2025. Census 2026 report measures 2025 poverty with official and Supplemental Poverty Measure definitions; these use different resources and expense boundaries. Verified for version two 4 October 2026.

RELATED CHAPTERS 034 · 035 · 036 · 037 · 038 · 039

CHAPTER 034

County transfer dependence

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN United States counties annual observations 1970 to 2022 with county data availability through 2024 noted

A majority of counties crossed a high transfer income threshold by 2022, revealing geographically widespread reliance on public support while county counts, aging and migration complicate its interpretation.

Measuring the local transfer share

County transfer dependence divides government transfer income received by county residents by their total personal income. It measures the composition of income attached to a place of residence. BEA counts a person's income in the county where that person lives even when the job is elsewhere. The indicator therefore differs from local production, payroll at establishments in the county or the fiscal budget of the county government. Federal benefits received by residents can dominate the numerator without passing through a county budget. [1][2]

The Economic Innovation Group's historical implementation uses BEA government transfer components and total personal income. This government only concept differs from broader personal current transfer receipts that also include business and nonprofit related payments. A current recreation should retain the original numerator or show a labelled methods change. It should also distinguish medical benefits from cash income because a service payment's recorded value does not provide the recipient with an equivalent unrestricted spending balance. Official personal income accounting supplies a broader resource concept than a cash household ledger. [1][3]

Two geographical summaries are useful and should remain separate. The share of counties above a threshold treats each county equally, while the share of residents living in such counties weights places by population. A small rural county and a large metropolitan county each count as one in the first measure. Thus a statement that most counties are highly transfer reliant cannot be translated into a statement that most Americans have the same reliance. Nor does a county average establish the experience of every household living there.

The high dependence threshold used in the historical study is government transfers of at least 25 percent of personal income. Medium dependence spans 15 percent to below 25 percent and low dependence falls below 15 percent. These categories provide a consistent descriptive map, although a county moving from 24.9 to 25.1 percent has little substantive discontinuity. The continuous share and income levels should accompany the classifications. A threshold is useful for showing the diffusion of a pattern, while the underlying values show its degree. [1]

A threshold crossed across the national map

The original EIG analysis reports that fewer than 1 percent of counties received at least one quarter of personal income from government transfers in 1970. The proportion was 5 percent in 1990, 10.4 percent in 2000 and 53 percent in 2022. The report was published in September 2024. These county count statistics establish a striking five decade expansion in the geographical reach of public support, while their observation endpoint remains 2022. [1]

Current BEA county personal income information is available through 2024, with the latest release dated 5 February 2026. That newer general data endpoint does not by itself verify an updated count using the EIG government only threshold. Reproducing the count requires the corresponding components, geographical treatment and consistent numerator. This chapter consequently keeps the historically verified 2022 classification result and records newer source availability separately. It does not claim that 53 percent is the latest measured value in 2026. [2]

There is an important data continuity problem. BEA lists CAINC35, the detailed county personal current transfer receipts table used by the original study, as discontinued on 1 November 2024. The discontinuation affects how an analyst can update detailed government benefit components. Historical archives remain part of the source trail, but the existence of newer total personal income data does not guarantee identical detailed inputs for extending the analysis. An update should document which retained tables or administrative data replace the discontinued detail. [4]

The secular signal concerns the broad movement across comparable classifications over decades, rather than the exact crossing date for every county. Differences in economic size, population composition and income sources can make the same transfer share arise in quite different places. A retirement destination can have a high share because residents choose to move there after working elsewhere. A place losing young workers can have a high share because the remaining population ages and current earnings become relatively weak. Separate these paths before interpreting a map as evidence of local job destruction.

Observation year	Counties with government transfers at least 25 percent of personal income
1970	Less than 1 percent
1990	5 percent
2000	10.4 percent
2022	53 percent

EIG original analysis of BEA county income components; each county receives equal weight in this threshold statistic. Published September 2024. [1]

The geography of employment based distribution

The post labor relevance is that national growth can coexist with a changing local income foundation. Productive gains, professional employment and asset income may concentrate in particular places, while public benefits sustain residents elsewhere. A county transfer share identifies where household resources rely heavily on a national distribution mechanism rather than income associated with current employment or

local ownership. It offers a geographical view of economic inclusion that a single national labor share cannot provide.

A place can become more transfer reliant without a collapse in its nominal benefit receipts or a disappearance of all employment. If wages and business income grow slowly while public payments keep pace with eligibility and medical costs, the share rises gradually. A second route is outmigration: working age residents depart, reducing earnings and increasing the relative weight of benefits among those who remain. The change can then reflect both labor opportunities and population sorting. The ratio provides the outcome, while population and age data identify the path.

Consider two hypothetical counties, each receiving 20 units of transfers. One has 80 units of other personal income, so transfers provide 20 percent of its total. The other has only 40 units of other income, giving a 33.3 percent share. The second county crosses the high dependence threshold despite identical public receipts. The comparison illustrates why weaker nontransfer income can matter as much as larger benefits. It also explains why comparisons should report levels per person rather than describe every high share as exceptional public generosity.

The local perspective is especially useful for testing labor market compression because it can link persistent income changes to industrial exposure, commuting access and migration. A credible study could compare places with differing exposure to production automation while accounting for earlier trends, age structure and other shocks. The descriptive transfer map alone does not accomplish that identification. Trade, resource cycles, industrial relocation, education and housing constraints can influence local earnings independently of automation.

Public income can stabilize communities. Benefits support consumption when local earnings weaken and can prevent demographic or industrial change from becoming deeper deprivation. That protective role is itself part of the post labor distribution question. The desirable outcome is adequate, reliable resources, rather than a low transfer share at any cost. A declining ratio caused by benefit reductions with no improvement in earned income would not indicate renewed prosperity. The metric should track the institution supporting a place, alongside the living standards it enables.

Age migration and geographical accounting

Age standardization is crucial before treating county transfer dependence as a working age labor indicator. The retirement and medical programs included in official benefit accounting connect directly to age and eligibility. Compare counties with similar age profiles or estimate the share expected from their composition, then examine departures from that expectation. A statistical residual remains a descriptive adjustment and does not by itself identify an automation effect. Unobserved health, family composition and program rules can still explain differences. [3]

Migration requires separate treatment because counties are open populations. Rising transfer dependence may partly reflect high earners leaving or retirees entering. A map of current residents cannot determine how the same households' incomes evolved. Use population change, age specific migration where available and employment trends to distinguish changes among stayers from sorting across places. Residence based income is appropriate for local household support, while establishment employment and production provide complementary information about the area's earning capacity. [2]

Geographical comparability also matters over decades. County boundaries, independent cities and statistical equivalents can change; survey and administrative allocations may use different conventions. Reproduction should preserve the study's geography crosswalk or construct a documented consistent set. Without that work, a change in a count can arise partly from changing geographical units. Threshold statistics are particularly sensitive when a newly defined unit has a different population or income mix from the predecessor area.

Medical spending values create another layer of comparison. Differences in healthcare cost, program participation and state eligibility can change measured transfers without proportionate cash support. Separating retirement cash, unemployment cash, income maintenance and medical benefits would help identify the working age distributional role. Because the detailed county transfer table was discontinued, any reconstruction using other sources needs a clear reconciliation to BEA totals. Missing detail should remain an acknowledged limitation rather than being filled by an assumed allocation. [3][4]

Finally, county dependence is not a county median household metric. High earners can lower the area's aggregate share even when many lower income residents rely on transfers. Conversely, a large retired population can raise the share while working households remain prosperous. Household survey estimates by income and age offer a complementary view where samples are sufficient. The strongest post labor finding would combine persistent weak earned resources among comparable working age residents with a growing protective role for transfers, rather than infer that relationship from county colors alone.

Maps and comparisons that can be reproduced

The primary visualization should pair maps for several verified years with a continuous national series of the proportion of counties above the 25 percent threshold. Use identical bins and a consistent county geography. State plainly that the summary weights counties equally. Add a population weighted companion to show the number or share of people living in each tier; do not derive it from county counts. Preserve the historical 2022 endpoint until the original numerator is updated consistently. [1]

Below the maps, plot each county's transfer share against real nontransfer income per person or its growth. A further panel can compare age composition and population change. These views help separate a benefit numerator effect from a weak earnings denominator and reveal whether high dependence reflects retirement attraction or working age departure.

For source maintenance, archive the EIG study and its data definitions, BEA county total and component tables, geographic crosswalks and release dates. Record the discontinuation of CAINC35 on 1 November 2024. Before updating, identify exactly which official detail remains and whether the resulting numerator is government only or all current transfers. A new proxy should receive a new label and a comparison over any overlapping years. [1][2][4]

Read this chapter beside national transfer dependence, working age poverty and household income composition. The local measure adds information about where the distributional change occurs. Its secular evidence supports the growing geographical role of public support, while age, migration and benefit valuation determine how much of that pattern can be attributed to weakening employment based security.

SOURCES AND REPRODUCTION NOTES

[1] Kenan Fikri Sarah Eckhardt and Benjamin Glasner Economic Innovation Group (2024). The Great “Transfer”-mation: How American communities became reliant on income from government. Original county analysis September 2024; 1970 1990 2000 and 2022 threshold shares, page 8 and Appendix I definitions; verified retrieval 4 October 2026

[2] U S Bureau of Economic Analysis (2026). Personal Income by County. Current release 5 February 2026 for 2024; residence based income definition and downloadable data links; verified retrieval 4 October 2026

[3] U S Bureau of Economic Analysis (2019). Appendix: Summary National Income and Product Accounts. Government social benefits personal current transfers and personal income boundaries; appendix updated May 2019; verified retrieval 4 October 2026

[4] U S Bureau of Economic Analysis (2026). Discontinued or Delayed Statistics. CAINC35 Personal current transfer receipts discontinued 1 November 2024; historical archive listed; verified retrieval 4 October 2026

RELATED CHAPTERS 033 · 035 · 036 · 037 · 040

CHAPTER 035

Working age poverty before and after taxes and transfers

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN United States adults ages 18 to 64 reconstructed historical series 1967 to 2023

Public taxes and transfers play a larger role in keeping working age adults out of poverty, while the direction of poverty itself depends on whether the threshold tracks a fixed or changing standard of living.

Two resource accounts and an explicit poverty line

This indicator compares the fraction of working age adults whose household resources fall below a poverty threshold before and after government taxes and transfers are counted. The population is adults ages 18 to 64. The difference between the two rates measures the immediate accounting contribution of the specified public policies to measured poverty. Its unit is percentage points of that population. A companion can express the gap as a share of the pretax and pretransfer rate, but the percentage point and proportional measures should remain clearly distinguished. [1]

The poverty threshold is part of the indicator, not a minor technical detail. A fixed standard adjusted for inflation asks whether households can afford a stipulated basket over time. A threshold that changes with contemporary essential spending asks whether resources keep pace with evolving living standards and costs. A relative line tied to median resources asks about distance from the middle of the distribution. These questions can yield different long term answers without any arithmetic inconsistency. The dashboard should show their meanings before selecting a headline.

The Supplemental Poverty Measure includes more resources and expenses than the official cash poverty measure. It takes account of noncash benefits and tax credits, subtracts taxes and certain necessary expenses, and adjusts thresholds for geographical housing costs. Census derives its thresholds from expenditure information on basic necessities. These choices are especially useful for examining the distributional role of government because food support, housing support and taxes affect resources even when wages remain unchanged. Government medical program spending is not simply added as unrestricted cash under this framework. [2]

A pretax and pretransfer calculation removes specified government resources and tax effects from observed household accounts, then compares the adjusted resources with the same poverty line. It is a mechanical counterfactual. It does not estimate every behavioral change that would occur if the programs had never existed. Earnings, employment, family living arrangements and private support might respond to policy. The gap is consequently best described as the measured accounting poverty reduction under observed conditions, with causal program effects requiring additional research designs. [1]

A growing public contribution with mixed poverty outcomes

Columbia University's original historical study, published 12 June 2025, covers 1967 through 2023. Under its historical SPM, working age poverty before taxes and transfers rose from 15.1 to 17.0 percent, while the postpolicy rate declined from 13.9 to 12.3 percent. The accounting gap therefore widened from 1.2 to 4.7 percentage points. The same study reports postpolicy relative poverty rising from 11.2 to 15.2 percent, while anchored 2022 poverty fell from 21.5 to 11.4 percent. [1]

These findings demonstrate two separate changes. The government's accounting contribution became larger, while the interpretation of household progress depends on the chosen standard. A fixed real threshold registers substantial improvement; a standard tied to changing living conditions registers less favorable distributional progress. Preserve both results. The evidence supports a secular increase in the protective role of public policy and a more qualified statement about the sufficiency of private resources. It does not support a blanket claim that working age living standards are lower than in the 1960s. [1]

The current Census poverty publication is Poverty in the United States 2025, issued on 15 September 2026 using the 2026 and earlier CPS Annual Social and Economic Supplements. That is a newer official observation year, but it is not automatically an extension of Columbia's reconstructed 1967 to 2023 working age series. Historical reconstruction, threshold treatment and revisions must be reconciled before appending later values. This chapter keeps the long series endpoint at 2023 and identifies the newer official release as a separate monitoring source. [3]

A long comparison needs more than two endpoints. Recessions and temporary fiscal interventions can widen the policy gap sharply, and annual resources move around thresholds. The full historical lines should be displayed where available, with each threshold in its own panel. The selected checkpoints establish the scale of the secular change while the full history reveals whether it emerges gradually, in policy steps or through exceptional episodes. Do not infer a smooth path or invent annual observations by interpolating the reported endpoints.

Measure	1967	2023
Historical SPM before taxes and transfers	15.1 percent	17.0 percent
Historical SPM after taxes and transfers	13.9 percent	12.3 percent
Accounting policy gap	1.2 percentage points	4.7 percentage points
Relative poverty after policy	11.2 percent	15.2 percent
Anchored 2022 poverty after policy	21.5 percent	11.4 percent

Original Columbia historical working age analysis, adults 18 to 64; policy gaps calculated from reported historical SPM endpoints. Published June 2025, observations through 2023. [1]

Testing the ability of work to distribute security

This is a closer post labor indicator than total national transfer spending because it focuses on adults of working age and a concrete resource standard. It asks how many adults remain below a needs threshold when the public system is removed from the accounting. If their privately supplied resources increasingly fall

short while policy keeps measured poverty stable, public institutions are carrying more of the distributional task. That mechanism corresponds to the thesis that employment can remain widespread while good work becomes less sufficient to provide reliable household security.

The pretax and pretransfer measure still is not a wage only measure. Household resources can include capital and other private income, and some working age adults do not work for reasons unrelated to job scarcity. Disability, education and unpaid care influence resources and labor supply. Household structure also determines how earnings are pooled. The inference should therefore concern private resource adequacy unless a further decomposition shows how wages, hours and ownership income contribute. The chapter on household income composition supplies that complementary accounting.

The difference between absolute and relative progress is economically meaningful. Greater productivity can make some goods easier to obtain while access to housing, care and social participation remains tied to income position. A fixed real threshold can fall even when the distance from prevailing living standards widens. Post labor economics should identify which aspect of security it seeks to explain: purchasing a constant basket, maintaining access to contemporary essentials, or participating in the prosperity created by growth. Different poverty lines illuminate different parts of that question.

A hypothetical example illustrates this distinction. Suppose a household's resources rise from 20 to 25 units while the inflation adjusted cost of a fixed basket stays at 22. It moves above that fixed poverty line. If the contemporary needs threshold rises from 22 to 28 because prevailing expenditure standards change, it remains below the updated line. If a transfer adds 5 units, it crosses the latter as well. These outcomes can coexist: material improvement, incomplete access to an evolving standard and a larger protective role for public support.

The indicator also records successful policy. Keeping more adults above a needs threshold can be a desirable adaptation to market and demographic change. A large accounting gap is therefore evidence of an important institution, not proof that the institution itself creates dependency or that the economy has no productive work. For the post labor thesis, the strongest evidence is the combination of a growing public contribution with persistent shortcomings in earned resources, supported by independent information on job quality and the costs households face.

Counterfactuals revisions and household composition

Mechanical subtraction requires careful wording. If observed resources are 30 units including a 6 unit transfer, removing the transfer produces 24. That calculation says how the household's measured status changes holding the rest of its account fixed. It does not establish that the household would still earn the same amount under a different policy regime. Program evaluations can estimate behavioral responses; accounting decompositions identify the direct measured contribution. Both are useful, but their conclusions should not be substituted for one another.

Threshold changes also should be interpreted explicitly. The SPM's link to contemporary expenditure and geographical housing costs allows its standard to evolve. An anchored threshold holds a chosen year's real standard fixed. Relative poverty changes when the middle of the resource distribution changes. Choose the threshold before interpreting the trend and publish sensitivity across plausible standards. A poverty line can

encode an important normative judgment about inclusion without being arbitrary, but the judgment must remain visible to the reader. [2]

Historical survey reconstruction introduces limitations because earlier questionnaires and data fields differ from current ones. The original research attempts to reconstruct a long comparable account; its older endpoints are research estimates rather than official SPM releases published contemporaneously in the 1960s. Census began publishing annual supplemental estimates in 2011 and later implemented methodological improvements. Researchers extending the historical series must document those differences and current revisions, rather than present every year as equally observed under an unchanged questionnaire. [1][2]

Changes within the working age population can affect the aggregate rate. Age within the 18 to 64 range, education, disability, family structure and the number of earners influence pooled resources. A more informative extension would compare similar household types and report depth of poverty as well as prevalence. Many small movements around the line can shift a poverty rate without indicating the scale of shortfalls for those far below it. Poverty gaps and material hardship can complement the binary threshold classification.

Automation attribution remains an additional empirical task. Trade, housing supply, care costs, minimum wage policy, bargaining institutions and family change can alter earnings adequacy and the policy gap. A persuasive technology explanation would connect exposure to longer term private income outcomes while accounting for these factors and preexisting trends. The verified secular contribution of public policy is strong descriptive evidence about distributional architecture. It supplies a test to which the causal theory must respond rather than resolving the cause in advance.

Four panels and a policy gap

Use separate panels for historical SPM, anchored 2012, anchored 2022 and relative poverty wherever the original annual data can be obtained. Each should show before and after taxes and transfers for adults ages 18 to 64. Label rates as percentages of adults and the policy difference as percentage points. Do not connect observations from different threshold methods into one line or relabel a relative result as absolute poverty. [1]

A companion chart can show the accounting gap over time. Keep the resource components and expense deductions attached to the series definition. Mark exceptional fiscal periods and retain uncertainty where available. The source note should state reconstructed historical series 1967 to 2023, published 12 June 2025. Newer Census 2025 observations belong in a separate panel until their definitions and revisions have been reconciled. [1][3]

For reproduction, archive the original research data, thresholds, price adjustments, age selection, household units and weights. Record whether support is cash or noncash and which taxes enter the calculation. Recompute before and after resources using the same threshold and population so the gap reflects the resource change rather than a changed line or sample.

Read this chapter beside national transfer dependence, refundable tax credit supplementation, household income composition and renter housing burden. Together they identify the public contribution, the specific

support channel, the private resource source and a major essential cost. The result is a more precise test of employment based security than an undifferentiated claim that rising benefit spending necessarily demonstrates post labor.

SOURCES AND REPRODUCTION NOTES

[1] Ryan Vinh Christopher Wimer Sophie Collyer and Sofia Giorgianni Columbia University Center on Poverty and Social Policy (2025). 2023 Working Age Adults' Poverty Rates in Historical Perspective. Poverty and Social Policy Brief volume 9 number 8, 12 June 2025; reconstructed adults 18 to 64 series 1967 through 2023; verified retrieval 4 October 2026

[2] U S Census Bureau (2025). About the Supplemental Poverty Measure. Thresholds resource boundaries and official publication history; revised 13 June 2025; verified retrieval 4 October 2026

[3] U S Census Bureau (2026). Poverty in the United States: 2025. Report P60 290, released 15 September 2026 using 2026 CPS ASEC; official current context separately defined from historical reconstruction; publication record verified 4 October 2026

RELATED CHAPTERS 033 · 034 · 036 · 037 · 040 · 042

CHAPTER 036

Refundable tax credit supplementation

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN United States CBO distributional series 1979 to 2023 with IRS tax year 2025 rules as current context

Refundable credits grew from a small to a substantial addition relative to low income households' base resources, indicating a structural tax system role in supplementing market and social insurance income.

Public support administered through the tax system

Refundable tax credit supplementation measures the value of refundable credits relative to household income, particularly near the bottom of the distribution. A refundable credit can produce a payment when its value exceeds the tax otherwise owed. This differs from a deduction, which reduces taxable income, and from a nonrefundable credit, which generally reduces liability only to zero. The metric asks how much public support reaches households through the tax system rather than through an employer paycheck or a separately administered benefit. [1][2]

The longitudinal measure used here is CBO's average refundable tax credits as a percentage of income before transfers and taxes for selected income groups. That denominator has a specific definition: market income plus social insurance benefits. Market income includes labor, business and capital income and realized capital gains; social insurance includes programs such as Social Security and Medicare. Thus the phrase before transfers in this report means before means tested transfers, not before every government benefit. The ratio should never be labelled credits relative to pure wages or pure market income. [1]

CBO treats refundable credits within individual income taxes. They can make the average individual income tax rate negative for a group, while other taxes such as payroll and excise taxes still impose a burden. A negative individual income tax rate therefore does not mean that recipients pay no taxes overall. The full household resource calculation adds means tested transfers and subtracts federal taxes from the base measure. Accounting placement differs from some transfer income presentations, so combining datasets requires an explicit bridge that counts each credit once. [1][3]

The credit family is also heterogeneous. The EITC requires earned income and varies with filing status and qualifying children. Other refundable or partly refundable credits address children, education or health insurance and follow different rules. Current IRS guidance identifies those distinctions. Some support can be paid in ways that reduce a specific cost rather than appearing as unrestricted cash in a checking account. A broad credit ratio describes fiscal supplementation; a cash security analysis requires further detail on payment timing and the resource actually received. [2][4]

A larger supplement over forty four years

CBO's September 2026 report covers household income from 1979 through 2023. In the lowest quintile, average refundable credits rose from 1 percent to 13 percent of income before transfers and taxes. The 2023 level was similar to the prepandemic level after temporary credits elevated support during 2020 and 2021.

This long comparison demonstrates a structural expansion of credit supplementation beyond the extraordinary pandemic episode. It establishes the increasing role of the tax system in household resources, without identifying the cause of the underlying need or policy choice. [1]

The observation year is 2023 even though the report was released in 2026. Administrative tax information creates a lag in this distributional analysis. Current IRS tax year 2025 rules describe newer program design, but they are not an updated estimate of average credits received by the lowest quintile. Treat rules and realized incidence separately: an announced maximum, an eligible claimant's calculated credit, total administrative payments and a household group average are different quantities with different denominators. [1][2][4]

CBO also reports average individual income tax rates in 2023 of minus 11 percent for the lowest quintile and 16 percent for the highest quintile. These rates reflect the complete individual income tax account, rather than refundable credits alone. They help explain why after tax resources can exceed the base income of some low income households. Payroll, corporate and excise tax incidence belongs elsewhere in the overall federal tax calculation and should remain visible when interpreting net fiscal support. [1]

The growth in refundable credits can coexist with changes in direct benefits. For example, CBO attributes part of the 2023 low income tax rate change to premium tax credits as households shifted from Medicaid to marketplace coverage after pandemic enrollment rules expired. That is a change in the channel of healthcare support, not necessarily an equal increase in freely spendable household cash. The appropriate historical interpretation distinguishes recurring credit expansion, temporary stimulus and substitutions between public support mechanisms. [1]

Measure	1979	2023
Lowest quintile refundable credits divided by CBO base income	1 percent	13 percent
Lowest quintile average individual income tax rate	Not stated here	Minus 11 percent
Highest quintile average individual income tax rate	Not stated here	16 percent

CBO base income includes market income and social insurance benefits; credit and individual income tax rows measure different quantities. Report released September 2026, observed through 2023. [1]

When earnings require a public supplement

The post labor connection is particularly clear for employment linked support. A worker can have earnings yet receive a material public supplement that helps the household meet needs. This makes the distinction between employment and sufficiency observable. A growing role for earned income credits may reflect a system increasingly combining wages with fiscal distribution rather than expecting the wage alone to provide an adequate household floor. The trend therefore belongs beside working age poverty and wage adequacy indicators.

An in-work supplement should be evaluated against the same household's annual earnings and needs, with an employment definition fixed across years. Reporting a refundable credit as a share of matched resources is different from counting employed recipients or estimating how many people the credit moves above a

poverty line. Each can change while the others remain stable. Census's annual poverty framework includes policy resources and necessary expenses, providing a complementary adequacy test rather than an interchangeable denominator. [5] For example, a household can receive a larger credit because a child is added or legislation changes, while its hourly wage and work schedule are unchanged. Conversely, a credit can shrink when earnings increase, without a loss of security. The strongest labor compression finding would combine rising supplementation among comparable working households with weaker earned resources relative to essential costs; greater coverage on its own measures a policy expansion.

The interpretation remains conditional because credits are designed by policymakers. A larger supplement may arise from more generous rules, higher take up, changing family eligibility or weaker earned resources. These are separate mechanisms. Policy can improve security even if the market wage distribution is unchanged. Conversely, a credit can offset deteriorating earnings without restoring access fully. To distinguish them, compare real earned income, household needs and credits within similar household types, then decompose the difference into policy schedules and the characteristics of recipients.

The EITC also shows why supplementation and replacement should not be conflated. Earned income is necessary for eligibility under the IRS definition. Interest, dividends, pensions, Social Security and unemployment benefits are excluded from earned income for this purpose. The program supports households participating in work rather than furnishing a universal income independent of employment. It can be highly relevant to post labor distribution while still leaving resources contingent on the ability to earn. That contingency is a distinct feature of its institutional design. [4]

Consider a hypothetical household earning 25,000 units with a 3,000 unit refundable credit. The credit equals 12 percent of earnings and increases annual resources, but the household's labor dependence remains substantial. If the credit disappears when earnings disappear, it offers a different protection from a benefit independent of employment. If a different credit addresses health insurance, its contribution may reduce an essential expense rather than expand general purchasing power by the same recorded amount. These examples illustrate the accounting and eligibility issues without describing a typical recipient.

The metric also connects to bargaining and wage setting, but cannot resolve their incidence. A public wage supplement might improve a worker's outside options; some of its benefits could also affect employers through wage responses. Estimating these effects requires original policy research rather than assuming that the credit either subsidizes employers fully or flows entirely to workers. The verified long series demonstrates fiscal supplementation. Its broader contribution is to specify the distributional institution whose incidence and durability should be evaluated.

Coverage timing and fiscal classifications

The household unit requires care. Credits are calculated under tax filing rules, while CBO organizes its analysis into households and income groups. A household may contain more than one tax filing unit. CBO ranks households using income adjusted for household size and forms groups containing roughly equal population shares, rather than equal numbers of tax returns. Therefore IRS counts of claimants or tax units cannot be translated directly into the fraction of CBO households receiving a credit. Preserve each source's unit when comparing take up and incidence. [3]

Annual amounts can also conceal liquidity. A household receiving a large refund after filing may still face difficulty paying monthly bills earlier in the year. Advance payments can change that timing without changing

the final annual entitlement. The economic security question includes predictability and access throughout the year, not merely an annual ratio. Current IRS guidance notes timing rules for EITC refunds; researchers should distinguish the tax year to which a benefit relates from the calendar date on which money arrives. [2]

A ratio can rise because credits grow or because base income declines. Report average credit amounts in real dollars, recipient participation and the denominator as well as the ratio. If a group's base income is low, even modest benefits can create a large percentage. At the household level, zero or negative income introduces additional boundaries. CBO group averages avoid some individual ratio instability, but they still are not the weighted median of household credit to income ratios. The dashboard should name the aggregation explicitly. [1]

Classification can create double counting when datasets are combined. A credit shown as a negative tax in CBO may appear within government assistance in another framework. Adding both its tax effect and a transfer amount to total resources would exaggerate support. A coherent household ledger assigns the payment once, records its tax and benefit classification in a crosswalk and reconciles the resulting total. For cash capital measures, refundable tax credits remain public fiscal support unless they independently satisfy the specified asset funded institutional tests.

A stronger post labor interpretation would show rising supplementation required to maintain a given real living standard among comparable working households, with wages or hours becoming less adequate. A weaker interpretation would show rising earnings and security while policy deliberately shares additional prosperity through credits. Both are possible. The series supports an expanded tax system role over decades; it does not independently establish automation induced wage compression or that households would be equally poor under an entirely different tax regime.

A distributional chart of supplementation

Plot CBO's refundable credit percentage for the lowest, second and middle quintiles across the full available 1979 to 2023 series. Label the denominator income before means tested transfers and federal taxes including social insurance. Highlight temporary 2020 and 2021 support, with the later return toward prepandemic levels visible. The latest point should carry observation year 2023 and publication month September 2026. [1]

Add real average credit amounts and recipient shares where matching data are available. A separate table can summarize major credit eligibility concepts and payment channels from IRS guidance, using the tax year appropriate to those rules. Do not plot the maximum credit under current law as if it were the average amount households receive. The 2025 rules are current institutional context at this cutoff, while the measured distributional endpoint remains older. [2][4]

Reproduction requires storing CBO's income definition, household size adjustment, group construction and treatment of refundable credits. Record any conversion to a three channel labor capital transfer ledger and demonstrate that the credit is counted once. Separate the group average ratio from household medians or claimant averages. [1][3]

Connect this chapter to working age poverty, national transfer dependence and household income composition. Credits reveal one specific mechanism by which the public system supplements private resources. Their role strengthens the post labor reference when examined with earnings adequacy and

essential costs, while their employment linked design also shows the limits of fiscal support that remains contingent on work.

SOURCES AND REPRODUCTION NOTES

[1] Congressional Budget Office (2026). The Distribution of Household Income, 2023. September 2026 report; 1979 through 2023 refundable credit ratios, page 24; individual tax rates page 23 and definitions page 2; verified retrieval 4 October 2026

[2] Internal Revenue Service (2026). Refundable tax credits. Refundability and credit family definitions, including tax year 2025 context; verified retrieval 4 October 2026

[3] Congressional Budget Office (2024). The Distribution of Household Income in 2021. Detailed methodological appendices, household ranking and tax allocation; latest report refers readers to these definitions; verified retrieval 4 October 2026

[4] Internal Revenue Service (2026). Earned income and Earned Income Tax Credit (EITC) tables. Earned income eligibility and tax year 2025 rules; distinguishes excluded interest dividends and benefits; verified retrieval 4 October 2026

[5] U.S. Census Bureau (2026). Poverty in the United States: 2025. Census 2026 report measures 2025 poverty with official and Supplemental Poverty Measure definitions; these use different resources and expense boundaries. Verified for version two 4 October 2026.

RELATED CHAPTERS 033 · 035 · 037 · 038 · 040

CHAPTER 037

Household labor capital and transfer income composition

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN United States CBO observations 1979 to 2023 and Survey of Consumer Finances 1989 to 2022

Income sources differ across households and public support expanded over decades, but labor remains the largest component of average base income in every broad quintile and cash and noncash accounts require separate treatment.

The channels through which households receive resources

Household income composition measures the amounts and shares received from labor, ownership and public support. It is a set of related indicators rather than one number. A household can be described by labor earnings, recurring ownership income, cash transfers and relevant noncash support, with unresolved items shown separately. The central question is which claim on economic output finances its living standard. Composition can reveal reliance on one source even when total income grows, and can distinguish employment based security from ownership or public insurance.

The accounting boundary must be declared. A cash ledger records receipts available for spending, while a broad resource account may include employer benefits, accrued income and services. BEA compensation includes wages and supplements such as employer pension and insurance contributions. Personal interest includes monetary and imputed components, rental income includes imputed owner occupied rent, and personal income subtracts contributions for government social insurance. A national three category chart using these lines therefore is not automatically a cash flow statement for an individual household. [1]

The frequently cited FRED chart showing wages falling from 63 percent to 49 percent is a historical illustration published on 29 September 2016. Its graph divides each component by the sum of five displayed series, rather than by official personal income. The quoted 49 percent is therefore neither a verified 2026 observation nor automatically the wage-to-personal-income ratio. [6] A new chart should reproduce that displayed-series denominator or explicitly rebuild a different official ratio before updating the endpoint. Cash wages and total compensation should also appear separately. Under BEA's handbook, supplements consist of employer pension and insurance contributions and government social insurance contributions; paid vacation and sick leave belong within wages and salaries. [7] Calling every supplement health insurance or treating all benefit spending as lost household value would misstate the accounts. The useful post labor question is whether spendable earnings, total compensation and broad resources show different long trajectories among comparable households.

Business income requires special care because an owner may supply both work and capital. Assigning every business receipt to capital overstates the ownership channel; assigning it all to labor can conceal genuine returns on assets. The analysis should specify an allocation or preserve a mixed category and show sensitivity. Pension receipts can include principal and yield, while asset sales and borrowing finance spending without

constituting recurring income. Maintaining a financing account alongside the income account prevents those economically different resources from being conflated.

The denominator also matters. A source share can be calculated for an individual household, as a weighted median of household shares or as aggregate source income divided by aggregate total income. Those summaries need not coincide. Large ownership receipts concentrated among a few households can raise the aggregate capital share while the typical household receives little. Report participation in each source, amounts conditional on receiving it and its share of resources. These measures jointly describe how broad access is and how consequential it becomes for recipients. [2][3]

Verified long changes and continuing labor reliance

CBO's latest distributional report covers 1979 to 2023 and was published in September 2026. It distinguishes labor, business and capital income, realized capital gains, social insurance benefits, means tested transfers and federal taxes. CBO reports that labor income makes up the bulk of income before means tested transfers and taxes for the average household in each quintile. That is important counterevidence to any claim that the broad middle or even every low income group has already shifted primarily to ownership receipts. The statement concerns group average base income, not every household or posttransfer resources. [2]

The public contribution did grow strongly. Average means tested transfer rates for the lowest quintile more than doubled between 1979 and 2023. Within that group, Medicaid and CHIP benefits increased from 9 percent to 48 percent of CBO's base income. These benefits are valued at governments' average cost of provision. They consequently establish a larger publicly financed resource component, rather than an equivalent rise in unrestricted household cash. Their expansion cannot be read as a complete measure of compensation for lost wages. [2]

Ownership related income is more consequential at the very top, and realized gains make the top group's annual resources more volatile. CBO's long composition figure for the top 1 percent shows capital income and gains moving more sharply than other components, including the rise from 2019 to 2021 and subsequent decline in 2022 and 2023. This history is relevant to source concentration, but its cyclical swings should not be converted into a monotonic secular capital income trend. Recurring cash yield and realized gains also belong in separate panels. [2]

A current measurement study adds another warning. CBO's January 2026 health insurance analysis reports its standard health insurance component rising from 6.1 percent of average income after taxes and transfers in 1979 to 12.3 percent in 2021. The observation endpoint is older than the release date. This change means broad resource growth increasingly contains healthcare support whose household use differs from cash. Census's newer 2025 money income report excludes in kind transfers and provides a distinct perspective; neither definition should silently replace the other. [4][5]

Measurement crosswalk based on BEA and CBO concepts; cash ledger column is an analytical reporting choice, not a replacement official definition. [1][2][4]

Accounting item	Broad official account	Cash security account
Employer insurance contribution	Labor compensation resource	Shown separately from cash wages
Medicaid and CHIP	Public benefit valued by government cost	Service support rather than unrestricted cash

Accounting item	Broad official account	Cash security account
Owner operated business income	Business or mixed income	Labor and capital allocation disclosed
Realized capital gain	Included in CBO market income	Separated from recurring ownership receipts
Borrowing or principal withdrawal	Financing or balance sheet transaction	Separate financing account

Why composition changes the distributional diagnosis

The post labor question is whether growth reaches the income channels on which ordinary households depend. If gains accrue mainly to owners while most households continue relying on earnings, rising aggregate output can coexist with weak perceived security. Composition identifies that exposure directly. It distinguishes the amount of output available in the economy from the institutions assigning purchasing power to households. A decline in the production intensity of labor and a change in household income sources are related hypotheses, yet one does not mechanically establish the other.

The household level view adds information beyond a national labor share. National compensation shares describe how production income is divided across factors under a specific accounting boundary. Household composition describes the sources received by particular people. A worker can own assets and a wealthy household can also receive a large salary. Changes in factor shares therefore do not map one for one into household inequality. Ownership concentration, taxes, benefits and the distribution of wages determine how the production account becomes the household account.

A hypothetical economy illustrates this distinction. Suppose labor receipts total 60 units and ownership receipts total 40. If every household receives the same proportions, an ownership expansion can be shared broadly. If almost all 40 ownership units reach a small group while the others receive only labor income, the same national composition produces very different security. An aggregate shift toward capital would then matter especially because access to its returns is uneven. Household participation and source amounts reveal the difference that a factor share alone cannot.

Public support supplies a third route. A household whose wages remain insufficient may maintain access through refundable credits, social insurance or noncash benefits. Rising total resources could consequently coexist with greater reliance on policy. That combination supports the claim that the welfare state distributes a larger part of security, while also showing that policy can successfully protect living standards. It should not be described as deterioration merely because the source changes. The level, reliability and adequacy of the resource determine its practical value.

For post labor economics, the most informative trajectory is a joint one: how real earned resources, ownership participation and public support evolve among comparable working age households. A capital share rising only because wages collapse is a warning, not an ownership success. A transfer share falling only because benefits are cut is also not renewed labor sufficiency. Publish source amounts relative to essential costs alongside composition percentages, so the framework rewards greater access and resilience rather than favorable looking ratios produced by a shrinking denominator.

Units ages and unresolved income

Household composition varies across the life cycle. Retirees may intentionally draw down assets accumulated through decades of work, while young households rely on wages and build wealth. Comparing a young household's present cash yield with a retiree's total withdrawals without separating principal would create a misleading ownership contrast. Analyze age groups and recurring income separately, then use a financing account to describe planned drawdowns. Asset ownership and current yield are related measures with different meanings for security. [3]

Survey units differ. The Survey of Consumer Finances organizes observations into its family or primary economic unit, whereas Census and CBO use household concepts with their own definitions. CBO ranks households using size adjusted income and statistically matches tax and survey information. Survey income can be underreported, especially for some transfers; CBO adjusts data using administrative information. Reproduction requires respecting those distinctions rather than combining unweighted records or assuming that a tax return represents an entire household. [2][3]

Noncash values require matched denominators. If employer insurance or public services enter one group's total income, comparable support should be considered for others under the same boundary. Adding only the noncash category whose growth supports a preferred narrative can distort both levels and inequality. CBO's health insurance sensitivity study shows that excluding insurance reduces measured income growth especially in lower groups. That finding is a reason to report cash and broad resource accounts side by side, with their uses explained. [4]

Ownership income also has multiple time concepts. Interest and dividends can be recurring cash receipts, gains can be realized irregularly, and unrealized appreciation changes wealth without supplying a current payment. Assets held within retirement arrangements may grow while remaining unavailable for ordinary spending under current rules. A complete analysis tracks yield, gains, asset stocks and access separately. It should not label an increase in portfolio value as an equivalent increase in spendable annual income. [1][2][3]

The unresolved category is a transparency device. Family gifts, mixed business receipts, pensions and ambiguous program payments should remain identifiable until the classification can be justified. Publish reconciliation totals and sensitivity to reasonable alternative allocations. A clean three slice graphic is attractive, but completeness should not be achieved by forcing unknown receipts into whichever category most strongly supports the thesis. The relevant empirical question is whether independent researchers can reconstruct the same household resource account from the recorded data.

A dashboard of amounts shares and participation

The main chart should show real source amounts and source shares by income group for consistent observed years. Present recurring labor, capital and government cash receipts separately from noncash support, gains and financing. Add participation rates for capital income and public benefits. Keep aggregate shares beside weighted household medians where microdata permit, clearly identifying their different weighting and meaning. [1][2][3]

Use CBO's 1979 to 2023 history for broad distributional resources and SCF's 1989 to 2022 repeated surveys for ownership and household balance sheet context. Census's 2025 money and posttax income accounts provide newer cash oriented context, but need a definition bridge before joining a long CBO line. Record observation years, publication dates, price indexes and survey units for every panel. [2][3][5]

For reproduction, retain source variables, classification rules, weights, imputation procedures, taxes, residuals and any labor capital allocation of business income. Validate totals against official accounts while recognizing that cash receipts and national accounting income are different concepts. Publish sensitivity to medical valuation and capital gain treatment, rather than hide them within one preferred summary. [1][2][4]

Read this chapter with transfer dependence, refundable credits, income growth distribution and the proposed Capital Allocation Ratio and Public Wealth Ratio. Composition supplies their empirical foundation. Its mixed classification preserves both the growing importance of public support and the continuing centrality of labor for average household base income, while identifying the data needed to test broader ownership participation.

SOURCES AND REPRODUCTION NOTES

[1] U S Bureau of Economic Analysis (2019). Appendix: Summary National Income and Product Accounts. Account 3 labor compensation property receipts transfers and personal income definitions; updated May 2019; verified retrieval 4 October 2026

[2] Congressional Budget Office (2026). The Distribution of Household Income, 2023. September 2026 release, 1979 to 2023; base income definition, top 1 percent composition, means tested benefit components; verified retrieval 4 October 2026

[3] Board of Governors of the Federal Reserve System (2023). Survey of Consumer Finances (SCF). 1989 through 2022 repeated survey files; 2022 report released 18 October 2023; family unit weights and imputations; verified retrieval 4 October 2026

[4] Congressional Budget Office (2026). Sensitivity of the Distribution of Household Income to the Treatment of Health Insurance From 1979 to 2021. Released 6 January 2026; standard insurance spending 6.1 to 12.3 percent of average postpolicy income and valuation sensitivity; observation endpoint 2021; verified retrieval 4 October 2026

[5] Melissa Kollar and Zach Scherer U S Census Bureau (2026). Income in the United States: 2025. P60 289, 15 September 2026; 2025 money and posttax income definitions; verified retrieval 4 October 2026

[6] Federal Reserve Bank of St. Louis, FRED Blog (2016). Sources of household income. September 2016 illustration: its wage percentage uses the sum of five displayed series, rather than the complete official personal-income denominator. Verified for version two 4 October 2026.

[7] Bureau of Economic Analysis (Current handbook consulted 4 October 2026). NIPA Handbook, Chapter 10: Compensation of Employees. Authoritative compensation definitions distinguish wages, including vacation pay, from employer pension, insurance and government social-insurance contributions; consulted October 2026. Verified for version two 4 October 2026.

RELATED CHAPTERS 033 · 035 · 036 · 038 · 039 · 040 · 044

CHAPTER 038

Capital Allocation Ratio

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Author developed definition in Labor Zero version 36 September 2026 with no verified official longitudinal CAR series

CAR compares recurring cash ownership income with cash labor earnings plus government cash transfers, providing a proposed household composition lens that must be paired with income adequacy and distribution.

The manuscript definition and cash ledger

The Capital Allocation Ratio is David Shapiro's proposed measure in Labor Zero version 36. Its formula is CAR = C divided by W plus T. C is recurring cash income from ownership; W is cash labor earnings; T is government cash transfers. C includes interest, dividends, net rental income, royalties and the capital portion of business distributions. The denominator combines resources from current work and public cash support. A CAR of 0.25 means 25 units of recurring ownership income for every 100 units of labor earnings and transfers. [1]

The appendix defines a household account over a year, with other income and unresolved classifications held in a visible residual O. Income from relatives does not automatically become a government transfer. A pension whose yield and principal cannot be separated remains identifiable as an unresolved receipt. This residual is important because household data contain economically mixed items. A neat ratio should not conceal classifications the underlying source cannot justify. The implementation must publish the source crosswalk and disclose how much remains outside the three main channels. [1]

Qualifying asset funded cash benefits are included in C. If the same payment appears as a government transfer in the official source, subtract it from T when reclassifying it into C. The household's total resources do not change merely because the framework changes their label. Qualification depends on the manuscript's inclusive capital institutional tests, rather than public ownership alone. The Public Wealth Ratio then measures the inclusive component of the household resource account; CAR measures all recurring ownership receipts, including private capital. [1]

CAR's cash boundary differs from broad official income accounts. BEA compensation includes noncash and accrued components, property income contains imputations and personal income has other adjustments. CBO includes realized gains and health benefits in its broader measure. Those official accounts are useful reconciliation benchmarks, but their labels cannot be inserted unchanged into the proposed cash formula. CAR is undefined when W plus T is zero. Report those households separately, rather than create a finite value with an arbitrary tiny denominator. [1][2][3]

A proposed measure rather than an observed secular series

There is no verified official decades long CAR series in this reference. The manuscript supplies a definition, illustrative calculations and a measurement standard. It does not make the ratio an established statistical agency indicator or prove that it has risen secularly. Source components have long histories, but assembling

them into a consistent household CAR requires decisions about cash yield, mixed income, pensions and reclassified benefits. The appropriate status is proposed metric, with future repeated estimates able to test its empirical usefulness. [1]

Existing data can support parts of the account. The Federal Reserve's Survey of Consumer Finances offers repeated household economic observations from 1989 through 2022, with the latest report released in October 2023. It contains income and ownership information, but uses a family or primary economic unit rather than an automatically identical Census household. Its weights, multiple imputations and sampling design need to be preserved. A proxy using only reported interest and dividends should be called a narrow ownership receipts proxy, since it omits other qualifying C components. [4]

CBO's 1979 to 2023 household income distribution provides complementary context, distinguishing labor, business, capital income, gains and public support. Its labor category includes benefits and employer payroll taxes, and its base income already includes social insurance. It therefore helps identify source concentration without directly producing the manuscript's cash CAR. BEA's national and county income components likewise require a bridge for imputed rent, accrued benefits and other accounting distinctions. A long component history is a starting point for construction, not a substitute for validating the proposed ratio. [2][3]

Hypothetical ledgers show the arithmetic without implying observed household estimates. A household receiving 40 units of labor cash, 10 of transfers and 10 of recurring ownership cash has CAR 0.20. If it instead receives 30 of ownership cash with the same 50 in the denominator, CAR is 0.60. If work and transfers fall to 5 while ownership receipts remain 10, CAR rises to 2 even as total recurring income falls from 60 to 15. The last case demonstrates why a rising ratio cannot serve as an adequacy target by itself. [1]

Illustrative annual ledger	W plus T	C	CAR	Total excluding residual
Initial household	50	10	0.20	60
More ownership receipts	50	30	0.60	80
Earnings and transfer collapse	5	10	2.00	15

Hypothetical units chosen to illustrate the manuscript formula. These are not empirical observations, median households or proposed policy targets. [1]

Ownership participation and the equivalent income share

CAR directs attention to whether a household participates in recurring returns from productive assets. That is central to post labor economics because an economy can generate large ownership returns while ordinary households continue depending almost entirely on work and transfers. The proposed metric asks about the household's source composition rather than the economy's total capital stock. It can help describe the breadth of participation, but needs source amounts and ownership incidence to determine whether the receipts materially improve security. [1]

When the ledger is complete, O is zero and components are nonnegative, CAR converts directly to capital's share of cash income: the share equals CAR divided by one plus CAR. CAR 0.25 corresponds to a 20 percent

share; CAR 1 corresponds to 50 percent. This transformation adds no independent statistical information. Its value is communicative and analytical: comparing ownership income with the other two channels can focus a discussion on reliance. A dashboard should not count CAR and the mathematically equivalent capital share as separate corroborating evidence. [1]

The equivalence changes when meaningful resources remain outside W, T and C. For example, a hypothetical household with W of 40, C of 10 and unresolved or other income O of 50 has CAR 0.25, yet the identified capital flow accounts for only 10 percent of its total 100. Omitting the residual would make the ownership contribution appear larger. Publish both the ratio and the complete source account, along with the size and treatment of residuals, so readers can see which conclusion the available classification actually supports. [1]

Distribution also separates aggregate CAR from CAR50. CAR50 is the weighted median of defined household CAR values. It is not the ratio of median C to median W plus T, nor the ratio of the household at median total income. A small group with substantial ownership income can raise aggregate CAR while most household ratios remain zero. Report participation in C and multiple percentiles alongside the median. This distinguishes broad ownership access from a larger national ownership income flow concentrated among existing recipients. [1]

A household can be resilient with a modest CAR because wages are secure, transfers reliable or asset drawdowns planned. Another can have a high CAR and very little income. The post labor policy objective concerns adequate and durable access to output, so the proposed ratio belongs beside after tax recurring resources relative to an essential budget, liquid reserves and exposure to earnings shocks. An ownership composition target earns its usefulness by showing additional security, rather than merely changing the percentage of an inadequate total.

Recurring yield mixed receipts and false improvements

Recurring ownership income should be measured after the costs required to earn it. Net rent differs from gross rental receipts because maintenance and other relevant costs affect the income available to the owner. A business owner supplies work as well as assets, so the capital portion of distributions needs a documented allocation. Count pass through profits and later distributions once. Sensitivity estimates can show how the result changes under reasonable labor capital splits, while an unresolved mixed category avoids pretending that the allocation is directly observed. [1][2]

Asset principal and financing should remain separate. Selling an asset, withdrawing savings or borrowing can support spending but does not establish recurring capital yield. A retiree can intentionally use principal and maintain high security despite little current C. A household borrowing to cover bills can maintain spending while becoming more exposed. The manuscript therefore keeps an income account and financing account side by side. Pension receipts may mix principal and return, and investment gains should be shown separately from recurring cash receipts. [1]

Eligibility and reclassification can create apparent change without new resources. Suppose a public asset funded payment previously listed in T meets the institutional tests and moves into C. CAR rises because C increases and the denominator decreases, even though the household receives the same money. That is a meaningful change in source description, yet it is not an increase in purchasing power. Repeated releases

should distinguish new ownership receipts from classification changes and include a bridge showing the old and new treatment. [1]

Boundary cases need explicit handling. Zero W plus T makes CAR undefined, including households living exclusively on C or other resources. Negative business or investment income creates signed components for which ordinary share interpretations can fail. Very small positive denominators produce extreme ratios that can dominate a mean. CAR50 reduces some sensitivity to extremes but does not resolve missing classifications or adequacy. Publish the excluded population, relevant losses and income levels, and use separate descriptive measures for cases outside the ordinary nonnegative ledger. [1]

The empirical test should compare preexisting ownership receipts with household outcomes after earnings shocks. A ratio measured after the shock may improve simply because wages vanished. Use benefit and income amounts measured before the event, then examine essential consumption, arrears or forced asset sales among otherwise comparable households. CAR's equivalent capital share cannot supply an independent additional predictor, and correlated wealth or age may explain apparent resilience. The metric's interpretation improves when those competing explanations are measured and the proposed source account can be reconstructed independently.

Publishing CAR and CAR50 responsibly

A first release should show a distribution of household CAR, including zeros, defined percentiles and a separate zero denominator count. Publish aggregate CAR and CAR50 together with a clear explanation of their different construction. A companion chart should display recurring C amounts, capital participation and after tax resource adequacy by age and household type. These measures make it possible to see whether a higher ratio comes from more ownership income or less income in the denominator. [1]

Reproduction requires a declared household unit, income reference year, cash components, costs, tax treatment, residuals, weights and imputation procedures. Keep the original variables and classification crosswalk. For each reclassified public payment, record the evidence for qualification and demonstrate removal from T. Mark receipts proxies distinctly and reconcile them with broad BEA or CBO accounts without claiming their denominators are interchangeable. [1][2][3][4]

Repeated estimates should distinguish economic changes, population composition and classification revisions. Do not publish a decades long trend until historical components have been reconstructed under a consistent rule and uncertainty assessed. Source observation years can lag survey or publication years, particularly in household income data, so those dates should be recorded separately. [4]

Read CAR with household income composition, transfer dependence and PWR. CAR describes the recurring ownership channel; PWR adds the institutional inclusive capital distinction. Both should be evaluated against the practical result they aim to support: ordinary households maintaining adequate, reliable access to economic output when earnings fluctuate or become less sufficient.

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro (2026). Labor Zero version 36 unpublished user manuscript. Supplied manuscript saved 9 September 2026; chapter 5 Measuring the Great Decoupling and Appendix sections The Household Ledger, How the Ratios Fit Together, Income Before

Ratios, What Existing Data Tell Us, Evidence That Would Change the Conclusion and A Common Measurement Standard; consulted 4 October 2026

[2] U S Bureau of Economic Analysis (2019). Appendix: Summary National Income and Product Accounts. Account 3 official labor property transfer and imputed income definitions used as reconciliation benchmark; updated May 2019; verified retrieval 4 October 2026

[3] Congressional Budget Office (2026). The Distribution of Household Income, 2023. Official broad income categories and 1979 to 2023 source context; not an official CAR calculation; published September 2026; verified retrieval 4 October 2026

[4] Board of Governors of the Federal Reserve System (2023). Survey of Consumer Finances (SCF). 2022 survey released 18 October 2023; 1989 through 2022 public files, family unit weighting and imputations; potential component source rather than official CAR series; verified retrieval 4 October 2026

RELATED CHAPTERS 033 · 036 · 037 · 039 · 040 · 044

CHAPTER 039

Public Wealth Ratio

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Author developed definition in Labor Zero version 36 September 2026 with current institutional examples and no official longitudinal PWR series

PWR measures qualifying inclusive capital benefits as a share of the whole household resource account, requiring documented asset backing, household transmission and separate cash and service adjusted versions.

Inclusive capital benefits within the complete resource account

The Public Wealth Ratio is David Shapiro's proposed household measure in Labor Zero version 36. Its formula is PWR = I divided by Y. I is the qualifying inclusive capital benefit attributable to the household; Y is the whole declared household income and value account, including I itself. The numerator is a flow of benefits reaching households, rather than the market value of public assets. The denominator must match the benefit boundary and observation period. Cash PWR and service adjusted PWR should be reported separately. [1]

The cash version uses qualifying inclusive capital cash benefits within total recurring household cash income. Such payments already appear in the capital category of the manuscript's ledger. They must not be added to total income again when computing PWR. If an official source classifies the payment as a government transfer, the analytical reclassification subtracts it from that transfer category and adds it to capital without changing total resources. The ratio is defined only with a positive denominator and ordinary percentage bounds require nonnegative, consistently classified components. [1]

A qualifying institution must satisfy five tests: broad eligibility within a defined polity, a rule based path from assets to beneficiaries, genuine yielding asset backing, benefits independent of employment, and durable governance. Each should be recorded as met, unmet or unresolved with supporting evidence. Public ownership by itself is insufficient. An asset accumulating within government without transmitting a household benefit does not create a measured household income floor. A tax financed service does not become inclusive capital merely because it is publicly provided. [1]

The broader service adjusted version includes qualifying asset financed services in I and all comparable services within the declared boundary in Y. This matched denominator prevents favorable treatment of only the numerator's noncash support. Standard national accounting distinguishes disposable income from resource measures adjusted for social transfers in kind, offering a useful precedent for separate accounts. PWR nevertheless adds the author's institutional qualification and household attribution, so it is not an official adjusted disposable income statistic or an existing national accounts series. [1][5]

Institutional examples and the absence of a measured long series

This reference does not verify an official secular PWR series. The manuscript defines a proposed accounting and institutional framework. Public funds and dividend programs provide observable components, but their asset histories or budget shares do not substitute for household PWR. A fund can grow substantially while

benefits remain small, uneven or difficult to attribute. A genuine time series requires consistent household income, benefit eligibility, source tracing, service valuation and classification decisions repeated over observed years. [1]

Alaska provides a concrete cash transmission example. The Department of Revenue's 2026 announcement identifies a 1,000 dollar Permanent Fund Dividend plus a separate 200 dollar energy relief payment, with initial disbursements starting 1 October 2026. The web page was posted 28 September and the release text is dated 18 September. The amount describes a program payment per eligible recipient, not a household income share. A PWR calculation must establish which component qualifies, identify actual household receipts and combine them with the matching household denominator. [2]

The Alaska Permanent Fund Corporation explains a protected principal and an Earnings Reserve Account available through legislative appropriation. Earnings support a percent of market value draw used for public services and the dividend. That source establishes important parts of the asset to budget transmission, while eligibility documentation identifies recipient rules. A full PWR assessment still must evaluate all five tests and the traced payment, including whether separate relief has qualifying backing. Do not count the complete announced package merely because it appears beside the dividend. [3][4]

Norway illustrates the distinction between investment accounts and household benefits. The Government Pension Fund Global's 2025 annual accounts describe its relationship with the treasury and the net transfer mechanism connected to petroleum revenues and budget use. That fiscal relationship is not a direct equal cash dividend to households. Household PWR would require an additional allocation of qualifying services or other benefits. A portfolio return, net government inflow or public expenditure financing share uses a different numerator and denominator from the proposed household ratio. [6]

Manuscript institutional test	Evidence needed before inclusion
Broad eligibility within a defined polity	Documented beneficiaries and exclusions
Rule based transmission	Asset to payout or service rule
Yielding asset backing	Income producing assets and consolidated liabilities
Employment independent benefit	Eligibility does not depend on holding a job
Durable governance	Rights withdrawal rules oversight and continuity

The five tests are the author's proposed classification requirements. A public asset name or a favorable return does not replace their assessment. [1]

How shared ownership can support household security

PWR addresses a different question from CAR. CAR compares all recurring ownership cash income with labor earnings and government cash transfers. PWR identifies the portion of household support supplied through qualifying shared institutions. A household can have a high CAR from private investments and a low PWR. Another can receive meaningful inclusive benefits while still relying chiefly on wages. The ratios describe source composition and institutional character; neither establishes that the household's total resources are adequate. [1]

The post labor connection is the possibility of distributing productive returns through durable shared claims. If earnings become less sufficient, a broadly eligible dividend or service financed by yielding assets could

support access without requiring each household to purchase an individual portfolio. PWR makes that household transmission explicit. The relevant result is the amount of reliable benefit and the needs it covers, rather than public ownership's scale in isolation. It therefore links the capital side of production to the distributional security of ordinary people.

A hypothetical cash example shows the denominator rule. A household has 40 units of wages, 10 of transfers and 10 of capital, including 5 of inclusive cash benefits. Its total cash income is 60 and cash PWR is 5 divided by 60, or about 8.3 percent. Adding the 5 again would inflate total income to 65 and misstate the account. The payment is a component of C and of Y, rather than an additional resource beyond them. This accounting principle applies even when the source labels the payment a transfer. [1]

A service example shows the matched boundary. Suppose a household has 50 cash units and receives 20 units of comparable services, of which 10 are qualifying asset financed services. Service adjusted PWR is 10 divided by 70, or about 14.3 percent. Including only the qualifying service in the denominator would produce 10 divided by 60 and overstate its share. The illustration is hypothetical and assumes a defensible household valuation. Actual allocations may differ with use, eligibility and the characteristics of the service. [1]

The proposed measure could inform evaluation if larger benefits before an earnings shock predict smaller declines in essential consumption or fewer arrears. It must be measured before the shock because a ratio can rise when wages collapse. A reliable tax transfer of the same size may offer similar immediate consumption protection; PWR's institutional distinction needs evidence on durability, rights, financing and political interruption beyond the amount paid. Those are empirical questions, rather than benefits guaranteed by naming a payment inclusive capital. [1]

Household attribution durability and double counting

Services require a defensible allocation. Childcare benefits depend on families having young children; transport support depends partly on location and use; other services may justify broader eligibility based allocations. Dividing a public budget equally by population can be inappropriate when use and incidence differ. State whether the valuation uses cost, replacement expense or another income equivalent approach, and report ranges where the data cannot support a precise household amount. The objective is the benefit actually attributable to the household under the chosen boundary. [1]

Trace each flow once from source to destination. Investment income received by a fund, a transfer into the treasury and a service financed with that transfer are successive stages of the same financing path. They are not three household benefits. Only the qualifying household attributable share belongs in I. A tax saving already reflected in disposable resources must not be added again to Y, and a service and a supposed tax saving from financing it must not both enter the numerator. Stabilization benefits requiring counterfactual assumptions should be reported separately from observed cash and services. [1]

Durability requires the consolidated balance sheet as well as a governance label. Borrowing to buy assets creates matching liabilities and does not create net wealth at inception. Payments funded through principal sales can continue temporarily while future capacity shrinks. Portfolio returns differ from payout rates, and smoothing changes the timing of adjustments rather than eliminating investment losses. Report assets, liabilities, fees, contributions, returns and withdrawals alongside household benefits so a rising PWR is not financed by concealed depletion or an unsustainable obligation. [1]

The ratio can improve for unfavorable reasons. If inclusive benefits remain 5 while other cash income falls from 55 to 5, PWR rises from about 8.3 to 50 percent even though total cash resources fall from 60 to 10. Publish the benefit amount relative to an essential budget and total after tax resources alongside PWR. Institutional support matters only if it supports access; a larger share of an inadequate total is not automatically progress. Household need and source reliability should constrain interpretation. [1]

PWR50 is the weighted median of household PWR values, with boundary cases and the cash or service adjusted version stated. It is not the ratio of median benefits to median household income, nor a national public asset share. Equal per person payments produce different household shares depending on household size and other resources; services can reach narrower groups. Aggregate fiscal capacity therefore does not determine median PWR. The distributional promise must be evaluated using actual eligibility and transmission rules joined to household data. [1]

A reproducible benefit and institution dashboard

A first release should show cash PWR, service adjusted PWR, aggregate shares and PWR50 separately. Add participation, household benefit amounts and essential cost coverage by age, income and household type. A parallel institutional register should record all five qualification tests with evidence and unresolved cases. The chart should clearly distinguish measured household benefits from illustrative estimates or program payment amounts. No decades long PWR trend should be implied until the required account has been reconstructed consistently. [1]

Reproduction requires household units, observation years, source income, taxes, residuals, weights, service boundaries and valuation methods. For each qualifying institution retain consolidated accounts, payout and eligibility rules, costs, contributions and the household transmission crosswalk. Reconcile payments counted in capital with removal from official transfer labels where necessary. For services, verify that comparable support also enters the denominator and that successive financing stages are not counted repeatedly. [1]

The 2026 Alaska payment announcement and fund structure documentation illustrate evidence needed for a current program assessment; they do not provide a measured household PWR50. Norway's investment accounts likewise document fiscal transmission at an earlier stage. Record publication and benefit years separately and preserve distinctions among return, payout, treasury financing and household resources. [2][3][6]

Read PWR beside CAR, transfer dependence and household income composition. The proposed metric gives shared ownership an explicit household benefit test. Its value will depend on whether independent teams can reproduce it and whether the institutional distinction helps explain durable security beyond simpler measures of income, wealth and the amount of public support.

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro (2026). Labor Zero version 36 unpublished user manuscript. Supplied manuscript saved 9 September 2026; chapter 5 Measuring the Great Decoupling and Appendix sections The Household Ledger, How the Ratios Fit Together, Count the Benefit Once, Income Before Ratios, Prices Risk and Shared Wealth, Evidence That Would Change the Conclusion and A Common Measurement Standard; consulted 4 October 2026

[2] Alaska Department of Revenue (2026). Department of Revenue Announces 2026 Permanent Fund Dividend. Web posted 28 September 2026, release text dated 18 September; 1,000 dollar PFD and separate 200 dollar energy relief, disbursements beginning 1 October; verified retrieval 4 October 2026

[3] Alaska Permanent Fund Corporation (2026). Fund Structure. Protected principal, Earnings Reserve Account, appropriation and percent of market value transmission to services and dividends; verified retrieval 4 October 2026

[4] Alaska Department of Revenue Permanent Fund Dividend Division (2026). Eligibility Requirements. Official recipient rules used as evidence for a proposed institutional assessment; verified retrieval 4 October 2026

[5] Organisation for Economic Co operation and Development (2026). Household disposable income. Official resource account context including adjusted disposable income and social transfers in kind; methodological precedent rather than official PWR; verified retrieval 4 October 2026

[6] Norges Bank Investment Management (2026). Web report: Annual report 2025. 2025 financial accounts, government transfer accounting and Note 1 mandate; statements approved February 2026; fiscal transmission does not itself establish household PWR; verified retrieval 4 October 2026

RELATED CHAPTERS 033 · 037 · 038 · 040

CHAPTER 040

Distribution of household income growth

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN United States CBO comparable annual distributional history 1979 to 2023 with separate Census 2025 context

Household income grew across broad income groups but much faster at the top, and taxes and transfers moderated rather than eliminated the resulting increase in inequality.

Who receives the gains from growth

The distribution of household income growth measures how real income changes across different parts of the household distribution. A common presentation indexes each group's average income to an initial year and follows cumulative percentage growth. Another records each group's share of total income. These measures answer complementary questions: growth shows whether a group's resources increased, while shares show whether it received a larger or smaller portion of the total. A group can become better off in real terms while receiving a smaller share when other groups grow faster.

CBO supplies a long U.S. history from 1979 to 2023. Its base measure, income before transfers and taxes, combines market income with social insurance benefits. Market income includes labor, business, capital and realized gains; social insurance includes benefits such as Social Security and Medicare. Income after transfers and taxes adds means tested benefits and subtracts federal taxes. These names require an explicit note because the before measure already contains some government support and the after measure is not simply cash wages after withholding. [1]

The groups are formed using income adjusted for household size. CBO divides household income by the square root of the number of people for ranking, then defines quintiles containing approximately equal shares of the covered population. The reported income amounts are generally unadjusted household amounts. Consequently, an income quintile here is not necessarily exactly one fifth of tax returns or one fifth of households. Replication and comparison with Census or tax based studies require preserving the unit, ranking measure and weighting. [2]

The distribution is a sequence of cross sections. Households can move across groups as they age, change employment, experience gains or alter family structure. The growth of the lowest quintile therefore does not describe the lifetime income change of a fixed set of initially poor households. It measures the resources available at that position in the distribution in each year. Longitudinal mobility is a separate metric, including absolute intergenerational mobility, and should be used to investigate the prospects of particular cohorts.

Positive growth with increasingly unequal shares

CBO finds that average real income rose in every quintile from 1979 to 2023, both before and after means tested transfers and federal taxes. Growth was fastest in the highest quintile, and the distribution of growth was more even after the public adjustments. The long result is unequal participation in rising income, rather than a verified decline in every group's resources. Keeping this positive growth visible is essential to an accurate assessment of the post labor argument. [1]

The concentration change is clear in income shares. The top 1 percent's share of income before means tested transfers and taxes rose from 9 percent in 1979 to 16 percent in 2023, while the lowest quintile's share declined from 5 percent to 4 percent. After transfers and taxes, the top 1 percent's share increased from 7 percent to 13 percent and the lowest quintile's share remained 8 percent. Public distribution moderated the inequality but did not prevent the top share from rising strongly. [1]

The latest year within the CBO history also supplies counterevidence to a uniform yearly pattern. In 2023, base income rose 5 percent in the lowest quintile, mainly through labor income, and declined among the highest groups as realized gains fell. These annual changes coexist with the longer concentration trend. The observation endpoint is 2023, although the report was published in September 2026. A secular account should retain the annual reversals and identify cyclical sources of income instead of portraying every year as further exclusion. [1]

For newer context, Census reports real median household money income of 87,460 dollars in 2025, up 2.6 percent from its revised 2024 estimate and the highest in its record beginning in 1967. This was released 15 September 2026. Money income excludes in kind transfers and differs from CBO's broad account; the Census statistic should not be appended to a CBO group average line. It nevertheless confirms why the thesis should concern relative access, source dependence and adequacy rather than claim that all aggregate household income measures continuously decline. [3]

Income share	1979	2023
Top 1 percent before means tested transfers and federal taxes	9 percent	16 percent
Lowest quintile before those adjustments	5 percent	4 percent
Top 1 percent after those adjustments	7 percent	13 percent
Lowest quintile after those adjustments	8 percent	8 percent

CBO distributional shares, with social insurance already in the base income measure. Published September 2026, observations through 2023. [1]

Economic growth and the channels of inclusion

The post labor connection is the possibility that economic growth increasingly enriches some claims on output while ordinary employment delivers a smaller relative part of prosperity. If ownership related resources grow rapidly near the top and labor reliant households grow more slowly, the economy can improve total living standards while compressing access to its gains. The distributional growth metric tests this outcome directly. It does not need to assume that production stops requiring people or that all lower incomes fall in absolute terms.

The share of people in middle-income households provides an additional distributional view. Pew defines that tier relative to the size-adjusted national median, rather than as a fixed population quintile. Its historical analysis finds a smaller middle tier alongside a larger upper tier and a modestly larger lower tier; a separate chapter reports both population membership and aggregate income shares. These repeated cross sections describe the shape of the distribution, not the paths of identified individuals moving between tiers. [6][7]

The distinction matters for interpretation. Fixed-rank groups can show unequal income growth while retaining the same share of the covered population by construction. A median-based tier can change size as the distribution widens or narrows. Middle-tier shrinkage is consequently informative about the breadth of a shared income range, but upward expansion cannot automatically be called impoverishment. Nor is the published tier a wage-only or pre-transfer measure: regularly received cash benefits enter money income, while taxes and noncash benefits are omitted. Comparing earnings, cash transfers, and disposable resources separately is necessary before assigning the household outcome to weakened labor distribution. [8][9]

The distinction between levels and shares is fundamental. In a hypothetical economy, one group's real income rises from 20 to 30 while another's rises from 80 to 170. The first group gains 50 percent, yet its share falls from 20 percent of the original total to 15 percent of the new total. Such an outcome supports unequal growth and may affect relative access to scarce goods, even though the first group is materially richer. The example is illustrative arithmetic rather than a reported empirical estimate.

Income sources determine how the unequal growth translates into labor dependence. Higher wages at the top, mixed business returns, capital yields and realized gains can all increase concentration. A top income increase is therefore not automatically a shift from labor to capital. Source decomposition is needed to identify the mechanism. The chapter on household income composition and the proposed Capital Allocation Ratio distinguish recurring ownership receipts from labor earnings; this distributional chapter establishes who receives total resources under a broader account.

Taxes and transfers introduce another layer. If the public system supplies more of the growth near the bottom, it demonstrates an expanded role in sharing resources while also delivering real gains. CBO's before and after comparisons allow the institutional contribution to be examined. That supports a post labor argument about distributional architecture without making public support itself a sign of failure. The relevant question is whether security would remain adequate through earnings alone, how the support is financed and how durable the resulting claims are.

Unequal gains can also influence access to limited supply goods. Higher incomes among some households may increase their capacity to bid for desirable housing or education, while others' resources grow more slowly. This mechanism requires evidence about prices, supply and location; income shares alone cannot establish it. Read housing affordability and renter burden alongside the growth distribution to see whether private resource gains translate into improved access. The framework should explain the relationship between income position and essential costs rather than treat inequality as a complete welfare measure.

Gains health benefits and changing households

Capital gains create substantial sensitivity. CBO's original analysis of 1979 to 2021 shows that realized gains are more concentrated and more variable than other major income sources. Realization can depend on asset markets and tax decisions, while unrealized appreciation remains outside the standard income measure. A short comparison centered on an exceptional realization year can exaggerate or reverse a distributional trend. Report versions with and without realized gains where available, while recognizing that excluding them removes a real resource channel for recipients. [4]

Healthcare valuation affects apparent growth differently across groups. CBO's January 2026 study explains that broad income includes employer insurance and publicly financed insurance, generally valued by resource cost. Excluding health insurance reduces measured growth especially among lower income groups. That is a

meaningful resource difference, but it cannot be interpreted as an equal amount of cash available for any purchase. Separate cash oriented and broad resource measures, and state whether the question concerns flexible purchasing power or access to services. [5]

Household size and composition also change over time. More adults earning in one household, changes in marriage and living arrangements, retirement and migration can alter average household resources. Size adjusted rankings address some differences in needs but do not eliminate all composition effects. Group averages can also be affected by the very high incomes within the top group. Report finer top percentiles and relevant working age comparisons rather than infer a uniform experience among all households in a broad quintile. [2]

Price adjustment is another boundary. CBO converts amounts using BEA's personal consumption expenditures price index. Census uses a different documented combination of price indexes in its current historical money income report. Even consistent national inflation adjustments cannot capture every household's exposure to housing, care or location specific prices. If the analysis claims declining adequacy, it should compare income with an explicit essential cost standard in addition to a broad real income index. Different price indexes should remain identified rather than mixed casually. [1][3]

The descriptive history does not identify automation's causal share. Tax policy, bargaining institutions, education, trade, market concentration, demographics and asset valuations can influence the growth distribution. A technology mechanism would be stronger if source specific gains and labor income changes tracked credible exposure while alternative explanations and preexisting trends were addressed. The verified evidence is long unequal growth moderated by fiscal policy, with positive real gains across groups and important recent improvements. That precise finding supplies a demanding benchmark for the theory.

A chart of growth shares and public contribution

The main figure should pair indexed real group income before and after means tested transfers and federal taxes for 1979 to 2023. Use the same base year and show cumulative percentage growth, with the groups and household size ranking stated. A second figure should show income shares for the top 1 percent, the middle groups and the lowest quintile. Both views are necessary because rising levels and falling shares can coexist. [1][2]

Add sensitivity panels for realized capital gains and health insurance where the original CBO data permit. Keep their older 2021 observation endpoint visible if using the dedicated sensitivity studies. The latest Census 2025 median can appear as a separately defined context panel, with its cash oriented money income boundary and 15 September 2026 release date. Do not splice different income concepts into a continuous line. [3][4][5]

For reproduction, retain the underlying data, group definitions, equivalence scale, population weights, price index, tax and benefit classifications and release vintage. Distinguish a share change in percentage points from a proportional growth rate. Note that cross sectional quintile growth is different from growth for a fixed panel of households.

Read the results beside household income composition, working age poverty, transfers and intergenerational mobility. These companions identify which sources produce the gains, whether needs are met, how public policy contributes and whether successive cohorts move ahead. The secular finding is unequal participation in growth, with verified absolute improvements retained rather than suppressed.

SOURCES AND REPRODUCTION NOTES

[1] Congressional Budget Office (2026). The Distribution of Household Income, 2023. September 2026 release; annual observations 1979 through 2023, cumulative growth and income shares before and after public adjustments; verified retrieval 4 October 2026

[2] Congressional Budget Office (2024). The Distribution of Household Income in 2021. Methodological appendix household unit, square root equivalence ranking, population quintiles and statistical matching; verified retrieval 4 October 2026

[3] Melissa Kollar and Zach Scherer U S Census Bureau (2026). Income in the United States: 2025. P60 289 released 15 September 2026; 2025 real median money income 87,460 dollars and 2.6 percent increase; current price and population controls explained; verified retrieval 4 October 2026

[4] Congressional Budget Office (2025). Sensitivity of the Distribution of Household Income to Capital Gains, 1979 to 2021. Original presentation dated 6 March 2025; realized gains concentration and volatility sensitivity, endpoint 2021; verified retrieval 4 October 2026

[5] Congressional Budget Office (2026). Sensitivity of the Distribution of Household Income to the Treatment of Health Insurance From 1979 to 2021. Original report released 6 January 2026; income growth sensitivity and insurance resource cost methodology, endpoint 2021; verified retrieval 4 October 2026

[6] Rakesh Kochhar, Pew Research Center (2024). The State of the American Middle Class. Published 31 May 2024; population observations 1971–2023 correspond to income years 1970–2022, with both upward expansion and real gains. Verified for version two 4 October 2026.

[7] Rakesh Kochhar, Pew Research Center (2024). Methodology: The State of the American Middle Class. Defines median-based tiers, household-size adjustments, survey-year versus income-year timing, and separate regional-price treatment for the ACS demographic analysis. Verified for version two 4 October 2026.

[8] U.S. Census Bureau (Undated methods page, accessed 4 October 2026). About Income. Official money-income definition excludes capital gains and noncash benefits; it differs from wealth, consumption, and comprehensive after-tax resources. Verified for version two 4 October 2026.

[9] U.S. Census Bureau (Undated methods page, accessed 4 October 2026). Alternative Measures of Income Definitions. Official definitions identify government cash transfers within income; excluding noncash benefits does not make a money-income series pre-transfer. Verified for version two 4 October 2026.

RELATED CHAPTERS 033 · 035 · 036 · 037 · 038 · 041 · 042 · 043

CHAPTER 041

Absolute intergenerational income mobility

EVIDENCE STATUS **Historical evidence** · OBSERVATION SPAN United States birth cohorts 1940 to 1984 assessed at comparable adult ages

The probability that children exceed their parents real income fell substantially across successive birth cohorts even as aggregate production continued to grow.

What absolute mobility measures

Absolute intergenerational income mobility is the fraction of people whose inflation-adjusted income exceeds their parents income at a comparable age. Its numerator counts children who clear that threshold; its denominator includes all children in the population being studied. The resulting percentage is a statement about the distribution of improvements across families. An economy can become considerably richer while this fraction falls, because average growth and the breadth of household advancement are different quantities.

The comparison requires an explicit income unit. Household income includes a spouse or other members, whereas individual earnings describe the person receiving labor compensation. A rise in two-earner households can improve household mobility without improving the earnings prospects of each worker. Conversely, delayed marriage can reduce measured household advancement even when individual earnings rise. Both versions therefore deserve attention. The original long-run American study includes household comparisons and a separate sons-versus-fathers earnings comparison, allowing these questions to be distinguished. [1]

Age matters because income typically changes across adulthood. Comparing a child at thirty with a parent at sixty would mix intergenerational progress with career stages. Comparing both generations at approximately the same age reduces that problem. It still leaves differences in education duration, retirement expectations, marriage timing and career trajectories. A useful reading asks whether the observed loss of advancement persists when the comparison is shifted to later adulthood or adjusted for household size, rather than selecting the specification that produces the largest decline.

Absolute mobility differs from relative mobility. Relative mobility describes movement between positions in the income distribution, such as whether a child raised in the bottom fifth reaches the top fifth. In a fast-growing economy, everyone could remain in the same relative position while almost everyone earns more than their parents. In a stagnant economy, many people could exchange ranks while few clear their parents real income. These are separate dimensions of opportunity, and the reference should retain the distinction.

For post-labor analysis, this metric tests whether growth still delivers broad household advancement through the institutions of work, income and family. It does not directly measure labor hours, automation adoption or

the number of jobs. Its strongest contribution is to connect macroeconomic decoupling with an outcome people understand: the chance of achieving a higher material standard than the preceding generation.

The historical decline and its endpoint

Chetty and colleagues estimated that roughly 90 percent of Americans born in 1940 exceeded their parents real household income, compared with approximately 50 percent for children born in the 1980s. The earnings-only comparison for sons and fathers was steeper, falling from 95 percent for the 1940 cohort to 41 percent for the 1984 cohort. Their decomposition associates most of the decline with a less equal distribution of growth, with slower aggregate growth also contributing. The study appeared in Science in 2017. These are historical cohort estimates, not observations of people born in 2026. [1]

The time axis requires unusually careful labeling. A birth year is a cohort identifier, not the year in which adult income was received. A person born in 1984 reaches thirty in 2014. A figure ending with the 1984 cohort therefore summarizes adult outcomes substantially later than its horizontal label might suggest, while still having an observation endpoint well before the present. This lag is unavoidable when researchers follow people into adulthood. The chapter qualifies as multi-decade historical evidence, but the published result should never be extended to later cohorts through an unlabeled extrapolation.

Newer research can update the surrounding picture without replacing this metric. The Changing Opportunity project studies children born from 1978 through 1992 and finds different developments across class and racial groups. Its fourteen-year birth-cohort window is shorter than the twenty-year secular criterion used in this reference. It also measures a different set of outcomes. That research is useful for checking whether one national average hides improving trajectories for some groups and worsening trajectories for others. It should appear as complementary evidence, with its own time span and definitions. [2]

The Census Bureau released Income in the United States 2025 on 15 September 2026. Its annual income estimates provide a current cross-sectional check on household resources and earnings, but they do not link the same parents and children across generations. A record or rising median household income in that release would be compatible with historically lower absolute mobility. The two observations answer different questions: the current median describes a present distribution, while mobility describes advancement across linked generations. [3]

Comparison	Earlier cohort	Later cohort	Observed scope
Real household income exceeds parents	About 90 percent born 1940	About 50 percent born in 1980s	Comparable adult ages
Sons earnings exceed fathers	95 percent born 1940	41 percent born 1984	Individual earnings comparison
Current Census income release	Historical annual tables	Calendar year 2025	Cross sectional income not linked mobility

Historical mobility estimates from source 1 and current income release scope from source 3

Why aggregate growth can bypass advancement

A simple hypothetical illustrates the mechanism. Suppose a parent earns 40 units of real income and the average economy grows strongly. If the child receives 42 units, the child counts as upwardly mobile. If most

additional production accrues to other households and the child receives 38 units, that household counts as downwardly mobile even though national output rose. The question is therefore partly about the allocation of growth. A national production increase does not mechanically raise every child above a family-specific baseline.

This connects to post-labor through several channels. Automation can increase output per worker and the returns to productive assets. If ownership is concentrated, the additional income can accrue disproportionately to households already receiving investment income or high professional earnings. A displaced worker may find another position and remain employed while losing a wage premium or career progression. A lower probability of beating the previous generation can emerge through those changes without a proportionate increase in measured unemployment. These are mechanisms to investigate, rather than findings identified by the mobility series alone.

The parental threshold also becomes harder to clear when an earlier generation received unusually favorable growth, affordable assets or strong employment institutions. A child entering a slower-growing economy faces a different starting environment. This means absolute mobility contains information about both the child economy and the parent benchmark. Calling the metric an employment failure alone would discard that information. A complete interpretation considers productivity growth, the distribution of income, education costs, family composition and the resources the parent generation accumulated.

The ownership channel is especially relevant to distinguishing income from wealth. A child can inherit a valuable house and feel more financially secure without exceeding a parent earnings benchmark. Another child can earn more but struggle to acquire the same housing or retirement security. The income mobility metric is therefore best paired with housing affordability, inheritance flows and retirement provision. Those companion measures show whether nominal or inflation-adjusted income advancement translates into comparable access to assets and future security.

Absolute mobility also provides a bridge between institutional and production measures. Output per hour and capital services describe production. The labor share describes how income is divided between broad factors. Mobility describes whether the resulting incomes yield widespread advancement across generations. The sequence is analytically useful because each link can change independently. A stronger post-labor account would show related movement across the links while preserving their different denominators and avoiding a claim that every change has a single technological cause.

Competing explanations and tests of interpretation

Slower economic growth is a direct alternative explanation. When real income expands less rapidly, fewer people clear their parents income even if the distribution is unchanged. Distributional concentration is another explanation, and it can arise through taxation, financial markets, trade, employer bargaining power or differential returns to education. Automation may contribute to several of these channels, but the aggregate mobility statistic does not isolate its contribution. The original decomposition is informative about growth and distribution; it should not be relabeled as an automation experiment. [1]

Household changes deserve separate treatment. More adults living alone, changing marriage patterns, later family formation and differences in family size affect household income comparisons. Inflation adjustment also matters. A broad consumer price index treats the consumption bundle as a statistical average, while

younger families may face unusually high costs for entering housing, education or childcare. Analysts should show the main published specification and report its sensitivity checks. They should resist replacing a transparent national deflator with a hand-selected price series solely because it creates a preferred conclusion.

Composition can alter national results even when subgroup trajectories differ. If the shares of demographic groups change, the overall percentage can move because the population mix changed. Mobility analyses should therefore compare outcomes within parental income groups and relevant demographic categories where the source supports it. The newer linked-record research demonstrates why a uniform deterioration narrative is inadequate: opportunity can change differently across groups and places. Its existence is a reason to examine disaggregation, rather than to abandon the long-run national finding. [2]

The metric would become stronger evidence of labor-market compression if later linked cohorts show lower earnings mobility alongside losses of middle-income occupational opportunity, weaker wage premiums and reduced labor income shares. It would become weaker evidence if the decline is explained predominantly by slower aggregate growth or family composition while real individual earnings and employment security improve broadly. These are empirical discriminators. They allow the framework to be tested against observations rather than treating any unpleasant household outcome as confirmation.

Cross-country comparisons require harmonized definitions. Tax systems, household units, social insurance and parental income observation windows differ. OECD work on social mobility helps locate the concept in that wider institutional setting, but a chart should not combine incompatible percentages into a single international ranking. A low mobility level at one date and a decline over time are also distinct claims. The present entry concerns a verified American historical decline, with international material supplying interpretation rather than an invented global time series. [4]

Charting and updating the evidence

The preferred figure plots birth cohort on the horizontal axis and the percentage exceeding parental real income on the vertical axis. Label the axis explicitly as birth cohort and identify the adult comparison age in the subtitle. Use the original published data tables, available through the Opportunity Insights research page, and preserve the authors definitions. A second panel can show the sons-versus-fathers earnings comparison. Separate panels prevent household income and individual earnings from appearing interchangeable. [1]

Mark the last observed cohort clearly. Do not append the latest Census median income as though it were another point in the mobility curve. Put current income evidence in an adjacent table with its observation year and a label explaining that it is cross-sectional. Likewise, newer relative-mobility estimates should occupy a separate panel. A dashboard gains credibility when its series can disagree without being cosmetically forced onto the same trajectory. [2][3]

Updates should occur when comparable linked-generation research is released, not every month. Maintain a small record of the income definition, inflation adjustment, age window, parental observation method and subgroup coverage for each version. Preserve the original dataset when later research changes definitions, and note whether a new result extends the same series or introduces another measure.

Read this chart alongside household income growth distribution, working-age poverty before and after transfers, renter cost burden and inheritance flows. Together they distinguish advancement in earnings from access to necessities and assets. Absolute mobility remains a historical distributional outcome with a substantial observation lag. Its value is the evidence that the benefits of economic expansion have become less reliably shared across generations, while the companion metrics identify the production and institutional channels that may account for that result.

SOURCES AND REPRODUCTION NOTES

[1] Raj Chetty and colleagues at Opportunity Insights (2017). The Fading American Dream: Trends in Absolute Income Mobility Since 1940. Science 356 398 to 406 and downloadable original data tables; birth cohorts through the 1980s; verified retrieval 4 October 2026

[2] Raj Chetty Will Dobbie Benjamin Goldman Sonya Porter and Crystal Yang (2024 working paper and 2026 journal publication). Changing Opportunity: Sociological Mechanisms Underlying Growing Class Gaps and Shrinking Race Gaps in Economic Mobility. Original linked record study of birth cohorts 1978 to 1992; fourteen year cohort window is complementary short history; verified retrieval 4 October 2026

[3] United States Census Bureau (2026). Income in the United States: 2025. Released 15 September 2026; calendar year 2025 CPS ASEC income estimates; cross sectional series; verified retrieval 4 October 2026

[4] OECD (2018). A Broken Social Elevator? How to Promote Social Mobility. Institutional comparison of mobility concepts and evidence; not a current uniform international time series; verified retrieval 4 October 2026

RELATED CHAPTERS 035 · 040 · 042 · 043 · 044

CHAPTER 042

Renter housing cost burden

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN United States 1960 to 2024 with observed historical benchmarks and annual ACS updates

Rent consumes a larger share of many households resources than it did several decades ago making income from work less effective at securing an essential good.

Defining housing burden and its population

Renter housing cost burden measures the share of renter households spending more than thirty percent of their income on housing and utilities. Severe burden uses a threshold above fifty percent. The numerator counts households above the chosen threshold; the denominator is the renter population eligible for the calculation. A percentage describes prevalence, while a household count describes the number affected. Both are useful, but population growth can raise the count even when the percentage is unchanged. The Census Bureau and Harvard Joint Center for Housing Studies publish these measures using household survey data. [1][2]

Gross rent is broader than a landlords advertised rent. It includes the housing costs specified by the statistical source, commonly rent and utilities paid separately. The income denominator is also important. A household may combine wages, self-employment income, pensions, investment income and transfers. A burden ratio therefore measures pressure on household resources rather than pressure on wages alone. Analysts interested in the labor mechanism should supplement the all-renter result with working-age, employed-householder or earnings-specific comparisons where reliable data permit.

Treatment of households reporting zero or negative income can change results. A ratio cannot be calculated in the ordinary way when the denominator is zero. Some tabulations exclude those observations from their burden denominator; others classify them as burdened. No-cash-rent households require another convention. The JCHS historical presentation states its treatment explicitly, assuming zero or negative income households are burdened and households not required to pay rent are unburdened. These choices should be recorded beside the series rather than silently ignored. [2]

The thirty-percent threshold is a practical convention rather than a universal boundary of material hardship. Thirty percent of a high income leaves substantial resources for other needs; the same proportion of a very low income may leave too little for food, transport or healthcare. Severe burden gives a clearer signal of constrained budgets, while residual-income analysis asks how much remains after housing costs. A useful dashboard shows both ordinary and severe burden, together with household income bands.

The post-labor relevance lies in the conversion of distributed income into access to necessities. Productivity and asset values can rise while a growing share of households need more earnings simply to retain shelter. The metric belongs to the distribution and security side of the framework. It provides supporting evidence about the limits of income from employment; it does not establish that the economy needs fewer workers or that automation caused the housing shortage.

Long history with reversals and current observations

JCHS historical tabulations show ordinary renter burden at roughly one quarter in 1960 and the early 1970s, rising to 35 percent in 1980. The rate was around 47 percent in 2008 and 51 percent in 2011. It improved from approximately 49 percent in 2014 to 46 percent in 2019, then rose again during the pandemic period. These checkpoints establish a long deterioration with meaningful reversals. They support a secular comparison across decades, while contradicting a claim of uninterrupted annual worsening. [2]

The State of the Nations Housing 2026 reports 22.7 million cost-burdened renter households in 2024, or 49 percent, including 12.1 million with severe burdens, or 26 percent. These are the latest observations verified in that report at the reference cutoff. The reports publication year is 2026; the burden observations refer to 2024. A current housing-market commentary can contain newer rent or vacancy data without updating the historical household burden calculation. [3]

An independent Census release for 2023 reported that 49.7 percent of the renter households for which its calculation was defined exceeded the thirty-percent threshold. The denominator and tabulation rules differ from some JCHS presentations. Small discrepancies should therefore be investigated before being interpreted as changes in the economy. The safest long-run figure uses a single documented calculation across years and presents another sources latest estimate as a separate cross-check. [1]

The historical American Housing Survey provides another multi-decade source trail. A HUD-commissioned analysis of 1973 through 2005 records rental housing costs and burdens in appendix tables, allowing researchers to inspect an earlier survey rather than relying only on a modern retrospective chart. It should be treated as a separate series where questionnaire, sample or calculation methods differ. Convergent evidence across sources strengthens the finding; an unexplained splice can create a misleading appearance of precision. [4]

The empirical message is specific. The prevalence of rent burden is much higher than in the early historical benchmarks, and severe burden affects a substantial share of current renters. That does not mean every household has experienced worsening conditions continuously. Tenure transitions, changes in household income and the arrival of higher-income renters can alter the observed population. The measurement follows the distribution of renters at each date, not a fixed group of households across sixty years.

Observation year	Ordinary renter burden	Source scope
1960 and early 1970s	About 25 percent	Historical JCHS tabulations
1980	35 percent	Historical JCHS tabulations
2011	51 percent	Historical JCHS tabulations
2019	46 percent	Historical JCHS tabulations
2024	49 percent	JCHS 2026 report

Selected published observations only with no interpolation sources 2 and 3

How housing pressure interacts with labor income

Consider a hypothetical renter earning 3,000 units per month. Housing and utilities costing 900 units create a thirty-percent burden; costs of 1,500 create a fifty-percent burden. If wages rise by ten percent while housing

costs rise by twenty percent, the household can receive a larger paycheck yet have less room for other spending. This arithmetic illustrates why average earnings growth and improvements in financial security need separate observation. It does not describe an actual sample household.

A post-labor transition could exacerbate that squeeze through the distribution of income. If productivity gains increasingly accrue to owners while typical workers receive smaller shares, renters may face a combination of limited income growth and rising asset-related costs. Losses of predictable hours or benefits can make a fixed monthly rent harder to manage even when annual income is unchanged. Housing burden then becomes a concrete measure of the consequences of weakened labor income distribution rather than a technological exposure measure.

The housing supply mechanism can run independently. In a city with attractive jobs and restrictive construction, additional income may bid up a scarce stock of homes. Existing landowners benefit, while renters must devote more resources to the same location. This is an ownership and scarcity problem that can occur during strong employment growth. A credible post-labor account should connect it to broader ownership and distribution patterns while acknowledging that increasing housing supply can improve the result without changing automation adoption.

Location also determines access to opportunity. A household unable to afford housing near expanding employers may face expensive commuting or be excluded from the relevant labor market. This creates a feedback between housing pressure and job access. Workers can be employed in aggregate while geographic barriers reduce their practical choice of jobs. A national renter burden percentage cannot identify this mechanism by itself, but regional burden maps combined with employment growth and commuting costs can investigate it.

Housing burden helps interpret transfer dependence too. Public income support can raise the denominator and reduce observed burden. Rental assistance can reduce out-of-pocket costs. If burden remains elevated despite those supports, households may face a stronger underlying squeeze than a wages-only comparison suggests. Conversely, rising transfers can make the observed ratio improve even when market earnings weaken. Tracking the composition of income and assistance prevents the burden chart from being used as an isolated confirmation signal.

What the chart can and cannot establish

The principal alternatives are concrete: insufficient construction, land-use restrictions, financing conditions, construction costs, demographic demand and changes in rental quality. Each can push housing costs relative to household income. Automation can also reduce costs in construction or administration, potentially easing the squeeze. A theory that predicts every technology change must worsen housing affordability would therefore be too crude. The actual effect depends on supply response, ownership and the institutions through which productivity gains are passed through.

Household composition requires special attention. If more affluent households rent because buying is difficult, the renter population becomes richer and the aggregate burden ratio may improve without conditions improving for existing low-income renters. If higher-income renters become homeowners, the remaining renter population may become poorer and burden may rise. Income-band or percentile

comparisons help distinguish these shifts. They do not fully solve the issue because a dollar-income band changes purchasing power over time unless it is inflation-adjusted.

Housing quality complicates comparisons across generations. More space, amenities or utilities can raise observed costs while providing better living conditions. Analysts should examine costs for comparable housing and geographic areas where possible. At the same time, the ability to afford a changing standard of decent shelter is a legitimate social question. Holding quality constant answers a price question; evaluating contemporary adequate housing answers a security question. The chapter keeps those interpretations distinct instead of treating one as automatically invalid.

The post-labor interpretation strengthens if renter burden rises within comparable working-age income groups while typical real earnings, hours security or labor compensation shares weaken. It weakens as a direct labor-demand indicator if the trend is explained mainly by supply constraints during broad improvements in wages and employment security. Both findings would still matter for institutional design. An economy that distributes income reasonably well can nevertheless distribute housing poorly, and that problem deserves its own diagnosis.

Survey uncertainty and definition changes should be visible in technical notes. ACS estimates have sampling error, especially for small areas. Five-year pooled data improve precision but smooth over timing; one-year estimates capture changes more directly for sufficiently large populations. Historical decennial benchmarks should be shown as observed points. The JCHS long historical chart includes estimates between some benchmarks, so a reproduced figure must distinguish those from direct observations. [2]

Reproducing and monitoring the measure

Use a two-line figure showing ordinary and severe burden as percentages of renter households. Set the vertical scale from zero to one hundred to preserve the prevalence interpretation. Add a small table of affected household counts for the latest year. A separate lower panel can show the distribution by inflation-adjusted income band. Avoid a graph of counts alone, which confounds population growth with changes in the chance of being burdened.

For reproduction, begin with the published JCHS data downloads or the underlying ACS tables and document rent, utilities, income and exception rules. Record the observation year, release date and survey version. Preserve the historical source notes for decennial benchmarks. Use Census and the American Housing Survey as checks with clearly separated definitions, rather than automatically concatenating their estimates. The 2026 JCHS report provides data and charts through its accompanying resource page. [3][4]

Update after comparable annual household estimates arrive. New monthly rental-price indexes can indicate near-term pressure, but should remain leading or contextual indicators until a household-income denominator is available. Changes in the burden ratio can arise from rent, income or both; a monitoring note should identify which component moved where the source permits.

Read the result with home prices relative to income, working-age poverty, household income composition and transfer dependence. Those measures explain whether shelter pressure is associated with earnings distribution, asset ownership or public support. Renter burden belongs in the evidence set as a durable

indicator of household security and access to an essential good, with a verified multi-decade deterioration and visible periods of improvement.

SOURCES AND REPRODUCTION NOTES

[1] United States Census Bureau (2024). Nearly Half of Renter Households Are Cost Burdened Proportions Differ by Race. Released 12 September 2024; 2023 ACS observations and denominator; verified retrieval 4 October 2026

[2] Whitney Airgood Obrycki Harvard Joint Center for Housing Studies (2024). Rental Housing Unaffordability: How Did We Get Here?. Original Census and ACS tabulations with observed historical benchmarks 1960 to 2022; interpolation rules disclosed; verified retrieval 4 October 2026

[3] Harvard Joint Center for Housing Studies (2026). The State of the Nation's Housing 2026. 2024 renter burden observations on report pages 5 and 31 to 32; accompanying data available at https://www.jchs.harvard.edu/state-nations-housing-2026; verified retrieval 4 October 2026

[4] Frederick Eggers and Alexander Thackeray for United States HUD (2007). 32 Years of Housing Data. Revised October 2007; American Housing Survey 1973 to 2005 appendix tables A17 and A18; separate historical series; verified retrieval 4 October 2026

RELATED CHAPTERS 033 · 035 · 037 · 043

CHAPTER 043

Home prices relative to household income

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN United States 1990 to 2025 in the verified JCHS comparison with longer official price and income series available

The purchase price of housing has risen relative to household income over the long run separating access to an important asset from progress in current earnings.

A ratio of an asset price to an income flow

The home-price-to-income ratio divides a representative dwelling purchase price by a representative annual household income. Its units are years of income, although the ratio does not imply that a household can buy a home by devoting that many years of gross income to the purchase. A ratio of five means the selected home price equals five times the selected annual income. Taxes, living expenses, financing and maintenance remain outside this simple comparison. The value is a transparent indication of how an asset-entry price relates to resources distributed each year.

The numerator can be the median transaction price, a quality-adjusted price index or an estimate of the value of the existing housing stock. These are different measures. A median sale price changes when the types of homes sold change, while an index attempts to track price movement for more comparable properties. New-home and existing-home markets also cover different stocks. Analysts must state which numerator they use and should avoid switching between them when comparing historical affordability.

The income denominator may describe all households, owner households, renter households or households in a particular region. A national median-home-price divided by national median-household-income is a summary of two distributions, not the observed experience of a median family purchasing a median house. The households buying homes differ from all households. For access analysis, a separate comparison with renter income can be useful because renters are potential first-time entrants. Such a version should carry a different label and retain its own historical denominator.

Both price and income should refer to the same geography and consistent observation period. Dividing a metropolitan home price by national income can exaggerate or understate local access. Since both inputs are normally measured in current dollars, their ratio can be calculated without separately deflating them. If the two components are charted in levels, inflation adjustment becomes necessary for meaningful long comparisons. The methodological record should also identify annual averages versus year-end observations.

This measure complements renter burden. Renter burden examines the cost of current shelter relative to income, while the price-to-income ratio examines entry into ownership. A household can afford rent but remain unable to acquire the asset, or purchase during a favorable period and later enjoy low fixed financing costs. Those differences explain why ownership access is a distinct dimension of household security rather than another label for the same affordability statistic.

The verified long comparison and available sources

The State of the Nations Housing 2026 reports that the median price for an existing single-family home in 2025 was nearly five times median household income, compared with an average ratio of 3.2 throughout the 1990s. Its accompanying resources offer metropolitan home-price-to-income comparisons from 1990 through 2025. The endpoint concerns calendar year 2025 and the report was published in 2026. This supports a multi-decade increase, while the housing boom, crash and later recovery prevent a monotonic interpretation. [1]

The Census Bureau supplies long household-income tables alongside its current annual report. Income in the United States 2025 was released on 15 September 2026 and distinguishes money income from post-tax income. A researcher reproducing an annual price-to-income comparison should check which version the original housing study uses. Updating the denominator to a newly published income concept without recalculating historical years can generate an artificial shift. Income comparisons should also distinguish real change from revisions to survey processing or inflation adjustment. [2]

Official house-price indexes offer an independent view of housing asset values. The Federal Housing Finance Agency publishes national and regional indexes with documentation of the underlying transactions and statistical construction. A price index can be divided by a consistently rebased household-income index to show relative growth, but that indexed result is different from years of income. The former answers how the relationship changed; the latter expresses the current scale of a representative purchase. [3]

The Census Bureau and HUD also publish sales prices for new residential properties. That source is useful for checking the new-home market, whose construction and composition may differ from existing-home transactions. It should remain a separate panel or comparison. A median new-house price does not automatically validate the exact existing-home ratio reported by JCHS, and the differences can reflect larger homes, different locations or changing buyer composition. [4]

The historical interpretation should preserve the shape of the series. A rise over several decades can include a period in which ownership became easier because prices declined or incomes rose. In that case the metric still documents a long structural change, but it also demonstrates that institutions, credit conditions and construction can move the outcome in the opposite direction. The secular criterion asks for a sustained historical pattern across a sufficient window, not a line that never experiences relief.

Series	Verified period or endpoint	Interpretation
JCHS existing home price to household income	1990s average 3.2 and 2025 nearly 5	Published national long comparison
JCHS metropolitan ratios	1990 to 2025	Geographic access comparison
Census household income report	Calendar year 2025 released September 2026	Current denominator source
FHFA house price indexes	Historical and current quarterly indexes	Quality adjusted relative price check

Source 1 supplies the reported ratio sources 2 to 4 provide independent components and methods

Why ownership access matters for post labor economics

Homeownership illustrates the distinction between income distribution and capital access. Workers receive income over time, while buyers acquire a durable asset through accumulated savings and borrowing. If the asset price rises faster than annual resources, the threshold for entry increases. Existing owners can receive a capital gain while households relying on wages face a larger down payment and financing requirement. The same price movement can therefore strengthen one households balance sheet and weaken another households access to comparable security.

A hypothetical comparison makes the distinction concrete. Suppose a home costs 150 units and annual household income is 50 units, giving a ratio of three. Later the home costs 250 units while income rises to 60 units, giving a ratio above four. The household earns more than before but must save more for the same down-payment percentage. If a parent gives the buyer part of that deposit, family wealth helps bridge the gap. This arithmetic explains why home prices and inheritance flows can jointly reveal increasing dependence on already accumulated assets.

In a post-labor framework, automation can expand productive output while concentrating additional claims on income and wealth. Housing is one possible place those claims are stored. Its supply often adjusts slowly, so additional purchasing power among asset-rich households can support prices even when ordinary wage gains are modest. The resulting ownership barrier can coexist with high employment. This is a plausible distributional mechanism, and it must be distinguished from an identified estimate that automation caused house prices to rise.

Financing changes the practical burden. A high price-to-income ratio can coincide with low mortgage interest rates, producing smaller monthly payments than the purchase price alone suggests. A lower ratio at a high interest rate can still be difficult for new buyers. The down-payment barrier persists even when monthly financing is cheap. A complete access dashboard should therefore show purchase price relative to income, required deposit relative to income and a mortgage-payment calculation under a stated rate and loan term.

Ownership also influences future resilience. A fixed-rate mortgage can stabilize one major payment while rents continue to change. Equity may provide resources in retirement, although maintenance, insurance and property taxes remain substantial costs. Because workers enter ownership at different dates and prices, a national ratio cannot describe all owners equally. The metric matters most for entrants and households attempting to move, and it helps explain why income progress can be experienced differently by people with similar wages but different asset histories.

Competing causes and limits of interpretation

Housing supply constraints are the leading alternative explanation. Land-use rules, permitting delays, limited infrastructure, expensive construction and scarce desirable locations can push purchase prices above what typical income growth would otherwise sustain. Population movement and household formation can change demand. Mortgage credit and interest rates influence bidding capacity. These mechanisms can produce a higher price-to-income ratio even in an economy where wages and labor demand are strengthening. The metric should therefore support an ownership-access diagnosis before it supports a technological one.

Quality and composition matter. If larger or more expensive homes dominate transactions, a median sale price can rise without the same increase in prices for an unchanged dwelling. Likewise, the types of households represented in the income median can change. A quality-adjusted index and regional disaggregation help test whether the increase is broad or driven by mix. These checks require additional data and should be presented as refinements rather than as grounds for inventing a single perfectly comparable historical ratio.

The ratio also omits the distribution of income and wealth. A small group of high-resource buyers can purchase homes priced far above national median income, while lower-income households remain renters. Cash buyers need not finance the same share of a purchase as first-time borrowers. A rise in the national ratio can thus reveal a changing marginal buyer rather than an identical deterioration for every household. That possibility is relevant to the post-labor ownership thesis, but it needs evidence about buyer resources and wealth transfers.

The interpretation strengthens if entry costs rise relative to wages for comparable working-age households and if access increasingly depends on parental transfers, existing equity or investment wealth. It becomes weaker evidence of labor-market compression if the change is mainly a local housing shortage while broad earnings and job security improve. A falling ratio would count as improvement in this dimension even if labor-share trends worsen elsewhere. A serious reference permits that disagreement because asset access and production intensity are separate measurements.

Claims about a universal generational loss should remain bounded by geography and timing. Some markets have lower prices, and buyers entering after a downturn can face favorable conditions. The national long-run result does not erase those cases. It establishes a broader increase in a specific access threshold. Policies increasing construction, reducing financing costs or distributing ownership can improve that threshold without reversing productivity growth, which makes this measure particularly useful when moving from evidence toward institutional solutions.

Chart design and a reproducible update process

The primary chart should show the published annual ratio for a consistent housing market and household-income definition. Use years of household income on the vertical axis. A second panel can show an indexed house-price series and indexed household income, both rebased to the same year, to make the relative movement visible. Label that panel as an index comparison rather than years of income. Do not treat a median transaction price as a quality-adjusted price index.

Maintain separate national and metropolitan panels. The regional view should match prices and income within each area, using stable geographic definitions or a documented crosswalk. Summaries can show the median metropolitan ratio and the share of markets above a chosen access threshold, but the threshold is an analyst choice and should be marked accordingly. The JCHS accompanying data provide a starting point for the verified 1990 to 2025 comparison. [1]

For annual updates, record the numerator source, housing type, income concept, observation period and revision date. For higher-frequency monitoring, combine quarterly price information with the latest available annual income only when the stale denominator is explicitly disclosed. A mortgage-payment scenario should

state interest rate, term, deposit and included costs. It is a scenario calculation rather than a directly observed household burden.

Interpret the result alongside renter burden, inheritance flows, wealth ownership and absolute income mobility. This combination reveals whether work-generated income can secure shelter today, enable asset entry and support advancement across generations. Home prices relative to income remain supporting evidence of changing access to capital, with strong reasons to investigate the role of supply and credit before assigning the change to automation.

SOURCES AND REPRODUCTION NOTES

[1] Harvard Joint Center for Housing Studies (2026). The State of the Nation's Housing 2026. National existing single family home ratio 2025 compared with 1990s average on report page 3; metropolitan resource series 1990 to 2025; verified retrieval 4 October 2026

[2] United States Census Bureau (2026). Income in the United States: 2025. Released 15 September 2026; money income and post tax income concepts and current annual estimates; verified retrieval 4 October 2026

[3] Federal Housing Finance Agency (2026). House Price Index. Official historical and current house price indexes and methods; used for independent indexed comparisons rather than an asserted current ratio; verified retrieval 4 October 2026

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RELATED CHAPTERS 037 · 041 · 042 · 044

CHAPTER 044

Inheritance and gift flows

EVIDENCE STATUS **Historical evidence** · OBSERVATION SPAN Italy 1995 to 2016 France 1950 to 2010 and selected inherited wealth comparisons through 2010

Verified European series show inherited resources becoming more important relative to current income while a current comparable United States flow series was not established in this review.

Separating inherited flows from inherited wealth

Inheritance and gift flows measure resources transferred between people across generations, commonly through bequests at death and gifts during life. A flow series records what changes hands during a year. It can be expressed in currency units, per recipient, as a share of national income or relative to the stock of private wealth. Each version answers a different question. Transfers relative to national income compare resources transmitted through ownership with resources generated during current production.

The numerator requires explicit boundaries. Some datasets cover estates reported for tax purposes, some cover what beneficiaries report receiving, and some estimate transfers missing from administrative records. Gifts made during life may be taxed separately or incompletely recorded. Transfers can include cash, housing, securities, businesses and other assets. Their value depends on the valuation date and method. A comprehensive label should identify whether gifts are included and whether the observation is an administrative total or an estimate adjusted for coverage.

Inherited wealth is a stock concept. It asks how much current wealth can be attributed to previous inheritances, sometimes adding returns accumulated after receipt. The answer depends on treatment of those returns, subsequent consumption and transfers to later heirs. Two studies can produce different inherited-wealth shares while observing the same original transfers if they make different capitalization assumptions. The OECD report explains these distinctions and assembles evidence across countries, which is valuable for locating compatible measures before charting them. [1]

Recipient prevalence is another separate measure: the proportion of households that have ever received an inheritance or gift. A high prevalence does not imply large amounts, and a low prevalence can coexist with substantial flows concentrated among a small group. Distribution by recipient income or wealth helps assess who gains access to assets. Age deserves its own treatment because inheritances often arrive after people have accumulated other resources or passed their early working years.

For post-labor economics, the metric concerns allocation of purchasing power and ownership through family assets. It is relevant when employment becomes a less reliable route to the resources needed for housing, investment and retirement. An inheritance can support a household without the recipient producing a corresponding amount of current labor. That is a distributional channel, not direct evidence that productive work has become unnecessary. The framework benefits from measuring it alongside income from labor and broadly shared forms of ownership.

Verified secular histories and their age

Original research using Italian inheritance-tax records documents inheritance and gifts rising from 8.4 percent of national income in 1995 to 15.1 percent in 2016. The twenty-one-year observation span clears the secular criterion. The research was circulated in 2020; the empirical endpoint remains 2016. The number should be described as an Italian historical flow estimate, including the authors adjustments and coverage conventions, rather than as a current European or American rate. [2]

Pikettys original French long-run study describes annual inheritance flows falling below five percent of national income around 1950 and returning to roughly fifteen percent by 2010. It uses a much longer historical framework and also discusses future scenarios. Only the historical portion belongs in an observed secular-evidence chart. A projection to 2050 cannot be treated as an observed continuation, even when the same figure combines historical estimates and modeled futures. [3]

The OECDs 2021 assessment presents estimates of inherited wealth as a share of private wealth across selected countries, including comparisons through 2010. It reports differing patterns across countries rather than a universal rise. These stock estimates provide international context but should remain separate from the Italian annual-flow ratio. A chart combining both without a clear change in units would appear to corroborate a single measure while actually plotting two different concepts. [1]

A U.S. snapshot is available in CBOs family-wealth analysis using 2022 survey data. Seventeen percent of families in the bottom income third reported ever receiving an inheritance, compared with twenty-eight percent in the top third. Average amounts among recipient families were also higher in the top third. That cross-sectional evidence illustrates unequal access; it does not establish a multi-decade increase in U.S. annual inheritance flows. [4]

The evidence set therefore has an important boundary. The verified trend is strong for specified historical country series, while the most current U.S. source in this review supplies distributional detail rather than the same longitudinal flow measure. A future update should seek a comparable administrative or carefully reconstructed U.S. series. Until then, the chapter supplies historical and international support for ownership-based allocation, with explicit observation endpoints rather than an inferred present-day number.

Country and measure	Earlier observation	Later observation	Interpretive boundary
Italy inheritance and gifts divided by national income	8.4 percent 1995	15.1 percent 2016	Observed historical flow estimate
France annual inheritance divided by national income	Below 5 percent around 1950	About 15 percent around 2010	Historical estimate separate from projections
United States ever inherited by income third	Bottom third 17 percent	Top third 28 percent in 2022	Cross sectional distribution not a trend

Original evidence sources 2 and 3 and current distribution snapshot source 4

The ownership pathway to household resources

A hypothetical illustrates the scale distinction. Suppose a country generates 1,000 units of national income during a year and families transfer 100 units of assets to heirs. The flow ratio is ten percent. Those transferred assets need not have been produced during that year, and the transfer is not an addition to GDP

simply because ownership changes. If national income grows slowly while valuable accumulated assets pass between generations, the ratio can rise even without a sudden change in the number of people inheriting.

This matters because labor income and asset transfers serve different functions. Earnings generally arrive incrementally, while a gift can provide the deposit necessary to acquire housing or the equity necessary to start a business. Two workers with equal wages can therefore have sharply different opportunities if one receives family assets and the other does not. A labor-income comparison alone would miss that difference. Inheritance flows help show how accumulated ownership can determine access to future capital and economic security.

Automation can be relevant through the value and income of productive assets. If scalable capital generates a larger stream of returns, owners may accumulate more wealth to transmit. Their heirs then receive claims on future income without matching current labor contributions. This is a plausible connection to post-labor distribution. The inheritance series itself does not identify which assets gained value through automation, and much inherited wealth consists of housing or other assets whose valuations reflect additional forces.

Public ownership can alter the same allocation problem. A household relying solely on family inheritance receives resources according to its ancestry. A citizen fund or public wealth mechanism can distribute asset-derived benefits under different rules. The presence of significant private wealth transmission therefore clarifies why the design of ownership institutions matters in a productive economy. It does not demonstrate that any particular public mechanism will succeed; the relevant comparison concerns access, governance and who receives the returns.

The channel also interacts with retirement and timing. If heirs receive assets late in life, inheritances may improve retirement resources while providing little assistance with education or a first home. Gifts made earlier can have stronger effects on asset entry. A total annual flow can hide this timing distinction. A deeper dashboard would separate age at receipt, transfer type and recipient resources, allowing analysts to see whether inheritance supplies early opportunity, later security or concentrated wealth at the top.

Demography valuation and causal boundaries

Demographic change can raise the flow ratio without a technological explanation. A large generation reaching older ages can increase the number of estates. Longer lives can increase the age of heirs and alter accumulated assets. Smaller families can leave fewer recipients sharing a given estate. An inheritance series should therefore be read with deaths, age structure and household composition. These variables provide concrete alternatives to a story driven exclusively by labor substitution.

Asset-price changes are equally important. A home or portfolio can appreciate while labor income changes modestly, raising the value eventually transferred. Low interest rates, housing scarcity, financial conditions and tax policy can affect those prices. A rising inheritance-to-income ratio can thus reflect wealth valuation rather than a greater volume of productive assets. The appropriate response is to examine asset composition and distinguish market revaluation from saving and capital formation, rather than excluding the series because it contains several mechanisms.

Administrative records have coverage limits. Estate-tax thresholds, exemptions, avoidance and gifts outside the reporting system can change the population observed. A reform raising the exemption may reduce

reported estates even if total transfers rise. Researchers often adjust for unobserved estates or link tax data with demographic information. Those adjustments should be described at the level necessary to interpret the published estimate. Reproduction should preserve the original methodology instead of treating taxable totals as comprehensive social totals.

Inheritance can increase absolute wealth inequality while reducing relative inequality for some recipients. A modest gift can be a large fraction of a low-wealth households assets even when wealthy households receive larger amounts in currency units. The sign of an inequality effect depends on the measure and population. The post-labor relevance is therefore broader than a blanket claim that every inheritance increases every inequality statistic. It concerns the role of prior ownership in determining current resources and opportunity.

The interpretation strengthens if observed flows grow relative to income over compatible long windows and if family transfers increasingly determine asset entry or lifetime resources. It weakens if the apparent change comes mainly from tax-record discontinuities or a temporary asset-price cycle. Evidence that broadly distributed inheritance improves access should also be retained. A reference that tracks allocation mechanisms must be able to describe both concentration and diffusion, rather than assigning all capital-related changes the same negative meaning.

Monitoring a slow moving allocation mechanism

Chart annual inheritance and gift flows as a share of national income for one country at a time. Use observed points or the authors published historical estimates, distinguish modeled adjustments, and visually separate projections. A second chart can show recipient prevalence or amounts by income group. Keep inherited-wealth stock shares in another panel with their capitalization method identified. None of these series should be converted into one continuous global line.

The update record should identify tax thresholds, reporting coverage, asset valuation, included gifts and the denominator source. Where the series is reconstructed by researchers, archive the published dataset and code when available. Where only cross-sectional survey information is current, label it as a distribution snapshot and retain the older flow endpoint. Current media forecasts of a future wealth transfer are scenarios and cannot substitute for observed administrative evidence.

Updates may arrive infrequently because comprehensive inheritance data require administrative processing or original research. That does not diminish the historical trend, but it limits short-term monitoring. An annual dashboard should state the age of the latest observation and look for compatible new research rather than filling missing years with assumed continuation. The U.S. distribution snapshot can be refreshed as new Survey of Consumer Finances or CBO analyses become available. [4]

Pair inheritance flows with home prices relative to income, household income composition, ownership concentration and absolute intergenerational mobility. These relationships reveal whether family assets supplement, replace or amplify opportunities created through employment. The chapter contributes a verified ownership-based allocation pathway to the post-labor evidence set while keeping country scope, data age and causal interpretation explicit.

SOURCES AND REPRODUCTION NOTES

[1] OECD (2021). Inheritance Taxation in OECD Countries Household Wealth and Inheritances. Flow and stock concepts and international inherited wealth comparisons including 1990 to 2010; verified retrieval 4 October 2026

[2] Paolo Acciari and Salvatore Morelli (2020). Wealth Transfers and Net Wealth at Death Evidence from the Italian Inheritance Tax Records 1995 to 2016. Original author institution summary linking research; NBER working paper 27899 indexed primary PDF https://www.nber.org/system/files/working_papers/w27899/w27899.pdf returned 403 on direct fetch; verified summary 4 October 2026

[3] Thomas Piketty (2011). On the Long Run Evolution of Inheritance France 1820 to 2050. Quarterly Journal of Economics original paper; historical evidence through 2010 is separate from projected years; verified retrieval 4 October 2026

[4] Congressional Budget Office (2024). Trends in the Distribution of Family Wealth, 1989 to 2022. 2022 inheritance recipient prevalence by age and family size adjusted income thirds; snapshot is not a historical inheritance flow series; verified retrieval 4 October 2026

RELATED CHAPTERS 037 · 039 · 041 · 043

CHAPTER 045

Household debt relative to income

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN United States quarterly observations 1980 to second quarter 2026

Household debt rose strongly relative to disposable income before 2008, then declined substantially, leaving a mixed long history that does not support continuous financial deterioration.

Debt stocks and income flows

The household debt to income ratio divides outstanding household debt by disposable personal income. The Federal Reserve publishes this relationship in its Financial Accounts of the United States. Debt is a balance sheet stock at a date; disposable personal income is a flow measured over time. With annualized income in the denominator, a ratio of 0.90 means debt equivalent to about nine tenths of one year's aggregate disposable income. It does not mean that households spend 90 percent of each paycheck on debt payments. The latter is a different metric, the debt service ratio. [1][2]

Disposable income includes several sources beyond employee earnings. It reflects income after personal current taxes, including relevant property income and transfers. Consequently, debt relative to disposable income asks whether the household sector's liabilities have become larger relative to its total available income flow. A debt to labor earnings ratio would ask a narrower question about reliance on employment to support liabilities. Comparing these denominators can be informative, provided the definitions remain explicit and both are available on a consistent basis. [1]

Aggregate debt divided by aggregate income also differs from the median household's own debt to income ratio. Households without debt contribute income to the denominator, while heavily indebted borrowers contribute disproportionately to the numerator. Two economies can have the same aggregate ratio with very different concentrations of repayment risk. The Survey of Consumer Finances offers a complementary household level perspective, including debt ownership, balances, assets and family characteristics. Its latest completed published survey at this cutoff is 2022, released in October 2023. [3]

The type and purpose of debt matter. A mortgage normally accompanies an asset and provides access to housing services; consumer borrowing can finance durable goods, education or current consumption. Debt accumulated to buy an appreciating asset carries a different balance sheet implication from repeated borrowing to meet routine bills. Neither distinction guarantees affordability. A useful reference therefore records debt composition, collateral, interest terms, delinquency and income distribution alongside the aggregate ratio. The Financial Accounts supply the macroeconomic backbone, while household surveys reveal who is exposed. [1][3]

A rise followed by substantial reversal

The Federal Reserve's current chart data show household debt at 0.67 times disposable personal income in the fourth quarter of 1980, rising to 1.34 in the fourth quarter of 2007. By the second quarter of 2026, it

stood at 0.90. These observations cover more than four decades, but their shape matters more than the length alone. The precrisis rise is substantial historical evidence of increasing leverage. The subsequent decline is equally substantial evidence against a claim that debt dependence has continued to intensify along a single uninterrupted path. [1]

The current endpoint belongs to the Financial Accounts release of 11 September 2026. It measures the second quarter, rather than conditions on the publication date or the October research cutoff. Retain that lag in labels. The published ratio is rounded, so changes calculated from displayed values should be described with suitable precision. Using these checkpoints, 2026 leverage remained above the early 1980s level and below the precrisis peak. Both comparisons are true; choosing one without showing the other would distort the evidence. [1]

The period after 2007 should be analyzed as a distinct regime. A falling ratio can reflect debt repayment, writeoffs, weaker credit expansion, faster nominal income growth, or combinations of these forces. The ratio alone cannot allocate the change among them. Its arithmetic is particularly sensitive when nominal income rises quickly: liabilities may continue increasing in dollars while becoming smaller relative to income. Reports of record nominal debt therefore need a denominator before they can establish greater aggregate burden. [1]

The long series also should not be confused with a direct record of household distress. A sector can reduce leverage because families strengthen their finances, because lenders restrict access, or because previously indebted households experience default. To decide among these accounts, consult flow measures and surveys rather than infer the cause from one stock ratio. The Financial Accounts distinguish changes in household debt by broad category, and the Survey of Consumer Finances provides repeated cross sections from 1989 through 2022. Their different frequencies and units should remain visible. [1][3]

Observation	Debt divided by disposable income	Interpretation
Fourth quarter 1980	0.67	Early verified checkpoint
Fourth quarter 2007	1.34	Precrisis high checkpoint
Second quarter 2026	0.90	Latest verified observation

Federal Reserve Financial Accounts current accessible chart data; stock divided by annualized disposable income, rounded as published. [1]

How borrowing relates to employment security

Within post labor economics, debt can be a bridge between current earned income and access to essential goods. When housing, training or consumption costs rise faster than earnings for a group, borrowing may let households maintain access temporarily. That mechanism is plausible, but the aggregate ratio is an indirect test. It does not establish that automation caused borrowing, that employment income fell, or that every borrower used credit to compensate for weak wages. Those claims require evidence on income, expenditure and the purpose of new loans.

A hypothetical example makes the distinction concrete. Suppose a family's annual disposable income remains 60,000 units while the price of a home and its mortgage rise from 180,000 to 240,000 units. Its mortgage to income ratio increases from three to four. This could reflect a housing access problem without any

deterioration in the number of hours employed. If the same family borrows to purchase a business that produces reliable additional income, a higher initial ratio may accompany improved future security. The debt statistic captures financing exposure, while the economic interpretation depends on the asset and subsequent income.

The relevant post labor proposition is that labor earnings may become less sufficient to acquire a secure position in the economy. Debt is one possible adjustment margin, alongside transfers, capital income, increased hours, delayed purchases and family assistance. A persistent rise in borrowing among households with stagnant earned income would strengthen this interpretation. A stable aggregate ratio with worsening leverage among young renters or lower income borrowers could also matter. That distributional claim should be demonstrated with comparable survey estimates rather than inferred from national totals. [3]

Debt can amplify an income shock because payments persist when employment earnings fluctuate. The severity of that amplification depends on scheduled payments, cash reserves, refinancing options and income insurance. A household with long maturity debt and substantial savings can carry a large balance comfortably; another with a smaller balance and an unstable income may face acute stress. This is why debt to income and debt service belong together. The first measures accumulated obligations, while the second measures the current required claim on disposable income. [2]

The reversal since 2007 imposes a useful discipline on the framework. If post labor is understood as increasing compression of access to good jobs, the theory must explain how households adjust when aggregate leverage falls. Possible responses include reduced consumption, larger transfers, delayed household formation or stronger income growth. The debt series cannot select among them. Its contribution is to constrain an overly simple account in which the system necessarily sustains living standards through ever increasing borrowing.

Alternative explanations and distributional limits

Credit supply, housing finance and regulation can change debt independently of labor demand. Mortgage availability, repayment rules, lending standards and the treatment of default affect both how much households can borrow and how long balances remain outstanding. Housing prices influence the amount needed to purchase a home. Interest rates influence demand for borrowing and the payment required on a given balance. These mechanisms should be evaluated alongside wage and employment trends before attributing historical leverage growth to production automation.

Population composition introduces another ambiguity. Debt is typically associated with particular stages of the life cycle, while income and assets vary across age groups. A change in the age composition of borrowers can alter an aggregate ratio even if debt exposure within each group is stable. Household level monitoring should therefore report age bands, homeownership status, income groups and family structure. Comparisons across Survey of Consumer Finances waves require the survey's weights, multiple imputations and sampling procedures; treating its raw records as a simple random sample would misstate both levels and uncertainty. [3]

Averages can hide credit exclusion as well as financial strain. If lenders stop lending to low income households, their debt balances may fall despite worsening access to housing or transportation. Conversely, a rise in credit access may increase balances while improving the ability to smooth temporary income shocks.

The desired interpretation is consequently conditional: higher debt is concerning when repayment risk, interest burden or dependence on uncertain earned income rises, while lower debt is reassuring when it reflects stronger balance sheets and adequate access to needed goods.

The denominator also prevents a pure employment interpretation. Transfers and capital receipts can support disposable income even when labor earnings stagnate. A falling debt to disposable income ratio might therefore coexist with increasing reliance on public support. That combination would be relevant to post labor distribution, although it would demonstrate a different channel from private credit accumulation. Cross reference national transfer dependence and household income composition to identify which income source supports the ratio. Do not mechanically relabel every improvement in an income inclusive measure as a hidden deterioration.

The strongest contrary evidence would be broad improvements across borrower groups: lower leverage, lower delinquency, manageable debt service, rising real earnings and adequate liquid reserves over a prolonged period. The strongest supporting evidence would be deteriorating repayment exposure concentrated among households whose labor income fails to keep pace with essential costs. Neither conclusion follows automatically from the three national checkpoints. Their role is to establish the aggregate history accurately and specify the household evidence needed to interpret it. [1][2][3]

Charting and updating the series

Plot the full quarterly debt to disposable income series from the Federal Reserve's Financial Accounts rather than connect only the selected checkpoints. Use a vertical axis labelled debt divided by annual disposable income and retain the displayed units. Annotate the 2007 turning point and identify the latest observation as the second quarter of 2026. Include the 11 September 2026 release date in the source note, with an extraction date, because historical values can be revised. [1]

A second panel can show required debt service using the Federal Reserve's current methodology. Keep the stock ratio and payment percentage on separate axes and avoid presenting them as interchangeable measures. A distributional companion should use Survey of Consumer Finances waves, with age or income groups, to show debt ownership and borrower exposure. Its latest survey year is 2022, so do not suggest that those household estimates describe 2026. [2][3]

Reproduction requires downloading the underlying chart data, retaining the relevant Financial Accounts series definitions and recording the income frequency. Verify that the stock and income denominators refer to the intended household sector. Calculate annual summaries consistently, choosing either year end observations or annual averages and stating the choice. Mixing these conventions can create apparent changes that belong to timing rather than economic behavior. [1]

For the post labor dashboard, classify this metric as mixed evidence. Its precrisis history supports a long rise in household leverage; its recent history counters continuous escalation. Read it beside housing affordability, transfer dependence, household income composition and debt service. Those relationships turn a national balance sheet ratio into a testable account of how households obtain security, while preserving the improvements that the data actually show.

SOURCES AND REPRODUCTION NOTES

[1] Board of Governors of the Federal Reserve System (2026). Financial Accounts of the United States - Z.1 - Current Release. Ratio of household debt to DPI; fourth quarter 1980, fourth quarter 2007 and second quarter 2026; release 11 September 2026; verified retrieval 4 October 2026

[2] Board of Governors of the Federal Reserve System (2026). Household Debt Service Ratios. Current methodology quarterly payment ratios; release 22 September 2026; verified retrieval 4 October 2026

[3] Board of Governors of the Federal Reserve System (2023). Survey of Consumer Finances (SCF). 2022 survey released 18 October 2023; public historical files 1989 through 2022 and survey weighting guidance; verified retrieval 4 October 2026

RELATED CHAPTERS 033 · 037 · 042 · 043 · 046

CHAPTER 046

Household debt service burden

EVIDENCE STATUS **Counterevidence** · OBSERVATION SPAN United States current methodology quarterly series 2005 to second quarter 2026

Required debt payments absorbed a smaller aggregate share of disposable income in 2026 than in 2005 or 2007, countering a secular claim of continuously increasing debt payment burden.

Required payments as a share of income

The Federal Reserve's household debt service ratio measures required household debt payments relative to disposable personal income. Its current methodology uses scheduled payments reported in credit bureau data for mortgages, consumer loans and lines of credit. The ratio is divided into mortgage and consumer components, which sum to the total. It is a cash flow burden measure: how much of the household sector's available income is claimed by scheduled borrowing obligations during the period. Outstanding debt relative to income, by contrast, measures the size of accumulated liabilities. [1][2]

The published unit is a percentage of disposable personal income, with quarterly values seasonally adjusted. The denominator includes income sources beyond wages and salaries and is measured for the aggregate household sector. Therefore, an 11.11 percent ratio does not imply that the median borrower pays precisely that percentage or that every household carries debt. Income from households without loans also enters the denominator. Distributional analysis requires information on borrowers, income groups and payment obligations rather than treating the sector total as a representative household. [1][2]

The current measure includes scheduled mortgage payments and consumer debt payments such as automobile and student loans. For credit cards, the scheduled amount is the minimum required payment, rather than every voluntary payment a cardholder makes. Mortgage escrow for property taxes and insurance is included where bundled into the mortgage payment. This makes the statistic useful for required household cash commitments, although its numerator is broader than principal and interest alone in those cases. The component definitions should remain attached to any comparison with rent or essential expenditure. [2][3]

The series underwent a major measurement change in 2024. Current methodology estimates begin in 2005; estimates using the previous methodology extend from 1980 through 2024. The older approach inferred payments from balances, average rates and maturities, while the current approach observes scheduled payments in credit bureau records. A chart that splices the old 1980 level onto the new 2026 level without marking the change is not a consistent forty six year series. The current method alone nevertheless provides more than twenty observed years for the secular criterion. [2]

A lower burden over twenty one years

The current methodology series starts at 14.80 percent in the first quarter of 2005 and reaches 15.85 percent in the fourth quarter of 2007. It later falls to 11.73 percent in the fourth quarter of 2019. During the

pandemic period it reaches 9.05 percent in the first quarter of 2021. The latest value is 11.11 percent in the second quarter of 2026, comprising 5.83 percent mortgage service and 5.28 percent consumer service. These values come from the release dated 22 September 2026. [1]

The evidence distinguishes a postpandemic rebound from the longer history. The 2026 burden exceeds the unusually low 2021 observation, yet remains below both the 2019 level and the early series values. Selecting 2021 as the sole baseline would make the chart look like a secular deterioration when it captures recovery from a special period. Selecting only 2007 could obscure later increases. Show both the full path and several economic reference points so readers can assess each comparison on its own terms. [1]

Debt payment ratios can fall through several channels. Repayment and reduced borrowing lower obligations; refinancing or longer maturities can reduce scheduled payments on a given balance; faster income growth increases the denominator. Payment pauses and unusual transfers can also alter a measured ratio temporarily. The published total establishes the outcome, while component data and underlying institutional events are needed to identify how it happened. It would be inappropriate to attribute every decline to stronger employment or every rebound to weaker employment.

The mortgage and consumer components help prevent a misleading aggregate story. The total may stay stable while one form of borrowing becomes more burdensome and another less burdensome. Fixed payment obligations can also respond slowly to changes in market borrowing rates, since many loans were originated earlier. A national payment ratio consequently may improve for existing borrowers even as prospective homebuyers face much higher costs for a new purchase. The housing price to income metric measures a different margin of access and can move in a different direction. [1][2]

Quarter	Total required payments as percent of income
2005 first quarter	14.80
2007 fourth quarter	15.85
2019 fourth quarter	11.73
2021 first quarter	9.05
2026 second quarter	11.11

Federal Reserve current credit bureau methodology, seasonally adjusted household debt service as a percentage of disposable personal income. [1]

A constraint on the post labor argument

This metric is valuable because it can contradict a familiar version of the post labor story. A claim that households increasingly finance ordinary survival through ever larger required debt payments is not supported by the aggregate twenty one year series. Required payments consumed less income in 2026 than in 2005. The correct conclusion is specific: the national scheduled payment burden has eased over this window. That result should remain in the reference even if other indicators show weaker bargaining power or more difficult access to housing. [1]

A broader post labor framework can accommodate the decline, but only by specifying another mechanism. Households may rely more on transfers, postpone borrowing financed purchases, receive stronger capital income, reduce consumption or encounter credit restrictions. Each hypothesis has separate empirical

implications. For example, a transfer increase can improve the denominator and lower debt service even if earned income contributes less to household security. That possibility calls for an income source decomposition rather than declaring the improvement illusory. Genuine improvements should be recorded alongside structural strains.

Scheduled payments also differ from the price of maintaining a middle class life. Renters without mortgage debt can face high housing costs while contributing no mortgage payment to this numerator. People who cannot afford a home purchase may carry less debt than comparable previous cohorts. Consequently, lower debt service need not mean easier wealth acquisition. The relationship to post labor economics lies in how labor income supports access and resilience, which requires both current payment affordability and evidence on the goods households can obtain.

Consider a hypothetical household with annual disposable income of 50,000 units and required annual payments of 6,000 units. Its debt service ratio is 12 percent. If a new transfer raises disposable income to 55,000 without changing payments, the ratio falls to about 10.9 percent. If income stays fixed and a loan extension reduces payments to 5,000, the ratio falls to 10 percent, while total interest paid over the loan's life could increase. The same favorable indicator movement can have different economic meanings; these numbers illustrate arithmetic and are not reported survey observations.

The interpretation becomes stronger when payment relief accompanies higher liquid assets, stable loan quality and rising real earned income across household groups. It becomes more ambiguous when relief accompanies exclusion from credit or delayed access to housing. The national series supplies a necessary aggregate check, while complementary household evidence identifies who gains. A reference designed to test the theory should retain this counterevidence prominently because it distinguishes a distributional argument from an unsupported assertion that every household financial indicator has worsened.

Measurement changes and hidden concentrations

The 2024 methodology revision is central to interpreting long comparisons. Federal Reserve research explains that the previous series relied on assumptions about average loan terms, while the revised approach sums required payments in credit bureau records. Mortgage escrow also creates a level difference because it was excluded previously and included in the new measure when bundled. Compare trends within one methodology or display the overlapping old and new estimates separately. Neither a difference in levels nor a change at the adoption date should be treated automatically as an economic shock. [2][3]

Credit bureau coverage is a measurement boundary. Scheduled obligations visible in those records support the estimate; the ratio should not be described as a complete account of every informal loan, family obligation or expense commitment. The Federal Reserve's method documentation identifies the underlying sample and construction. Follow those definitions when reproducing the series, and avoid adding categories to the numerator while continuing to call the result the official ratio. A broader household obligations measure can be useful, but it requires its own explicit scope. [2][3]

An aggregate ratio can conceal severe burdens among lower income borrowers. It can also conceal disparities between older owners with established loans and young households entering housing markets. A borrower focused calculation should distinguish the fraction carrying debt from the burden conditional on debt ownership. Otherwise, a decline caused by fewer households borrowing could be mistaken for reduced

payments among existing borrowers. Household surveys provide the distributional complement, with the added need to respect survey weights and their older observation dates.

Interest rate changes further complicate simple comparisons. Scheduled payments on existing fixed rate loans may adjust slowly, while new borrowers immediately encounter new financing terms. Variable rate debts behave differently. Inflation can lift nominal income while leaving some contracted payments unchanged, reducing the ratio even where purchasing power remains constrained by other prices. Thus the indicator is informative about a particular set of financial commitments, and requires real earnings and essential cost measures to describe overall household living standards.

A twenty year claim of deterioration would need evidence stronger than a recent rise from a trough: consistently increasing burden across comparable borrower cohorts, or widening exposure among groups whose earnings fail to cover required expenses. The current national path does not provide that result. The appropriate classification is counterevidence for uniform debt burden escalation, accompanied by a monitoring role for current risks and distributional concentration. This preserves both the verified improvement and the possibility of different outcomes in specific groups. [1]

A chart that preserves the favorable trend

Use a quarterly line chart beginning in 2005, with the vertical axis labelled required household debt payments as a percentage of disposable personal income. Display total, mortgage and consumer ratios together only if their colors and sum are clear. Mark the 2007 peak period, the 2019 prepandemic observation and the exceptional 2021 low. Label the latest point second quarter 2026, released 22 September 2026. These dates prevent the reader from treating the source publication as a contemporaneous October measurement. [1]

If showing the earlier 1980 history, place the previous methodology in a separate panel or draw both estimates across their overlap with an explicit methods note. Do not create a continuous unmarked line by concatenating them. Download the current release and retain a versioned copy of the data and documentation. Historical revisions can alter comparison values, so a dashboard should store release and extraction dates along with series names. [2]

For monitoring, add borrower specific debt service, delinquency, liquid reserves and housing access when comparable sources are available. Distinguish minimum card payments from voluntary repayments, and note escrow inclusion in the mortgage component. The methodological definitions determine which cash commitments the chart measures. [2][3]

Read this chapter beside household debt relative to income, renter housing burden, house prices relative to income and household income composition. A combination of lower aggregate debt service and higher housing entry costs is economically coherent. It would suggest different outcomes for established borrowers and households seeking access, rather than a single national progression toward financial distress.

SOURCES AND REPRODUCTION NOTES

[1] Board of Governors of the Federal Reserve System (2026). Household Debt Service Ratios. Release 22 September 2026; current methodology 2005 through second quarter 2026; total mortgage and consumer ratios; verified retrieval 4 October 2026

[2] Board of Governors of the Federal Reserve System (2024). Household Debt Service Ratios - About. Current and previous methodology coverage; escrow and credit bureau definitions; last updated 25 September 2024; verified retrieval 4 October 2026

[3] Daniel Ringo Federal Reserve Board (2024). Introducing a Credit Bureau-Based Measure of U.S. Household Debt Service. Original methodological research dated 4 September 2024; sample construction and minimum credit card payments; verified retrieval 4 October 2026

RELATED CHAPTERS 033 · 037 · 042 · 043 · 045

CHAPTER 047

Multiple jobholding

EVIDENCE STATUS **Counterevidence** · OBSERVATION SPAN United States monthly comparable CPS series January 1994 to September 2026

The official multiple jobholding rate remains below its mid 1990s levels despite a recent rebound, so it does not establish a twenty year rise in households needing several jobs.

Counting workers with simultaneous jobs

Multiple jobholding measures the proportion of employed people who hold at least two jobs during the Current Population Survey reference week. The official rate divides multiple jobholders by all employed people in the specified group. Its unit is a percentage of workers, rather than a percentage of jobs or households. One person with two jobs contributes once to total household survey employment and once to the multiple jobholder count. This makes the rate a measure of simultaneous work arrangements, distinct from annual job turnover or the number of employers someone had over a year. [1][2]

The definition has an important boundary: at least one job must be a wage and salary job. It includes people with two wage and salary jobs, self employed people who also have a wage and salary job, and unpaid family workers with a wage and salary job. People running multiple businesses without a wage and salary job are excluded. Consequently, a general discussion of side businesses or freelance clients is broader than the official multiple jobholding statistic. Whether a reported activity qualifies depends on the survey's employment and class of worker concepts. [2]

The measure also differs from households having two earners. Two adults each working one job do not create a multiple jobholder. Nor does one person changing jobs several times during a year necessarily hold multiple jobs in a reference week. These distinctions matter for post labor analysis, because the coping strategies are economically different: adding another earner, adding a concurrent job, increasing hours in the same job and changing employers each respond to different constraints. Their indicators should be compared without merging them into one unsupported claim about work intensity.

BLS publishes both seasonally adjusted and unadjusted estimates. The monthly rate series LNS12026620 is seasonally adjusted; table A39 provides unadjusted demographic and economic detail. Seasonal adjustment supports comparisons across months, while the unadjusted table allows comparisons of the same calendar month across years. Do not switch between these treatments in a long chart. Although September 2026 happens to be 5.5 percent in both retrieved presentations, identical rounding at one point does not make their histories interchangeable. [1][3]

The long trend and the current rebound

The seasonally adjusted official series begins in January 1994 at 5.8 percent. Selected mid 1990s months exceeded 6 percent; November 1996 is 6.5 percent in the current retrieved history. January 2014 is 4.7 percent, January 2020 is 5.2 percent, and April 2020 is 4.0 percent. The latest observation, September 2026,

is 5.5 percent, updated with the 2 October 2026 Employment Situation release. This more than thirty year history contains decline, a pandemic disruption and a recent recovery, rather than a continuous secular increase. [3]

An original BLS published study of 1994 through 2013 found a broad decline across demographic groups and examined transitions between single and multiple jobs. Its historical analysis supports the conclusion that the earlier decline was substantive. The article was published in April 2015, so it cannot establish the subsequent trend by itself. Current official data are required for the latest endpoint. The study's monthly presentation and the current seasonally adjusted series also should not be combined casually, since vintage and seasonal treatment affect displayed values. [4]

Table A39 reports 9.000 million multiple jobholders in September 2026, or 5.5 percent of employed people, compared with 8.794 million and 5.4 percent a year earlier. The same current table shows higher multiple jobholding among women than men: 6.4 percent versus 4.7 percent. These are current unadjusted estimates, rather than evidence of a decades long widening gender gap. A subgroup's latest level supplies a useful monitoring question but does not establish its longitudinal trajectory. [1]

Current work arrangements also vary. In September 2026, 5.199 million people had a full time primary job and a part time secondary job, 2.250 million had two part time jobs, and 421,000 had two full time jobs. Such categories do not describe a single archetype of someone holding two full time jobs to survive. Their significance depends on total hours, earnings and reasons for holding the second job. A dashboard should preserve the composition rather than infer the most burdensome arrangement from the headline count. [1]

Month	Seasonally adjusted multiple jobholding rate
January 1994	5.8 percent
November 1996	6.5 percent
January 2014	4.7 percent
January 2020	5.2 percent
April 2020	4.0 percent
September 2026	5.5 percent

Official BLS series LNS12026620 retrieved through the Federal Reserve Bank of St Louis; selected actual monthly observations, not annual averages. [3]

Coping behavior and its alternatives

The intuitive connection to post labor economics is straightforward. If one job supplies insufficient income or hours, a worker may add a second job. This can reveal a gap between employment and household security: the person remains employed while needing another income stream. However, the multiple jobholding rate does not identify that motivation. A second job may also support a desired extra purchase, professional development, entrepreneurship or enjoyable work. The economically relevant question is why the arrangement occurs and whether it reflects a persistent shortfall in the primary job.

Two part time jobs may reflect fragmented scheduling, limited hours at an employer or personal preferences. A full time job plus a short additional activity may mean something else. Equal headcounts can therefore imply different pressures on household time. The rate does not report exhaustion, schedule predictability,

commuting costs or net earnings after care expenses. To use it as evidence of labor market compression, pair it with primary job wages, hours desired and actual, total work hours and credible information about economic necessity. [1][2]

There is also an opportunity constraint. Holding another job requires an available job, compatible hours and sufficient health or care flexibility. A weak labor market can reduce multiple jobholding because second jobs disappear, even when households need more money. A stronger market can raise the rate because workers can finally obtain additional work. This possibility explains why the sign of the indicator cannot automatically be read as welfare deterioration or improvement. The rate records an arrangement produced jointly by workers' preferences and employers' demand.

A hypothetical worker earning 40,000 units at a primary job may take a second job earning 5,000 to meet higher rent. Another worker at the same initial income may take the same additional work to fund training that later leads to a better occupation. Both enter the numerator identically. If primary earnings rise and the first worker can leave the second job, that is favorable; if the second job disappears while bills remain, the measured rate also falls. Reasons, earnings and subsequent outcomes distinguish these cases.

The long official history places a limit on the proposed narrative. It does not support a general claim that Americans have spent the last several decades increasingly combining multiple jobs. Recent increases can be monitored as possible renewed strain, but they remain shorter than the secular criterion and coexist with lower rates than mid 1990s observations. The post labor framework gains credibility by acknowledging this counterevidence and testing other adjustment margins, such as transfers, housing access or primary job quality, on their own records. [3]

Coverage and interpretation safeguards

Survey reporting may fail to capture some activities, but a possible coverage gap is not itself evidence that the true trend rose. A claim that gig work changes measured multiple jobholding requires research on classification, respondent interpretation and the size of omitted activity over time. The official definition already includes some self employment combined with wage and salary work. The appropriate response is to investigate identifiable differences between surveys and administrative sources, while retaining the official long series as a clearly bounded measure. [2]

The reference week is another limit. People taking occasional work at other times of the month or year may not appear as current multiple jobholders. An annual measure of any concurrent jobholding could consequently exceed the weekly snapshot. Changes in duration can also matter: the same weekly rate can result from many short spells or fewer long spells. A study of transitions offers information about entries and exits, while the headline cross section does not. It is important to state which time concept supports a particular claim. [2][4]

Counts grow partly when total employment grows. A new record number of multiple jobholders can occur even with a stable or lower rate because the denominator is larger. Use the percentage for prevalence and the count for scale. For subgroup comparisons, each rate needs its own employed denominator; a group's share of all multiple jobholders is a different quantity. September 2026 demographic differences should also be interpreted with sampling uncertainty, especially in smaller groups, rather than as precise rankings of hardship. [1]

Population controls and seasonal revisions can affect comparisons across releases. Keep a versioned copy of the source series and avoid mixing historical extracts from different vintages without noting the change. BLS introduces updated population controls annually with January data. For annual summaries, choose a consistent averaging method and state whether missing observations affect the result; the retrieved current series shows a missing October 2025 observation. Inventing a value to complete the chart would create evidence that the source does not supply. [1][3]

Support for a post labor interpretation would require a sustained increase in economically compelled multiple jobholding, preferably among comparable working age groups, accompanied by inadequate primary earnings or desired hours. Evidence that second jobs reflect voluntary transitions or higher opportunity would weaken that inference. Stable or declining weekly prevalence is relevant counterevidence to the broad prevalence claim even if hardship persists among the workers who do hold multiple jobs. The distinction between the number affected and the severity of their experience is essential.

Monitoring without converting a rebound into a secular trend

Chart the monthly seasonally adjusted BLS rate LNS12026620 from January 1994 to September 2026. Use a percentage axis, mark the pandemic interval and display a clearly labelled moving average if smoothing is helpful. Leave missing observations visibly missing. Put the 2 October 2026 release date beside the latest month, rather than implying that the September survey describes every subsequent day. Selected checkpoints can accompany the line, but should not replace the full history. [3]

In a separate panel, show the current unadjusted composition of full time and part time primary and secondary jobs from table A39. A third comparison can show women and men or other adequately measured groups. Keep same month comparisons separate from the seasonally adjusted trend and explain each denominator. Counts describe how many workers are affected; rates describe prevalence within the employed population. [1]

Reproduction requires storing the series identifier, seasonal treatment, source vintage and reference week definition. For claims about necessity, obtain a source that measures motivations rather than treating every additional job as financially compelled. For broader side activity, define the employment concept and explain its coverage relative to CPS. [2]

Classify the historical indicator as counterevidence to a decades long rise, while retaining recent changes as a monitoring signal. Connect it to household income composition, debt service, renter burden and working age poverty. These companions can show whether a second job adds discretionary income or fills a basic resource gap, and prevent one visible work arrangement from carrying more explanatory weight than its data allow.

SOURCES AND REPRODUCTION NOTES

[1] U S Bureau of Labor Statistics (2026). A-39. Multiple jobholders by selected demographic and economic characteristics. September 2026 unadjusted levels and subgroup rates; updated 2 October 2026; verified retrieval 4 October 2026

[2] U S Bureau of Labor Statistics (2026). Concepts and Definitions (CPS). Multiple jobholders, wage and salary employment, reference week and hours definitions; verified retrieval 4 October 2026

[3] U S Bureau of Labor Statistics via Federal Reserve Bank of St Louis (2026). Multiple Jobholders as a Percent of Employed. Official BLS monthly seasonally adjusted series January 1994 to September 2026; updated 2 October 2026; missing October 2025 retained; verified retrieval 4 October 2026

[4] Etienne Lale U S Bureau of Labor Statistics Monthly Labor Review (2015). Multiple jobholding over the past two decades. Original analysis of CPS transitions and prevalence 1994 through 2013; published 1 April 2015; verified retrieval 4 October 2026

RELATED CHAPTERS 035 · 037 · 042 · 045 · 046 · 048

CHAPTER 048

Job tenure

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN United States selected CPS observations 1983 to January 2026 with survey changes disclosed

Overall median tenure does not show a decades long collapse, while age composition, sector and the reasons for job transitions determine whether shorter tenure indicates insecurity or opportunity.

Time with the current employer

Employee tenure measures how long a wage and salary worker has been continuously employed by the current employer at the survey date. The headline is the median number of years: half the covered workers have longer tenure and half shorter tenure. It refers to the sole or principal job of both full time and part time employees. Tenure with an employer can include promotions or changes in role, so it differs from time in a specific occupation, job title or task. The statistic describes completed time so far in an ongoing employment relationship. [1][2]

BLS tenure estimates exclude all self employed people, including those with incorporated businesses, even though incorporated owners enter some other CPS wage and salary categories. The covered population therefore is narrower than all employed people. Workers who already lost or left a job are not observed with their previous tenure in the headline current employee measure. This survivor boundary is important: the median among remaining employees can change even when employment security deteriorates for people who exit the sample's employed group. [2]

The latest observation was collected in the January 2026 CPS supplement and released on 24 September 2026. Biennial supplements provide repeated cross sections rather than a continuous monthly tenure series. The headline should be labelled January 2026 rather than September or October 2026. More detail is available by age, sex, sector and other characteristics. The share with one year or less of tenure and the share with long tenure are useful companions because different parts of the distribution can change while the median remains similar. [1][2]

Tenure is often used as a proxy for job stability, but stability and economic security are not identical. A worker can remain many years in an insecure or poorly paid position; another can move voluntarily into better paid work. Short tenure may indicate recent hiring, displacement followed by reemployment, voluntary mobility or a new labor market entrant. Interpretation consequently requires evidence on reasons for separation, wages after moves and the probability of job loss. The official technical note explicitly explains why aggregate tenure can rise or fall under either favorable or unfavorable economic conditions. [2]

The median has not followed a continuous decline

BLS historical chart data report an overall median of 3.5 years in January 1983, 3.8 years in February 1996 and 4.0 years in January 2006. The median reached 4.6 years in January 2012 and January 2014, then was 4.1

years in January 2020. The latest release reports 3.9 years in January 2024 and 4.1 years in January 2026. This sequence provides more than twenty years of observed history, but it does not describe a universal secular decline in tenure. [1][3]

Comparisons depend on the baseline. January 2026 is below the 2012 and 2014 values, above 1983 and close to 2006. The recent recovery from 2024 also matters. A chart beginning at the unusually high early 2010s median could make the story appear to be a uniform erosion of long employment relationships. A chart spanning the full available record shows fluctuation and changes in population composition. Both the lower recent level relative to the peak and the lack of a long universal decline should be stated. [1][3]

The latest group differences are substantial. Median tenure is 9.6 years among workers ages 55 to 64, compared with 3.0 years among workers ages 25 to 34. Men's median is 4.3 years and women's 4.0 years in January 2026. The share of covered employees with one year or less at the current employer is 20.6 percent, down from 22.2 percent in January 2024. These current differences identify the importance of age and employment composition; they cannot by themselves establish secular changes within each group. [1]

Historical comparisons also require a methods note. Before January 1983, the question concerned the present job and could be interpreted as either the current employer or the current role. The wording changed to clarify employer tenure, producing a break. A further follow up introduced in February 1996 improved precision for short tenure responses. Earlier 1983, 1987 and 1991 observations used different coding for durations. Preserve these documented distinctions and place the strongest longitudinal comparisons within the more consistent recent period. [2]

Survey observation	Overall median years
January 1983	3.5
February 1996	3.8
January 2006	4.0
January 2012	4.6
January 2020	4.1
January 2024	3.9
January 2026	4.1

Official BLS historical chart and latest release; selected observed supplements, with question and coding changes discussed in the text. [1][2][3]

What durable employment contributes to security

The post labor connection concerns the capacity of an employment relationship to support a stable life. Long relationships may allow predictable earnings, firm specific skills, advancement and access to employment linked benefits. If good employment becomes harder to maintain, households may need more income insurance and alternative claims on productive output. A decline in tenure within comparable groups could support this mechanism, especially if it accompanies involuntary displacement and persistent earnings losses. The aggregate median, however, is only an initial descriptive check.

An important distinction is between disruption and mobility. Suppose two workers each leave an employer after three years. One is laid off, experiences months without income and accepts a lower wage. The other receives a better offer, changes firms immediately and gains more predictable hours. Both start their new jobs with low tenure. Their welfare and bargaining outcomes move in opposite directions. A useful post labor analysis separates these paths rather than equating every employment transition with labor market compression.

Tenure also records the opportunities available to those outside established relationships. When hiring expands, many new employees enter with little tenure, lowering the median even if incumbents remain secure. This is especially relevant when employment recovers from a downturn. Conversely, layoffs concentrated among recent hires remove short tenure observations and can increase the median among remaining workers. The official methods note identifies these mechanisms. A higher median can therefore accompany an adverse labor market shock, while a lower median can accompany new opportunities. [2]

Age composition deserves equal attention. Older employees have had more time to develop long relationships, and a workforce with more older employees can have higher aggregate tenure even if each age group experiences less stability. An age standardized comparison would hold the group shares fixed while examining within group tenure distributions. Such an adjustment could reveal a different pattern from the headline median, but it must be calculated from actual group data. The reference should avoid asserting that an uncomputed adjustment necessarily reverses the observed result. [1][2]

A labor security dashboard should therefore connect tenure to displacement, reemployment wages, benefit continuity and household financial resilience. Tenure becomes informative when it helps distinguish dependable employment from repeated forced restarting. Its contribution to the post labor framework is conditional and distributional: whether households can sustain reliable claims through employment. The verified national history rejects a broad claim that the duration of all employment relationships has collapsed over several decades, while leaving specific group and transition questions open. [1][3]

Why the headline can conceal different experiences

The median compresses a distribution into one point. The fraction with less than one year and the fraction with ten years or more may change without shifting the midpoint substantially. The same median can describe a population with a large stable core and many short spells, or a population clustered near the midpoint. Use the distribution of tenure, including current long and short tenure shares, when analyzing security. A single rounded median is inadequate for strong claims about widespread fragmentation. [1][2]

Sector and occupation composition also affect the national statistic. A change in the share of employment in groups with typically long relationships can alter overall tenure even if their internal patterns stay constant. The current BLS release reports sector detail, permitting comparisons within private and public employment. A shift away from one sector may reflect changing industrial structure, outsourcing or policy rather than automation alone. If automation is the proposed cause, the analysis needs evidence on exposure and transitions beyond the fact that employment composition changed. [1]

Survey errors and duration coding matter when changes are small. BLS explains both sampling and nonsampling uncertainty, and its analyses generally use a 90 percent confidence level. Do not convert a tenth of a year movement into a precise estimate of changing job security without considering uncertainty and

rounding. The technical documentation also describes the follow up question on short durations and the shift in historical wording. These are material limitations for reproducing a long record from microdata. [2]

Observed current tenure is not expected remaining tenure. An employee who has been with a firm ten years might lose the job tomorrow, while a recent hire might remain for a decade. Estimating separation risks or expected duration requires longitudinal information. Nor does tenure reveal how much of the relationship involved full hours, stable earnings or genuine advancement. A long but deteriorating employment relationship can provide less security than the duration suggests; a short relationship with high pay and transferable skills can provide more.

The interpretation would strengthen if comparable working age groups showed a sustained decline in long tenure, rising involuntary separations and worse postseparation earnings. It would weaken if shorter tenure primarily reflected voluntary moves to better jobs or a larger flow of entrants into employment. The overall series supplies mixed evidence because its pattern depends on period and composition. It should be retained as a diagnostic and a check against exaggerated historical claims, rather than assigned an automatically negative direction. [1][2][3]

A tenure chart with composition visible

Plot only observed CPS supplement dates, using markers joined by lines if desired. Label the vertical axis median years with current employer. Annotate the 1983 question break and 1996 short duration follow up, and keep earlier differently worded estimates out of an apparently continuous comparable series. The latest marker should read January 2026, released 24 September 2026. Historical data from the BLS 2020 chart can be combined with verified later releases using consistent definitions and disclosed survey dates. [1][2][3]

Add age specific panels, especially for working age groups, alongside the overall line. Include the shares with one year or less and with long tenure rather than relying solely on the median. If producing age standardized results, document the fixed population weights and calculate them from the underlying distributions; a weighted average of age group medians is not necessarily the population median. The adjustment needs the actual distribution or microdata. [2]

A monitoring table should separate voluntary job moves, layoffs, new entrants and reemployment wherever suitable sources permit. Wages and benefits before and after transitions provide the economic context that tenure lacks. Household transfers and financial reserves can show whether a forced move threatens access to essentials.

Classify the national history as mixed evidence. Read it beside multiple jobholding, working age poverty, household income composition and measures of displacement. This arrangement allows tenure to test the durability of employment as a route to security without treating a better job offer or an expansion in hiring as evidence of post labor deterioration.

SOURCES AND REPRODUCTION NOTES

[1] U S Bureau of Labor Statistics (2026). Employee Tenure Summary: Employee Tenure in 2026. January 2026 supplement, released 24 September 2026; overall medians and demographic details; verified retrieval 4 October 2026

[2] U S Bureau of Labor Statistics (2026). Employee Tenure Technical Note. Covered workers, historical question and coding changes, age and cycle interpretation; updated 24 September 2026; verified retrieval 4 October 2026

[3] U S Bureau of Labor Statistics (2020). Median tenure with current employer was 4.1 years in January 2020. The Economics Daily dated 29 September 2020, historical observed supplements 1983 through 2020; verified retrieval 4 October 2026

RELATED CHAPTERS 035 · 037 · 047

CHAPTER 049

Capital input relative to labor hours

EVIDENCE STATUS Secular evidence · OBSERVATION SPAN 1987 to 2025

Capital services grew substantially faster than human hours over almost four decades, documenting a durable change in the input mix.

Two inputs with different economic units

Capital input relative to labor hours compares the services supplied by productive assets with the time people supply to production. The numerator is an index of capital services. The denominator is an index of hours actually worked, including employees, proprietors and unpaid family workers within the selected business sector. Because the underlying quantities have different physical units, the ratio is expressed as a normalized index or a growth rate. It does not count machines per person, assign a dollar value to an hour or measure financial wealth. [1][4]

The main U.S. source is the BLS total factor productivity program. Its private nonfarm business series excludes general government, nonprofit institutions, owner occupied housing and farms. These boundaries matter when comparing it with GDP, total employment or household income. A chart pairing this capital measure with all economy hours would combine different populations. Retain the private nonfarm business output and hours series from the same release when building the comparison. [1]

Capital services weight assets by their estimated contribution to production, using rental prices. A server, warehouse and research asset each supply a flow of services over time, and the aggregation accounts for differences in depreciation, expected returns and taxation. Financial securities are excluded. Shares establish an ownership claim on production, whereas this numerator represents assets used to produce. Consequently, a stock market rally does not automatically increase measured capital input. [1][4]

Hours are preferable to headcount for this question. A firm may employ the same number of people while reducing schedules; another may replace part time positions with full time positions. Hours also include work by proprietors whose labor disappears from an employees only comparison. Workforce skill changes are recorded separately as labor composition. The ratio examined here uses unweighted hours, so it describes the changing combination of capital services and human time rather than the complete quality adjusted input bundle. [1]

This entry retains the two separate input trajectories. The adjacent capital intensity entry expresses their ratio directly. They are linked measurements of one production change, and should count as one family of evidence when assessing independent support for post labor.

Observed growth across business cycles

The March 2026 release supplies a long record ending in 2025. Across 1987–2025, private nonfarm capital input grew an average 3.4 percent a year, while hours grew 0.9 percent. The difference appears across the

published business cycle periods: capital grew faster than hours in the 1990 s, the early 2000 s, the 2007–2019 cycle and the period beginning in 2019. These averages meet the twenty year secular criterion without requiring every individual year to move in the same direction. [2]

The pace of capital accumulation changed considerably. Capital input grew 4.7 percent annually during 1990–2000, compared with 2.4 percent during 2007–2019. Hours grew 1.7 and 0.6 percent in those respective periods. The evidence therefore supports sustained capital deepening alongside a slowdown in its rate of expansion. Describing the entire record as continually accelerating automation would add a claim that this table does not establish. [2]

The latest annual comparison is 2.7 percent capital growth against 0.4 percent hours growth in 2025. Its capital estimate is preliminary. BLS constructs the newest year with six broad asset groups; earlier detailed years use ninety asset types. Publication in 2026 does not make these observations a 2026 annual input result. Future investment and national accounts revisions can change both the most recent year and earlier history. [1]

There is a consequential correction to the earlier source trail. The current BLS vintage reports capital input growth of 2.7 percent and an hours decline of 0.1 percent in 2024. Earlier notes recorded different capital and hours estimates. Use the revised figures consistently throughout a new presentation; preserving an older capital estimate beside a revised hours estimate would make the implied ratio misleading. [1][2]

Period averages are geometric growth measures drawn from the published source. Their subtraction provides a convenient approximation to growth in the capital to hours ratio. Exact ratio growth uses the ratio of growth factors. Since each displayed rate is rounded, calculated results should retain modest precision and should not be presented as a new independently measured statistic.

Period	Capital input annual growth	Hours annual growth
1987 to 2025	3.4%	0.9%
1990 to 2000	4.7%	1.7%
2000 to 2007	3.5%	0.1%
2007 to 2019	2.4%	0.6%
2019 to 2025	2.6%	0.5%
2025	2.7%	0.4%

Source [2]; private nonfarm business; average annual rates for multiyear periods

How production becomes less dependent on added hours

The comparison identifies an important way production can expand: businesses add productive capacity faster than they add human time. A warehouse can process more shipments using conveyors and software, or a design business can equip a stable staff with more capable computing. Those examples illustrate how capital deepening can reduce the additional hours required for a unit of output. They do not establish that a specific warehouse or occupation has lost workers.

For the post labor framework, the relevant question is whether production growth continues to require proportional increases in labor. A sustained widening of capital services and hours indexes shows that

proportionality has already changed. The economy's productive apparatus carries an increasing amount of capital service behind each hour. The same observation remains relevant when the assets are conventional machinery, telecommunications systems or research rather than recently introduced AI tools.

Capital can substitute for a task and complement the person doing the remaining work at the same time. An automated inventory system eliminates counting tasks while increasing the value of scheduling, exception handling and equipment maintenance. The industry's employment outcome depends on how much output expands and how remaining jobs are reorganized. Aggregate capital growth therefore supplies a mechanism for reduced labor intensity, while output and hours data determine the realized production relationship.

Investment also creates work during construction, installation and integration. Buying a capital asset can increase labor demand at its producer before saving hours at the purchaser. Domestic aggregates include some of this work and exclude some imported production. A narrow company comparison can miss these effects. Long run sectoral evidence becomes stronger when it follows employment in suppliers and adjacent services as well as users of the equipment.

Distribution is a separate link. Greater capital input does not determine who receives the additional income. Workers can capture higher compensation when institutions or scarce skills give them bargaining power; owners can capture rents when access to assets or markets is restricted. Pairing this comparison with labor compensation shares, typical pay and ownership concentration tests that second step. The production observation concerns the changing input mix. The distribution observation concerns the claims households receive on the resulting output.

What the input comparison can and cannot establish

Capital accumulation has accompanied economic development for centuries. A factory replacing primitive tools with modern equipment ordinarily raises labor productivity and can support higher wages. The mere existence of capital deepening does not establish a terminal transition to an economy that can dispense with labor. Its significance here rests on its duration, breadth and relationship to output growth, task substitution and household distribution.

Recessions require particular care. Hours can fall abruptly while installed assets remain in place. The capital to hours ratio then rises even when new investment is weak. A pandemic closure can produce a large mechanical increase without any improvement in operational automation. Comparing full cycles reduces this distortion, and examining real investment and utilization helps establish whether new productive systems actually expanded. BLS explicitly identifies short run hours volatility as a source of capital intensity variation. [1]

Capital services estimates themselves depend on assumptions about asset lives, depreciation and rental prices. Software can become obsolete before its accounting life ends, while a building may continue providing useful services longer than expected. Changes in those assumptions affect the numerator without corresponding one for one to new equipment installed. Detailed asset composition and industry results can identify whether a broad increase reflects many assets or a concentrated reweighting. [1][4]

Work performed outside the measured sector is another boundary. Purchasing services can move hours into another industry, and importing a component can move them overseas. A decline in direct human time inside

a production unit may therefore describe a change in the organizational boundary. Economy wide domestic input indexes reduce the first problem, but identifying global labor substitution requires international input output accounts and supplier information.

The interpretation would strengthen if capital services continued growing faster than hours through several expansions while real output increased and direct labor requirements fell across many industries. It would weaken if the pattern mainly reflected temporary utilization declines, outsourcing with unchanged total hours, or movement toward sectors with different accounting treatment. These conditions provide ways to investigate the hypothesis rather than treating capital's expanding role as its own causal explanation.

A reproducible two line input chart

Download annual capital input and hours indexes for private nonfarm business from the BLS productivity tables. Preserve the release date, sector definition, base year and raw observations. Normalize both indexes to 100 in a common starting year, preferably a business cycle peak that gives at least twenty years of history. Plot them on one axis with the same scale; a logarithmic axis is useful when comparing compounded long run growth. [2][4]

Add a separate panel for capital services per hour, calculated by dividing the two indexes and renormalizing the result. Show annual data rather than generating interpolated quarterly capital observations. Shade recessions and annotate the pandemic so the audience can see why a sharp hours contraction affects the ratio. If only the published period averages are available, present a comparison table instead of inventing a continuous series.

Update after the annual total factor productivity release. Record preliminary status for the latest year and rebuild the full chart when revisions arrive. A monitoring note should report capital growth, hours growth, real output growth and the exact or approximate change in their ratio. This makes a new increase intelligible and prevents a headline about more capital from concealing falling output.

Link the chart to capital intensity and the capital deepening contribution, which interpret the same input data in different units. Add fixed asset stock and investment composition to explain which assets are expanding. Compare labor share and household capital income to examine distribution. These relationships form a sequence of questions: what productive inputs grew, how production changed, and how households obtained claims on the gains. No single input line answers all three. [3]

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Total Factor Productivity 2025. March 19 release and technical notes; preliminary aggregate 2025 and detailed capital 2024; verified retrieval 4 October 2026

[2] Bureau of Labor Statistics (2026). Table A Productivity output and inputs for selected periods 1987 to 2025. Private nonfarm business growth rates, annual and business cycle averages; verified retrieval 4 October 2026

[3] Bureau of Labor Statistics (2026). Table B Labor productivity growth and contributions of capital intensity labor composition and total factor productivity. Percentage point contributions through 2025; verified retrieval 4 October 2026

[4] Bureau of Labor Statistics (2026). Handbook of Methods Labor Productivity and Costs Calculation. Capital services, labor input, aggregation and productivity calculation; verified retrieval 4 October 2026

RELATED CHAPTERS 050 · 051 · 053 · 054 · 057 · 060 · 063 · 064

CHAPTER 050

Capital services per labor hour

EVIDENCE STATUS Secular evidence · OBSERVATION SPAN 1987 to 2025

The capital services available behind each hour of private nonfarm work rose across the published multidecade record.

The ratio that defines capital intensity

Capital services per labor hour is the productive capital input index divided by the hours worked index. Economists call increases in this ratio capital deepening or rising capital intensity. The ratio measures how much service from equipment, structures, intellectual property, inventories and land accompanies each unit of human time. It can increase because capital grows, because hours fall, or because both change at different rates. BLS defines capital intensity in these terms. [1][4]

The unit is an index, usually normalized to 100 in a base year. An index reading of 150 means the ratio is fifty percent above that base year. It does not mean each employee owns a specified dollar amount of machinery. BLS aggregates assets using rental prices, giving assets weights appropriate to the services they supply. This differs from a market value balance sheet, where a scarce parcel of land can become more valuable without supplying more productive services. [1]

The denominator includes human hours within the same business sector as the capital numerator. When the selected series is private nonfarm business, it excludes farms, general government and other activities outside that sector. Pairing the numerator with working age population or payroll headcount would answer a different question. Capital services per resident concerns an economy's productive apparatus relative to its population; services per hour concern the input mix of production.

The ratio also differs from the capital contribution to productivity. A rise in capital intensity is multiplied by capital's cost weight when deriving its accounting contribution. Thus a two percent increase in capital per hour need not add two percentage points to output per hour. Maintaining this distinction prevents exaggerated statements about how much productivity capital supplied. The measurement here establishes the intensity change before asking about its weighted contribution. [3][4]

For post labor analysis, the numerator can contain any durable productive technology. The historical movement is broader than industrial robots and contemporary AI. Telecommunications, software, research assets, storage equipment and automated physical processes all enter through their contribution to productive capital. An account of the secular trend should retain this breadth while labeling a specific technology separately when direct evidence exists.

Decades of deepening at varying speeds

BLS reports capital input growth of 3.4 percent annually and hours growth of 0.9 percent across 1987–2025 for private nonfarm business. Dividing their growth factors gives an approximate 2.48 percent annual rise in capital services per hour. That calculation uses rounded period averages; an exact historical index should be

downloaded rather than reconstructed from these rounded values. The long span establishes sustained deepening, while its particular rate remains sensitive to the selected endpoints. [2]

The published subperiods help distinguish duration from acceleration. During 1990–2000, capital grew 4.7 percent and hours 1.7 percent annually. During 2000–2007 the rates were 3.5 and 0.1 percent. During 2007–2019 they were 2.4 and 0.6 percent. Each comparison implies a rising ratio, but the later period's implied pace is smaller. Capital's expanding presence per hour has persisted despite considerable variation in investment, growth and business conditions. [2]

For 2019–2025, capital input grew 2.6 percent annually and hours 0.5 percent, implying roughly 2.09 percent ratio growth using the same calculation. The latest annual estimate, 2025, records 2.7 percent capital growth and 0.4 percent hours growth. This is a recent extension of the established pattern. It cannot by itself show that AI has produced a new permanent growth regime, because the data aggregate numerous asset classes and the newest observation is preliminary. [1][2]

Research on investment relative to valuation helps explain why capital deepening can continue while physical investment appears weak. Gutiérrez and Philippon found that U.S. investment fell short of the levels associated with profitability and Tobin’s Q beginning in the early 2000s. Their estimates attributed about one third of the investment gap to intangibles and associated much of the remainder with competition and corporate governance. They explicitly described those explanations as supported hypotheses rather than causal results established by that paper. [5]

Crouzet and Eberly developed a related account in which a shift toward software, intellectual property, brands and business processes changes the physical investment required for expansion. Their evidence connects intangible intensity to the investment gap and to concentration, while allowing both productivity advantages and market power to contribute. Consequently, weak spending on property, plant and equipment should be examined alongside broader asset formation and productive services. It can reflect a change in capital composition, a restriction of expansion, or both. This does not make weak investment evidence for automation by itself: the task, output and hours response still determines whether productive labor saving occurred. [6]

The years around the pandemic illustrate why a continuous ratio chart is necessary. Employment and hours shifted abruptly, producing changes in capital intensity even before installed equipment could respond. A period average can smooth those disturbances but cannot identify whether an individual year's increase came from new assets or fewer hours. The two underlying input lines should therefore remain accessible whenever the ratio becomes the presentation's headline.

These observations are rates of change, not levels of capital intensity comparable across countries. A U.S. index normalized to 100 cannot be directly compared with a German index normalized to 100 to establish which country uses more capital per hour. Such a comparison requires consistent purchasing power and service valuation methods.

Period	Capital growth	Hours growth	Implied ratio growth
1987 to 2025	3.4%	0.9%	About 2.48%
1990 to 2000	4.7%	1.7%	About 2.95%
2000 to 2007	3.5%	0.1%	About 3.40%

Period	Capital growth	Hours growth	Implied ratio growth
2007 to 2019	2.4%	0.6%	About 1.79%
2019 to 2025	2.6%	0.5%	About 2.09%

Source [2]; ratio growth calculated from rounded published average annual rates

Why the ratio matters for production constraints

Imagine a delivery operation with one hundred human hours and a capital services index of one hundred. If a new automated sorting system increases capital services to one hundred and twenty while hours remain one hundred, capital intensity rises twenty percent. Whether deliveries also rise twenty percent is a separate empirical question. This deliberately hypothetical example distinguishes an increased productive input from the output response and prevents the ratio from becoming an assumption about automation's effectiveness.

When assets remove a binding production constraint, a given group of workers can serve more customers, produce more components or manage more transactions. The direct link to post labor is the shrinking requirement for added human hours as production expands. Capital intensity provides one observable input signature of this change. The most persuasive reading pairs it with rising real output and declining hours per unit, rather than assuming every additional asset successfully substitutes for people.

A rising ratio can also describe complementary growth. Hospitals use more diagnostic equipment per clinician; an engineering team gains access to more powerful computing. Human skill can become more valuable as capital expands. For some tasks, larger capital installations require more maintenance, integration or judgment. These examples explain why capital deepening can coexist with high wages and employment growth in the industries adopting it.

The long run employment outcome depends on demand and task structure. If a process becomes cheaper and customers purchase much more of its output, the remaining human tasks can expand in absolute terms. If demand changes little, a lower labor requirement per unit can reduce hours or hiring. The ratio is relevant in both cases because the production relationship has changed, even though the labor market result differs. Tracking demand alongside the input mix makes that difference observable.

Asset access gives the ratio an institutional dimension. A small business that rents cloud infrastructure can deepen its capital use without owning a data center. Productive services may be measured at the supplying industry, while the customer purchases an intermediate service. Ownership and access can therefore separate. Determining who receives returns requires tracing the ownership of the supplying assets and the contracts through which users purchase their services.

Interpreting increases without overstating substitution

Capital intensity has an arithmetic denominator problem. If hours drop ten percent and capital is unchanged, the ratio rises by about eleven percent. That observation can coincide with falling output, idle factories and financial distress. It does not establish a successful replacement of human work. A recession driven ratio jump should be analyzed with utilization, investment and output before being used to illustrate technological progress.

The selected aggregation also matters. An economy can become more capital intensive because capital grows within industries or because production shifts toward industries that already use more capital. Those

mechanisms have different implications for displaced occupations and regional adjustment. Industry capital and hours data help separate them. Aggregate deepening alone cannot identify the share of the change that reflects task automation inside incumbent firms.

Some productive knowledge remains outside measured capital. Organizational systems, workforce training and business practices can improve the use of existing assets without entering the standard investment boundary. Their effects may appear partly in total factor productivity. Conversely, assets categorized as intellectual property can represent research or entertainment whose relation to reducing human work is indirect. Asset composition must be examined before labeling the full increase automation. [1][4]

Higher intensity need not raise capital's share of income. The resulting income split depends on substitution possibilities, market structure, depreciation and factor prices. An abundant asset can become cheaper as its services expand, while scarce human capabilities command higher pay. A claim about owners receiving more therefore needs a compensation share or profit measure in addition to this ratio. The production and distribution indicators complement one another without becoming mechanically identical.

The post labor interpretation strengthens when deepening accompanies persistent increases in output per hour and reduced hiring requirements across multiple cycles and sectors. A broad rise supported mainly by residential valuation, one temporary hours collapse or a statistical reclassification would offer weaker evidence. For this reason the dashboard should describe this as an established input trend and keep the causal attribution to a specific technology at the level warranted by separate research.

Building and maintaining the intensity series

Obtain capital input and hours worked indexes from the same BLS annual productivity dataset and calculate capital input divided by hours. Normalize the ratio to a clear base year. Retain annual observations from at least the late 1980 s through the most recent published year, and store the data vintage. A chart caption should specify private nonfarm business, capital services rather than financial assets, and hours actually worked. [1][2]

Use a main line for the ratio and companion lines for its numerator and denominator. Annotate years where the ratio rose primarily because hours contracted. A second view can display average annual growth across the official business cycle periods. The cycle view is useful for assessing secular persistence, while the annual view reveals the economic route by which each increase occurred.

Update annually when BLS releases total factor productivity results. Recompute the entire history after revisions instead of appending a new endpoint to an obsolete series. BLS publishes preliminary newest year estimates with less detailed asset information; label them accordingly. Later asset detail can improve the interpretation even when the aggregate direction remains similar. [1]

Read this metric alongside the capital input comparison, capital deepening contribution, equipment and intellectual property investment, and total factor productivity. Those entries answer whether assets expanded, how much their intensity contributed to productivity, which types expanded, and what growth remained beyond measured inputs. Household ownership and capital income then show who has claims on the productive apparatus. This sequence makes the ratio an interpretable part of the reference rather than a catchall label for every technological development.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Total Factor Productivity 2025. March 19 release and technical notes; preliminary aggregate 2025 and detailed capital 2024; verified retrieval 4 October 2026

[2] Bureau of Labor Statistics (2026). Table A Productivity output and inputs for selected periods 1987 to 2025. Private nonfarm business growth rates, annual and business cycle averages; verified retrieval 4 October 2026

[3] Bureau of Labor Statistics (2026). Table B Labor productivity growth and contributions of capital intensity labor composition and total factor productivity. Percentage point contributions through 2025; verified retrieval 4 October 2026

[4] Bureau of Labor Statistics (2026). Handbook of Methods Labor Productivity and Costs Calculation. Capital services, labor input, aggregation and productivity calculation; verified retrieval 4 October 2026

[5] Germán Gutiérrez and Thomas Philippon (2017). Investmentless Growth: An Empirical Investigation. Studies weak U.S. investment relative to Tobin's Q since the early 2000s; intangible, competition and governance explanations remain qualified hypotheses. Verified for version two 4 October 2026.

[6] Nicolas Crouzet and Janice C. Eberly (2019). Understanding Weak Capital Investment: The Role of Market Concentration and Intangibles. Explains weak physical investment relative to valuation through intangible capital, concentration, productivity advantages and market power; mechanisms need not be exclusive. Verified for version two 4 October 2026.

RELATED CHAPTERS 049 · 051 · 053 · 056 · 057 · 063 · 064

CHAPTER 051

Capital deepening contribution to growth

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN 1987 to 2025

Capital intensity supplied a persistent positive contribution to labor productivity, though its contribution has varied rather than continuously accelerated.

A contribution measured in percentage points

The capital deepening contribution measures how much growth in capital services per hour contributes to growth in output per hour under a growth accounting framework. BLS calculates it by weighting the growth in capital intensity by capital's share of production costs. Its unit is percentage points of labor productivity growth per year. It differs from the percentage growth rate of capital, the level of investment and the dollar value of asset owners' wealth. [1][3][4]

The underlying decomposition separates labor productivity into capital intensity, labor composition and total factor productivity. More capital behind each hour contributes through the first term. Changes in workforce characteristics contribute through the second. The remaining growth, after accounting for the measured inputs, is assigned to the third. The components approximately sum to measured labor productivity growth; published figures can differ slightly because of independent rounding. [3]

A hypothetical example makes the weight important. Suppose capital services per hour rise three percent and capital's cost share is one third. The capital intensity contribution is approximately one percentage point. If labor productivity rises two percent, the other percentage point must come through labor composition and the residual in that accounting exercise. This arithmetic does not estimate what output would have been if businesses had been prohibited from investing.

Use the private nonfarm business contribution when comparing with the same sector's output and hours. The private business series includes farms and can have a different annual result. Neither series represents all government and nonprofit production. Sector labels are especially important when a presentation combines the growth decomposition with economy wide labor share or national income measures. [1]

This metric occupies a precise place in the post labor argument. It quantifies one route by which production rises without proportionately more human time: workers have access to more productive asset services. Its positive contribution documents the role of capital deepening in observed productivity. It does not count eliminated jobs, identify AI investment or determine whether workers or owners receive the resulting income. Those questions require related labor market, asset composition and distribution series.

The historical accounting record

For private nonfarm business, BLS reports an average capital intensity contribution of 0.9 percentage point per year over 1987–2025. Labor productivity grew 2.0 percent annually across that span. The contribution was therefore a substantial part of the recorded productivity improvement over almost four decades.

Dividing the rounded figures suggests roughly forty five percent, but this ratio should be described as approximate and dependent on the chosen interval. [3]

The contribution was 1.0 percentage point in 1990–2000 and 1.1 in 2000–2007. It fell to 0.7 during 2007–2019 before returning to 0.9 over 2019–2025. This sequence supplies a secular positive role for capital, together with clear variation in its pace. It does not support describing the capital contribution as a smooth upward trajectory. The strongest historical claim is persistence across different technological and business cycle eras. [3]

For the latest annual observation, 2025, labor productivity rose 2.2 percent and capital intensity supplied 0.9 percentage point. Labor composition supplied 0.4 and total factor productivity 0.8; rounding explains their slight discrepancy with the reported total. In 2024 the corresponding contributions were 1.1, 0.3 and 1.5 against 3.0 percent labor productivity growth. The recent slowdown therefore involved the residual as well as capital intensity. [1][3]

Asset detail provides another useful boundary. Table B gives contributions from information processing equipment, research and development, other intellectual property and other capital for detailed years. The 2025 subcategories are unavailable in this release. A claim that AI supplied a particular fraction of the newest aggregate contribution would exceed the published classification. Even software and information equipment categories encompass many applications beyond machine learning. [3]

Earlier project notes mixed capital input growth with productivity contribution. The current reference keeps them separate. An intellectual property contribution to capital input growth is a decomposition of the capital numerator. A capital intensity contribution to labor productivity is a cost weighted decomposition of output per hour. They involve different totals, weights and units, so a number from one table cannot replace the other.

Period	Capital intensity contribution	Labor productivity growth
1987 to 2025	0.9 percentage point	2.0%
1990 to 2000	1.0 percentage point	2.2%
2000 to 2007	1.1 percentage points	2.7%
2007 to 2019	0.7 percentage point	1.5%
2019 to 2025	0.9 percentage point	2.2%
2025	0.9 percentage point	2.2%

Source [3]; private nonfarm business; average annual values for multiyear periods

A bridge between assets and labor saving

A direct productivity comparison shows that more output is produced per human hour. The capital contribution adds an explanation of the measured inputs behind that change. It asks how much of the improvement is associated with additional capital services per hour, weighted by their economic cost. This is particularly useful for a framework that treats automation as a process extending across decades rather than a phenomenon beginning with generative AI.

Consider an office that introduces enterprise software, a factory that installs precision machinery and a logistics network that adds automated sorting. Each can reduce the time required for recurring operations. Where the assets qualify as measured capital, their accumulated services appear in capital intensity. Where complementary workflow changes increase effectiveness beyond measured asset accumulation, some effect may appear in total factor productivity. The separation helps avoid treating every productivity improvement as a direct return to physical machinery.

The contribution is compatible with workers becoming more capable. The same person may produce more because better tools make their judgment, coordination or dexterity more effective. A declining hours requirement per unit can coexist with more skilled workers, higher output and even more total hours. The employment implication turns on demand growth and how tasks change. Capital's contribution supplies evidence about the productive mechanism without requiring an assumption that all complements eventually become substitutes.

For the distribution thesis, the comparison to compensation is consequential. If capital deepening raises productivity and typical pay rises proportionately, growth continues supporting wage based prosperity. If productivity rises while compensation increasingly concentrates among a small group or shifts toward profits, the channel from technical progress to broad security has weakened. The growth accounting result sets the production context for that separate distribution test.

There are also resource requirements. Productive capital requires electricity, maintenance, finance and replacement. A positive gross contribution does not establish that the economy obtained the improvement at negligible cost. Depreciation and operating costs determine the net gain available to households. This makes gross and net measures useful companions, especially when rapidly depreciating digital equipment accounts for a larger share of investment. The dashboard should show the productive improvement while preserving the costs involved in sustaining it.

Accounting is different from a causal experiment

Growth accounting relies on assumptions about how input payments reflect productive contributions. BLS weights inputs by cost shares and constructs capital services with estimated rental prices. This creates a coherent decomposition of measured growth. It does not isolate the causal effect of a particular investment through a randomized comparison or an identified natural experiment. A company may invest because demand is already rising, and other changes may occur simultaneously. [1][4]

A positive capital contribution also does not prove that total employment would have been higher without investment. Without better equipment a business could lose customers, become uncompetitive or cease operating. Investment may preserve employment even while reducing hours per unit. Counterfactual job estimates require a model of demand, substitution, competition and alternative adjustment. The accounting table establishes what happened to measured inputs and output, leaving that counterfactual open.

The long run contribution can slow for reasons other than a reduced technical capacity to automate. Investment weakness, falling demand, financing costs, changes in asset prices and industry composition all affect the ratio and weight. The 2007–2019 contribution being lower than earlier periods is therefore useful evidence about realized capital deepening, while its interpretation requires the economic conditions of that interval. A long history should preserve such reversals rather than selecting only the strongest years.

Capital assets can embody technology whose quality is difficult to measure. Underestimating improved equipment quality can move apparent growth from capital input toward the residual. Changes in the investment boundary can move it in the opposite direction. Revisions that capitalize research or software can therefore alter the decomposition even when the underlying activity existed previously. Inspecting national accounts methods helps establish which portion of an apparent structural break is measurement. [4]

The interpretation strengthens when multiple industry decompositions show durable contributions accompanied by falling labor requirements per unit, and when identifiable investment episodes explain task changes. It weakens if the aggregate increase depends predominantly on temporary hours collapse or reclassification. These criteria allow the metric to remain strong descriptive evidence without claiming a degree of technological or employment attribution it cannot supply alone.

A decomposition chart with stable units

Build a stacked bar chart of annual or business cycle average contributions using BLS Table B. Show capital intensity, labor composition and total factor productivity on one common percentage point axis. Overlay the reported labor productivity growth rate or label it above each bar. Retain negative components when present. Avoid a pie chart when the total is small or a component is negative, since the implied shares become unstable. [3]

The preferred secular view displays the published periods beginning in 1990 alongside a longer 1987–2025 average. A companion annual chart provides detail and identifies the pandemic and subsequent recovery. Make the sector label visible. If a chart uses private nonfarm business, every component must come from that sector's rows rather than mixing private business and nonfarm observations. [2]

Update annually, preserve the vintage and annotate preliminary newest year estimates. When detailed asset contributions become available, show them in a separate decomposition whose denominator is explicitly labor productivity growth. Capital input growth contributions belong in their own chart. A monitoring worksheet should label each field as percent growth or percentage point contribution so numerical similarity cannot conceal a unit mismatch.

Connect this entry to capital services per hour, labor composition and total factor productivity. Fixed assets and equipment or intellectual property investment explain the capital's composition. Productivity and typical pay, labor share, profits and household ownership assess how the gains reach people. Together these measures distinguish added assets, improved use of inputs and distributional outcomes, preserving the capital contribution's specific role in the broader evidence set.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Total Factor Productivity 2025. March 19 release and technical notes; preliminary aggregate 2025 and detailed capital 2024; verified retrieval 4 October 2026

[2] Bureau of Labor Statistics (2026). Table A Productivity output and inputs for selected periods 1987 to 2025. Private nonfarm business growth rates, annual and business cycle averages; verified retrieval 4 October 2026

[3] Bureau of Labor Statistics (2026). Table B Labor productivity growth and contributions of capital intensity labor composition and total factor productivity. Percentage point contributions through 2025; verified retrieval 4 October 2026

[4] Bureau of Labor Statistics (2026). Handbook of Methods Labor Productivity and Costs Calculation. Capital services, labor input, aggregation and productivity calculation; verified retrieval 4 October 2026

RELATED CHAPTERS 049 · 050 · 052 · 053 · 054 · 057 · 060 · 064

CHAPTER 052

Labor composition contribution to growth

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN 1987 to 2025

Changing workforce characteristics supplied a persistent positive productivity contribution, showing that human input changes alongside capital deepening.

Measuring the workforce mix

Labor composition describes changes in the characteristics of the workers supplying hours to production. BLS groups labor by age, education and sex, then aggregates hours using wage based weights. A shift toward groups receiving higher compensation increases measured quality adjusted labor input relative to unweighted hours. The labor composition contribution weights that difference by labor's share of production costs when explaining labor productivity growth. [1][4]

Its units require care. Labor composition growth is a percentage change in the weighted labor input index relative to hours. Its contribution to output per hour is measured in percentage points. An index change of 0.6 percent can supply a smaller productivity contribution because labor has less than a one hundred percent cost weight. The source publishes both quantities, and their numerical difference reflects the accounting method rather than inconsistent observations. [2][3]

Education and age are observable proxies for labor characteristics. The measure does not directly assess each person's competence, motivation, task performance or capacity to supervise an automated system. Wage weights reflect labor market valuations and can also incorporate institutions, scarcity and differences in opportunity. Consequently, an increase should be described as a change in the measured workforce mix instead of a universal improvement in every worker's skill. [1][4]

The private nonfarm business population includes employees, proprietors and unpaid family workers in covered activities. It excludes production outside that sector. This is a composition measure for hours used in production, rather than an education attainment rate for the full adult population. Rising qualifications among employed workers can occur alongside difficult entry conditions for other people, and the aggregate composition result will not identify those excluded individuals.

This entry acts as an interpretive control in the post labor reference. It prevents output growth on slowly growing hours from being automatically assigned entirely to machines. The economy can increase effective human input by changing who works, which groups supply hours and how their hours are weighted. Understanding this contribution improves attribution of the residual and clarifies whether productivity growth has accompanied greater demand for particular human capabilities.

A stable trend with pandemic disruption

Across 1987–2025, BLS records average annual labor composition growth of 0.5 percent in private nonfarm business. Its contribution to labor productivity averages 0.3 percentage point. Both the 1990–2000 and 2007–2019 periods show the same rounded 0.5 percent composition growth and 0.3 percentage point contribution. The long history establishes a persistent role for workforce mix rather than a recent phenomenon associated solely with AI. [2][3]

The published 2000–2007 period records 0.4 percent annual composition growth, again with a rounded 0.3 percentage point productivity contribution. Over 2019–2025 composition grew 0.5 percent annually and supplied 0.3 percentage point. The consistency of these rounded period values makes it inappropriate to claim a continuously accelerating shift toward highly skilled human work on the strength of this measure alone. [2][3]

Individual years can be much more volatile. Labor composition rose 2.8 percent in 2020 and fell 0.8 percent in 2021. BLS explains that younger and less educated workers were more likely to lose jobs in the contraction and reenter as activity recovered. A rising composition index during a severe downturn can therefore be produced by selection among remaining workers. It need not represent a sudden education or training breakthrough. [1]

The latest annual observations, 2024 and 2025, each show 0.6 percent labor composition growth. The productivity contribution was 0.3 percentage point in 2024 and 0.4 in 2025. BLS rounds these series separately, so small differences should be interpreted with the unrounded downloadable data when exact decomposition arithmetic matters. The 2025 estimates were published in March 2026 and remain preliminary in that release. [1][3]

The table keeps index growth and contribution alongside one another. This presentation is useful for auditing claims that refer loosely to skills carrying growth. The first column quantifies a measured workforce change. The second indicates its cost weighted role in productivity. Neither gives an occupation level count of people who gained skills, nor a direct measure of the availability of good jobs for workers with those characteristics.

Period	Labor composition growth	Productivity contribution
1987 to 2025	0.5% annually	0.3 percentage point
1990 to 2000	0.5% annually	0.3 percentage point
2000 to 2007	0.4% annually	0.3 percentage point
2007 to 2019	0.5% annually	0.3 percentage point
2019 to 2025	0.5% annually	0.3 percentage point
2025	0.6%	0.4 percentage point

Sources [2][3]; private nonfarm business; contribution and index growth are different units

Human capabilities within an automating economy

Capital deepening can change the kinds of people and work a production system uses. If software automates repetitive processing, a firm may retain workers who handle exceptions, manage customers or design systems. If machinery makes a physical task less demanding, workers previously excluded from that activity

may become productive in it. Those mechanisms can shift workforce composition while total hours grow slowly. The direction of the wage weighted measure depends on which groups gain or lose hours.

For the post labor thesis, this helps distinguish compaction from a simple across the board disappearance of work. A smaller or slowly expanding pool of hours can contain a different mixture of skills and responsibilities. Production may become increasingly selective about which human inputs remain scarce. Evidence of changing composition can therefore illuminate the distribution of access to work, provided occupational and entry data substantiate the selection process.

The measure also demonstrates continuing human contributions. A positive labor composition contribution means part of productivity growth is associated with changes in measured labor input, even after unweighted hours are held conceptually separate. A complete account should acknowledge this contribution. Treating all output beyond hours as the product of capital would erase a component explicitly recognized in the accounting system.

Education attainment growth can have beneficial effects outside paid production. It can improve health decisions, civic participation or family capabilities even if employers do not create enough jobs requiring every graduate's credentials. The growth accounting index records only the characteristics embodied in hours used by the covered business sector. Graduate underemployment and credential requirements thus address a different aspect of the labor market and belong alongside this entry when interpreting employment access.

A useful analytical distinction is between an extensive margin and an intensive margin. Adding more people or hours changes the extensive supply of labor. Changing the characteristics of each weighted hour changes the measured intensive contribution. Automation can affect both, and so can migration, retirement, education policy and participation changes. Following the separate margins allows the reference to describe how production evolves without assuming every workforce shift was caused by technological substitution.

Selection weights and causal limits

A composition increase can occur through exclusion. If workers with lower measured wage weights lose hours while higher weighted groups retain them, average weighted labor rises relative to total hours. This is a selection effect. It can raise observed productivity even when no individual becomes more productive. The pandemic illustrates the practical importance of this possibility and makes full cycle comparisons preferable to interpreting a single recession year as evidence of a new skill regime. [1]

Wages serve as weights because they provide information about the value assigned to labor in production. They also reflect bargaining institutions, discrimination, geography and labor market constraints. The measure's categories do not eliminate every source of unequal pay within otherwise comparable groups. Interpret the index as a standardized economic aggregation whose assumptions help organize production data, while avoiding a moral or biological ranking of workers. [4]

The categories are necessarily coarse. Age does not distinguish all experience, education does not capture all skills, and sex is a classification used by the statistical source. Rapid changes in the ability to use software or operate new equipment may occur within categories and remain unmeasured. Such improvements can influence the residual. Composition being stable therefore does not establish that human capabilities or work practices stopped changing.

Capital and workforce composition are interdependent. A firm buying more complex equipment may also hire different employees or train existing staff. The growth accounting components separate measured inputs using accounting rules, while causal investments may operate through several components at once. A research program seeking the effect of automation should examine investment timing, worker histories and task changes rather than assigning mutually exclusive causes to every published contribution.

This entry would support the compression interpretation more directly if a long term rise in measured workforce selectivity coincided with narrower entry routes, increasing credential demands and stable or declining total labor requirements per unit. It would point toward broad human augmentation if productivity and compensation gains spread across groups and access to work improved. As published, it is useful supporting context and an attribution check, rather than independent proof that labor's aggregate economic role is diminishing.

Monitoring quality adjusted labor alongside hours

Display the labor composition index and unweighted hours in separate panels, with a third view showing the composition contribution to labor productivity. Use annual BLS private nonfarm business data and identify the vintage. Annotate the 2020 and 2021 changes to show how employment selection can affect the series. The chart title should describe measured workforce composition rather than implying a direct test of intelligence, education quality or training effectiveness. [1][2][3]

For the secular view, compare full business cycle average contributions. The long period ending in 2025 supplies almost four decades of history. Preserve intermediate periods so a stable or slowing contribution remains visible. A monitoring note should state composition growth and percentage point contribution separately and compare them with capital intensity and total factor productivity from the same source.

Follow annual revisions and avoid extending the composition index with a proxy such as college attainment without marking a series break. Population education data and employed workforce weighted hours have different denominators. If newer attainment statistics are included, place them beside the BLS measure and explain their relationship instead of treating them as interchangeable observations.

Connect this entry to education requirements, graduate underemployment, early career entry, capital deepening and total factor productivity. The first group explains who can enter and remain in productive work; the second explains how the input mix contributes to output. Typical pay and labor share then assess whether the measured human contribution reaches workers broadly. Together these connections preserve human input as an observable part of the production system while examining the changing conditions under which people can supply it.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Total Factor Productivity 2025. March 19 release and technical notes; preliminary aggregate 2025 and detailed capital 2024; verified retrieval 4 October 2026

[2] Bureau of Labor Statistics (2026). Table A Productivity output and inputs for selected periods 1987 to 2025. Private nonfarm business growth rates, annual and business cycle averages; verified retrieval 4 October 2026

[3] Bureau of Labor Statistics (2026). Table B Labor productivity growth and contributions of capital intensity labor composition and total factor productivity. Percentage point contributions through 2025; verified retrieval 4 October 2026

[4] Bureau of Labor Statistics (2026). Handbook of Methods Labor Productivity and Costs Calculation. Capital services, labor input, aggregation and productivity calculation; verified retrieval 4 October 2026

RELATED CHAPTERS 049 · 050 · 051 · 053

CHAPTER 053

Total factor productivity

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN 1987 to 2025

Output efficiency improved over decades, with a substantial slowdown after 2007 and a partial recent recovery rather than an established continuous acceleration.

The residual after measured inputs

Total factor productivity compares real output with a combined index of productive inputs. In the BLS private nonfarm business aggregate, those inputs are capital services and quality adjusted labor. TFP rises when measured output grows faster than the weighted input bundle. Its annual growth rate is expressed as a percent, while its contribution to labor productivity growth uses percentage points. It is often called multifactor productivity in older releases and research. [1][4]

The combined input measure incorporates hours, workforce composition and capital services with economic weights. Consequently, a firm adding more machines can increase labor productivity without increasing TFP by the same amount. The additional capital is counted as an input. TFP captures the remaining improvement after that input expansion is recognized. This distinction matters when asking whether output on slowly growing hours reflects more productive assets, more effective use of existing inputs or both.

The residual includes several influences. BLS identifies technological change, efficiency improvements, returns to scale, resource reallocation and other factors. Organization, utilization, omitted inputs and measurement error can also affect the relationship between recorded output and inputs. TFP is therefore an aggregate efficiency measure whose interpretation requires supporting evidence. Labeling the full residual AI progress or capital's contribution would exceed what the accounting establishes. [1]

The sector boundary is private nonfarm business. It excludes general government, nonprofit institutions, owner occupied housing, government enterprises and farms. Sector and industry TFP measures can use different output and input concepts, including intermediate inputs in industry accounts. An industry gross output residual should not be compared directly with the aggregate value added measure without explaining the difference. [1][4]

TFP belongs in the post labor reference because it describes how much production improves beyond measured input accumulation. A long run positive trend means an economy can obtain more output from a given measured bundle of assets and human labor. It does not determine whether labor is substitutable in every task, whether employment falls, or whether households gain access to the improvement. Its specific contribution is evidence of persistent improvements in the effectiveness of the production system.

A long rise interrupted by slower periods

BLS reports average annual private nonfarm TFP growth of 0.9 percent over 1987–2025. Output grew 2.9 percent and combined inputs 2.1 percent annually across the same span. Rounding prevents exact

subtraction, but the figures show the broad relationship: measured inputs increased, and production also became more effective relative to those inputs. The history meets the twenty year duration criterion. [2]

The rate varied across technological eras and business cycles. TFP grew 0.9 percent annually in 1990–2000, 1.3 percent in 2000–2007 and 0.6 percent in 2007–2019. Its growth was 1.0 percent annually over 2019–2025. The post 2007 slowdown is a material part of the empirical record. Recent performance is stronger than that earlier slow interval, but a six year comparison does not establish a permanent acceleration above the pre 2007 trend. [2]

The latest year, 2025, records 0.8 percent TFP growth. Output rose 2.6 percent and combined inputs 1.7 percent. In 2024 TFP rose 1.5 percent. BLS notes that both output and TFP growth decelerated in the latest two years. A reference claiming that the newest technologies have already produced an accelerating national productivity explosion would conflict with this observed sequence. [1]

Detailed capital estimates end in 2024 in the March 2026 release, while aggregate 2025 TFP is preliminary. Subsequent revisions to output, hours and investment can change the residual. Its status as a residual makes it sensitive to revisions in several source series at once. Always attach the publication date and observation endpoint when comparing new releases with figures saved in an earlier manuscript.

The secular finding is persistent cumulative improvement in efficiency, alongside uneven growth rates. It offers support for the capacity to expand production without proportionate input expansion. It also supplies a useful discipline: strong technological narratives should explain why measured efficiency growth slowed for a long interval and how much of a recent increase reflects cyclical recovery, asset accumulation or a genuinely sustained change in the production system.

Period	TFP annual growth	Output annual growth	Combined input growth
1987 to 2025	0.9%	2.9%	2.1%
1990 to 2000	0.9%	4.0%	3.1%
2000 to 2007	1.3%	2.8%	1.5%
2007 to 2019	0.6%	2.1%	1.6%
2019 to 2025	1.0%	2.7%	1.6%
2025	0.8%	2.6%	1.7%

Source [2]; private nonfarm business; rounded average annual growth rates

Efficiency and the loosening production constraint

A manufacturing process can yield more usable products from the same equipment and labor after improved scheduling reduces downtime. A logistics operation can deliver more packages with the same vehicles and hours when routing improves. A software service can handle more users without proportionate staff growth when its architecture becomes more efficient. These are illustrative mechanisms through which output can improve relative to measured inputs.

Such improvements fit the broad automation argument when technology allows a production system to rely less on recurring human coordination or execution. They also include changes in organization and allocation that do not involve substituting a robot for a worker. TFP helps preserve this broader view of productive

change across decades. A framework limited to visible machinery would miss software enabled scale, improved process design and other changes captured indirectly in efficiency.

The connection to labor requirements operates through output per hour. If TFP rises while the other input relationships remain similar, output per human hour can rise. The amount of human time needed for a unit of output falls. Whether total hours subsequently decline depends on demand. Expanding demand can absorb the productivity gain through more output; stable demand can translate it into fewer hours, reduced hiring or changes in work intensity.

TFP is especially useful for analyzing coordination. Information retrieval, scheduling and quality control can limit the effective use of equipment and people. Removing those bottlenecks improves production even without a large increase in the measured stock of capital. Some expenditure enabling that improvement is recorded as software investment; other knowledge and organizational changes remain outside standard capital measures. The decomposition should therefore be read as organizing measured channels rather than fully separating every underlying mechanism.

Distribution remains open. Higher efficiency can support lower prices, greater profits, higher wages, more leisure or a combination. A production system can become markedly more efficient while household insecurity rises if access to income remains tied to scarce employment or concentrated ownership. Pairing TFP with compensation and transfer measures examines that institutional link. The efficiency series establishes productive possibilities; the distribution series establish how society allocates their benefits.

Reasons a productivity residual can mislead

Capacity utilization changes can move measured TFP over a cycle. A factory may produce less while retaining machines and staff, lowering output relative to measured inputs. During recovery the same installed capacity can produce more, raising the residual without a new invention. Full cycle averages and independent utilization measures reduce the risk of treating those movements as permanent technical progress.

Output measurement is difficult where quality changes rapidly or services lack clear physical units. New products, free digital services and improved performance can be imperfectly captured by price indexes. Capital quality is also difficult to measure. If the improvement in an input is understated, more growth can appear in TFP. If an unmeasured asset later enters the capital boundary, the accounting can move growth toward capital input. These issues affect attribution rather than automatically invalidating the broad output record. [4]

Reallocation between firms and industries can raise aggregate productivity even when incumbent firms do not improve. More productive firms gaining market share can increase the national residual. This may be associated with scalable technology, competitive selection or changing demand. Worker displacement and ownership concentration can then depend on where expanding firms operate and whom they hire. Aggregate TFP alone cannot establish whether that mechanism improves opportunities for the displaced workers.

Technical improvement can spread slowly. New equipment may require complementary software, management changes, training and redesigned business processes before delivering measured gains. A weak short run aggregate response therefore does not prove a technology lacks productive potential. Equally,

promising demonstrations do not prove that a long run national acceleration has already occurred. Both claims need observation of adoption, operational performance and persistence over time.

The post labor interpretation strengthens when efficiency improvements endure through full cycles and correspond to independently observed reductions in labor requirements across production systems. It weakens if gains vanish after utilization normalizes or depend mostly on accounting shifts. The historical slowdown should be retained as an empirical constraint. A complete explanation of the secular transition must accommodate rising efficiency levels alongside periods when the rate of improvement is comparatively modest.

A chart that distinguishes levels from growth

Use BLS annual TFP indexes for a long run level chart, normalized to a stated base year. Place annual growth rates in a separate panel, since a continuously rising index can coexist with slower growth. The index shows cumulative productive improvement; the rates show whether the pace is accelerating or decelerating. Include the full post 2007 period and the pandemic rather than choosing endpoints that conceal slower performance. [2][4]

A second chart should display TFP beside capital intensity and labor composition contributions to output per hour. This makes the residual's position clear and avoids attributing all productivity to one channel. Use the same sector, annual frequency and vintage. Industry decomposition can be added when its output and intermediate input definitions are explicitly stated. [3]

Update after each annual release and rebuild the series after revisions. Keep preliminary newest year labels. A monitoring statement should report output growth, combined input growth and the residual together, followed by the business cycle average. It should identify which new evidence would distinguish utilization from durable efficiency improvement.

Connect TFP to capital deepening, productive asset investment, output versus hours and revenue per employee. Those entries explain the measured inputs and concrete production relationships. Add labor share, typical pay, ownership and transfer income to investigate distribution. TFP supplies a production capacity signal within that chain. Maintaining the distinction between its level and its growth rate allows it to support a long run productivity trend without implying that every recent technology has already accelerated aggregate performance.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Total Factor Productivity 2025. March 19 release and technical notes; preliminary aggregate 2025 and detailed capital 2024; verified retrieval 4 October 2026

[2] Bureau of Labor Statistics (2026). Table A Productivity output and inputs for selected periods 1987 to 2025. Private nonfarm business growth rates, annual and business cycle averages; verified retrieval 4 October 2026

[3] Bureau of Labor Statistics (2026). Table B Labor productivity growth and contributions of capital intensity labor composition and total factor productivity. Percentage point contributions through 2025; verified retrieval 4 October 2026

[4] Bureau of Labor Statistics (2026). Handbook of Methods Labor Productivity and Costs Calculation. Capital services, labor input, aggregation and productivity calculation; verified retrieval 4 October 2026

RELATED CHAPTERS 049 · 050 · 051 · 052 · 054 · 057 · 060 · 064

CHAPTER 054

Productive fixed capital stock

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN 1925 to 2024 verified stock extract with BEA update through 2025

The productive asset base expanded over decades, while current cost valuation alone cannot establish real automation or labor substitution.

Accumulated assets after depreciation

Productive fixed capital stock is the accumulated value or quantity of assets used repeatedly in production, after allowing for depreciation. The practical U.S. measure is BEA's private nonresidential fixed assets: structures, equipment and intellectual property products. A net stock is a point in time estimate, generally at year end. It is different from investment during the year, which is a flow, and from capital services, which describe the productive service supplied by assets. [1][2][3]

BEA publishes several valuation concepts. Current cost net stock estimates the depreciated assets at contemporary replacement prices. Historical cost retains acquisition price information. Real or quantity indexes remove price changes under the national accounts methodology. The choice determines what a rising line means. Current cost stock can rise because new assets were added, because replacement prices increased, or through both processes. A claim about increasing physical productive capacity should therefore rely on real quantities and services alongside current cost values. [2]

Private nonresidential assets provide a narrower production focused boundary than household net worth. They exclude financial claims and owner occupied homes. They also differ from the full business capital input measure, which can include land and inventories. Financial wealth can rise through share valuations without a proportional increase in these produced assets. Land appreciation can increase wealth even though the stock of land has not expanded.

Net stock incorporates the remaining economic value of past investment after depreciation. An old machine can still contribute to output, while a newer asset may have a short economic life. BEA uses asset specific investment histories and depreciation patterns to estimate these balances. The result is a statistical reconstruction of the installed productive base, rather than a census counting every machine, building and software installation. [2]

For post labor economics, this stock supplies background evidence about the apparatus available to support production. More productive assets can permit greater output without proportionately more recurring human labor. Their presence does not establish whether they actually do so. Output, utilization, capital services and hours provide the operational test; the fixed stock describes the assets through which that productive change may be sustained.

The long balance sheet and its current endpoint

The verified FRED extract of BEA current cost private nonresidential net stock runs from 1925 through 2024. Selected values are $7.07 trillion in 1990, $11.61 trillion in 2000, $18.68 trillion in 2010 and $35.90 trillion in 2024. These observations document the scale and history of the replacement cost balance sheet. They are nominal valuations, so their increase cannot be converted directly into a claim that physical automation capacity rose by the same multiple. [4]

The extract's vintage matters. It was last updated in October 2025. BEA's own Fixed Assets page records a September 30, 2026 annual update covering estimates for 2021–2025. The existence of that newer official release does not supply a verified value for every series in an older mirror. This chapter retains the audited 2024 extract as a numerical checkpoint and identifies the newer BEA table as the correct location for updating the complete series. [1][4]

The history contains valuation reversals. Current cost net stock fell from $18.79 trillion in 2008 to $18.23 trillion in 2009 in the extract. That decline accompanied the financial crisis and illustrates why a nominal stock cannot be treated as an automatically smooth technological progress index. Investment, depreciation, asset prices and exceptional losses all can affect the balance. [4]

For the secular criterion, the stock's long coverage is sufficient to examine several decades, but coverage alone does not prove any particular normalized trend. The analytically useful tests are real stock per hour, real stock per worker, the asset composition of stock, and productive capital relative to output. These tests distinguish economic scale from a changing requirement for human time. The BLS capital services record provides more direct evidence of the input mix.

The table intentionally labels its figures current cost. A chart intended to show the productive transformation should present these values beside quantity indexes and depreciation, and should preserve the official revision vintage. A national accounts reclassification can add assets to the measured boundary even if organizations had already been creating them for years. That change is economically informative but needs a method note before being portrayed as an investment surge.

Year	Current cost private nonresidential net stock
1990	$7.07 trillion
2000	$11.61 trillion
2010	$18.68 trillion
2020	$27.01 trillion
2024	$35.90 trillion

Source [4]; nominal replacement cost net stock at year end; audited extract predates September 2026 BEA update

Installed capacity and the duration of labor saving

A stock measure explains how the gains from investment persist. A business does not need to rebuild its entire production apparatus each year. Past investment supplies services over an asset's economic life, and current investment expands or replaces that capacity. Long lived machinery, warehouses and codebases can sustain lower labor requirements well after the initial purchasing episode has passed.

This makes net stock relevant to a secular transition. Temporary labor shortages or high wages can induce investment that permanently changes a process. Once the system is installed, production may continue using fewer hours per unit even after the original pressure subsides. A persistent installed base provides one reason technological substitution can survive ordinary cyclical changes. Actual persistence still needs observation of output, staffing and replacement decisions.

The asset types differ. A structure creates space and infrastructure. Equipment performs or enables physical operations. Software and research assets organize or embody knowledge. Their service patterns and depreciation rates vary, so the stock's composition can matter more than its aggregate dollar total. A shift toward rapidly depreciating assets can require larger gross investment simply to maintain the same productive services.

Ownership also shapes distribution. The assets may be owned by corporations, proprietors or landlords and financed through debt or equity. Users can lease them instead of owning them. The labor saving production benefit can accrue to the user, while service revenues flow to the owner and financiers. A productive stock analysis should therefore remain distinct from an analysis of household claims on that stock.

A hypothetical case clarifies the distinction. A factory buys equipment costing ten million dollars and later produces the same output with fewer hours. The installed machinery belongs in fixed assets, the annual service enters capital input, the purchase enters investment, and any subsequent dividend enters household or shareholder income. These are four observations of related economic activity, with different units and timing. Keeping them separate makes the framework more explanatory and prevents counting the same investment as four independent pieces of evidence.

Prices depreciation and omitted assets

Replacement cost can rise when capital becomes more expensive. A building shortage can increase the measured current cost of structures even if little additional usable space is created. Conversely, better computers can provide more services while their quality adjusted prices fall. Dollar stock and productive capacity can therefore move differently. The relative price of machinery entry addresses the incentive and measurement implications of that divergence.

Depreciation is another boundary. Gross investment includes replacement of worn or obsolete assets. Net investment measures the addition after consumption of fixed capital. If a business must replace servers frequently, high spending can maintain rather than dramatically expand the productive base. An automation narrative based only on gross expenditure can overlook this resource requirement. Stock and service measures show whether additional capacity was actually sustained. [2][3]

The national accounts capital boundary is incomplete by design. Some organizational knowledge, brands, employee training and internally produced data may remain outside standard fixed asset measures or appear only in experimental estimates. Their economic importance can be real without being represented in this stock. Broad intangible investment research uses a wider boundary, so its totals cannot simply be added to official intellectual property assets without checking overlap.

Housing creates a frequent conceptual problem. A household wealth ratio including owner occupied property can rise because land and housing prices rise. That development concerns ownership, asset access and

distribution, but it does not establish the same thing as a factory or software stock expansion. The productive nonresidential boundary helps keep those channels distinct while allowing them to be connected elsewhere in the reference.

The post labor interpretation strengthens if real productive stock and capital services per hour rise, asset utilization remains effective, and labor requirements per unit fall across affected industries. It weakens if the balance sheet expansion is predominantly price inflation, depreciation replacement or reclassification. This is therefore supporting asset evidence, with stronger conclusions reserved for the linked production data. The stock documents the apparatus; operational measures establish what it accomplishes.

Reproducing a stock and composition chart

Download BEA Fixed Assets tables for private nonresidential net stock, distinguishing current cost and quantity indexes. Use the September 2026 update when reproducing a current chart and retain the original files. Report the actual endpoint available in the selected table. Do not append an unverified 2025 observation to an older FRED extract simply because BEA released new accounts. [1][4]

Show the real stock index in the main panel and the current cost valuation in a separate panel. Add equipment, structures and intellectual property composition where the table supports it. For per hour comparisons, match the asset population as closely as possible to BLS business hours and explain remaining differences. Capital services are the preferred numerator for the exact BLS capital intensity calculation.

A monitoring worksheet should record gross investment, depreciation, net investment, net stock and the relevant asset price measure. These quantities help explain whether a larger balance reflects increased capacity, replacement needs or valuation changes. Update annually and rebuild revised historical observations, since investment and depreciation revisions accumulate into the stock.

Connect this entry to capital input, capital intensity and the separate asset investment chapters. Wealth relative to income and household capital ownership address the claims people hold on productive and other assets. Corporate profits and capital income address flows from those claims. The resulting set distinguishes the physical and intellectual productive base from market valuation, financing and distribution, which is essential when discussing capital's expanding economic importance.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Economic Analysis (2026). Fixed Assets. September 30 2026 update; standard and detailed tables through 2025; verified retrieval 4 October 2026

[2] Bureau of Economic Analysis (2003). Fixed Assets and Consumer Durable Goods in the United States 1925 to 97. Methods for stocks, depreciation, investment and valuation; verified retrieval 4 October 2026

[3] Bureau of Economic Analysis (2026). NIPA Handbook Chapter 6 Private Fixed Investment. Definitions, asset coverage and investment estimation; verified retrieval 4 October 2026

[4] Bureau of Economic Analysis via FRED (2026). Current Cost Net Stock of Fixed Assets Private Nonresidential. Annual 1925–2024; units millions of dollars; extract vintage October 30 2025; verified retrieval 4 October 2026

RELATED CHAPTERS 049 · 050 · 055 · 056 · 057 · 062 · 063

CHAPTER 055

Nonresidential structures investment

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN 1947 to second quarter 2026

Business structures are a durable component of productive capital, but their investment cycle does not establish a continuously rising secular automation share.

Investment in the built production environment

Nonresidential structures investment measures expenditure on buildings and other fixed structures used in business production. It includes offices, factories, warehouses and other qualifying construction, with detailed categories defined in the national accounts. The metric is a flow during a period, expressed in current dollars, real quantities or growth rates. It differs from the accumulated value of existing structures and from the land on which they stand. BEA's private fixed investment framework provides the definitions. [1]

The principal quarterly series is private fixed investment in nonresidential structures. Its current dollar observations are seasonally adjusted annual rates. An annual rate describes the pace implied by a quarter; it is not the amount actually spent during that quarter. Divide by four only when the purpose requires an approximate quarter's flow, while retaining the statistical source's unit in published charts. [2]

Structures supply the built environment in which automation operates. A warehouse can house sorting equipment, a manufacturing building can support automated production, and a data center can host computing infrastructure. Buildings themselves do not identify the labor saving technology inside them. A rise in structures investment can also fund hotels, health facilities or other activities with substantial human service requirements.

A nominal investment share divides current dollar structures spending by current dollar GDP. A real growth series instead tracks the quantity change in the category. Chained dollar components should not be summed to construct arbitrary aggregates across time, because relative prices and chain weights change. Use official aggregates or current dollar shares when composition is the question. [1]

This entry adds the infrastructure dimension to the productive capital dashboard. The post labor hypothesis needs a physical apparatus capable of sustaining production, including power connections, buildings and networks. Structures investment observes part of that apparatus. Its evidentiary role depends on what is built, whether it becomes operational and how production then uses human hours. Broad construction growth alone gives no count of substituted jobs or recurring labor savings.

Long coverage and a recent reversal

BEA's structures series has quarterly coverage beginning in 1947. The latest audited observation, updated September 30, 2026, is $935.340 billion at a seasonally adjusted annual rate for the second quarter of 2026. The same current series reports $963.314 billion in the second quarter of 2025. This recent comparison

shows nominal spending lower than a year earlier despite a larger economy and intense attention to particular construction categories. [2]

The latest sequence is $951.689 billion in the third quarter of 2025, $939.100 billion in the fourth quarter, $924.535 billion in the first quarter of 2026 and $935.340 billion in the second quarter. It contains a decline and subsequent modest increase. The record therefore does not support a simple claim that all business structures spending is continuously accelerating. Specific manufacturing or computing construction can behave differently from the total. [2]

Long history allows a secular test, but the available numerical checkpoints here are deliberately a current snapshot rather than a claim about rising real investment over the entire period. To establish a twenty year change, reproduce real structures quantities, current dollar shares of GDP and category composition from one consistent vintage. Inflation, business cycles and swings in energy or commercial property investment can dominate an unadjusted dollar comparison.

One source audit found older cached FRED table extracts with different recent levels from the current September 2026 series. Those figures should not be spliced into the updated endpoint. This chapter uses the current series page for its latest observations and directs historical reproduction to a unified download. Keeping the vintage consistent is especially important after an annual revision that changes recent investment estimates.

The status is mixed evidence because the category is an economically important component of capital formation without an established one directional secular relationship to labor compression. It can corroborate the construction of particular productive systems and help explain the composition of capital input. Its strongest use combines detailed categories, operating capacity and labor requirements, rather than treating a large nominal expenditure as proof that human labor's role has already diminished.

Quarter	Structures investment annual rate
2025 second quarter	$963.314 billion
2025 third quarter	$951.689 billion
2025 fourth quarter	$939.100 billion
2026 first quarter	$924.535 billion
2026 second quarter	$935.340 billion

Source [2]; current dollar seasonally adjusted annual rates; September 30 2026 vintage

Construction work and recurring production work

Structures investment produces two kinds of labor effects at different times. Construction initially employs designers, contractors and tradespeople. After completion, the structure can support a production system that uses fewer recurring hours per unit. These effects can coexist. A temporary construction expansion does not establish that the completed operation will require an equally large permanent workforce.

For the post labor framework, this time separation matters. Building the apparatus of automation can create jobs while reducing the subsequent relationship between throughput and operating labor. A data center may require extensive construction and installation, then supply computing services to a large customer base with

a different ongoing staffing structure. A factory can undergo the same transition when a capital intensive process replaces a more labor intensive production arrangement.

The aggregate structures category cannot distinguish these cases without detail. A new hotel may add service employment. A new medical facility can complement clinicians. A warehouse might expand because demand is rising without any major change in its labor requirement per shipment. A structure's economic purpose and operating technology determine the mechanism, so the building count or spending total is only the first observation in an analysis.

Location adds another dimension. Construction can generate work in one county while the completed facility serves customers nationally. Energy and telecommunications connections can constrain where new capacity is built. Asset ownership can reside in another region altogether. Local payroll growth, national production and shareholder returns then appear in different places. Linking investment to labor outcomes requires geography and timing as well as the aggregate dollar series.

A stronger empirical chain follows permits or construction spending, completion, installed equipment, service output and operating hours. It asks whether the new capacity expands production beyond the growth in human time. This approach makes structures investment a leading physical commitment measure and the subsequent output to hours relationship an operating result. It also helps identify whether apparent labor savings merely shifted work to construction, suppliers or maintenance rather than reducing the lifetime labor requirement.

Independent drivers of building investment

Interest rates and financing conditions affect construction strongly. A rise in borrowing costs can delay projects even if their technologies are capable of reducing labor requirements. Conversely, cheap finance can produce overbuilding in activities with little automation content. This sensitivity makes short term structures investment a poor stand alone test of technological substitution.

Commercial property demand can shift because of remote work, population movement, tourism or retail changes. Energy exploration and related structures respond to commodity markets. Manufacturing investment can respond to trade policy, subsidies and supply chain strategy. These independent drivers can change the aggregate category substantially. Analysis should identify the category and motivation before linking a construction episode to post labor production.

Construction prices also matter. Nominal spending can rise when labor, materials or land related development costs increase. The quantity of completed usable space can rise much less. Real national accounts measures and construction cost indexes help separate that effect. At the same time, square footage alone may miss changes in infrastructure quality, cooling requirements or production capability.

The timing of expenditure is another limit. Spending occurs during construction, before the asset supplies productive services. Projects can be delayed, underutilized or abandoned. Investment intentions and announced budgets are still further removed from operating capacity. A reference should distinguish actual expenditure from an announcement, and the expenditure flow from installed service output. These distinctions become particularly consequential during highly publicized technology booms.

The interpretation strengthens when a long term shift in structures composition is accompanied by operating systems with lower hours per unit and durable demand for their services. It weakens when spending chiefly reflects price increases, policy timed projects, speculative building or idle capacity. Because the broad series currently contains a reversal, it should remain contextual and mixed evidence. The aggregate category can reveal the geography and resource commitment of capital formation without being forced into a uniformly rising trend.

A category and GDP share monitoring view

Download private nonresidential structures investment from BEA Table 5.3.5 and detailed structures categories from the related investment tables. Preserve current dollar levels, real quantity indexes and release date. Calculate a share using nominal structures investment and nominal GDP with matching quarter and annual rate units. A second panel should show the real growth rate, so the audience can distinguish spending's economic weight from construction quantity changes. [1][2][3]

Use at least twenty years of history for secular interpretation. Retain major commercial property and energy cycles. Detailed construction spending from the Census Bureau can show where recent growth occurs, but its categories and coverage should be mapped explicitly to BEA rather than added mechanically. The latest monthly construction report and quarterly national accounts may cover different periods. [3]

Update after quarterly GDP releases and annual revisions. Mark actual observations separately from company announcements or planned projects. A monitoring note should identify categories contributing to change and whether completed capacity or utilization data are available. Where data centers or factories are the substantive concern, display those categories beside the broad total instead of renaming the entire structures series AI infrastructure.

Read this entry with equipment investment, intellectual property investment, capital stock and capital services. Those measures distinguish the building, the installed productive systems, accumulated capacity and its economic service. Regional employment and output to hours comparisons supply the operating consequences. Together they explain how investment can create construction work while enabling a different long term relationship between output and recurring human labor.

Track the interval between expenditure, completion and productive use when detailed project records permit it. A factory built during one year can supply services for many later years, while a stalled project can absorb spending without operating output. This timing check makes construction investment more informative about sustained capacity than an announcement total or a single quarterly growth rate.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Economic Analysis (2026). NIPA Handbook Chapter 6 Private Fixed Investment. Structures definitions and estimation; verified retrieval 4 October 2026

[2] Bureau of Economic Analysis via FRED (2026). Private Fixed Investment Nonresidential Structures. Quarterly 1947–2026 Q2; latest levels September 30 2026; verified retrieval 4 October 2026

[3] Census Bureau (2026). Construction Spending. Value of construction put in place and category detail; verified retrieval 4 October 2026

RELATED CHAPTERS 054 · 056 · 057 · 058 · 049 · 050

CHAPTER 056

Equipment investment

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN 1947 to second quarter 2026

Equipment investment sustains the productive machinery of automation, though spending levels and economic shares need separate interpretation.

The flow into machinery and other equipment

Equipment investment is expenditure on durable productive equipment used in business activity. It includes information processing equipment, industrial equipment, transportation equipment and other categories. The national accounts record qualifying investment as a flow when assets are acquired or produced. This differs from the net stock already installed and from the flow of capital services those assets supply over their economic lives. BEA's private fixed investment methods define the category and its boundary. [1]

The principal current dollar quarterly series is nonresidential equipment investment. Observations are seasonally adjusted annual rates in billions of dollars. They should be compared with nominal GDP or other investment categories on the same frequency and annual rate basis. Real quantities and equipment price indexes supply separate views of how much productive equipment is added and what businesses pay for it. [2][3]

Equipment can save labor through many channels. Industrial machinery performs physical operations, telecommunications equipment reduces the need for travel or repeated information transfer, and computers automate calculation and record handling. Some equipment simply expands a business's existing capacity. Others improve quality, safety or reliability. The category includes productive assets whose effect on hours differs substantially, so its aggregate cannot be labeled a direct measure of robot adoption.

Gross expenditure includes replacement of depreciated or obsolete assets. Rapid technology improvement can shorten useful lives and increase the amount of investment needed to maintain effective capacity. Net investment and capital services are useful companions for this reason. An increase in spending may reflect more productive assets, higher purchase prices, faster replacement or some combination. [1]

This measure adds an upstream resource commitment to the post labor reference. It records purchases through which businesses can change their production systems. A firm's announcement of an investment budget is less concrete than actual expenditure, while expenditure remains less informative than operating output and hours. Following the sequence from investment to installed assets to production allows the dashboard to distinguish a plausible labor saving mechanism from its realized economic effect.

Historical checkpoints and current composition

BEA's quarterly equipment investment series extends back to 1947. Selected first quarter values are $376.407 billion in 1990, $749.400 billion in 2000 and $719.807 billion in 2010, all at nominal seasonally adjusted annual rates. The second quarter of 2026 records $1,922.516 billion. This gives more than three

decades of audited checkpoints while showing that the nominal flow can decline between distant observations, as it did around the financial crisis. [2]

The current 2026 observation is substantially above $1,651.610 billion in the second quarter of 2025. It follows $1,709.980 billion in the third quarter of 2025, $1,754.081 billion in the fourth and $1,836.848 billion in the first quarter of 2026. These latest values describe the observed spending expansion. They do not isolate automation, and they remain nominal until an appropriate equipment price index is applied. [2]

Dividing matching nominal investment by nominal GDP gives a different comparison. Equipment investment was approximately 6.41 percent of GDP in the first quarter of 1990, 7.49 percent in the first quarter of 2000, 4.88 percent in the first quarter of 2010 and 5.90 percent in the second quarter of 2026. These calculated checkpoints show why a record dollar total cannot by itself establish an unprecedented economic share. The series has a long history of meaningful cyclical variation. [2][3]

BLS's capital services decomposition adds an operating context. Equipment contributed 0.5 percentage point to private nonfarm capital input growth in 2024, compared with 1.1 in 2019. Information processing equipment contributed 0.3 percentage point in 2024. These are contributions to capital input growth, distinct from equipment spending growth or contributions to labor productivity. The different units must remain explicit. [4]

The secular question is whether real equipment and its productive services per hour rise, and whether composition shifts toward assets capable of doing more tasks. The nominal spending series alone supplies supporting evidence about capital formation. Its GDP shares and reversals make it a useful control against a story that assumes every new spending record means equipment has continuously taken a larger fraction of the economy.

Observation	Equipment investment annual rate	Calculated GDP share
1990 first quarter	$376.407 billion	6.41%
2000 first quarter	$749.400 billion	7.49%
2010 first quarter	$719.807 billion	4.88%
2026 second quarter	$1,922.516 billion	5.90%

Sources [2][3]; nominal annual rate ratio; calculated shares rounded to two decimals

From equipment purchases to recurring human work

Equipment can reduce a unit's direct labor requirement while creating other forms of work. A new machine needs manufacturing, installation and maintenance. Its use can eliminate repetitive operations and increase demand for technical supervision. The net human hours effect depends on these complementary tasks, demand for the final output and the geographic location of suppliers.

A useful analysis distinguishes the initial build from subsequent operation. Purchasing equipment concentrates labor in the asset's production and installation. If the equipment supplies services for many years, its lifetime operating benefit can exceed those initial hours. Conversely, frequent replacement and intensive maintenance can make the lifetime labor savings smaller than a headline about operating staff suggests. Capital services and depreciation help frame this temporal comparison.

The post labor connection becomes concrete when equipment makes throughput less dependent on the availability of additional people. A printing system can handle a larger order without adding a proportional number of operators; a distribution center can process additional shipments through the same automated line. These examples illustrate the mechanism, and industry output and hours then test whether it occurred at scale.

Lower equipment prices can broaden adoption beyond the most capital rich firms. Businesses may lease machines or purchase cloud services rather than own the equipment directly. Productive capital can consequently supply work through a service provider whose assets and labor are recorded in another industry. The analysis should track both the adopter's purchased services and the supplier's capital and hours to avoid mistaking an organizational transfer for a disappearance of human work.

Distribution depends on who owns and finances the assets and on competition in the final market. Savings may become lower prices, higher margins, higher wages or larger output. A rise in equipment investment is an observation about productive input formation. It becomes evidence for labor market compression when linked to declining hours per unit, reduced hiring or narrowing employment access. It becomes evidence for changing prosperity channels when linked to profits, ownership and household income.

Prices mix and investment cycles

Equipment investment is sensitive to the business cycle. Firms can postpone machines when demand is weak and buy them when expected demand improves. A large increase after a recession may therefore represent recovery of previously deferred purchases. Full cycle comparisons and asset stocks prevent this bounce from being mistaken for a new secular acceleration.

Different equipment categories have different price trends. Computing quality can improve quickly while transportation or industrial equipment prices behave differently. A nominal aggregate can conceal a substantial real expansion of one category and price inflation in another. Use asset specific quantity and price indexes where possible, and retain the published chain weighted aggregate rather than summing incompatible chained dollar components. [1]

Imports affect where investment creates jobs. An imported machine can expand U.S. productive capacity while manufacturing employment occurs abroad. A domestic equipment maker can export assets whose subsequent labor saving occurs elsewhere. The investment and production boundaries therefore answer different questions. An analysis of national labor demand needs trade and supplier information alongside the purchaser's capital expenditure.

Policy can change purchasing timing through tax treatment, subsidies, tariffs and eligibility rules. Firms may accelerate investment before a deadline or delay it because of uncertainty. That timing influences annual or quarterly growth even when the long term technology path is unchanged. A secular chart should make policy driven episodes visible and avoid treating the short run slope as a technological adoption parameter.

Finally, equipment quality and effective use vary. Two firms can buy similar machines but achieve different productivity because their workflows, skills and maintenance differ. Equipment spending indicates capacity and commitment, while output relative to inputs tests realization. The post labor interpretation strengthens when real equipment services per hour and operating productivity increase together over decades. It

weakens when higher spending largely reflects prices, replacement needs, idle assets or transfers of production rather than durable reduction in labor requirements.

Maintaining an equipment dashboard

Use BEA's equipment investment series and detailed Table 5.5.5 categories, with current dollar, quantity and price views kept separate. Compute a nominal GDP share from matching quarters. Plot at least twenty years and preserve the early 2000 s and financial crisis cycles. A useful display combines the broad total with information processing, industrial and transportation equipment, allowing differences in technology and demand to remain visible. [1][2][3]

Update after quarterly GDP releases and annual revisions. The latest audited endpoint is the second quarter of 2026 in the September 30 release. Store raw levels and formula based shares so a revision to GDP or investment automatically updates the ratio. Do not combine a revised numerator with an older denominator when calculating a current comparison.

For the operating view, add BLS equipment contributions to capital input growth and the equipment stock from BEA fixed assets. These measures help distinguish purchasing flows from installed services. Label contribution units carefully; a percentage point share of capital input growth is different from a percentage change in spending or a contribution to labor productivity. [4]

Read this entry with relative equipment prices, capital intensity, productive fixed stock and structures investment. Digital expenditure detail can identify the newest asset wave, while output versus hours and hiring determine labor effects. Corporate profits and household capital ownership assess distribution. This connected view turns equipment purchases into a traceable element of the production transition and preserves the cyclical information that a single record spending headline would conceal.

Keep imported equipment in domestic investment when it is acquired for domestic productive use, while recognizing that its manufacturing jobs may be located abroad. This distinction can explain simultaneous growth in domestic capital formation and weak domestic equipment manufacturing employment. The installation and operating labor consequences require their own records rather than being inferred from the nationality of the equipment supplier.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Economic Analysis (2026). NIPA Handbook Chapter 6 Private Fixed Investment. Equipment definition, price methods and investment estimates; verified retrieval 4 October 2026

[2] Bureau of Economic Analysis via FRED (2026). Gross Private Domestic Investment Fixed Investment Nonresidential Equipment. Quarterly 1947–2026 Q2; current dollar annual rates; September 30 2026; verified retrieval 4 October 2026

[3] Bureau of Economic Analysis via FRED (2026). Gross Domestic Product. Matching nominal GDP denominator for calculated investment shares; verified retrieval 4 October 2026

[4] Bureau of Labor Statistics (2026). Total Factor Productivity 2025. Detailed capital contribution evidence through 2024; verified retrieval 4 October 2026

RELATED CHAPTERS 054 · 055 · 057 · 058 · 059 · 049 · 050

CHAPTER 057

Intellectual property and intangible investment

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN 1990 to second quarter 2026 for audited official intellectual property checkpoints

Official intellectual property investment became a larger share of GDP over decades, while broader intangibles require a separate accounting boundary.

A capital boundary that includes knowledge

Intellectual property products investment is expenditure on durable knowledge assets recognized in the national accounts. The official U.S. category contains software, research and development, and entertainment, literary and artistic originals. It includes qualifying production for an organization's own use as well as purchased products. These assets can supply benefits over more than one period, which is the reason their creation is treated as investment rather than solely a current operating expense. [1]

Broader intangible capital extends beyond this official category. Depending on the research framework, it may include brands, organizational capital, workforce training, design and data. Those concepts are economically useful, but their totals use different boundaries and estimation methods. A statement about all intangibles should identify the source's included assets. Official intellectual property investment and a broader research total should not be added without adjusting overlapping components.

The metric can be expressed as current dollar investment, real growth, share of GDP, share of nonresidential investment, accumulated stock or contribution to capital services growth. Each expression answers a different question. Investment is the current creation of assets; stock reflects past creation after depreciation; services reflect productive use. A contribution to capital input growth is weighted by the capital aggregation and has a different denominator from the investment share.

Software illustrates why intangible production can change labor intensity. Developing a system uses human work, but deploying it repeatedly need not require a proportional number of additional developers or operators. Research can generate a process subsequently embodied in equipment or products. Artistic originals can be reproduced and distributed widely. Their economic role includes scale and reuse, while the particular relation to human substitution varies across assets and industries.

This entry is central to the post labor capital side because an increasing fraction of productive investment takes forms capable of supporting repeated services through a common asset. It describes a long technological transition extending well before AI. It also requires careful interpretation: some intangible investment complements labor strongly, some secures market access or differentiation, and some replaces recurring tasks. The official aggregate identifies the asset formation, while operating evidence establishes its effect.

A rising official investment share

Audited BEA intellectual property investment at nominal annual rates was $160.336 billion in the first quarter of 1990, $400.258 billion in the first quarter of 2000 and $571.363 billion in the first quarter of 2010. The second quarter of 2026 records $1,879.315 billion. Dividing by matching nominal GDP gives approximately 2.73, 4.00, 3.87 and 5.77 percent respectively. The checkpoints show a larger economic share over more than three decades, alongside an interval when the share declined modestly. [2][3]

The latest quarterly values are $1,706.719 billion in the second quarter of 2025, $1,750.567 billion in the third, $1,789.376 billion in the fourth, $1,836.018 billion in the first quarter of 2026 and $1,879.315 billion in the second. These are actual published investment estimates, not announced budgets. They remain current dollar annual rates and should be paired with quantity and price measures when the question concerns real productive capacity. [2]

BLS provides evidence of the service contribution. Intellectual property products contributed 1.6 percentage points to private nonfarm capital input growth of 2.7 percent in 2024. The contribution was 1.4 percentage points against 3.0 percent total capital growth in 2019. This recent composition comparison supports an important role for knowledge assets, but its five year span alone does not meet the secular rule. The longer official investment share supplies that historical dimension. [4]

There is ongoing measurement development. BEA's 2026 research on own account data develops experimental estimates covering 1997–2024. The source distinguishes proposed capitalization from the standard published boundary. This matters because recognizing an existing activity as investment can change measured GDP, capital stock and productivity attribution without an equivalent new operational change in the year of reclassification. [5]

The status is secular evidence for the rise of official knowledge asset investment's GDP share. The broader assertion that all intangible investment exceeds all tangible investment in every advanced economy requires separate country coverage and asset definitions. The narrower audited finding is sufficient to establish a substantial long run composition shift in U.S. capital formation without relying on an unsupported universal claim.

Observation	Intellectual property investment	Calculated nominal GDP share
1990 first quarter	$160.336 billion annual rate	2.73%
2000 first quarter	$400.258 billion annual rate	4.00%
2010 first quarter	$571.363 billion annual rate	3.87%
2026 second quarter	$1,879.315 billion annual rate	5.77%

Sources [2][3]; matching current dollar annual rates; calculated shares

Reusable assets and scalable production

Intangible assets can separate initial creation from repeated use. A scheduling system takes work to design, integrate and validate. Once operational, it can process many additional schedules with comparatively little additional human input. A research discovery can improve the same process across multiple factories. This

reuse creates a route for output to grow faster than the recurring labor involved in delivering each additional unit.

Scale is not unlimited. Software needs maintenance, security, computing resources and customer support. Research can fail, and successful knowledge must often be adapted to local conditions. Intellectual property assets also depreciate when new technology or products make them obsolete. The relevant economic observation is whether the recurring input requirement grows less than output, after these continuing costs are included.

A common asset can nevertheless serve many customers or locations. That feature can change firm structure. Centralized systems can replace repeated local administrative work, while networks make distribution across distance cheaper. The same capability can concentrate production among providers whose fixed costs are spread across larger markets. The connection to superstar firms and market concentration comes through this scale mechanism, while the investment series alone does not prove concentration occurred.

The relationship to workers can differ by task. Software can eliminate data entry while increasing the demand for system design, exception handling or customer judgment. Research assets can make scientists more effective and create new products that employ other workers. An industry's headcount outcome depends on demand growth, complementary tasks and competitive effects. Intangible investment indicates the formation of assets with reuse potential; task and employment data establish the realized substitution pattern.

Ownership is consequential because access and returns can be contractually controlled. Copyright, patents, licenses and platform accounts determine who can use a common asset and on what terms. Productive reuse can reduce human input while revenue remains concentrated among owners. Alternatively, open systems and broad ownership can spread the gains. Linking intangible investment to household ownership and capital income makes this institutional dimension observable without presuming that scale has only one distributional outcome.

Valuation and the meaning of a larger share

Intangible assets are difficult to value when they lack an arm's length transaction. Own account software and research commonly require cost based estimates of the labor and other inputs used to create them. The expenditure is observable more readily than the eventual commercial value. A large recorded investment can therefore represent an expensive development effort whose benefits arrive later, or an unsuccessful effort, rather than immediate measured operating productivity. [1]

Price indexes introduce another challenge. Software quality and functionality change, and research output has no simple standardized physical unit. Real growth estimates depend on methods for separating prices from improved capabilities. Revisions can alter the apparent investment trajectory. Current dollar shares avoid the need to compare arbitrary chained dollar sums but still reflect the interaction of quantities, relative prices and accounting boundaries.

The official intellectual property category includes artistic originals, whose purpose can be entertainment and cultural production rather than reducing labor inputs elsewhere. R&D also includes numerous objectives:

better health treatments, new materials, product differentiation and process improvement. Calling every dollar automation would collapse these purposes. Detailed software and process related assets provide a closer connection, while the broader category documents knowledge based capital formation.

An accounting expansion requires explicit treatment. Capitalizing data or organizational assets recognizes activity that may already have supported production. It can move part of measured growth from total factor productivity toward capital accumulation. This is an improvement in attribution, and should not be confused with a sudden real world surge in automation caused by the statistical update. Experimental and standard estimates should remain clearly labeled. [5]

The post labor interpretation strengthens if rising intangible services per hour accompany lower recurring labor requirements across firms and sectors. It weakens if the spending growth mostly reflects asset creation costs without operating benefits, changing classifications or compensation growth among developers. The audited long run share establishes a durable investment shift. Stronger claims about labor displacement require observing the use of the resulting assets and accounting for human work involved in creation, maintenance and complementary services.

An investment composition and service chart

Plot intellectual property investment as a share of nominal GDP using BEA's current dollar series and matching GDP. Use at least 1990 onward and retain the early 2000 s reversal. Add software, R&D and artistic originals where detail is available. A second panel should show official real quantity indexes, while a third can display BLS asset contributions to capital input growth. Label each denominator explicitly. [1][2][3][4]

Avoid stacking chained dollar components across decades. For a composition chart, use current dollar expenditure shares or a published official aggregate. Keep broad intangible estimates in a separate view with their asset boundary stated. Newly capitalized or experimental data assets should be identified with a different label rather than silently merged into the standard historical series.

Update quarterly official investment observations and annually the capital stock and detailed services decomposition. Store vintages and note whether the newest services estimates lack asset detail. When methods change, reproduce the complete comparable series or mark the break. A monitoring note should describe which assets contributed to the increase and whether operating productivity evidence followed.

Read this entry with capital intensity, total factor productivity, equipment and digital investment. Market concentration and profits test whether scalable assets change industry structure and income claims. Household capital ownership and capital income test the distributional channel. The sequence distinguishes creation of reusable knowledge, operational efficiency and economic access to the resulting gains, preserving the official long run finding without making it carry every part of the post labor hypothesis.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Economic Analysis (2026). NIPA Handbook Chapter 6 Private Fixed Investment. Software, research and development, artistic originals and own account investment; verified retrieval 4 October 2026

[2] Bureau of Economic Analysis via FRED (2026). Gross Private Domestic Investment Fixed Investment Nonresidential Intellectual Property Products. Quarterly current dollar investment through 2026 Q2; September 30 2026; verified retrieval 4 October 2026

[3] Bureau of Economic Analysis via FRED (2026). Gross Domestic Product. Matching current dollar denominator; verified retrieval 4 October 2026

[4] Bureau of Labor Statistics (2026). Total Factor Productivity 2025. Detailed capital input contributions through 2024; verified retrieval 4 October 2026

[5] José Bayoán Santiago Calderón Bureau of Economic Analysis (2026). Toward Economics Statistics On Own Account Data and Databases Assets for 1997 to 2024. Experimental asset estimates and proposed measurement boundary; verified retrieval 4 October 2026

RELATED CHAPTERS 049 · 050 · 051 · 053 · 054 · 056 · 058 · 060 · 063

CHAPTER 058

Digital and AI capital expenditure relative to GDP

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Digital production accounts 1997 to 2024 with AI specific research beginning in the 2020s

A digital investment share can extend the secular capital story, but an AI only spending series has insufficient comparable history and requires a carefully defined boundary.

A useful composite that needs a fixed boundary

Digital and AI capital expenditure relative to GDP is the value of qualifying digital productive investment divided by national output in the same period. A secular version would combine a defined set of computer hardware, communications equipment and software investment. A narrower AI version would identify only the portion attributable to AI production and use. These are different concepts, with different historical coverage, and should be maintained separately. BEA's digital economy research explicitly addresses the challenges of measuring AI production. [1][2]

The numerator should use actual capital formation within the national accounts boundary. Company cash capital expenditure, additions under finance leases, research expense and purchases of cloud services can overlap or fall into different statistical categories. A cloud provider's equipment investment and a customer's cloud subscription should not both be counted as national investment in the same productive asset. Corporate financial statements are useful source material but require a mapping to domestic investment categories.

The denominator should be nominal GDP when the numerator is nominal expenditure. Match the geographic boundary, period and annualization. A multinational firm's worldwide fiscal year budget divided by U.S. calendar year GDP produces a ratio of different populations. It may illustrate financial scale if labeled, but it does not measure a domestic investment share. Planned budgets should also remain separate from realized expenditure.

Data centers illustrate the boundary problem. Their structures, servers, networking, software and power infrastructure can appear in separate accounts. Some infrastructure serves conventional cloud services, search, video and enterprise applications as well as AI. Assigning the entire value to AI overstates the technology's measured direct investment. A broad digital capital series can legitimately include it, provided the same inclusion rule is applied historically.

The status is proposed metric because there is no single universally defined twenty year AI capital expenditure share established in the audited sources. Long digital asset histories and production accounts do exist. They can provide secular context while a separately labeled recent AI series follows the newest wave. This preserves the user's broad automation argument without projecting a recent classification backward into decades for which it was not observed.

Long digital history and short AI identification

The Integrated BEA BLS Industry Level Production Account covers 1997–2024 in its April 2026 update. Over that span, aggregate real value added grew 2.33 percent annually, with capital input contributing 1.10 percentage points. Within the contribution, IT capital supplied 0.22 percentage point and software 0.20. The IT category separates communications equipment and computer hardware, whose contributions were 0.10 and 0.12 respectively. These are growth accounting contributions, not expenditure shares of GDP. [3]

That distinction provides a useful historical anchor. Digital assets have contributed to production over more than two decades, while the specifically identified AI adoption era is short. The account's AI related discussion uses industry intensity classifications based on business survey observations from 2019, 2022 and 2023. It does not retrospectively measure an AI only investment series beginning in 1997. [3]

Recent production accounting also prevents a uniform acceleration claim. For 2021–2024, the IT capital contribution was 0.10 percentage point and software 0.29, compared with 0.24 and 0.19 over 1997–2021. Aggregate capital and TFP contributions slowed while the labor contribution increased. The various digital components therefore moved differently. An overall narrative needs to reflect that composition rather than interpreting every new technology expenditure as the same macroeconomic result. [3]

The older BEA Digital Economy Satellite Account was last updated in December 2023 and is no longer produced because of budget constraints. Its available estimates can provide historical context, but they cannot be treated as a live measure of 2026 digital GDP. The core investment accounts remain available, and BEA continues new AI and data research outside that discontinued satellite product. [1]

For the spending ratio proposed here, reproduce a stable broad numerator from standard investment tables and show the selected components explicitly. The verified production contributions establish that digital capital has a durable role; they do not fill in missing expenditure ratios. Retaining this distinction prevents a familiar growth accounting number from being repurposed as an apparently precise measure of how much GDP the economy currently spends on AI.

Accounting component	1997 to 2024 contribution	2021 to 2024 contribution
All capital	1.10 percentage points	0.95 percentage point
IT capital	0.22 percentage point	0.10 percentage point
Software capital	0.20 percentage point	0.29 percentage point
Labor input	0.58 percentage point	1.13 percentage points
Integrated TFP	0.65 percentage point	0.60 percentage point

Source [3]; annual contributions to aggregate value added growth, not investment shares

Why the investment commitment is relevant

A digital investment ratio tracks the resources committed to the apparatus that processes information and supports scalable services. Over time, businesses can replace repeated human calculation, retrieval and coordination with software and computing systems. The numerator describes formation of that productive infrastructure. Its GDP share indicates how large the commitment is relative to the economy rather than how dramatic the latest nominal spending announcement sounds.

The post labor mechanism can operate before a technology produces a visible reduction in headcount. Firms may first integrate systems, redesign workflows and use freed time to handle more demand. Hiring requirements can then decline relative to output even while existing staff remain employed. Digital spending offers a leading input observation, and output versus hours or hiring provides the operating outcome.

AI can accelerate or broaden functions already supported by earlier digital automation. Its hardware and software build on computing, networks, databases and enterprise systems created over many decades. A broad digital history therefore supplies the correct secular context. The narrower AI share can reveal a new composition within the apparatus as measurement improves, without redefining the entire historical investment path as AI.

The commitment has costs. Computing equipment depreciates, energy must be supplied and systems require maintenance. Large gross expenditure may represent expansion, replacement or both. Productive services, utilization and net returns determine whether the investment sustains lower labor requirements. A spending ratio rising faster than useful output can instead indicate overcapacity or expensive experimentation.

Investment concentration also matters. A few providers may own infrastructure used by numerous businesses and households. The productive service can spread widely while financial returns remain concentrated. Alternatively, competition can reduce prices and broaden access. Linking expenditure to market structure, profit rates and household capital ownership examines the distributional step. The ratio itself records resource allocation toward an enabling apparatus, while those companion metrics identify who benefits and whether the resulting production depends less on recurring human work.

Double counting geography and technology attribution

The most common measurement error is combining several versions of the same expenditure. A chipmaker records revenue, a cloud provider records equipment purchases and a customer records service expense. Summing all three does not measure capital formation; it mixes intermediate sales, investment and consumption of services. A national investment numerator should follow final capital asset formation and use a consistent domestic accounting boundary. [2][4]

Company capital expenditure can include land, buildings and conventional equipment with no identifiable AI purpose. Some software investment is internally produced and appears differently in financial statements. Lease accounting can move expenditures between cash flow and balance sheet presentations. Comparing companies or years requires consistent treatment before aggregating values. Budget guidance is an intention, with timing and scope that may change.

Geography can be obscured by multinational reporting. A U.S. headquartered firm can construct assets abroad, while a foreign headquartered company can build domestically. Domestic GDP requires domestic investment regardless of headquarters. Worldwide company totals are therefore a different monitoring series. They can indicate corporate commitments without becoming a valid share of U.S. capital formation.

Technology attribution remains uncertain for shared infrastructure. The same server or network can support numerous applications. An AI workload share may change after installation. A source classifying industries by AI exposure or adoption is measuring another dimension, rather than counting AI only assets. A good

dashboard should retain the exposure, investment and use measures separately, connecting them where evidence permits.

The interpretation would strengthen with comparable domestic asset estimates that allocate shared systems by observed productive use, follow actual investment and map the resulting services to output and hours. It would weaken if the apparent trend depends on announced budgets, global totals or a definition that widens over time. The proposed metric should therefore be published with a data dictionary and explicit allocation rules. Its secular digital component can become established evidence once reproduced consistently, while the recent AI component remains a shorter history.

A two layer monitoring design

Build a long run digital investment share from consistently defined nominal computer hardware, communications equipment and software components in BEA investment tables. Divide by matching nominal GDP. Retain at least twenty years and identify every included category. Show structures or data center investment as separate contextual components when the available classifications cannot isolate their digital share. [1][4]

Create a second, recent AI monitoring panel with actual expenditures, source documents, geography, fiscal periods and allocation rules. Display announcements separately. Company totals can be shown as financial commitments with their worldwide boundary, while the domestic national accounts ratio stays analytically separate. Do not force a long AI history by relabeling earlier general computing investment.

Update quarterly core investment observations and annually detailed capital services. Use the integrated production account to inspect how digital capital contributes across industries. Mark the discontinued digital satellite account's endpoint and avoid implying that its historical estimates continue automatically to the present. [1][3]

Read the chart with equipment, structures and intellectual property investment, capital intensity and TFP. Add utilization and output versus hours to test productive realization. Profits and ownership reveal the distribution of returns. This design preserves both the long automation history and the newest technology wave, giving each the empirical span and definition it can actually support.

Maintain an asset level mapping table that states whether each component is equipment, structures or intellectual property, whether it is purchased or produced internally, and whether the reported geography is domestic or worldwide. Identify shared infrastructure allocation assumptions separately from measured spending. If an assumption changes, publish both the revised historical estimate and the earlier definition before interpreting the resulting break as economic acceleration. This record is essential because the proposed AI share can change substantially through classification even when actual investment is unchanged.

SOURCES AND REPRODUCTION NOTES

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[3] Corby Garner Justin Harper Matt Russell and Jon Samuels Bureau of Economic Analysis and Bureau of Labor Statistics (2026). Integrated BEA BLS Industry Level Production Account 1997 to 2024 The Sources of U S Economic Growth During the Expansion of AI. April 27 2026; Tables1–3 and AI intensity definition; verified retrieval 4 October 2026

[4] Bureau of Economic Analysis (2026). NIPA Handbook Chapter 6 Private Fixed Investment. Investment boundaries and asset categories; verified retrieval 4 October 2026

RELATED CHAPTERS 049 · 050 · 051 · 053 · 054 · 055 · 056 · 057

CHAPTER 059

Relative price of machinery and equipment

EVIDENCE STATUS **Historical evidence** · OBSERVATION SPAN 1947 to 2026 equipment price series and several decades of relative investment price research

A long decline in the price of equipment relative to other output can encourage capital substitution, but the result depends on quality adjustment and the full cost of using capital.

What the price comparison measures

The relative price of machinery and equipment measures how expensive productive equipment is compared with another basket of goods and services. A reproducible national accounts version divides BEA's equipment investment price index by the GDP price index and rebases the resulting ratio to a common year. A falling ratio means equipment becomes cheaper relative to domestically produced output. It does not necessarily mean that the sticker price of every machine falls. [1][2]

This distinction matters for the Post Labor argument. A business compares the cost of acquiring and operating equipment with the cost of accomplishing tasks through labor. If equipment delivers more useful capability for each dollar, investments that were previously uneconomic can become worthwhile. That can expand automation across tasks long before the latest generation of artificial intelligence. The price measure therefore addresses an incentive for substitution, rather than counting displacement after it occurs.

The numerator here is equipment investment, not all private investment. Structures, software and research have different price histories and depreciation patterns. Machinery and equipment itself includes a heterogeneous asset basket, ranging from computing and communications hardware to transport equipment and industrial machinery. Aggregate movement can reflect changes in the mix of investment as well as prices of detailed assets. A digital equipment breakdown can reveal developments hidden in the aggregate.

The denominator must be named. Equipment relative to GDP prices, consumption prices and hourly compensation answers three different questions. GDP prices provide a broad domestic output comparison. Consumption prices relate equipment to household purchasing power. Compensation relates capital acquisition to labor costs, although an acquisition price alone is not the annual service cost of capital. Avoid switching denominators while describing one secular trend.

Treat this metric as historical evidence for changing investment economics. It is a useful explanation for capital deepening when accompanied by actual investment and services data. It becomes evidence of labor compression only when a connection is established to tasks, hours, earnings or employment. Lower equipment prices can also encourage expansion that raises labor demand. The price change identifies an opportunity; business decisions and market responses determine the employment outcome.

The observed long equipment price history

BEA's equipment implicit price deflator has a quarterly history beginning in 1947. The accessible historical extract audited for this chapter was updated on 22 January 2026 and extended through 2025 Q3. It reports an index of 138.150 in 1990 Q1,118.528 in 2000 Q1,102.899 in 2010 Q1 and 113.753 in 2024 Q4, with 2017 equal to 100. These values show that the quality adjusted aggregate price level of equipment fell considerably between 1990 and 2017, before rising in subsequent years. [1]

The series page available at the research cutoff contained a newer observation of 120.270 in 2026 Q2 from an August 2026 vintage. The GDP deflator page had already incorporated the 30 September 2026 annual update. Because those accessible vintages differed, this chapter does not present their quotient as a precisely matched latest relative price observation. A live dashboard should retrieve both series from the same national accounts vintage before publishing that ratio. [1][2]

This is a substantive qualification, rather than an obstacle to examining the long history. Equipment's own deflator can be inspected independently. The broad price level increased across the decades while the equipment index declined over much of the period. However, an exact relative price line should preserve matched definitions and revisions. A precise numerical decline in the ratio requires the corresponding denominator observations, rather than relying on a general inflation narrative.

The rise in equipment prices after the 2017 reference year is also informative. It means that a story of constantly falling nominal machinery prices would be incorrect. Some technologies may become cheaper in performance terms while other equipment becomes more expensive. Import prices, material costs, delivery constraints and investment composition can change the aggregate. A secular pattern can contain reversals without licensing a claim that every latest movement confirms it.

Original research by Karabarbounis and Neiman studied the global decline in labor's share and the relative price of investment goods over several decades. Their model attributed roughly half the observed labor share decline to cheaper investment goods. That result provides a proposed mechanism and a quantitative model result; it is not a universal accounting identity or direct estimate of jobs lost to automation. [3]

A separate historical benchmark comes from the Federal Reserve Bank of St. Louis’s 2019 analysis of Riccardo DiCecio’s Relative Price of Investment Goods series, PIRIC. It reported a decline of almost 78 percent between 1947 and 2016. That dated result supplies evidence beyond the equipment index alone, but it is not the decline of the equipment deflator divided by the GDP deflator used in this chapter’s main specification. [5]

PIRIC divides the research investment deflator INVDEF by CONSDEF; the latter covers personal consumption expenditures on nondurable goods and services. The current listed PIRIC endpoint is 0.87630 in 2024 Q4, with 2017 equal to one, from the December 2025 update. Preserve its source definitions and vintage. Reconstructing the historical 78 percent claim using a generic private fixed investment deflator divided by total PCE would substitute different measures. A companion PIRIC chart can document the research series while the equipment/GDP chart answers the narrower production-price question. [6][7]

Quarter	Equipment deflator	Meaning
1990 Q1	138.150	Index 2017 equals 100
2000 Q1	118.528	Same audited historical extract
2010 Q1	102.899	Same audited historical extract

Quarter	Equipment deflator	Meaning
2024 Q4	113.753	Same audited historical extract

BEA equipment implicit price deflator via FRED; 22 January 2026 historical extract, not a latest matched relative price ratio. [1]

Quality and the cost of capital services

Quality adjustment is central to interpreting machinery prices. A newer computer may sell for the same number of dollars while providing substantially greater processing capacity. The national accounts aim to separate changes in capability from pure price changes, so quality adjusted prices can fall even when purchasers face stable or rising sticker prices. BEA's estimating methods describe price and quantity indexes and the treatment of quality change. [4]

This makes the equipment deflator especially relevant for productive capacity, but it also introduces measurement dependence. New features must be valued, product introductions linked and changing specifications compared. Some capabilities can be measured more directly than others. A revision in price methodology can change measured real investment, capital stocks and productivity. The reference should identify methodological breaks and avoid treating every movement as a directly observed engineering quantity.

An acquisition price is only one part of the annual cost of using equipment. Financing costs, economic depreciation, expected resale values, maintenance, energy, insurance and taxes affect the business calculation. Short lived digital equipment may become cheaper to buy while requiring frequent replacement. A machine with a low purchase price may still be expensive to operate. Compare price trends with capital service costs when judging substitution incentives.

The labor comparison is similarly broader than a wage rate. Employers consider compensation, hiring costs, training, reliability and the organization's ability to supervise or coordinate tasks. The relevant economic comparison concerns a useful outcome, not a dollar of equipment against an hour of labor in the abstract. A capital asset can replace one task while requiring new human work elsewhere. That is why prices should be connected to observed workflows or industry production data.

The aggregate index also does not identify the distribution of access. Large firms may obtain financing, complementary software or skilled staff more easily than small firms. A technological opportunity can therefore produce concentration in adoption even when the market price of the underlying equipment falls for everyone. The resulting competitive changes may affect wages and job quality indirectly. These are plausible pathways to investigate, rather than implications contained in the price ratio itself.

A good interpretation reports the acquisition price metric clearly and keeps the additional service cost calculation separate. Combining them without documenting assumptions would obscure whether a measured change comes from technology, interest rates, depreciation or tax treatment. That distinction is necessary for a decades long automation argument.

What would establish a labor compression mechanism

The strongest case would show that equipment becomes cheaper relative to labor for specific productive tasks, that businesses respond by increasing relevant capital services, and that those tasks then require fewer hours for comparable output. Evidence on displaced workers and subsequent earnings would connect the

production mechanism to household consequences. This sequence is more informative than assuming a falling relative investment price automatically creates fewer good jobs.

The substitution response depends on the production relationship between capital and labor. Some equipment replaces tasks previously performed by workers. Other equipment makes workers more productive or enables products that could not previously be supplied. A lower equipment price can increase the scale of the business, potentially offsetting the hours saved per unit. Capital deepening and labor compression can occur together, but one cannot be inferred from the other without examining this response.

The labor share is a useful companion because it measures distribution within production. Yet the cheaper investment goods explanation relies on a model of how firms substitute and how factor shares respond. Changes in industry composition, market power, bargaining institutions, trade and measurement may also matter. The historical research is a reason to examine these relationships carefully, rather than a reason to assign every decline in labor share to capital prices. [3]

An industry comparison can help. If price declines are concentrated in assets used by industries that subsequently increase output per hour and reduce their labor share, the joint pattern is consistent with substitution. Exposure measures, investment timing and comparable demand conditions would make that test stronger. Simply comparing industries after the outcome could conflate adoption with changes in product demand or outsourcing.

The evidence would weaken a strong Post Labor interpretation if cheaper equipment mainly supports expanding output, rising hours and broadly improving worker earnings. That outcome would still demonstrate technological progress and capital deepening. It would show that productive capability does not necessarily compress the distribution of good jobs in the period examined. A useful reference must retain that possibility explicitly.

Classify the metric as historical evidence about automation incentives, with an established long price history. Upgrade the labor interpretation only when independent outcome measures substantiate it. Keep the recent AI hardware cycle visible, but do not let it replace the longer price history or erase differences among equipment assets.

How to reproduce and maintain the chart

Retrieve quarterly equipment and GDP implicit price deflators from the same BEA release vintage. Divide the equipment index by the GDP index, then multiply by 100 after rebasing to the chosen reference period. Store the underlying indexes alongside the quotient so readers can see whether movement comes from equipment prices, general prices or both. Report the source codes and seasonal adjustment consistently. [1][2]

For the secular view, show at least twenty years and mark major revisions. Add detailed computing, communications and industrial equipment series where comparable histories exist. Keep the aggregate equipment line distinct from a broader investment price index used in research. They have different asset weights and therefore need not produce the same quantitative trend.

A second panel can compare the price ratio with real equipment investment, capital services per hour and the capital deepening contribution to productivity. A third can examine compensation and labor share for industries with substantial adoption. This arrangement separates the incentive, investment response and labor outcome while making the proposed causal chain assessable.

Archive every annual update. A historical extract that lags the current release should remain labeled by its vintage, as the audited extract is here. Refresh both numerator and denominator together. Do not append a current denominator to an older equipment history and present the resulting line as a coherent revised series.

Interpret substantial departures over several years before treating them as a change in the secular mechanism. A temporary price surge can affect purchases without reversing the long diffusion of productive machinery. Conversely, persistent service cost increases could constrain substitution despite improvements in equipment capability. Maintain both the observed price series and the assumptions behind any user cost extension, so the result remains independently reviewable.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Economic Analysis via Federal Reserve Bank of St Louis (2026). Gross Private Domestic Investment Fixed Investment Nonresidential Equipment Implicit Price Deflators. Equipment deflator Y033RD; historical data extract 22 January 2026; series page August 2026 vintage latest 2026 Q2; verified retrieval 4 October 2026

[2] Bureau of Economic Analysis via Federal Reserve Bank of St Louis (2026). Gross Domestic Product Implicit Price Deflator. GDP deflator A191RD; 30 September 2026 vintage; verified retrieval 4 October 2026

[3] Loukas Karabarbounis and Brent Neiman (2013). The Global Decline of the Labor Share. Original several decade model and cross country evidence; journal publication 2014; verified retrieval 4 October 2026

[4] Bureau of Economic Analysis (2023). NIPA Handbook Chapter 4 Estimating Methods. Price and quantity indexes, quality adjustment and revisions; verified retrieval 4 October 2026

[5] Federal Reserve Bank of St. Louis; Asha Bharadwaj and Maximiliano Dvorkin (2019). Capital's gain is lately labour's loss. Reports an almost 78 percent decline in the research relative price of investment goods between 1947 and 2016. Verified for version two 4 October 2026.

[6] Riccardo DiCecio via Federal Reserve Bank of St. Louis (2025). Relative Price of Investment Goods (PIRIC). Research investment-price series divided by a consumption deflator covering nondurables and services; preserve the specified base year, endpoint and vintage. Verified for version two 4 October 2026.

[7] Riccardo DiCecio via Federal Reserve Bank of St. Louis (2025). Consumption Deflator (CONSDEF). Documents the nondurable-goods and services consumption denominator used in PIRIC, distinct from total PCE and GDP deflators. Verified for version two 4 October 2026.

RELATED CHAPTERS 049 · 050 · 051 · 056 · 057 · 060

CHAPTER 060

Corporate profits relative to GDP

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN 1947 to 2026 quarterly profits and GDP with a 1990 to 2026 audited comparison

Corporate profits occupy a larger share of aggregate output than in earlier decades, but taxes, geography, market power and business cycles complicate an automation interpretation.

The income flow being measured

Corporate profits relative to GDP compare an income flow accruing to corporations with the value of aggregate domestic production. The version used here is BEA corporate profits after tax with inventory valuation and capital consumption adjustments, divided by nominal GDP. Both quarterly series are expressed at seasonally adjusted annual rates. Multiplying their quotient by 100 produces a percentage of GDP. It is a scale comparison, not a corporate profit margin calculated from company sales. [1][2]

The adjustments are important. Inventory valuation removes gains or losses caused by changes in the price of goods held in inventories. Capital consumption adjustment replaces depreciation based on tax or historical cost conventions with an economic depreciation measure consistent with the national accounts. These adjustments help isolate profits from current production. Ordinary financial statement profits, taxable profits and profits from current production can diverge substantially. [3]

The Post Labor relevance concerns distribution. If productive systems generate income that increasingly accrues to corporate owners, employment may become a less comprehensive route to participation in economic gains. That inference requires evidence about labor income and ownership as well as the profit ratio. Corporations can earn more while workers also receive higher real compensation. A larger profit share does not by itself establish falling living standards or fewer jobs.

Corporate profits also are not the entire return to capital. Interest, rents and income from unincorporated businesses are recorded elsewhere. Profits can include returns to intellectual property, entrepreneurial risk and market power. The ratio should therefore be labeled corporate profits, rather than capital's total share of national income. Its relationship to the labor share depends on the accounting boundary and the other income components.

There is a geographic limitation in the popular series. National corporate profits include relevant income flows involving the rest of the world, whereas GDP measures domestic production. The quotient is widely useful as a macro indicator, but it is not a perfectly partitioned domestic income share. A stricter domestic distribution calculation uses domestic corporate profits within a matching domestic income account. Preserve that distinction when comparing it with wages or attributing changes to domestic automation.

The long comparison and current observation

The 30 September 2026 vintage of the BEA series reports after tax adjusted corporate profits of 301.048 billion dollars at an annual rate in 1990 Q1,602.659 billion in 2000 Q1 and 1428.295 billion in 2010 Q1. In 2026 Q2 the value was 3877.434 billion. Matching nominal GDP observations were 5872.701,10002.179,14764.610 and 32563.030 billion respectively. The ratios calculated from these observations are 5.13,6.03,9.67 and 11.91 percent. [1][2]

These selected observations cover more than three decades and show a materially larger current profit ratio. They do not establish a smooth line or an unchanged growth rate. The 2010 observation, for example, reflects a recovery period after a severe recession. A complete secular chart should use all quarters and compare multiyear averages or business cycle peaks, rather than allowing four convenient endpoints to carry the whole argument.

The latest release also reported that profits from current production increased 384.0 billion dollars at an annual rate in 2026 Q2. That figure is the change in the release's profit measure, not the level of after tax profits in the table here. It was revised down 16.9 billion from the second estimate. The distinction between a change, a level, a before tax aggregate and an after tax aggregate should remain explicit. [4]

A ratio is useful because the nominal economy has grown substantially. The rise from hundreds of billions to trillions does not, by itself, show a change in distribution. Dividing by GDP provides a common scale. The resulting share still responds to the cycle and policy. A recession can lower output and profits differently; a tax change can raise after tax profits without changing production technology.

The verified comparison supports a secular distributional observation: the current adjusted after tax corporate profit ratio is well above its early 1990 s level. It does not independently explain the cause. It is stronger evidence for increasing importance of corporate income than for automation alone. Any presentation should include both that substantive finding and the limits of attribution, while retaining the latest data and the longer history in the same vintage.

Quarter	Adjusted after tax profits billions	GDP billions	Profits divided by GDP
1990 Q1	301.048	5872.701	5.13 percent
2000 Q1	602.659	10002.179	6.03 percent
2010 Q1	1428.295	14764.610	9.67 percent
2026 Q2	3877.434	32563.030	11.91 percent

Author calculations from BEA CPATAX and GDP through FRED; 30 September 2026 vintage, nominal seasonally adjusted annual rates. [1][2]

Why profit growth has several explanations

Automation can increase profits when it reduces the labor required for a given output, improves quality or allows a firm to serve additional demand. Yet an increase in aggregate profits can also arise from stronger demand, changing financing conditions, tax changes, international operations and shifts toward more profitable industries. A profit ratio alone cannot separate these pathways. The corresponding changes in capital services, output and hours must be examined.

Market power is another possibility. A firm with stronger pricing power may capture a larger margin even without an unusually large technological advance. Intellectual property and network effects can combine productive innovation with barriers to entry. The presence of technology does not resolve whether the increased return reflects efficiency, scarcity rents or both. Competition measures and industry concentration help distinguish these mechanisms, although they also require careful interpretation.

Tax treatment changes the after tax numerator directly. Comparing before and after tax adjusted profits shows how much of a shift comes from taxation. A higher after tax share can benefit owners without representing a reallocation from wages within production. Conversely, a stable after tax ratio can conceal growing before tax profits if taxes rise. Both series are useful, but they should not be silently exchanged across periods. [3]

International income flows can matter for U.S. corporations. The geography of production, ownership and reported income are different dimensions. A U.S. corporation's foreign affiliate can generate profits from labor and assets located abroad. Foreign owners can receive income from domestic production. Tracking domestic industries and rest of world components separately makes a domestic automation explanation more credible than relying only on the national headline.

Accounting classifications also influence the comparison. Corporations and unincorporated enterprises have different income categories, and changes in organizational form can shift income across them. Depreciation assumptions matter especially as the asset mix moves toward short lived equipment and intellectual property. Current production adjustments improve comparability but do not erase every boundary issue. BEA methods provide the definitions needed to audit these choices. [3]

These qualifications guide the empirical test rather than canceling the observed increase. The profit ratio is a valuable distributional outcome. It becomes a more specific automation measure when the rise is concentrated in industries adopting labor saving production methods and persists after relevant demand, tax and composition changes are considered.

Connecting corporate returns to household outcomes

Corporate profits become economically consequential for households through dividends, retained earnings, changes in the value of ownership claims and public revenues. These are different channels. A corporation can retain profits to invest, distribute dividends or repurchase equity. An owner can benefit from higher company value without receiving current cash income. Profit growth therefore should not be equated with household dividend income in the same quarter.

The distribution of ownership determines who participates. If corporate equity is highly concentrated, an increase in profits can widen differences between households whose income primarily comes from work and those with substantial asset holdings. Retirement accounts broaden participation for some households, but ownership through pensions and funds should be measured with appropriate boundaries. Aggregate profitability alone does not reveal how broadly returns are shared.

A useful Post Labor test combines the profit ratio with labor compensation as a share of matching income, median compensation, capital ownership and household capital receipts. Strong output with rising profits and persistently weak labor income for broad groups would be consistent with a weakening employment

based distribution mechanism. Rising profits accompanied by broad real wage gains would support a different, more inclusive growth interpretation.

The choice of denominator matters in that test. Compensation and profits can be compared within corporate value added to study distribution in the corporate sector. Comparing each with total GDP includes the influence of the size of that sector. The latter can change because economic activity shifts into or out of corporations. A reference should present these as related but distinct measures rather than treating them as identical labor versus capital partitions.

Investment must also be observed. Higher profits can finance new productive capacity that complements workers or substitutes for their tasks. Capital expenditure, productive stocks and service flows reveal whether that reinvestment occurs. A payout ratio addresses a different question: how corporate income is allocated after it is earned. Neither investment nor payouts alone establishes the labor outcome.

The appropriate status is secular evidence for increasing corporate income relative to aggregate output, with a supporting role in a broader distribution argument. It should not receive the same evidentiary weight as directly observed compression in hours or earnings. This separation keeps the capital side strong without making its causal interpretation stronger than the data warrant.

Chart design and update rules

Build the headline ratio from CPATAX and nominal GDP using the same quarterly BEA vintage. Retain at least 1990 onward, and preferably the full postwar history. Show a quarterly line with a multiyear average so cyclical movements remain visible. Label profits after tax, with inventory valuation and capital consumption adjustments, in the title or accompanying definition. [1][2]

Add before tax adjusted profits and a domestic industry version as separate panels. They can reveal whether taxes or international income are responsible for part of the headline change. Use comparable denominators for sectoral income shares. Avoid mixing GDP and corporate value added without explaining the difference in economic scope.

Keep the profit level alongside the ratio in the downloadable table. Report billions of dollars and the annual rate convention consistently. Quarterly annualized values can be divided directly when both use that convention; they should not be added across quarters as if each were an actual annual total. Annual data or quarterly averages provide a coherent yearly comparison.

Refresh the complete history after annual national accounts revisions, retaining earlier versions for audit. The 2026 Q2 release demonstrates that even the latest profit change can be revised between estimates. Record the release date, observation date, adjustment definition and source codes before updating any presentation. [4]

Read the result with capital deepening, intellectual property investment, dividends and repurchases, ownership concentration and labor income. Seek convergence across these measures before attributing a secular rise to automation. A profit ratio that remains high over multiple cycles deserves attention even when its explanation is mixed. The aim is to document the changing distribution of production income and test how much technological substitution contributes to it.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Economic Analysis via Federal Reserve Bank of St Louis (2026). Corporate Profits After Tax with Inventory Valuation Adjustment and Capital Consumption Adjustment. BEA A551RC; 30 September 2026 vintage; 1947–2026 Q2 nominal SAAR; verified retrieval 4 October 2026

[2] Bureau of Economic Analysis via Federal Reserve Bank of St Louis (2026). Gross Domestic Product. Nominal GDP matching 30 September 2026 vintage; verified retrieval 4 October 2026

[3] Bureau of Economic Analysis (2026). NIPA Handbook Chapter 13 Corporate Profits. Current production adjustments, geographic scope, taxes and dividends; verified retrieval 4 October 2026

[4] Bureau of Economic Analysis (2026). GDP Third Estimate Industries Corporate Profits State GDP and State Personal Income Second Quarter 2026 and State PCE 2025. 30 September 2026 release; current production profit change and revision; verified retrieval 4 October 2026

RELATED CHAPTERS 051 · 054 · 057 · 061 · 062 · 063 · 064

CHAPTER 061

Corporate dividends and share repurchases

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN 1947 to 2026 dividends and 1996 Q4 onward equity issuance and retirement

Corporate payouts trace the distribution of returns to owners, while the long series distinguishes dividends, buybacks, new issuance and merger related equity retirement.

Two different routes from corporations to owners

Dividends and share repurchases describe different ways corporations transfer funds to equity holders. Dividends distribute income while an owner ordinarily retains the shares. A repurchase pays an owner in exchange for surrendering shares. Both can put corporate funds into the hands of investors, but they have different effects on outstanding equity and are recorded differently in economic accounts. Adding them without defining the purpose can obscure rather than clarify distribution.

The dividend measure used here is BEA net dividends within corporate profits after tax with inventory valuation and capital consumption adjustments. It is a national accounts flow, available quarterly at seasonally adjusted annual rates. It differs from personal dividend income because the receiving sectors and adjustments differ. The corporate payment side and household receipt side should be connected using BEA's accounting definitions, rather than assuming they are numerically identical. [1][2]

The Federal Reserve's enhanced Financial Accounts project provides gross equity issuance, gross retirement, repurchases and merger related retirement for domestic nonfinancial corporations. The historical quarterly data begin in 1996 Q4, providing nearly three decades by the 2026 cutoff. The project was updated on 18 September 2026. It excludes equity real estate investment trusts under its stated boundary, even though their classification in the main Financial Accounts changed. [3][4]

This metric matters for Post Labor because ownership may become an increasingly important channel through which productive gains are distributed. It also helps examine whether corporate funds finance further investment or flow to investors. Payouts alone do not establish a lack of productive investment, however. A company can invest substantially and distribute funds, and investors can reinvest proceeds elsewhere. The allocation question requires a broader flow of funds analysis.

The relevant claim is therefore specific: payouts show how some corporate returns reach owners, and their scale can be compared with output, profits and investment. They do not count the number of jobs eliminated or demonstrate that every payout represents money withheld from wages. The labor interpretation becomes stronger when high owner distributions coincide with weak broad labor income and concentrated ownership over multiple cycles.

The dividend history and accessible current data

In the 30 September 2026 BEA vintage, net dividends were 193.183 billion dollars at an annual rate in 1990 Q1,402.951 billion in 2000 Q1 and 587.676 billion in 2010 Q1. In 2026 Q2 they were 2198.211 billion. Dividing by matching nominal GDP produces ratios of 3.29,4.03,3.98 and 6.75 percent. The latest observation is substantially above the early 1990 s level relative to the economy, while the intermediate comparison shows that growth was uneven. [1][5]

A dividend to profit ratio answers another question. Using the same adjusted after tax profit series, dividends represented approximately 64.2 percent of profits in 1990 Q1 and 56.7 percent in 2026 Q2. These endpoint calculations do not show a universal increase in the fraction of profits distributed as dividends. Rising dividends relative to GDP can coexist with a lower dividend payout fraction when profits themselves rise relative to output. [1][2]

The Fed's equity retirement project provides the appropriate current historical download for buybacks. Its latest accessible documentation establishes the September 2026 update and distinguishes repurchases from mergers. The older rendered quarterly table remains a 2020 artifact and should not be presented as a 2026 observation. This chapter therefore provides a verified current dividend level and a documented current buyback source, without inventing a latest buyback number. [3]

The original 2017 Fed analysis plotted gross issuance and retirement relative to GDP from 1996 Q4. It found that issuance was relatively steady apart from the late 1990 s boom, while retirements and repurchases were strongly cyclical. Mergers contributed to the retirement pattern. Those findings describe the historical period examined in the original analysis; they should not be relabeled a conclusion about every subsequent quarter. [4]

A secular dashboard should reproduce the complete newer series before determining whether buybacks have increased persistently relative to output or profits. Large nominal totals are insufficient because market values and the economy have grown. The nearly thirty year history allows that test, but availability of a long dataset is not itself evidence of a monotonic trend. Keep the dividend result, the buyback measurement boundary and the trend assessment separately visible.

Quarter	Net dividends billions	Matching GDP billions	Dividends divided by GDP
1990 Q1	193.183	5872.701	3.29 percent
2000 Q1	402.951	10002.179	4.03 percent
2010 Q1	587.676	14764.610	3.98 percent
2026 Q2	2198.211	32563.030	6.75 percent

Author calculations from BEA DIVIDEND and GDP through FRED; 30 September 2026 vintage, nominal SAAR. [1][5]

Gross buybacks are not net equity withdrawal

The Fed defines net equity issuance as gross issuance less gross equity retirement. Gross retirement includes both share repurchases and retirement associated with mergers and acquisitions. Consequently, a negative net issuance value cannot be described as the amount spent on buybacks. The equation combines distinct

transactions, each of which can change over time. Use the explicitly identified repurchase series when the subject is repurchases. [3][4]

Gross issuance also matters for the economic interpretation. A company can repurchase shares while issuing equity to employees, raising new funds or completing an acquisition. Gross repurchase spending measures one cash flow. Net share count or net equity withdrawal measures the balance after issuance and other transactions. A claim that investors collectively received a particular net amount must account for those offsets and maintain a consistent corporate boundary.

A buyback is not all current income for its recipient. The seller gives up an asset in exchange for cash; part of the sale proceeds represents the value of that claim before the transaction. A realized gain depends on the owner's acquisition cost and tax rules. Treating the whole repurchase payment as household capital income would mix a financial transaction with an income flow. Dividends and buybacks can be compared as corporate cash distributions while remaining distinct in household income accounting.

The difference also matters for wealth. A dividend transfers value out of the corporation and ordinarily affects the price of the remaining claim. A repurchase reduces corporate cash and outstanding shares. Neither transaction, by itself, creates an equivalent amount of new aggregate wealth. The broader effect depends on financing, investment opportunities and valuation. It is incorrect to add profits, dividends, buybacks and equity gains as independent measures of the same generated value.

Mergers deserve separate treatment because their retirement flows can rise with asset valuations or acquisition activity. They do not necessarily represent recurring distribution of operating profits. The Fed documentation describes the geographic and transaction rules for mergers, which differ from the simple concept of an issuer buying its own stock. Those details should remain in a reproduction note even if the headline chart only displays repurchases. [4]

Frequency is another common source of error. The enhanced project reports quarterly flows at quarterly rates; national accounts dividends and GDP are often annualized. Convert them to the same convention before dividing or adding. A factor of four error would create a dramatic but entirely artificial difference in payout scale.

What payouts can and cannot imply about labor

A persistent rise in owner distributions relative to output can support the proposition that corporate ownership is an increasingly important route to economic participation. The practical relevance is greater when ownership is concentrated and labor compensation does not share proportionately in growth. Those are separate facts that should be tested with ownership and earnings data rather than assumed from the size of payout announcements.

A strong labor compression interpretation would connect payouts to productive substitution. Firms adopting labor saving systems might generate larger profits, reduce labor requirements and distribute a greater amount to owners. The evidence would be more persuasive if the timing and industry pattern align, and if displaced workers experience persistent earnings losses or deteriorating job quality. Aggregate dividends and buybacks identify a distribution channel, but do not establish that chain by themselves.

Payouts can also reflect mature businesses with fewer internal projects, changes in corporate tax incentives, investor preferences or financing conditions. Returning funds can enable investment in other businesses. Debt financed buybacks can increase leverage without proving improved productive capacity. These mechanisms have different implications for employment and economic resilience. The dashboard should include investment and balance sheet indicators to determine which pattern predominates.

The dividend to profit comparison gives a useful countercheck. If dividends relative to GDP rise because profits grow while the dividend fraction remains stable or falls, the primary change is the scale of corporate income. If the payout fraction rises while profits do not, corporate allocation is changing more directly. Repurchases can alter that picture, but only after using compatible sector definitions and including issuance where the question concerns net withdrawal.

Retirement ownership complicates a simple owners versus workers framing. Some workers own equities through funds or pensions, while many households hold little marketable wealth. The economic issue concerns the distribution and accessibility of ownership, not a categorical separation between all employed people and all investors. Corporate distributions may support retirement income for some while providing little direct benefit to others.

Treat this chapter as supporting evidence for the ownership distribution side of Post Labor. The verified dividend share has a long upward endpoint comparison; buybacks require the full updated trend to establish their direction. Neither should become a standalone headline claim that productive investment or good jobs must decline when payouts increase.

Maintaining a coherent payout dashboard

Create separate lines for net dividends, gross repurchases, merger related retirement, gross equity issuance and net equity issuance. For each, record corporate scope, geography, frequency and units. Use the Fed project data dictionary to retain its exclusion of equity real estate investment trusts. A single total labeled shareholder payouts should disclose exactly which components it adds and why. [3][4]

For a macro scale comparison, divide by matched nominal GDP after converting the flows to compatible annual rates or annual totals. For an allocation comparison, use a matching profit measure. Do not assume the national accounts corporate universe and the nonfinancial corporation project cover identical firms. Differences in boundaries can make a combined payout to profit ratio misleading even when all input values are individually correct.

Show at least the 1996 Q4 onward common period for the buyback panel, with a separate longer dividend chart. Display recessions and annual averages. This makes the distinction between cyclical peaks and durable shifts assessable. Keep nominal dollar levels available, but do not rely on them to establish a secular increase.

Add corporate investment, leverage and ownership concentration as companion panels. Household capital income can show the receipt side for dividends, with the accounting reconciliation explained. When interpreting repurchases, include net issuance or share count information so gross transactions are not mistaken for net withdrawal of capital.

Update the complete Fed and BEA histories when their releases change. The 2020 rendered buyback table and current 2026 download demonstrate why a familiar web page is not necessarily a current dataset.

Archive the downloaded file and its metadata. A reproducible payout panel can then distinguish changing corporate income, changing allocation and changing ownership without collapsing them into a single automation claim.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Economic Analysis via Federal Reserve Bank of St Louis (2026). Corporate Profits after tax with IVA and CCAdj Net Dividends. 30 September 2026 vintage; quarterly nominal SAAR 1947–2026 Q2; verified retrieval 4 October 2026

[2] Bureau of Economic Analysis (2026). NIPA Handbook Chapter 13 Corporate Profits. Profits, net dividends and reconciliation to personal dividend income; verified retrieval 4 October 2026

[3] Board of Governors of the Federal Reserve System (2026). Equity Issuance and Retirement. 18 September 2026 project update and quarterly data dictionary; separate repurchases and merger retirements; verified retrieval 4 October 2026

[4] William R Kuchinski Richard E Ogden Damian R Thomas and Missaka Warusawitharana Federal Reserve Board (2017). Equity Issuance and Retirement by Nonfinancial Corporations. Original methodology; quarterly history begins 1996 Q4 and source classification; verified retrieval 4 October 2026

[5] Bureau of Economic Analysis via Federal Reserve Bank of St Louis (2026). Gross Domestic Product. 30 September 2026 vintage; matching nominal GDP; verified retrieval 4 October 2026

RELATED CHAPTERS 054 · 055 · 056 · 057 · 060 · 062 · 063 · 064

CHAPTER 062

Wealth relative to national income

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN 1970 to 2010 international wealth income research and 1980 to 2026 U S household wealth relative to disposable income

Wealth has become larger relative to annual income over decades, increasing the importance of ownership while combining productive assets with housing, land and financial valuations.

A stock compared with an annual income flow

Wealth relative to national income compares a balance sheet stock with a flow earned over a year. A ratio of five means the measured wealth stock is equivalent to five years of the specified annual income. It does not mean wealth generates an annual return of five times income. The unit is a multiple of annual income, and the definitions of both sides determine its interpretation.

The national wealth concept must be distinguished from household wealth. National wealth consolidates relevant domestic assets and liabilities and accounts for net foreign assets. Household net worth includes assets owned by households less their debts, with the statistical treatment of nonprofit institutions identified. Financial claims between domestic sectors can appear as household assets and corporate liabilities. Adding all sector assets without consolidation would double count claims on the same underlying resources.

Private wealth relative to national income is the concept examined in the long international research cited here. The current U.S. companion presented in this chapter is the Federal Reserve ratio of household net worth to disposable personal income. It is a different ratio with a different numerator and denominator. It updates the ownership balance sheet perspective, but it cannot be appended directly to the international research series as though the definitions were identical. [1][2]

National income, GDP and disposable personal income also are different flows. GDP measures domestic production; national income measures income under its national accounts boundary; disposable personal income is personal income after personal current taxes. The denominator should therefore appear in the chart title. A shift in taxes or transfers can affect disposable income without the same change in national production. [3]

The Post Labor relevance is the growing economic scale of accumulated ownership relative to income generated each year. Access to wealth can influence security, spending capacity and participation in future returns. That is a distributional issue, not a direct engineering measure of automation. Wealth includes housing and land as well as productive business assets. A rising ratio can make ownership more consequential while revealing little about the amount of machinery replacing workers.

Use this metric to test whether economic position increasingly depends on accumulated claims and assets. To establish a technological mechanism, connect it with productive capital, profits, labor income and ownership distribution. Keep the balance sheet observation distinct from the production claim.

The established history and latest companion ratio

Piketty and Zucman's original study used national balance sheets for 1970 to 2010 across eight developed economies. It reported a broad rise in wealth relative to income, from roughly 200 to 300 percent in 1970 to 400 to 600 percent in 2010. Those are cross country ranges, not a single U.S. observation. The authors also published country data and historical extensions. The study is evidence of a several decade international pattern with a 2010 endpoint. [1]

The Fed's current U.S. household net worth to disposable personal income series supplies a separate, more recent companion. The accessible September 2026 release reports ratios of 4.87 in 1980 Q4,5.16 in 1990 Q4,5.88 in 2000 Q4,5.74 in 2010 Q4 and 7.03 in 2019 Q4. The ratio reached 8.25 in 2022 Q1, fell to 7.33 in 2022 Q4 and was 8.28 in 2026 Q2. These observations show both a substantial long increase and large intervening reversals. [2]

The latest ratio is therefore well above the early decades, but its path is not a smooth accumulation of productive equipment. Stock and property valuations can change rapidly. Disposable income also responds to the cycle, tax policy and transfers. The unusual pandemic income movements affected the denominator as well as the asset side. A complete chart should display all quarters and explain both components.

The international study and the current U.S. companion should appear in separate panels. The first answers a cross country question about private wealth relative to national income. The second monitors U.S. household net worth relative to disposable income. A common visual scale of multiples can make them comparable in form, but does not make their levels interchangeable. State that distinction wherever the panels appear together.

The secular conclusion is consequently narrower and stronger than a generic claim of capital taking over everything. Accumulated wealth has grown substantially relative to annual income in established long histories. The latest U.S. household balance sheet ratio reinforces the relevance of that development. It does not reveal whether the rise reflects productive accumulation, asset repricing or changes in the income flow, and it does not identify the households benefiting without distributional data.

Federal Reserve September 2026 accessible Financial Accounts release; household ratio to disposable personal income, not private wealth divided by national income. [2]

Observation	Household net worth divided by annual DPI
1980 Q4	4.87
1990 Q4	5.16
2000 Q4	5.88
2010 Q4	5.74
2019 Q4	7.03
2022 Q1	8.25
2022 Q4	7.33
2026 Q2	8.28

Accumulation valuation and income growth

A wealth income ratio can rise because households and other owners accumulate more assets, because existing assets become more valuable, or because annual income grows more slowly. These mechanisms have different meanings. New productive investment can expand capacity. Higher land prices can increase measured wealth without adding land. A lower discount rate can raise the market value of an unchanged stream of future profits. Slower income growth can increase the ratio even when wealth grows modestly.

This is why market value wealth and productive capital stocks should remain separate. A business can have a high stock market valuation because investors expect strong future returns, not because its machinery or structures multiplied. Its valuation may embody intellectual property, market power and expectations. A fixed asset account instead estimates the value or quantity of produced assets under specified depreciation conventions. Neither concept can be substituted for the other without changing the question.

Housing makes the distinction particularly important. A household's home is both an asset and a source of housing services. A higher home price raises owner wealth while making entry harder for a prospective buyer. The amount of usable housing may change much less than the transaction price. Rising housing wealth relative to income can therefore matter for household security and inequality without constituting automation of production.

Financial assets require consolidation and an ownership perspective. An equity claim is valuable to a household because it represents a claim on corporate returns. The corporation's underlying assets and the equity claim should not both be added to national wealth as independent resources. For household distribution analysis, however, the equity claim is exactly the relevant asset. The same record can be appropriate for one purpose and double counted in another.

The denominator also deserves analysis. Income can rise broadly while wealth rises faster; alternatively, wealth can stagnate while income falls. Plotting both underlying levels, in addition to the ratio, makes these cases distinguishable. A quarterly asset market rally can produce a pronounced ratio movement before any corresponding change in employment or production occurs.

For Post Labor, identify the portion associated with productive assets and corporate claims, then examine the associated returns and labor outcomes. The total wealth ratio establishes the importance of accumulated ownership. The mechanism requires a decomposition that separates saving, investment, asset price changes and the growth of the relevant income flow.

Distribution and competing interpretations

A larger aggregate wealth stock does not show that a typical household owns more wealth relative to its income. The aggregate can rise while gains are concentrated among households already holding substantial assets. Median wealth, wealth shares and asset composition provide the distributional counterpart. If productive returns increasingly accrue to concentrated ownership, the macro ratio can help explain why employment income becomes a less complete route to prosperity.

Conversely, broadly held assets can complement labor income. Retirement savings, homeownership and diversified investment can provide security across the life cycle. An increase in wealth relative to annual income is not automatically evidence of exclusion. The interpretation depends on how ownership is

distributed, whether people can acquire assets from earnings and whether liabilities offset the assets of particular groups.

Aging can increase the importance of accumulated wealth because people build balances during working years and draw on them later. That demographic mechanism is different from automated displacement. Changes in pension arrangements can also shift where assets are recorded and how risk is allocated. Comparing age groups and pension categories helps prevent a broad balance sheet shift from being attributed solely to technology.

Interest rates and expected returns can reprice assets. Lower discount rates can make future income streams more valuable even without an increase in their current cash flow. Stronger expected profitability can raise equity values before those profits are realized. These valuation channels may have substantial distributional consequences, but a higher wealth ratio alone does not establish that current productive systems need less labor.

The interpretation would strengthen if a rising ratio is accompanied by sustained growth in productive capital services, corporate income and concentrated ownership, while broad labor earnings or access to good jobs lag. It would weaken a strong automation reading if the increase is mainly housing repricing, demographic accumulation or a temporary asset rally with no corresponding production change. Those alternatives should be measured rather than treated as minor footnotes.

The appropriate classification is secular evidence for ownership's economic scale, with a supporting role in the Post Labor distribution framework. Preserve the international evidence's historical endpoint and the current U.S. companion's distinct disposable income denominator. The conclusion remains useful when its boundaries are explicit: accumulated assets and claims increasingly matter relative to annual income, while the causes and beneficiaries require further analysis.

A reproducible balance sheet chart

For the main international metric, retrieve the original national balance sheet data and retain private wealth relative to national income under the authors' definitions. Identify countries, years and whether values are net of liabilities. Preserve the 2010 endpoint unless a comparable updated source is verified. Do not extend it using a differently defined contemporary series. [1]

For the current U.S. companion, use the Fed's published household net worth to disposable personal income ratio and archive its release vintage. Show the 1980 onward history with quarterly values and a longer moving average. Label it clearly as a household balance sheet ratio to DPI. The latest 2026 Q2 observation is 8.28, but the substantial 2022 reversal should remain visible. [2]

Add decompositions of household assets, liabilities and valuation changes, with real estate separated from corporate equity and other financial assets. Productive fixed capital and capital services provide independent measures of production capacity. A panel of wealth shares and median wealth reveals whether the aggregate ratio corresponds to broad household security.

When reconstructing a stock flow ratio, divide the wealth stock by an annual income flow or an annualized quarterly flow. Do not divide by a single quarter's unannualized income and compare the resulting number

with annual ratios. Record the treatment of nonprofit institutions and the use of market or replacement cost valuation.

Refresh complete histories after revisions. Keep national wealth, household net worth and productive capital in separate source tables. Read the ratio with corporate profits, capital ownership, household capital income and labor compensation. That combination makes it possible to investigate whether ownership's increasing scale reflects productive accumulation, valuation or slowing income growth, and how each pathway affects households.

SOURCES AND REPRODUCTION NOTES

[1] Thomas Piketty and Gabriel Zucman (2014). Capital Is Back Wealth Income Ratios in Rich Countries 1700 to 2010. Original QJE paper; 1970–2010 comparative national balance sheets, Figure I and author data catalogue; verified retrieval 4 October 2026

[2] Board of Governors of the Federal Reserve System (2026). Financial Accounts of the United States Current Release Accessible Figures. September 2026 release; ratio of household net worth to DPI1980 Q4–2026 Q2; verified retrieval 4 October 2026

[3] Bureau of Economic Analysis (2026). Disposable Personal Income. Definition of DPI as personal income less personal current taxes; verified retrieval 4 October 2026

RELATED CHAPTERS 049 · 050 · 054 · 060 · 061 · 063 · 064

CHAPTER 063

Concentration of capital ownership

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN 1989 Q3 to 2026 Q2 Distributional Financial Accounts

Ownership of corporate equities and net worth is highly concentrated and became more concentrated over the long comparison, shaping who receives gains from productive capital.

Ownership shares and the asset boundary

Concentration of capital ownership measures how much of a defined asset stock belongs to particular groups. A top one percent share divides the assets held by that group by the corresponding aggregate asset stock. The denominator can be total net worth, corporate equities and mutual fund shares, business equity, real estate or another category. These choices answer different distributional questions and should appear directly in the metric name.

This chapter uses the Federal Reserve's Distributional Financial Accounts, which provide quarterly estimates beginning in 1989 Q3. The groups are ranked by wealth, rather than annual income. The Fed separately publishes distributions by income, age, generation, education and race. A household in the top wealth group is therefore not automatically a household in the same annual income percentile. That distinction matters especially for retirement and business ownership. [1]

Total net worth includes a broad balance sheet of assets less liabilities. Corporate equities and mutual fund shares are a narrower ownership category. The latter is relevant to corporate returns, but it does not represent every household claim on productive capital. Pension entitlements and other asset categories are treated separately in the accounts. The aggregate definition should be retained rather than describing the equity category as every stock holding through every institutional channel.

The Post Labor relevance is distributional. If production increasingly relies on capital while ownership is concentrated, productive gains can accrue to a relatively small group even when output grows. Concentration determines how widely households participate directly in returns to ownership. It does not measure the technical rate of automation or establish why firms adopt technology. It is the link between the capital side of production and household access to its benefits.

The measure also differs from corporate concentration. Corporate concentration concerns the share of sales, employment or market value controlled by firms. Ownership concentration concerns the households or institutions holding claims. An industry can contain many competing firms whose equity is predominantly held by wealthy households. Conversely, a concentrated industry can have broad ownership. Those are connected economic questions, but their metrics should remain distinct.

Report several asset categories alongside total net worth. A single overall concentration figure can conceal broad homeownership combined with narrow corporate ownership, or different liability burdens across

groups. The definition should make those possibilities visible before drawing conclusions about capital income or economic power.

The long distributional record and current shares

The 18 September 2026 DFA vintage reports that the top one percent of households by wealth held 22.8 percent of net worth in 1989 Q3 and 32.5 percent in 2026 Q2. Their share of corporate equities and mutual fund shares was 42.8 percent in 1989 Q3 and 50.9 percent in 2026 Q2. The corresponding 2000 Q1 observations were 27.9 percent of net worth and 45.5 percent of the equity category; 2010 Q1 values were 28.2 percent and 47.9 percent. [2][3]

These comparisons span nearly thirty seven years. They establish a substantial long increase in the top group's share of aggregate net worth and a smaller but meaningful increase in its share of corporate equity and mutual fund assets. They do not imply an uninterrupted quarterly rise. Asset price cycles, changes in composition and revisions to the underlying distribution estimates affect the path.

In 2026 Q2 the next nine percent, meaning the 90th to 99th wealth percentiles, held 37.2 percent of corporate equities and mutual fund shares. Combined with the top one percent's 50.9 percent, this gives 88.1 percent for the top ten percent by wealth, using the rounded published shares. The bottom half held 0.6 percent of the same asset category. The contrast demonstrates how unevenly direct ownership of this category is distributed. [3][4][5]

The denominator remains crucial. The top one's 32.5 percent share of total net worth and 50.9 percent share of the equity category are not competing estimates of the same thing. They show that corporate ownership is more concentrated than the broad balance sheet. Housing, deposits, retirement claims and debts contribute differently to total wealth. A dashboard should preserve those categories to explain the difference.

The verified evidence therefore supports a secular observation about ownership distribution. It becomes especially relevant when combined with rising profits or capital services, because those production gains may not reach households in proportion to their numbers. Yet the shares alone do not show the current cash income generated by the assets, the wealth of a typical household or the share of technology related gains that each group receives. Those outcomes require separate income and valuation records.

Observation	Top one percent share of net worth	Top one percent share of corporate equities and mutual funds
1989 Q3	22.8 percent	42.8 percent
2000 Q1	27.9 percent	45.5 percent
2010 Q1	28.2 percent	47.9 percent
2026 Q2	32.5 percent	50.9 percent

Federal Reserve DFA through FRED, 18 September 2026 vintage; groups ranked by wealth and shares refer to distinct asset denominators. [2][3]

How the quarterly estimates are constructed

The DFA combines two Federal Reserve data products. The Financial Accounts provide quarterly aggregate balance sheets, while the Survey of Consumer Finances provides detailed household observations every three

years. The accounts reconcile their concepts, derive distributional shares and allocate the aggregate assets and liabilities across household groups. Quarterly distribution estimates are therefore not the results of a newly completed household wealth survey every quarter. [1]

Between survey years the reconciled household balance sheets are interpolated. Beyond the most recent survey they are forecast using the account's methodology. The Fed publishes documentation and a public version of the code. This enables reproducibility and sensitivity analysis, but it means current estimates depend on extrapolation as well as observed aggregate market values. A change in the latest quarter should not be interpreted with the same certainty as a directly measured transaction census. [1]

Valuation effects can change shares without a transfer of assets between groups. If one group owns more equities and another owns more housing, a stock market rally can increase the first group's wealth share even when neither changes its portfolio. The composition of assets therefore helps explain concentration changes. It also connects distribution to the production side, because higher corporate valuations need not correspond immediately to higher capital services or current cash income.

Liabilities matter for net worth. Two groups can own similar gross assets but differ substantially in debt. Low or negative net worth can make a group's share small even when it owns some assets. A concentration measure based on net worth cannot be interpreted as the share of households with no possessions. Separate asset and liability tables are necessary to understand the balance sheet position.

Households can also move between percentile groups. The top one percent in one quarter is a statistical group, not necessarily the identical set of families forever. Group shares describe the cross sectional distribution at each date. To study mobility, inheritance or persistent access to ownership, a different longitudinal household design may be needed. The DFA long series establishes changing distribution, rather than individual family trajectories.

These features support careful use of the measure. Long changes across survey anchored periods are meaningful evidence of distributional structure. Very recent fluctuations require attention to forecasting, revisions and valuation. Documenting those limitations allows ownership concentration to contribute to the Post Labor framework without making the quarterly estimates seem more directly observed than they are.

Ownership as the distributional transmission channel

Automation can raise productive capacity while generating different household outcomes depending on who owns the relevant claims. If ownership is narrow, profits and capital gains can primarily benefit existing asset holders. If ownership is broad, the same production change can support retirement balances or other household resources across a wider population. Ownership distribution is therefore a structural condition shaping the consequences of technological progress.

That reasoning does not mean every return to a wealthy household comes from automation. Equity values and business income reflect demand, risk, financing, market power and expectations as well as technology. Nor does it mean that labor income becomes irrelevant when ownership is concentrated. Many households continue to depend on earnings, and some own assets acquired through work. The empirical question is how broad access to prosperity changes as production and distribution evolve.

A strong Post Labor interpretation would combine rising capital intensity and corporate income with increasingly concentrated ownership and weak broad labor earnings. Evidence that capital gains and dividends accrue disproportionately to the same groups would connect the balance sheet to current resources. Transfer receipts and taxes could then show how public distribution offsets or amplifies the gap. These relationships should be observed with compatible definitions rather than assumed from one concentration statistic.

The interpretation would differ if ownership broadens through pensions, savings or other mechanisms while labor income also improves. Concentration in one asset category could coexist with broader participation through separately recorded claims. The relevant policy and economic issue concerns effective access to returns, security and control. The equity category is an important component, but its boundary prevents it from becoming a complete measure of every indirect benefit.

Life cycle composition is another competing explanation for some distribution patterns. Households typically accumulate assets at different stages, and population aging can change aggregate ownership. Age specific wealth comparisons can test whether concentration rises within age groups or mainly reflects demographic composition. Similarly, inheritance, saving opportunities and housing entry costs can shape ownership without originating in automated production.

Treat this as strong secular distributional evidence and a necessary companion to the capital production metrics. It helps identify who is positioned to receive returns when productive capital grows. It cannot establish the technological cause of concentration by itself. The framework becomes more persuasive when it links observed production changes, ownership and household income while retaining the distinctions among them.

Charting concentration without losing composition

Chart the complete 1989 Q3 onward DFA history for the top one percent share of net worth and the separate corporate equity and mutual fund share. Use distinct titles and axes or clearly labeled lines so their denominators are unmistakable. Add the next nine percent and bottom half where the purpose is to show the distribution across groups. [1][2][3][4][5]

Retain the Fed's wealth percentile definitions and source vintage. State that the quarterly distribution is interpolated and forecast between triennial SCF anchors. Mark major survey updates or methodological revisions when they alter the history. Avoid treating the latest one tenth of a percentage point as a precisely measured household redistribution event.

Add asset composition and liabilities for each group. Housing, corporate equity, business equity and pension entitlements help explain differences in both levels and shares. A separate median wealth series is useful for describing the typical household, because a top share does not provide a median. Income percentile views can answer a different question and should remain labeled accordingly.

For current arithmetic, combine mutually exclusive wealth groups and use the same asset category and quarter. The 2026 Q2 top ten percent equity share of 88.1 percent is the sum of 50.9 and 37.2 percent, with rounding inherited from the source. Do not add overlapping top one and top ten groups or compare an asset share with a share of total net worth. [3][4]

Read concentration with capital services, profits, wealth relative to income, dividends and household capital receipts. That arrangement connects productive capacity to ownership and then to resources received. Archive complete releases so revised distribution estimates remain traceable. The result is a durable measure of ownership structure, rather than a volatile market headline presented as a complete explanation of Post Labor.

SOURCES AND REPRODUCTION NOTES

[1] Board of Governors of the Federal Reserve System (2026). Distributional Financial Accounts Overview. 18 September 2026 update; 1989 Q3 history, wealth groups, SCF reconciliation interpolation and forecasting; verified retrieval 4 October 2026

[2] Federal Reserve Board via Federal Reserve Bank of St Louis (2026). Share of Net Worth Held by the Top 1% (99th to 100th Wealth Percentiles). 18 September 2026 vintage; 1989 Q3–2026 Q2; verified retrieval 4 October 2026

[3] Federal Reserve Board via Federal Reserve Bank of St Louis (2026). Share of Corporate Equities and Mutual Fund Shares Held by the Top 1% (99th to 100th Wealth Percentiles). 18 September 2026 vintage; 1989 Q3–2026 Q2; verified retrieval 4 October 2026

[4] Federal Reserve Board via Federal Reserve Bank of St Louis (2026). Share of Corporate Equities and Mutual Fund Shares Held by the 90th to 99th Wealth Percentiles. 18 September 2026 vintage; 2026 Q2 share 37.2 percent; verified retrieval 4 October 2026

[5] Federal Reserve Board via Federal Reserve Bank of St Louis (2026). Share of Corporate Equities and Mutual Fund Shares Held by the Bottom 50% (1st to 50th Wealth Percentiles). 18 September 2026 vintage; 2026 Q2 share 0.6 percent; verified retrieval 4 October 2026

RELATED CHAPTERS 049 · 050 · 054 · 060 · 061 · 062 · 064

CHAPTER 064

Household capital income

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN 1959 to 2026 personal income series and 1979 to 2023 CBO household distribution

Asset income is an important and unevenly distributed household resource, but its aggregate share is cyclical and does not show a simple secular rise in the verified long comparison.

Which receipts count as capital income

Household capital income measures resources associated with ownership rather than current labor supplied. A narrow, reproducible national accounts measure is BEA personal income receipts on assets: personal interest income plus personal dividend income. Dividing these receipts by total personal income gives their aggregate income share. The unit is a percentage, and both flows should use the same observation period and release vintage. [1][2][3]

The narrow measure excludes several things that might informally be called capital income. Rental income of persons is recorded separately. Proprietors' income contains the income of unincorporated businesses and can combine returns to owner labor and capital. Retained corporate earnings do not become current personal dividends simply because shareholders own the corporation. A stock sale produces a financial transaction, and only a defined gain could count as income under an alternative income concept.

BEA personal income excludes realized and unrealized capital gains and losses. CBO's household distribution framework includes realized capital gains within market income. These are purposeful differences in accounting scope. A series incorporating capital gains can be more volatile and more concentrated than interest and dividends alone. Neither should be silently substituted for the other in a long history. [4][5]

The BEA measure also includes receipts recorded on behalf of persons, with imputations in the accounts. It is not identical to the amount of cash immediately available in household bank accounts. Separate BEA series identify imputed asset income and income excluding imputations. That distinction matters when the question concerns present spending capacity or the ability to live without labor earnings. [6]

The Post Labor relevance is the household distribution channel. If production increasingly generates returns to ownership, interest, dividends and related resources may become more important for those who hold assets. The aggregate receipt share is only one part of that test. Ownership distribution, capital gains, taxes and the accessibility of receipts determine how households actually participate.

The measurement should therefore begin with an explicit boundary. Interest and dividends provide a consistent core. A broader capital income measure can add rents and realized gains, but should preserve the treatment of mixed business income and avoid double counting. Report each component separately before calculating a total, so readers can distinguish a change in the economy from a change in the definition.

The long share comparison is mixed

The current accessible BEA personal income series report asset receipts of 993.2 billion dollars at an annual rate in January 1990,1383.7 billion in January 2000,1726.6 billion in January 2010 and 4705.1 billion in August 2026. Total personal income for those observations was 4783.8,8348.0,12267.7 and 27626.9 billion respectively. Their calculated asset receipt shares are 20.76,16.58,14.07 and 17.03 percent. [1][2]

These dated checkpoints cover more than thirty six years. They show that the current aggregate interest and dividend share is above the 2010 checkpoint but below the 1990 level. A simple claim that this particular share has continuously increased with automation is therefore unsupported by the verified comparison. The dollar level grew greatly, but total personal income grew as well. The ratio is needed to assess relative importance.

The latest monthly observation is August 2026, available by the 4 October cutoff. The 4705.1 billion figure is an annualized rate of asset receipts, not the actual amount received during that month. The same annualization applies to the total income denominator, so it cancels in their quotient. An annual average chart would provide a steadier secular comparison than a handful of monthly points. [1][2][4]

CBO's September 2026 household distribution report extends from 1979 through 2023. It shows that capital income, including realized capital gains, fluctuates more than other income categories and makes up a larger fraction of income for households near the top. The report describes the spike in realized gains from 2019 to 2021 and their decline in 2022 and 2023. This supports a distributional and cyclical reading rather than a smooth aggregate progression. [5]

The appropriate result is mixed evidence. Capital receipts are substantial and their distribution matters, but the narrow national aggregate share does not furnish an uncomplicated secular upward trend. A broader gain inclusive measure might show a different pattern, yet it must be reproduced under a consistent definition. Keep the countercheck visible rather than changing the numerator until it agrees with the framework.

Observation	Asset receipts billions	Personal income billions	Asset receipts share
January 1990	993.2	4783.8	20.76 percent
January 2000	1383.7	8348.0	16.58 percent
January 2010	1726.6	12267.7	14.07 percent
August 2026	4705.1	27626.9	17.03 percent

Author calculations from BEA PIROA and PI through FRED, September 2026 accessible vintage; nominal monthly SAAR and narrow interest plus dividend definition. [1][2]

Returns balances and the interest rate cycle

Asset receipts depend on both the quantity of assets held and the returns those assets pay. Interest income can rise because balances grow or because yields increase. Dividends can change with corporate profitability, payout policy and portfolio composition. Consequently, a rise in household asset income is not automatically evidence of more automated production. It may reflect monetary conditions or a change in how existing returns are distributed.

The interest component makes the narrow aggregate share particularly sensitive to the rate environment. Deposits and debt securities can generate more interest when yields rise, even if the productive machinery in the economy is unchanged. Conversely, declining interest rates can reduce current receipts while increasing the market value of long lived assets. Wealth and current income can therefore move in different directions without contradiction.

Dividend income has a closer connection to corporate earnings but still requires accounting care. Corporations can retain earnings instead of paying dividends, and investors can benefit through changes in equity values. A company that reinvests profitable earnings may increase owners' wealth without increasing current household dividend receipts. A high current dividend flow may reflect allocation decisions rather than a new acceleration in capital productivity.

Realized capital gains add another layer. A gain occurs when an asset is sold above the relevant acquisition value under the applicable income definition. Realization can be delayed or accelerated for financial and tax reasons. A surge in recorded gains does not necessarily mean that all the underlying value was created in the same year. CBO's gain inclusive series and BEA's gain excluding series should therefore remain separately labeled. [4][5]

Rents and business income broaden the ownership channel but can contain substantial noncapital elements. Rental income includes national accounts treatment of owner occupied housing, which is not necessarily a cash payment to the homeowner. An owner operated business can generate income through both the owner's work and assets. A broad capital versus labor partition requires assumptions to allocate that mixed income, and the assumptions should be documented. [3]

For the Post Labor mechanism, connect observed receipt changes to productive capital, profits and the distribution of ownership. Separate the contribution from yields, balances, payouts and gains wherever data allow. This makes it possible to investigate whether households rely more on returns from productive systems, while avoiding a false technological interpretation of an interest rate cycle.

Aggregate receipts and household dependence differ

An aggregate asset income share can rise even when most households receive little additional asset income. A small group with large holdings can account for much of the increase. The converse also is possible: ownership can broaden while the aggregate share stays stable if yields fall. Distributional evidence therefore is necessary to determine whether employment income is becoming less central for a typical household or only for those already wealthy.

CBO's framework is valuable because it separates labor, business, capital and other income across household groups over a long period. Its income before transfers and taxes includes market income plus social insurance benefits. It should not be interpreted as wages alone or as income before every transfer. Keeping those definitions explicit prevents a mistaken comparison with the narrower BEA asset receipt share. [5]

The ability to live from ownership also depends on liquidity and liabilities. Income credited within pension or insurance arrangements may not be immediately spendable. Debt service and taxes can reduce the resources available from gross receipts. A household with valuable assets may still rely heavily on labor earnings for

current expenses. A household dependence measure should therefore use accessible after tax resources and a clearly defined spending or income denominator.

Life cycle differences matter. Retirees can receive asset income after years of earning and saving, while younger households typically have smaller balances. An aging population can change aggregate receipts without automated displacement. Age specific comparisons and working age household measures can help distinguish demographic accumulation from a change in the distribution of production income.

The strongest Post Labor evidence would show that ownership related resources increasingly support high income households while broad working age households face weak labor earnings or rising transfer dependence. That pattern would suggest diverging routes to economic security. It still would require independent production measures to identify automation as a cause. Income composition describes the household consequence, not the technology itself.

The verified aggregate countercheck should remain part of the framework. The current narrow share is below its 1990 checkpoint, so it cannot be used as a universal secular rise. The more defensible use is to monitor distribution, access and composition, alongside gain inclusive income and wealth. Evidence can support the importance of ownership even when one aggregate share does not trend upward.

A layered income dashboard

Begin with monthly BEA interest and dividend receipts divided by total personal income, using PIROA and PI from the same release. Show annual averages over the full comparable history and keep monthly observations as a current monitoring layer. Retain the underlying dollar values and annual rate convention. The verified latest narrow share is 17.03 percent in August 2026. [1][2]

Separate interest from dividends, and display an excluding imputations variant where the purpose concerns available cash. Rental income and proprietors' income should remain distinct components. A broader capital income total must disclose every addition and any allocation of business income between owner labor and capital. Avoid treating this total as simply the inverse of labor's share, because transfers and other income also enter the personal income denominator. [3][6]

Use CBO's 1979 to 2023 distribution for household groups and gain inclusive market income. Label its endpoint separately from the 2026 national accounts observation. A realized gains panel should show the substantial cyclical changes rather than smoothing them into an apparent continuous rise. Keep income percentile and wealth percentile classifications distinct when connecting the CBO results to ownership data. [5]

Add household wealth, capital ownership, corporate profits, dividends and transfers. Together these records can distinguish holding assets, receiving current returns and obtaining public support. Working age and age specific cuts help assess whether a composition change reflects the labor market or demographic accumulation.

Refresh complete histories after annual revisions and preserve the source dictionary. Track whether a finding survives alternative definitions rather than selecting the definition that produces the strongest rise. This metric is most useful as a distributional diagnostic: who receives ownership income, how accessible it is and

how it interacts with labor earnings. Its mixed aggregate history is a necessary constraint on any stronger secular claim.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Economic Analysis via Federal Reserve Bank of St Louis (2026). Personal Income Receipts on Assets. Monthly interest plus dividends, 1959–August 2026; September 2026 accessible vintage; verified retrieval 4 October 2026

[2] Bureau of Economic Analysis via Federal Reserve Bank of St Louis (2026). Personal Income. Monthly nominal SAAR 1959–August 2026; matching accessible vintage; verified retrieval 4 October 2026

[3] Bureau of Economic Analysis (2019). NIPA Handbook Glossary National Income and Product Accounts. Personal income, property income, rents, proprietors income and imputations; verified retrieval 4 October 2026

[4] Bureau of Economic Analysis (2026). Personal Income and Outlays Release Additional Information. Current definitions, capital gains exclusion and annual rate convention; verified retrieval 4 October 2026

[5] Congressional Budget Office (2026). The Distribution of Household Income 2023. September 2026; 1979–2023 income composition and realized gains; pages 3 and10–13; verified retrieval 4 October 2026

[6] Bureau of Economic Analysis via Federal Reserve Bank of St Louis (2026). Personal income Personal income receipts on assets Imputations. Annual imputed asset receipt component; used for measurement boundary, not a quoted observation; verified retrieval 4 October 2026

RELATED CHAPTERS 033 · 035 · 036 · 060 · 061 · 062 · 063

CHAPTER 065

Agricultural output relative to labor hours

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN 1948 to 2023 with raw labor hours benchmark through 2017

U.S. agriculture supplies a long historical demonstration that production can expand greatly while direct farm labor contracts.

Output labor hours and the farm boundary

Agricultural output relative to labor hours asks how much farming produces for each hour of human work performed within the farm sector. The preferred presentation retains two component series, an output quantity index and a labor-hours index, alongside their ratio. Output includes crops, livestock, and other farm products weighted through the USDA Economic Research Service productivity accounts. A farm-output index aggregates unlike products using economic weights; it is broader than bushels of a particular crop and different from farm revenue at current prices. [1]

The denominator matters especially in agriculture because salaried employees represent only part of its workforce. Farm operators, self-employed people, and unpaid family members supply substantial work. A measure restricted to payroll jobs would miss their contribution and could misstate the historical reduction in labor requirements. ERS constructs labor information from establishment and household sources, including hours and compensation classified by workforce characteristics. Its labor-input index also adjusts the contribution of different hours for differences associated with worker characteristics and compensation. [2]

Raw hours and quality-adjusted labor input answer different questions. Raw hours describe human time used. The adjusted input index describes the estimated productive services contributed by that time. If education, experience, or the composition of the workforce changes, adjusted labor input can decline by a different amount than unweighted hours. A chart entitled labor hours must use an hours series. Relabeling an adjusted index as a literal number of hours would obscure part of the process being studied.

Purchased contract labor creates another boundary. ERS places contract labor services among intermediate inputs rather than in the direct labor-input category. Thus a fall in direct farm hours may coexist with more work supplied through contractors, machinery services, or other suppliers. The accounts acknowledge these purchased services, but a two-line farm output and direct-hours graphic does not independently measure the entire food production chain. Farming also excludes much food processing, transport, retail, and restaurant employment. [2]

The farm boundary also separates a machine's operation from its production. Fewer people may be needed on farms while machinery manufacturers, research organizations, transport firms, and maintenance providers supply important inputs. A farm chart need not account for every one of those hours to establish declining direct intensity. It should, however, avoid describing its denominator as the labor embodied in the entire food system. A linked input-output and supplier analysis would address that broader question.

Seven decades of production transformation

The latest ERS national productivity product available at this reference cutoff covers 1948–2023. Its data files were updated in June 2026; the product page was updated in July. ERS reports farm output in 2023 approximately 210 percent above its 1948 level. Over that span, output grew at an average annual rate of 1.52 percent, aggregate input use at 0.12 percent, and total factor productivity at 1.40 percent. These are official descriptions of the agricultural production accounts, rather than an extrapolation from farm employment. [1, 3]

An earlier ERS study provides the clearest verified raw-hours comparison used in the user's research: from 1948 to 2017, farm employment fell 81 percent and labor hours fell 83 percent. The endpoint is 2017, even though the study was published in 2022. Those quantities must remain distinct from the newer 2023 productivity estimates, which use revised accounts and a later endpoint. Combining the older hours decline with the new output increase would create an apparently current ratio assembled from incompatible observation periods. [4]

ERS's current discussion also identifies a substantial decline in its labor-input index and a shift toward purchased materials and services. The long history supports a change in production structure, while the distinction between raw time and adjusted input explains why different official summaries can contain different labor percentages. Every chart should specify which definition, version, and endpoint it uses. A publication date alone supplies none of that information. [1, 2]

The trajectory contains weather shocks, commodity cycles, and changes in product mix. Productivity is not expected to rise every year. ERS separately reports slower productivity growth during 2007–2019 and faster growth during 2019–2023, including a crop-production rebound. A secular account therefore depends on the multidecade trajectory rather than treating one unusually favorable harvest as evidence of a permanent technical advance. [3]

This history comfortably meets the twenty-year criterion. It demonstrates an observed long-run separation between food-production capability and direct farm employment. It does not imply that all workers who left farming failed to find employment elsewhere, or that the modern economy must experience the same transition at the same speed.

Observation window	Verified official comparison
1948 to 2017	Farm employment minus 81 percent and raw hours minus 83 percent
1948 to 2023	Farm output approximately plus 210 percent
1948 to 2023	TFP growth approximately 1.40 percent per year

Different endpoints and labor concepts are intentionally retained. ERS sources [1, 3, 4].

How production becomes less dependent on direct labor

Agriculture makes the central post-labor mechanism concrete. Demand is primarily for food and other farm products. Human work is an input used to obtain those products. When machinery, biological research, improved logistics, chemicals, information, or organization can supply more production with fewer direct

hours, the connection between product demand and farm labor demand weakens. The ultimate usefulness of food remains exceptionally high while the direct human time required to produce it changes.

Several complementary inputs participate in this transformation. Mechanization can let one operator cultivate or harvest more land. Better seeds and breeding can increase output supported by a similar set of farm tasks. Irrigation and chemicals can substitute for some manual work or increase yields. Research and improved management can change timing, losses, and equipment utilization. These channels fall within automation and productivity broadly understood; attributing the entire historical pattern to contemporary robots or artificial intelligence would misdate the transformation.

The distinction between labor productivity and total factor productivity is useful here. Output per labor hour can rise because farms use more machinery, chemicals, land services, or purchased work per hour. TFP seeks to account for changes in the combined input bundle. ERS's finding that total input growth was modest relative to output growth strengthens the interpretation of substantial improvement in the overall production system. It still depends on the accuracy of the accounts and does not assign a single causal percentage to machinery. [2, 3]

The effect on employment also depends on demand. A hypothetical production system doubles output per hour. If demand for its output doubles, total hours can remain unchanged. If demand grows only one quarter, hours fall. This arithmetic explains why large efficiency gains can lead to sectoral labor contraction where consumption does not expand equally quickly. It also explains why an efficient industry can remain a growing employer when new markets expand faster than labor savings.

The distributional question is separate. Consumers can benefit from reliable food and lower production costs; surviving operators can become more productive; owners of land, equipment, technology, or distribution assets can receive income; and displaced farm workers can experience difficult transitions. The production chart cannot measure these consequences directly. Its role is to establish the physical-economic premise that an essential output need not preserve its earlier labor intensity.

What the agricultural analogy establishes

Agriculture is powerful evidence for technological release of a production constraint. It is a less complete standalone account of aggregate labor-market compression. Historical farm labor withdrawal occurred alongside urbanization and expansion in manufacturing and services. To determine whether later sectors can absorb comparable numbers of workers on good terms, the reference must turn to sectoral hiring, earnings, job quality, and worker transitions. A small agricultural workforce today records an accomplished sectoral transition rather than a forecast of current unemployment.

Trade and geography affect the boundary. Imported food can reduce domestic labor requirements without reducing global work, while exports can support domestic production beyond U.S. consumption. A rigorous domestic account would pair production and farm hours with trade and purchased intermediate inputs. A global account would need labor embodied in imported products. These are different research questions, and neither should be answered simply by summing the direct employees of American farms.

The historical hours decline also contains changes in household organization. Unpaid family farm work can become paid employment elsewhere; young people can spend more time in school; farm businesses can

consolidate; and operators can retire. These changes matter to livelihoods independently of the technical tasks performed by machinery. An observed fall in hours establishes reduced direct farm labor use. Its interpretation as involuntary exclusion from prosperity requires additional person-level evidence.

Quality and external costs deserve attention. Output indexes value marketed production and attempt to measure real quantities, but they do not automatically deduct all environmental consequences, occupational risks, or animal-welfare costs. Greater measured output per hour can coexist with significant costs outside the farm business. Conversely, food quality, reliability, or variety can improve in ways conventional measures only partly capture. A productivity argument should identify its production measure rather than silently equating it to every dimension of welfare.

Evidence would strengthen the labor-saving reading if a consistently measured output-hours gap persisted after accounting for contract labor, product mix, and imported services. It would weaken a broad production-system interpretation if most apparent savings were offset by unobserved human work at suppliers. Neither possibility erases the documented direct-sector history. It changes the boundary at which the conclusion is valid.

Building and maintaining the historical chart

Create separate historical charts for the verified raw-hours study and the latest national productivity accounts. For the first, use the ERS research data through 2017 and label raw hours explicitly. For the second, download tables 1 and 1a covering 1948–2023, retain their units and index definitions, and show output, adjusted labor input, capital, intermediate inputs, and TFP where relevant. Do not append the 2023 output point to an older unrevised hours series. [1, 2, 4]

Rebase each index independently to a common starting year: new index equals current value divided by that series's baseline value, multiplied by 100. The output-hours ratio is the output index divided by the hours index. If the underlying labor measure is adjusted input, name the ratio accordingly. Archive the original workbook, its release date, extraction date, series labels, and formulas.

Use the complete annual path, clear source notes, and dates printed inside the chart. Avoid a synthetic smooth curve between selectively chosen endpoints. Include an input-composition companion so readers can see how purchased services and capital changed. Show a separate employment panel when discussing the number of people, because hours and headcount answer different questions.

Updates should follow ERS's actual schedule. The product states that its next national extension is planned for the end of 2027, with observations through 2025. That planned release supplies no observation for 2026. Until a release arrives, report the historical endpoint without implying real-time monitoring. [1]

This metric connects directly to manufacturing output and hours, capital deepening, and economy-wide productivity. Its distinctive contribution is a very long historical example of falling direct human input in production of goods people continue to need.

A useful secondary panel tracks output composition, direct labor, and purchased contract services. It can show whether an apparent acceleration coincides with a change in crops, animal production, or sourcing. Maintain the raw-hours and adjusted-input panels separately and identify whether a revision changes the historical pattern or only the latest observation.

SOURCES AND REPRODUCTION NOTES

[1] USDA Economic Research Service (2026). Agricultural Productivity in the United States. National tables 1948–2023 and release schedule; verified retrieval date 4 October 2026

[2] USDA Economic Research Service (2026). Agricultural Productivity in the United States Methods. Labor quality adjustment and contract labor among intermediate inputs; verified retrieval date 4 October 2026

[3] USDA Economic Research Service (2026). Agricultural Productivity in the United States Summary of Recent Findings. 1948–2023 output inputs and TFP growth; verified retrieval date 4 October 2026

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RELATED CHAPTERS 066 · 071

CHAPTER 066

Manufacturing output relative to labor hours

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN Q1 1987 to Q2 2026

Manufacturing produces substantially more measured output than in 1987 using substantially fewer hours, with a marked slowdown in productivity growth in later years.

Sectoral output and all worker hours

This metric compares manufacturing's real sectoral output with the hours worked to produce it. Its numerator is the BLS manufacturing output index; its denominator is BLS hours worked by all workers in the same sector. The resulting ratio is labor productivity. Manufacturing sectoral output excludes transactions within manufacturing to avoid counting intermediate production repeatedly, while retaining inputs purchased from outside the sector. It differs from BEA manufacturing value added, which deducts intermediate purchases more broadly. [1, 2, 3]

The denominator captures time rather than positions. Employment can decline while remaining employees work longer, or remain constant while overtime is reduced. Hours provide a closer measure of human input than a count of payroll jobs. BLS's major-sector accounts combine sources and include employees, proprietors, and unpaid family workers where applicable. They also distinguish hours worked from hours paid. The exact published sector definition should be preserved when comparing charts across industries. [3]

The consistently published manufacturing series used in the earlier research begins in Q1 1987. Its indexes are seasonally adjusted and currently expressed with 2017 equal to 100. Rebased starting points do not change the percentage growth between endpoints. OUTMS identifies real sectoral output, HOAMS hours, and OPHMFG the corresponding output-per-hour series in FRED's distribution of BLS data. The source notes identify a classification revision; historical downloads should use a consistent current classification rather than combine unreconciled releases. [1, 2]

The main comparison is a change in production intensity within a domestic industrial boundary. It is separate from manufacturing's share of total employment, the absolute employment peak in 1979, or employment in occupations commonly associated with factories. Manufacturing businesses employ managers and engineers as well as production workers; production occupations also occur outside manufacturing. Dates and classification matter because each comparison can have a different starting point and denominator.

Three historical objects must remain distinct. Manufacturing's share of employment measures its place within a growing labor market. Its absolute employment level measures the number of payroll positions within the sector. Output per hour measures the relationship between production and labor input. None is interchangeable with manufacturing's share of nominal GDP, household prosperity, or the employment prospects of a particular occupation. BLS uses sectoral output for manufacturing productivity and value-added output for several broader business-sector measures; the underlying concepts differ.

Long run expansion and the later slowdown

The September 2026 BLS vintage gives Q2 2026 output at 100.093 and hours at 99.714 in the original 2017-based indexes. The earlier source audit records the corresponding Q1 1987 starting values as 61.300 and 136.361. Rebasement therefore yields output growth of approximately 63.3 percent and an hours decline of 26.9 percent across more than thirty-nine years. The implied output-per-hour increase is approximately 123.3 percent. These are cumulative changes, rather than annual growth rates. [1, 2]

The complete path matters because the sector's most recent experience is much less dynamic than those long endpoints suggest. BLS reports manufacturing productivity growth averaging 2.1 percent annually since Q1 1987, 0.1 percent during Q4 2007–Q4 2019, and 0.5 percent during Q4 2019–Q2 2026. In the latter interval, output grew only about 0.2 percent annually and hours declined about 0.3 percent annually. Falling hours lately therefore partly reflect slow production growth, rather than exceptionally rapid productivity improvement. [4]

The latest quarter supplies useful counterevidence against assuming uninterrupted labor contraction. In Q2 2026, manufacturing output rose at a 5.4 percent annualized quarterly rate while hours rose at 2.9 percent; productivity rose at 2.4 percent. These one-quarter annualized rates are different from the cumulative 1987 comparison and from year-over-year rates. A growing volume of factory work can demand additional hours even within an industry with a lower long-run labor requirement per unit. [4]

Manufacturing payroll employment has its own much longer chronology. BLS's historical analysis distinguishes a midcentury high employment share from the June 1979 peak in the absolute payroll count. Employment share began shrinking well before absolute employment did. The production-hours chart therefore answers a stronger technical question than a shrinking sectoral share alone: whether output can expand while actual sectoral human input falls. [5]

The full path is more informative than the endpoints. Manufacturing output per hour rose especially strongly before the financial crisis, but the current index in Q2 2026 remained below its Q1 2011 level. BLS also documents a prolonged productivity slowdown and a renewed improvement beginning in 2025. Thus the historical lesson is not that all manufacturing employment losses followed a continuously accelerating productivity boom. The same sector can experience an earlier period of rapid efficiency gains and a later period of weak output growth, sluggish productivity, and limited employment recovery.

Window	Output and hours relationship
Q1 1987 to Q2 2026	Output plus 63.3 percent and hours minus 26.9 percent
Q4 2007 to Q4 2019	Productivity growth 0.1 percent annually
Q4 2019 to Q2 2026	Output plus 0.2 percent and hours minus 0.3 percent annually

BLS output and hours concepts; cumulative and annualized comparisons are separately labeled. [1, 2, 4]

The mechanism behind production with fewer hours

The manufacturing comparison supports a specific premise of post-labor economics: growth in a productive sector need not maintain its earlier demand for human time. Businesses still need manufactured goods. Improvements in production methods can allow a smaller pool of human hours to support more of those goods. That proposition predates modern AI and encompasses machinery, industrial software, process control, logistics, reusable design, and changes in the organization of production.

The employment outcome follows from the interaction of productivity and demand. A hypothetical factory improves output per hour by ten percent and experiences ten percent growth in output demand. Its hours can remain unchanged. If demand rises five percent, required hours fall; if demand rises twenty percent, hours increase. A productivity improvement alone therefore leaves open whether the industry becomes a larger employer. The verified long-run U.S. comparison shows that expanding domestic output and falling hours did coexist over the stated period.

Tasks can move in different directions within the same factory. Automated inspection can reduce repetitive checking while creating demand for maintenance, engineering, or systems integration. Computerized scheduling can lower coordination work while increasing the complexity of remaining decisions. A smaller workforce can become more skilled, better paid, or more concentrated across establishments. The aggregate ratio describes the combined result and does not reveal how its gains were divided among occupations or people.

Capital deepening offers an immediate connection to the capital-side metrics. More effective machinery per hour can raise labor productivity while the equipment owners receive part of the resulting income. Greater labor productivity can also support higher wages, lower prices, or more output. Those possibilities are separately measurable. A rise in output per hour does not by arithmetic force labor's income share to fall or median compensation to stagnate. Connecting those series is necessary to explain how production efficiency becomes labor-market compression rather than broadly distributed prosperity.

The manufacturing analogy becomes stronger when it is used as a research design rather than a verdict. The useful prediction is sustained separation between expanding activity and the number of people required across the relevant production chain. A temporary correction predicts eventual reattachment to a prior relationship; outsourcing predicts employment appearing in suppliers or other locations; genuine labor-saving change predicts fewer human hours for comparable output somewhere in the chain. These mechanisms can coexist, so the empirical task is to measure their contributions instead of assigning every observed change to one label.

Trade outsourcing composition and competing readings

Manufacturing is exposed to international trade. Imports can displace domestic establishments even while global manufacturing output expands. Exports can support domestic demand. Technology can make global coordination cheaper and support offshoring, while foreign labor still performs the relocated tasks. Consequently, the direct U.S. hours decline records a domestic production relationship; its interpretation as a global reduction in human labor requires additional evidence on foreign inputs and production.

Domestic outsourcing also changes where employees appear. A manufacturer can transfer logistics, cleaning, design, or IT work to suppliers classified in services. Payroll headcount declines at the manufacturer although the work persists. Sectoral output and hours are more informative than headcount alone, yet manufacturing's purchased outside inputs remain important. A supply-chain decomposition is needed to determine how much genuine production-system labor saving accompanies the direct-sector decline. [3]

Industry composition and output measurement create further limits. Rapidly improving computers and electronics receive quality adjustments that can generate large measured real-output increases even when physical unit counts change less dramatically. Aggregate manufacturing can also change because high-output-per-hour industries expand and more labor-intensive industries contract. Neither process proves that the

typical continuing factory made the same improvement. Detailed industries and establishment panels help distinguish within-unit change from shifting weights.

Houseman's original 2018 analysis makes the computer-industry qualification consequential. It argues that extraordinary measured gains in computer and electronic products dominate unusually strong aggregate manufacturing real-output and productivity growth since the 1980s. Removing that industry undermines the simple descriptive inference that productivity explains manufacturing's relative and absolute employment decline. The paper also identifies trade as important to the 2000s collapse and stresses that productivity statistics include mechanisms other than automation. [6]

This is a reason to publish detailed-industry and computer-excluded companion panels, rather than discard the official aggregate or reinterpret every quality adjustment as erroneous. Compare output, hours and employment under the same classification and vintage; separately track purchased intermediate inputs and foreign production exposure. The aggregate divergence is a valid accounting observation. Determining how much it represents automation, changing product quality, industry composition or international relocation requires further evidence. A claim that reshoring cannot create jobs also needs a demand and plant-level analysis: lower hours per unit does not determine the number of units ultimately produced domestically.

The slower post-2007 productivity record is consequential. It rules out using the 1987–2026 cumulative increase to imply continuously accelerating automation during every later employment decline. Weak demand, trade exposure, geographic change, and earlier productivity gains can leave employment depressed without a current productivity surge. The BLS release makes that timing visible. [4]

The strongest interpretation is observed secular reduction in direct manufacturing hours per unit of measured domestic sectoral output. Evidence on wages, worker displacement, regional recovery, and supplier labor determines its broader consequences. A claim that every missing manufacturing position was automated would exceed the data. The chapter's status rests on the multidecade output-hours relationship itself.

The appropriate boundary also depends on the question. Domestic employment research should separately identify imported services. Research on total human labor requirements should include those foreign workers. A domestic payroll reduction offset by foreign recruitment is a real deterioration in domestic demand, even if it is not a global reduction in human work. Technology can facilitate that relocation by reducing coordination costs. In the broad historical framework of the earlier research, technologically enabled relocation is part of organizational restructuring; it is not interchangeable with machines performing the relocated tasks.

Reproducing the manufacturing evidence

Download OUTMS, HOAMS, and the official output-per-hour series from the same BLS or FRED vintage. Preserve all quarterly observations from Q1 1987 through Q2 2026 and the seasonal-adjustment metadata. Independently divide each series by its Q1 1987 value and multiply by 100. Derive the productivity ratio from the output and hours indexes and compare it with the published productivity index to detect unit or alignment errors. [1, 2, 3]

Use aligned panels: real output and hours in the first, output per hour in the second, and payroll employment or employment share in a separately labeled companion. Plot all observations. Mark recessions without

substituting recession endpoints for the chosen baseline. Keep the manufacturing output concept printed in the notes so it is distinguishable from the BEA value-added comparisons for services.

Maintain at least three windows: the complete published history, 2007 onward, and 2019 onward. The long-run comparison establishes secular change; the later windows disclose its slowdown and cyclical behavior. Add detailed durable and nondurable manufacturing panels when interpreting recent changes. Update with the quarterly productivity release and record any historical revisions before replacing a published percentage. [4]

Combine this chart with worker displacement, labor share, compensation, trade, and capital intensity. Together they can distinguish production becoming more efficient, direct domestic employment shrinking, and workers losing access to comparable livelihoods. Manufacturing's strongest contribution is empirical precedent for persistent production growth with a much smaller direct human-hours requirement.

SOURCES AND REPRODUCTION NOTES

[1] U.S. Bureau of Labor Statistics (2026). Manufacturing Sector Real Sectoral Output for All Workers. Q2 2026 output index and historical series; verified retrieval date 4 October 2026

[2] U.S. Bureau of Labor Statistics (2026). Manufacturing Sector Hours Worked for All Workers. Q2 2026 hours index and historical series; verified retrieval date 4 October 2026

[3] U.S. Bureau of Labor Statistics (2025). Office of Productivity and Technology Calculation. Output hours compensation and productivity accounting methods; verified retrieval date 4 October 2026

[4] U.S. Bureau of Labor Statistics (2026). Productivity and Costs Second Quarter 2026 Revised. Long-term and business-cycle manufacturing growth rates; verified retrieval date 4 October 2026

[5] Katelynn Harris BLS (2020). Forty years of falling manufacturing employment. Employment history through June 2019; verified retrieval date 4 October 2026

[6] Susan N. Houseman (2018). Understanding the Decline of U.S. Manufacturing Employment. Original 2018 critique of computer-driven manufacturing aggregates and causal inference. Supports detailed-industry companions without treating every productivity gain as automation. Verified for version two 4 October 2026.

RELATED CHAPTERS 065 · 070 · 071

CHAPTER 067

Information sector output relative to employment

EVIDENCE STATUS **Short history** · OBSERVATION SPAN Q4 2022 to Q2 2026 with employment history beginning in 1939

The updated information-sector comparison shows strong real value-added growth alongside declining direct payroll employment.

Matching information production and payrolls

The information-sector metric matches BEA real value added for NAICS 51 with BLS payroll employment in that industrial category. The sector includes publishing and software publishing, broadcasting and other media, telecommunications, and data-related businesses. It is an employer-industry category rather than all technology occupations. A programmer working at a bank belongs to finance in this comparison, while a receptionist employed by a software publisher belongs to information. [1, 2]

The numerator is RVAI, measured in billions of chained 2017 dollars at a seasonally adjusted annual rate. The denominator is USINFO, measured monthly in thousands of payroll jobs, seasonally adjusted. To align the observations, average the three employment months in each quarter and match that average with the quarter's value-added observation. Multiplying thousands of jobs by one thousand harmonizes units if a level ratio is wanted. Growth-index comparisons are unaffected by that conversion. [1, 2]

Real value added deducts purchased intermediate inputs and removes measured output-price changes. It is closer to a production concept than consolidated corporate revenue or stock valuation. Payroll jobs still omit some relevant work, including self-employed contractors, supplier employees classified elsewhere, and foreign labor. The resulting ratio should therefore be named real value added per payroll job. [3]

The ratio calculated here is real value added per payroll job. It is not a measure of what an individual employee personally produces or deserves to be paid. Output reflects the joint use of workers, capital, software, organizational systems, and other inputs. The ratio also differs from official labor productivity per hour. It is nevertheless a useful measure of staffing intensity: how much measured real value added corresponds to each payroll position within the industrial boundary.

Let Y denote real value added and L payroll employment. The index of output per job is the output index divided by the payroll index. If output rises 28% while payrolls fall 10%, the resulting increase is 1.28/0.90 − 1, or about 42.2%. Adding 28% and 10% would understate the change. This is an accounting identity, not an estimated causal relationship. The exact sector-specific calculations follow.

Updated divergence and the longer employment history

Freshly verified public tables incorporate the September 30, 2026 BEA release and October 2 employment release. Between Q 4 2022 and Q 2 2026, information real value added rises from $1,544.2 billion to $2,089.8

billion at annual rates, approximately 35.3 percent. Quarterly-average payroll employment falls from 3.1023 million to 2.7773 million, approximately 10.5 percent. Their ratio increases approximately 51.2 percent. These calculations use all three employment months in each endpoint quarter. [1, 2]

The earlier September research reported output growth of 27.9 percent and jobs down 9.7 percent through Q 1 2026. Those were valid calculations for its stated vintage and endpoint. The new comparison extends the observation window and incorporates revised historical output. A researcher cannot describe the difference between the two ratios as growth during one quarter: part reflects statistical revision and a changed employment vintage. Archive both versions and identify the baseline of each published claim.

The most recent monthly employment observation extends beyond the matched production quarter. September 2026 information payrolls are 2.739 million in the retrieved table. That point can appear in an employment-only chart, but it should not be paired with Q 2 output and labeled a September productivity estimate. The numerator remains quarterly. [2]

The historical context rules out dating this industry's entire transformation to generative AI. The payroll series spans many decades, including the telecommunications and internet investment cycle around 2001, later contraction, recovery, and pandemic-era expansion. An employment peak can be followed by another expansion without restoring the earlier labor intensity. The contemporary divergence is important precisely because it occurs within this older history.

That history makes a simple first-decoupling narrative untenable. It also makes the comparison with manufacturing more interesting. An increasingly productive sector can experience employment recoveries without regaining an earlier employment peak. The structural question concerns the changing relationship across cycles, not whether every month or year points down. The contemporary evidence should be described as a renewed and unusually strong divergence in this sector, with possible changes in which constituent activities now participate.

The revised ratio is a quantity-per-payroll-job comparison, so its change can be decomposed exactly into the relative growth of those two components. Compute the output growth factor divided by the employee growth factor, then subtract one. Adding the percentage increase in output to the percentage decline in jobs is only an approximation. The multiplicative calculation is particularly important when the change is as large as in this recent information-sector comparison.

Measure	Q4 2022	Q2 2026
Real value added billions chained dollars SAAR	1544.2	2089.8
Quarterly average payroll jobs thousands	3102.333	2777.333
Output per payroll job index	100.0	151.2

Author calculations from verified updated BEA and BLS tables. [1, 2]

Digital scalability and reduced staffing intensity

Information activities have several mechanisms for delivering expanding output with relatively little additional direct labor. Software can be copied and updated across many customers; telecommunications

networks support additional traffic using capital infrastructure; databases and cloud systems automate recurring processing; and published digital products can reach larger audiences through distribution technology. These mechanisms developed through successive generations of automation, rather than beginning with any one model launch.

Scaling creates an economic distinction between building a system and operating each additional unit of output. A substantial team can create a reusable product whose customer volume subsequently expands much faster than maintenance work. An improved system can also reduce the human effort needed for existing customers. Both raise aggregate output per payroll job, but one depends more on demand expansion and the other on replacing recurring tasks. Detailed business-volume and workforce data are needed to separate them.

The ratio's increase does establish that the measured domestic sector supports more value added per direct payroll position. It can therefore coexist with fewer opportunities for additional workers even while the sector becomes economically larger. Industry employment size alone would miss this changed relationship. Graduates and displaced workers encounter the number, location, and requirements of openings; they cannot convert aggregate sector growth directly into a personal job.

Capital deepening is a likely companion mechanism that must be measured separately. Servers, networks, computing equipment, software assets, and reusable intellectual property can support production once performed through more human coordination or processing. The labor ratio attributes their combined output to a labor denominator; it does not measure a worker's independent contribution or a pure technological residual.

This distinction prevents labor productivity from being equated with a pure technology residual. More capital per unit of labor can raise output per worker even when efficiency measured across multiple inputs improves less dramatically. For the decoupling hypothesis, capital deepening is an economically relevant mechanism. For causal attribution, it remains necessary to identify which investments, organizational changes, and market shifts account for the observed input substitution.

The manufacturing parallel becomes more informative when national observations are connected to industry output, recruitment, firm purchasing, and worker transitions. Aggregate resilience combines expanding and contracting activities; it cannot establish whether particular production systems still provide comparable routes into paid work.

Composition outsourcing and the pandemic benchmark

The recent comparison remains below the twenty-year secular criterion. A sustained multiyear divergence is an observation deserving explanation; it is insufficient to establish a permanent new regime. Late 2022 also follows unusually strong pandemic hiring in several information businesses. A partial reversal of earlier overexpansion can produce declining payrolls even if long-run staffing needs have not fundamentally changed. The discriminating test is whether staffing resumes its older response to sustained activity after that correction.

Paid hours per worker can change, so payroll headcount should be supplemented by an hours measure. Remaining employees might work longer or face growing backlogs. Official hourly productivity series for

narrower information industries provide independent checks, as does the distinction between software and other publishing. A larger output-per-job ratio accompanied by rising overtime has different implications for workers from a comparable ratio supported by less human touch time.

Changes in measurement can also matter for digital services. Chained value-added estimates combine prices and quantities under official methods. Quality adjustment and fast-changing products affect real output; revisions can substantially change earlier observations. The visible September revision is an example of why an archival vintage belongs beside every numerical result. A ratio should not be interpreted with a precision greater than the reliability of its components. [1, 3]

Changes in the composition of an industry can raise its aggregate output per job even without a within-firm productivity improvement. If a scalable software activity expands while a labor-intensive media activity contracts, the information aggregate can become more productive as a matter of weighting. This is economically relevant reallocation, but it differs from showing that the same software engineer now produces more. Establishment panels, detailed industry decompositions, and matched worker records would help distinguish the channels.

Geographic boundaries matter as well. A global corporation may report worldwide employees and revenue, while U.S. payroll statistics record domestic establishments. A company can reduce U.S. staffing and expand abroad without lowering its global labor requirement. Conversely, a U.S. industry can gain output from the relocation of high-value activities while other tasks leave the country. Industry-level real value added is a better domestic production measure than global corporate revenue, but it still cannot resolve the full supply chain without additional data.

Charting the updated evidence and monitoring persistence

Download RVAI and USINFO from a single documented retrieval vintage. Preserve raw files, release metadata, and the transformation code. Compute each quarter's payroll mean only where all three monthly observations exist; never use a partial-quarter average without flagging it. Rebase the two quarterly series independently to Q 4 2022 equal to 100, then calculate their ratio. [1, 2]

Show the complete quarterly path through Q 2 2026, with a companion longer history beginning at the earliest common real-output observation. Add a payroll-only panel reaching September 2026. Label the production panel real value added and the labor panel payroll jobs. Display the recent comparison as short history and keep any secular interpretation tied to a separately demonstrated twenty-year window.

Monitor detailed subsectors, official hours-based productivity, capital input, replacement hiring, and outsourced-work purchases. Persistence through stronger demand would support an enduring reduction in staffing intensity; renewed proportional hiring would support a temporary correction. Growth in supplier labor would point toward relocation of tasks across firm boundaries.

Keep the older September chart as a dated artifact and publish the updated chart as a new vintage. The updated numbers strengthen the descriptive divergence, while the source revision reinforces the need to distinguish changing production from changing estimates.

The strongest next step is to replace the broad benchmark with linked observations of the same production units over time. Such a panel would separate output growth from prices, employee hours from headcount,

external labor from internal payroll, and replacement hiring from gross layoffs. It would also follow workers who exit. The purpose of the current estimate is to make the puzzle concrete enough to guide that research, not to settle a causal question that its inputs cannot identify.

Keep the common-history chart as a separate figure from the recent rebased comparison. Reusing the same vertical scale and visible cycle dates helps readers assess whether the latest movement is exceptional or part of a recurring pattern. A short-window result can then be evaluated within the historical record without being promoted to a secular conclusion by its title.

SOURCES AND REPRODUCTION NOTES

[1] U.S. Bureau of Economic Analysis (2026). Real Value Added by Industry Information. September 30 vintage Q4 2022 1544.2 and Q2 2026 2089.8; verified retrieval date 4 October 2026

[2] U.S. Bureau of Labor Statistics (2026). All Employees Information. October 2 vintage quarterly averages and September 2026 employment; verified retrieval date 4 October 2026

[3] U.S. Bureau of Economic Analysis (2018). Value added. Numerator definition and intermediate-input accounting; verified retrieval date 4 October 2026

RELATED CHAPTERS 068 · 069 · 070 · 072 · 077

CHAPTER 068

Professional services output relative to employment

EVIDENCE STATUS **Short history** · OBSERVATION SPAN Q4 2022 to Q2 2026 with matched historical data from 2005

Professional scientific and technical services have expanded real value added much faster than payroll positions in the recent comparison.

The professional services industry and the ratio

Professional services here means NAICS 54: professional, scientific, and technical services. It includes law, accounting, architecture, engineering, computer systems design, management consulting, scientific research, advertising, and related specialist services. It excludes administrative and support activities and management of companies included in the wider professional-and-business-services aggregate. Using the broader employment series with the narrower output series would create a mismatched ratio. [1, 2]

The numerator is BEA industry real GDP, distributed in FRED as USPROBUSRQGSP. It measures value added in millions of chained 2017 dollars at a seasonally adjusted annual rate. The denominator is BLS CES 6054000001, monthly payroll employment in thousands, seasonally adjusted. Quarterly payroll means provide the temporal match. Real value added per payroll job divides the first by the second after harmonizing units. [1, 2, 3]

An employed consultant and a self-employed consultant can perform similar work but enter the labor measurement differently. Payroll jobs belong to employers in this category; self-employed people require separate household or production-account information. Professionals employed inside banks, manufacturers, or hospitals belong to those industries. The metric consequently measures an important market for purchased expertise rather than all professional work performed in the economy.

A rising ratio indicates less direct payroll employment per unit of measured value added. It leaves open whether more hours, capital, subcontracting, improved processes, or changing service mix contributed. Average FTE or hours are stronger labor-input measures where available. The payroll ratio remains useful for assessing how sectoral business growth translates into positions.

The clearest descriptive test of decoupling compares output with labor in the same economic activity over the same period. Stock prices and corporate earnings can move for reasons unrelated to current domestic production. Real industry value added and industry payrolls provide a closer match. They still do not isolate automation, but they establish whether an industry is producing more while employing more people, roughly the same number, or fewer.

The category combines services with different scaling properties. A reproducible legal template, a scientific research program, a building design, and a custom consulting engagement need not have the same relationship between output and hours. Aggregation can change when one activity grows faster than

another. A broad ratio is therefore a useful starting point; a stronger mechanism test would follow more detailed industries and task content while retaining the consolidated reconciliation.

The latest matched observations and historical comparison

The September 30 BEA vintage gives Q 4 2022 real GDP of $2,077,614 million and Q 2 2026 of $2,367,283 million at annual rates. BLS monthly observations yield quarterly-average payrolls of 10.6564 million and 10.8194 million. Output therefore rises approximately 13.9 percent, payroll jobs 1.5 percent, and real value added per payroll job 12.2 percent. The arithmetic confirms a staffing plateau relative to expanding output, rather than an absolute employment collapse. [1, 2]

The earlier September research used Q 1 2026 as its common endpoint and a different output vintage, reporting 12.8 percent output growth and 1.3 percent job growth. The newer comparison extends the period and replaces revised output observations. Keeping those calculations separate protects the distinction between new activity and revision. The current table's September 2026 payroll count, 10.8436 million, belongs in an employment-only update until matching output is released. [2]

The industry was a major expanding employer before this interval. In the retrieved employment series, January 1990 payrolls were approximately 4.514 million. By late 2022 they exceeded 10.6 million. That long growth history is important counterevidence against describing professional services as a sector that has been shedding absolute employment for thirty years. The recent concern concerns a slowing relationship between growth and additional positions. [2]

The common output history starts in 2005 and supplies more than twenty years for contextual investigation. A secular test should compare complete paths and consistent subperiods rather than append a short recent plateau to an older narrative about manufacturing. The dataset permits that test; the current three-and-a-half-year headline is still a short-history result.

Measure	Q4 2022	Q2 2026
Real GDP millions chained dollars SAAR	2077614	2367283
Quarterly average payroll jobs thousands	10656.367	10819.433
Output per payroll job index	100.0	112.2

Updated BEA and BLS matched observations; author calculations. [1, 2]

Reusable expertise and the growth of output per position

Professional services have traditionally linked revenue expansion to hiring because expert time is part of delivery. That link can weaken as recurring work becomes standardized and reusable. Templates, enterprise software, automated calculations, searchable knowledge, remote coordination, and later AI assistance can let one team deliver a greater volume or wider scope of expertise. A firm selling access to a reusable process can scale differently from one charging for additional hours.

The process can alter career entry before sharply changing the number of incumbents. If a senior professional previously depended on several junior employees for research, documentation, or basic analysis,

better systems can reduce that supporting requirement. The senior role may remain useful and well paid. The resulting business can still expand while recruiting fewer entrants. This mechanism connects output-per-job evidence to hiring by experience, rather than requiring every expert role to disappear.

Customer demand remains decisive. New technologies also create integration, regulatory, redesign, and implementation work. Professional-services providers can add jobs serving those needs even while their delivery teams use less labor per assignment. An output-hours ratio and net employment may therefore move in different directions. Distinguishing new work from labor saving within established workflows makes the framework more precise.

Professional services also contain activities with very different production models. Computer systems design can use reusable software and infrastructure; law can require case-specific judgment; engineering can combine standardized tools with site-specific design; research can involve uncertain experimentation. An aggregate ratio is a weighted result across these businesses. It cannot establish that every occupation experienced identical efficiency gains or identical demand.

The company evidence therefore advances the framework's central investigation while narrowing its interpretation. Large increases in sales and, in Meta's case, a core activity measure are compatible with far weaker expansion in direct staffing. Yet higher labor expenditure and episodes of renewed hiring remain visible. The emerging concern is a weakening relationship between commercial expansion and broad access to additional positions. Whether that becomes a durable manufacturing-like shift depends on the persistence of this relationship and on what happens to work and workers beyond the reporting firm's own payroll.

Replacement hiring deserves particular attention. Net employment can remain steady while a firm stops replacing a portion of departing workers and hires a smaller number of specialists elsewhere. That pattern can restrict the career-entry pipeline long before headcount falls dramatically. To detect it, a panel needs hires by role and experience level, alongside the positions vacated. Counting only layoff events would miss much of the adjustment that the broader evidence in the earlier research suggests investigating.

Slower demand and changing business boundaries

A staffing plateau can arise without an acceleration in productivity. If output growth slows while output per worker continues along an existing upward trajectory, employment growth must slow by arithmetic. This is particularly relevant when interpreting the post-2022 interval. It is necessary to compare preexisting output-per-job growth with the recent rate instead of attributing every weak payroll increase to a new automation shock.

Demand shocks affect project businesses. Higher financing costs can delay consulting or engineering assignments; clients can postpone software implementation; mergers can change demand for legal and accounting services. Uncertainty can make businesses use existing capacity before hiring. A subsequent hiring rebound would weaken a permanent compression interpretation, especially if output and recruiting reconnect after delayed projects return.

Outsourcing can run in both directions. Client organizations may transfer internal specialists to firms in NAICS 54, increasing this industry's employment while reducing client payrolls. These providers can then subcontract, offshore, or automate part of their delivery. A complete production-system account needs the

client, the professional-services business, and relevant suppliers. Looking only at one layer can portray the same reorganization as either job creation or job loss.

Value added improves the numerator by deducting purchased services. Yet a payroll-only denominator does not capture all own-account labor, contractor time, or hours variations. Imported professional services affect domestic work differently from automated delivery. An updated chart should state that its conclusion concerns direct domestic payroll intensity.

The most informative disaggregation follows continuing establishments and specialist subindustries. If output per worker rises within stable businesses while vacancies, backfill hiring, and human touch time fall, the labor-saving interpretation gains support. If the aggregate change comes from business composition, delayed hiring, or external labor growth, a different mechanism dominates.

Neither comparison removes every alternative. Firms in the same industry can sell to different customers, face different financing constraints, or occupy different stages of a product cycle. Continuing firms may restructure because demand shifts among products. A balanced panel deliberately excludes entry and exit, so it cannot independently establish the total effect across all firms. Its strength is identifying an adjustment among survivors. The complete aggregate decomposition still requires expanding firms, shrinking firms, new entrants, closures, suppliers, and foreign activity.

Monitoring professional services without conflating categories

Build the chart using USPROBUSRQGSP and CES 6054000001, matching three-month payroll averages to each real-GDP quarter. Archive a current full-history dataset and a frozen copy of the earlier September vintage. Publish the recent indexed comparison beside the absolute employment path, including its pre-2022 expansion. [1, 2]

Add an industry crosswalk identifying which measures use NAICS 54 and which use the broader professional-and-business-services grouping. Keep employee headcount, payroll jobs, hours, and contracted work separately labeled. Where official detailed-industry output-hours data are available, use them as corroborating comparisons rather than relabeling the aggregate payroll ratio hourly productivity.

Monitor output growth, vacancies, hires, separations, entrant employment, contractor expenditure, and real compensation. A multiyear fall in payroll additions per output increment would be more persuasive if it persisted during recovering client demand and without offsetting supplier work. A growing backlog, longer hours, or an eventual hiring catch-up would limit the interpretation of scalability.

A useful chart update should answer three questions: has real production expanded, how much direct labor supports it, and are workers finding comparably remunerative routes into the resulting activity? Professional services make the connection between automation and access to skilled careers particularly visible, while their historical employment expansion remains part of the evidence.

The cases should not be combined into a single average percentage. Their reporting dates, countries, price measures, business models, and workforce definitions differ. A weighted total of their global headcounts would still not estimate U.S. knowledge employment. The analytical gain comes from comparing the kinds of relationships each company permits us to observe.

The appropriate boundary also depends on the question. Domestic employment research should separately identify imported services. Research on total human labor requirements should include those foreign workers. A domestic payroll reduction offset by foreign recruitment is a real deterioration in domestic demand, even if it is not a global reduction in human work. Technology can facilitate that relocation by reducing coordination costs. In the broad historical framework of the earlier research, technologically enabled relocation is part of organizational restructuring; it is not interchangeable with machines performing the relocated tasks.

For each update, preserve the full quarterly payroll calculation rather than just the rounded average. A month with a temporary staffing movement can shift the endpoint, and annual benchmark revisions can restate earlier employment. The research note should make it possible to distinguish a new quarter's growth from a retrospective revision in the same headline ratio.

SOURCES AND REPRODUCTION NOTES

[1] U.S. Bureau of Economic Analysis (2026). Real Gross Domestic Product Professional Scientific and Technical Services 54 in the United States. September 30 revised vintage through Q2 2026; verified retrieval date 4 October 2026

[2] U.S. Bureau of Labor Statistics (2026). All Employees Professional Scientific and Technical Services. October 2 employment vintage; quarterly average calculations; verified retrieval date 4 October 2026

[3] U.S. Bureau of Economic Analysis (2018). Value added. Gross output and intermediate-input definition; verified retrieval date 4 October 2026

RELATED CHAPTERS 067 · 069 · 072 · 073 · 077

CHAPTER 069

Financial sector output relative to employment

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN Q4 2022 to Q2 2026 with commercial banking context from 1987 to 2025

Finance and insurance have recently expanded measured real value added with nearly flat payrolls while narrower banking data show a much older output-hours separation.

Defining the financial production boundary

The principal financial-sector metric compares real value added in finance and insurance, NAICS 52, with payroll employment in the same industry. It includes credit intermediation, securities and investment activities, insurance, and related financial services. It excludes real estate and rental businesses in NAICS 53. A series entitled financial activities often combines these categories; using it as the employment denominator for finance and insurance alone would distort the comparison. [1, 2]

BEA real GDP for finance and insurance is distributed as USFININSRQGSP, in millions of chained 2017 dollars at a seasonally adjusted annual rate. BLS payroll jobs are CES 5552000001, in thousands, seasonally adjusted monthly. Quarterly means of payrolls supply the temporal match. Divide real industry value added by payroll jobs only after aligning quarter and units. The result is real value added per payroll job, rather than transactions per teller, revenue per banker, or individual productivity. [1, 2]

Financial output is harder to picture than manufactured goods. Customers purchase account management, risk intermediation, payments, investment services, and insurance, sometimes through explicit fees and sometimes through margins embedded in prices. Official production accounts measure services under their statistical conventions. Neither the level of assets under management nor the face value of issued loans is interchangeable with value added. Large asset-price gains can raise balances without generating a proportionate volume of additional service.

Payroll employment records people employed by the classified businesses. Financial institutions also purchase technology, legal advice, processing, and contracted labor from other sectors. A bank's employee count can fall while work persists at a service provider. BEA value added deducts intermediate purchases, improving the numerator's boundary, but an aggregate payroll ratio still lacks a complete account of all human hours supporting financial services. [3]

Financial production also requires a distinction between assets and services. A larger stock of loans, deposits, securities, or insured risks is not itself interchangeable with a real service-output measure. The accounts value the services involved in intermediation and risk pooling under specific statistical methods. An analyst should use the published real value-added series as labeled and treat balance-sheet quantities as contextual mechanisms rather than quietly substitute them for its numerator.

Updated financial comparisons and a longer banking record

The verified September 30, 2026 BEA table reports finance and insurance real GDP at $1,657,833 million in Q 4 2022 and $1,922,414 million in Q 2 2026. Matched BLS quarterly payroll averages are 6.7115 million and 6.6743 million. The updated calculation yields approximately 16.0 percent real-output growth, a 0.6 percent payroll decline, and 16.6 percent growth in value added per payroll job. [1, 2]

The earlier September research reported only 5.1 percent output growth through Q 1 2026. The newer difference reflects a later endpoint and substantial revisions. It cannot be attributed entirely to production during Q 2. The updated series also changes prior observations, underscoring why published charts require a recorded vintage. The direct numerical finding remains stronger output with little employment expansion over the recent window.

A narrower official measure gives a longer historical foundation. BLS commercial-banking productivity tables cover 1987–2025. They report output growth averaging 2.4 percent annually, hours declining 0.1 percent annually, and productivity growing 2.6 percent annually. Rounded growth factors need not reconcile perfectly through subtraction. The same release reports 2025 banking output up 2.9 percent and hours down 0.3 percent. These results belong to commercial banking, not all finance and insurance. [4]

The banking comparison meets the twenty-year criterion and illustrates an established reduction in direct hours per measured service output. The broad finance comparison supplies a recent extension across a larger production category. Maintaining those different scopes prevents the historical banking result from being silently assigned to every insurer, asset manager, or securities business.

September 2026 finance-and-insurance payrolls are 6.6446 million in the verified employment table. That monthly observation extends beyond Q 2 output and should remain in an employment-only panel. It describes direct staffing rather than an updated September productivity ratio. [2]

The recent finance-and-insurance comparison and the long banking productivity record have different boundaries. The former covers the entire NAICS 52 aggregate and uses employees; the latter covers commercial banking and uses hours. Their agreement can corroborate a possible change in direct labor intensity. It cannot validate an exact aggregate finance productivity percentage, because insurance and securities activities and average hours are not represented identically. Keep the two observations in independently labeled panels.

Series and window	Verified relationship
Finance and insurance Q4 2022 to Q2 2026	Real GDP plus 16.0 percent payrolls minus 0.6 percent
Commercial banking 1987 to 2025	Output plus 2.4 percent and hours minus 0.1 percent annually
Commercial banking 2025	Output plus 2.9 percent and hours minus 0.3 percent

The broad real-value-added ratio and narrower official hours-based productivity measure have different industry boundaries. [1, 2, 4]

Automation of financial coordination and transactions

Financial services contain repeatable coordination tasks: recording transactions, transferring information, checking account conditions, routing payments, matching customers with products, reconciling records, and preparing routine documentation. Databases, electronic trading, online banking, payment networks, and

automated processing have changed these activities for decades. The secular banking record therefore concerns broad automation rather than the recent arrival of generative AI alone.

The relationship between service use and staff can become less direct as systems scale. A hypothetical institution serves twice as many routine transactions while adding few staff because its processing infrastructure supports the extra volume. It can still need humans for complex cases, exception handling, product design, accountability, and sales. The issue for aggregate labor demand is how many human hours those remaining activities require relative to expanding service output.

Demand can offset savings. More convenient financial services can expand usage, create products, and bring additional customers into formal finance. Compliance obligations, risk management, and cybersecurity can create new work. A decline in tellers need not imply a decline in total bank employment if other functions expand. Conversely, adding specialists can coexist with fewer broad entry-level positions. The sectoral ratio records their net interaction and should be linked to occupational composition before drawing career conclusions.

A financial business can also scale through more assets per employee rather than more transactions. That can reflect market appreciation, large customer accounts, or product mix, producing a different staffing relationship from automating individual tasks. Growth in real value added provides an official production measure, but detailed transactions, customer counts, fees, and margins remain useful checks.

A longer-history companion asks whether financial technology makes intermediation cheaper for users. Philippon's original 2015 U.S. study, covering approximately 130 years, estimates annual intermediation costs around 1.5–2% of intermediated assets and emphasizes the changing quantities and characteristics of those assets and clients. [5] This denominator differs from payroll jobs and official real value added. Persistent costs can prompt investigation of pricing, services and distribution, but they do not show that all automation gains became profits or that the same unit-cost result holds after the study's observation period.

The latest output methodology introduces another useful caution. BEA's September 30, 2026 annual update changed its portfolio-management-and-investment-advice PCE quantity extrapolation to use BLS CES employment and hours, while current-dollar estimates continue to use Census revenue. BEA explains that inconsistent revenue and producer-price movements had generated uncorroborated quantity volatility under the previous method. [6] This change concerns one financial-service component, not all finance and insurance output. It nevertheless means that production and labor are not fully independent measurements for that component. An output-versus-payroll divergence should be examined with the statistical construction visible.

A financial dashboard should therefore keep distinct panels for industry value added per payroll job, transaction or customer volumes, intermediation costs relative to the assets serviced, staffing hours, and customer prices or outcomes. Where output construction uses labor-input extrapolation, disclose that dependency and seek an independent service-volume check. These companions assess whether measured labor leverage improves the cost or quality of financial services, without forcing all accounting concepts into a single productivity ratio.

The post-labor contribution is a changing human-input requirement for economically consequential intermediation. Capital, software, and institutions can support a larger volume of services with little

additional direct staff. The distributional effect depends on prices, profits, wages, ownership, customer access, and whether displaced workers find comparable roles.

The manufacturing parallel is strongest at this level of mechanism. Improving a production technology can reduce demand for a previously valuable intermediate skill without eliminating demand for the final product. A product can become cheaper, better and more widely used while the specialized labor once required for a stage of production becomes less necessary. The historical analogy does not require writing, coding and manufacturing to have identical market structures. It requires examining whether a similar separation between product demand and demand for particular human contributions is occurring.

Prices risk regulations and competing explanations

A larger financial output-per-job ratio can arise through changing market conditions. Interest-rate movements alter measured intermediation margins; trading volumes and asset prices affect activity; credit demand changes staffing; insurance losses and product mix alter accounts. The quarter-to-quarter financial series contains substantial variation. Comparing selected peaks can generate a misleading productivity story even where the twenty-year history is not strongly monotonic.

Regulation also changes the work requirement. Reporting, anti-money-laundering controls, consumer protection, and risk obligations can increase measured employment even while routine production becomes more automated. This does not make such roles economically pointless: institutions pay to meet enforceable requirements and prevent losses. Evaluating administrative employment requires a separate value and cost framework rather than assuming every noncustomer-facing position disguises technological redundancy.

Financial technology can shift tasks outside established institutions. Payments platforms, software providers, data businesses, outsourced processors, and consulting firms can gain work that banks previously performed internally. Importing those services changes domestic employment; automating them changes the total labor requirement. Their distinction is essential to a worldwide post-labor claim. The best evidence reconciles client and supplier work instead of inferring total labor removal from bank payroll alone.

The narrower commercial-banking hours record helps address the difference between positions and human time, but it does not establish a causal share attributable to machinery or software. Long-run changes also include consolidation, geographic redistribution, product innovation, and demand. The official productivity statistic reports the production relationship under its defined boundary. [4]

Evidence would strengthen structural compression if real service volume kept expanding while total hours across institutions and relevant suppliers fell, recruitment narrowed, and displaced workers faced lasting earnings losses. It would weaken that reading if staffing caught up with activity, complementary jobs expanded on comparable terms, or the apparent efficiency change mainly reflected pricing and accounting revision.

The appropriate boundary also depends on the question. Domestic employment research should separately identify imported services. Research on total human labor requirements should include those foreign workers. A domestic payroll reduction offset by foreign recruitment is a real deterioration in domestic demand, even if it is not a global reduction in human work. Technology can facilitate that relocation by reducing coordination costs. In the broad historical framework of the earlier research, technologically enabled relocation is part of organizational restructuring; it is not interchangeable with machines performing the relocated tasks.

Building a financial monitoring panel

Create a main chart for NAICS 52 real GDP and quarterly-average payrolls, independently rebased to Q 4 2022 equal to 100. Use the updated values and archive the September 30 output vintage. Show the complete common history beginning in 2005 as a contextual panel, and keep September payrolls in a separate monthly display. [1, 2]

Add a commercial-banking chart using official BLS industry output and hours from 1987 through 2025. Label its output concept and NAICS boundary separately. Its long history provides the strongest secular evidence in this entry, while the larger finance-and-insurance comparison describes recent behavior. [4]

Monitor transactions, real fees, customer counts, interest margins, occupational employment, recruitment, contracted work, and service quality alongside the aggregate ratio. Use branch and occupation data to interpret changes in customer-facing work, while avoiding the assumption that a branch closure eliminates every associated task. Follow displaced workers' pay and reemployment where data permit.

Financial services also connect to company revenue per employee, total work cost share, and operating profit per workforce equivalent. Combining those measures can reveal whether institutions simply moved work to suppliers, reduced human input, or captured a larger share of service income. The chart's contribution is to show production relative to direct labor with a transparent boundary.

A complete update sheet should contain the sector code, output units, quarterly output value, each of the three monthly payroll counts, the quarterly mean, and the calculated growth factors. Record release dates and whether a revision changes the base quarter. For the banking companion, preserve the official annual output and hours indexes. A source-specific series label makes the broader automation history assessable without pretending that the recent aggregate comparison measures the same population.

SOURCES AND REPRODUCTION NOTES

[1] U.S. Bureau of Economic Analysis (2026). Real Gross Domestic Product Finance and Insurance 52 in the United States. September 30 vintage through Q2 2026; verified retrieval date 4 October 2026

[2] U.S. Bureau of Labor Statistics (2026). All Employees Finance and Insurance. October 2 vintage and quarterly averages; verified retrieval date 4 October 2026

[3] U.S. Bureau of Economic Analysis (2018). Value added. Gross output less purchased intermediate inputs; verified retrieval date 4 October 2026

[4] U.S. Bureau of Labor Statistics (2026). Productivity and Costs by Industry Selected Service Providing Industries 2025. Tables 1 and 2 commercial banking 2025 and 1987–2025; verified retrieval date 4 October 2026

[5] Thomas Philippon (2015). Has the US Finance Industry Become Less Efficient? On the Theory and Measurement of Financial Intermediation. Original 130-year intermediation-cost study. Costs relative to serviced assets differ from value added per payroll job; findings are not a 2026 estimate. Verified for version two 4 October 2026.

[6] Lisa Mataloni, U.S. Bureau of Economic Analysis (2026). The 2026 Annual Update of the National Economic Accounts. September 2026 methodology update uses CES employment and hours for portfolio-management quantity extrapolation. The dependency concerns a financial-output component, not the entire sector. Verified for version two 4 October 2026.

RELATED CHAPTERS 067 · 068 · 071 · 074

CHAPTER 070

Software publishing output relative to labor hours

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN 1987 to 2025 with the latest annual comparison for 2025

Software publishing has a long history of output growing much faster than hours although total hours expanded over most of that history.

Official software publishing productivity

This metric uses BLS's official industry productivity accounts for software publishers. The numerator is real sectoral output and the denominator hours worked in the industry. Their ratio measures labor productivity. The selected-service-industry release retains 2017 NAICS code 5112 for its published table. A current establishment-employment series using a later classification should not be combined without an appropriate crosswalk. Software work performed inside other industries is outside this publisher boundary. [1, 2]

Real sectoral output is derived from industry revenue or sales measures with official price adjustment and removal of relevant intrasector transactions. It differs from lines of code, developer tasks, new product launches, corporate market value, and BEA value added in the entire information sector. Hours describe the human input of the industry under BLS methods. Official output per hour is therefore a closer production-input measure than revenue divided by closing employee headcount. [2]

The numerator captures economically valued software production, including products that can be reused across many customers. An expanded installation base, improved features, or changes in the mix of publishing activities can affect measured output. A labor-productivity ratio should not be interpreted as the average number of software projects personally completed by an engineer. Capital, product design, organizational structure, and customer demand contribute to the measured result.

The data are annual, so the latest observed year is 2025 despite publication in August 2026. The annual release does not identify a monthly acceleration during 2026. It includes both long-run and recent business-cycle comparisons, which make this metric unusually useful for testing a decades-long automation framework. Its recent output growth with falling hours is an additional observation within an already established history.

Five measures answer increasingly different questions. Revenue records money received for goods and services. Real output attempts to remove price changes. Value added deducts purchased intermediate inputs. Employee headcount counts people within a particular organizational boundary. Hours worked measure labor input more directly. The commonly available company ratio, revenue divided by year-end employees, combines the first and fourth measures. It is useful, but it is not interchangeable with real value added per hour.

BLS treats labor productivity as output relative to hours and emphasizes that it reflects the contribution of capital and other production inputs alongside labor. It is therefore an observed production ratio rather than a measure of each worker's personal ability or effort. A programmer can contribute more measured output because tools, infrastructure, existing code, or product distribution changed around the work. This is precisely why the ratio is useful for studying production leverage while remaining insufficient for attributing the gain to one technology. [3]

Long run growth and the recent hours decline

BLS reports average annual software-publishing output growth of 16.2 percent from 1987 through 2025, hours growth of 6.0 percent, and productivity growth of 9.7 percent. Those rates reveal pronounced relative decoupling across thirty-eight years. They also show substantial absolute growth in human hours. It would misstate the secular record to describe software publishing as an industry whose total labor input has declined since 1987. [1]

In the current business-cycle window, 2019–2025, output grew 10.6 percent annually, hours 5.9 percent annually, and productivity 4.4 percent annually. Demand expansion continued to absorb more labor over this interval despite rising output per hour. This is useful counterevidence against equating automation automatically with a shrinking employer. [1]

The most recent annual change differs: 2025 output rises 12.1 percent while hours decline 0.7 percent, producing productivity growth of 12.9 percent. The release reports software-publisher employment of 655,000 in its table. These official series describe the industry rather than the workforce of one selected platform business. [1]

The arithmetic illustrates the distinction between relative and absolute decoupling. Long-run output can grow faster than hours while both expand; a single year can show output increasing as hours fall. The older record satisfies the twenty-year rule for a rising output-hours ratio. The latest absolute hours decline remains short history until persistence establishes a broader regime.

BLS reports that productivity rose in only fifteen of the thirty selected service industries in 2025. Software's result was unusually strong and should not be assigned to the entire service economy. The dataset's heterogeneous outcomes offer a useful control against selecting only successful automation cases. [1]

Long-run annualized rates should also be interpreted multiplicatively. Output growing much faster than hours implies rising output per hour, but rounded published rates need not subtract to the rounded productivity rate exactly. Use original index observations for endpoint growth and the published methods for annualization. Do not reconstruct annual levels from a constant compound path and present them as observed data. Actual software demand and development investment vary substantially from year to year.

Window	Output	Hours	Productivity
1987 to 2025 annualized	plus 16.2 percent	plus 6.0 percent	plus 9.7 percent
2019 to 2025 annualized	plus 10.6 percent	plus 5.9 percent	plus 4.4 percent
2025 annual change	plus 12.1 percent	minus 0.7 percent	plus 12.9 percent

BLS selected service productivity release tables 1–3. Annualized long periods differ from a one-year change. [1]

Reusable products and the demand offset

Software publishing is a particularly intuitive example of labor as a production input whose requirement changes with technology. A team can build a product once and distribute it widely. Updates, hosting, support, security, and development still require resources, but additional customers need not require proportional additional developers. Improved development tools can reduce the time needed to implement, test, document, or maintain the same functionality.

This structure has operated across decades of programming languages, operating systems, libraries, version control, automated testing, cloud infrastructure, and reusable application components. Contemporary AI adds another layer. The long-term productivity figures demonstrate that the production relationship was already changing well before that layer appeared. A research program centered on broad automation can therefore use software as evidence of continuity while keeping recent AI-specific attribution separate.

The demand offset explains the long-run growth in hours. Cheaper, better, and more widely available software creates uses that were previously too costly or technically difficult. Firms develop new products; industries digitize; customers buy subscriptions; and networks expand. If new demand rises faster than the labor saving per unit, the publishing industry employs more human time. The BLS long-run figures show that both unusually rapid output growth and substantial hours growth occurred. [1]

The post-labor concern concerns the balance. If increasingly capable tools raise output per hour faster than the expansion of software demand, hours can plateau or contract. The 2025 result has that shape, but one observation cannot establish its permanence. It also does not show whether software work expands within other industries or shifts to contractors. Following the wider production system matters because a publisher can move tasks across classifications.

Different workers can face different outcomes. Demand may increase for product direction, advanced systems design, integration, and customer-facing expertise while declining for routine implementation. An expanding average wage or high industry productivity can coexist with fewer entry opportunities. Occupational and career-stage data are needed to connect the production ratio to labor-market compression.

A second denominator is the population seeking entry. Hires per incumbent employee measure turnover intensity. Hires per qualified prospective entrant measure access to an occupation. Neither can replace the other. A sector may restore its previous turnover rate while absorbing a smaller fraction of graduates. Conversely, a falling number of hires may be less troubling if the population seeking those jobs also declines. A complete account should report both employer-side flows and the size and composition of the entrant population.

The limits of software output and labor measurement

Software output is difficult to measure because features, reliability, security, and functionality change quickly. Price indexes attempt to account for changing products under official methods, yet users experience improvements that can be hard to price. Some software is free, bundled, internally developed, or supported by advertising. The publisher accounts do not capture every unit of code or all digitally enabled consumer welfare. Their scope remains measured market production.

Industry reclassification and outsourcing can change the direct labor boundary. A business can purchase development from another company, a foreign subsidiary, or independent contractors. Publishers can also acquire businesses and integrate their products and workforces. Aggregate industry productivity may rise because more scalable firms gain weight even when a typical continuing establishment changes less. Detailed data and supplier records would improve the causal interpretation.

Quality and workload must accompany any firm application of this metric. Producing more software can mean more valuable capabilities, more low-value features, or work that creates later maintenance demands. A short-run decline in development hours can be offset by incidents, security failures, or future rework. The official aggregate measures cannot identify that entire lifecycle. Operational indicators should test whether accepted outcomes remain useful and sustainable.

The long history should also prevent exaggerated novelty. Software productivity growth already averaged far above recent economy-wide growth. The 2025 increase may represent a new acceleration, cyclical composition, existing product leverage, or several mechanisms. A formal break test needs a sufficiently long preperiod, current adoption information, controls for demand and mix, and sensitivity to revisions. A model-release date alone cannot identify the cause.

A stronger labor-saving interpretation would require sustained output growth with falling total human hours across publishers and relevant suppliers, together with evidence that comparable software quality and delivery are maintained. Continued growth in publishing hours or broad complementary employment would constrain an absolute-labor-contraction claim while leaving relative labor-intensity decline intact.

The most useful test therefore concerns what happens after the adjustment. If staffing begins to track expanding activity at its earlier rate, the evidence favors a temporary reset. If additional business is repeatedly accommodated with little additional employment, the lower staffing intensity becomes more consequential even if its origin included earlier overhiring. The relevant object is the slope following the reset, rather than an argument over whether the initial peak was excessive.

Reproduction and updates for the software chart

Use the BLS selected-service-industry productivity release and its underlying database to obtain annual software-publishing output, hours, and productivity indexes. Retain the industry code, classification vintage, base year, and release date. Rebase output and hours to 1987 equal to 100 for the secular panel, and to 2019 equal to 100 for the current-cycle companion. Plot the annual observations rather than reconstructing a smooth path from rounded average rates. [1, 2]

Make the main message explicit in the captions: long-run output grew much faster than hours, while total hours grew; the latest annual observation shows output growth with a small hours decline. Keeping both statements visible makes the chart faithful to the data. Add a narrow 2024–2025 comparison only as a recent panel, not as a substitute for the historical record.

Compare the results with information-sector real value added per payroll job, but preserve their different output concepts and labor denominators. They are corroborating views rather than duplicate estimates. Detailed publishing and telecommunications comparisons can show how broad information composition changes.

Monitor the annual release for revisions, changes in classification, and discontinued series. The August 2026 release itself discontinued several accounting-services productivity measures because underlying data changed, illustrating why continuity must be checked before chart updates. [1]

Pair software production with hiring, freelance demand, contractor spending, and entrant outcomes. The ratio establishes production leverage; the companion measures determine whether that leverage enlarges opportunity, compresses specific careers, or reallocates work.

A labor-market companion should compare hours and hiring within the publisher boundary with software work purchased elsewhere. If internal publisher hours fall but implementation, integration, security, or contractor hours rise outside the industry, the publisher ratio still records genuine direct leverage. The broader employment conclusion depends on those other locations of work.

SOURCES AND REPRODUCTION NOTES

[1] U.S. Bureau of Labor Statistics (2026). Productivity and Costs by Industry Selected Service Providing Industries 2025. Software publishing tables 1–3 including 1987–2025; verified retrieval date 4 October 2026

[2] U.S. Bureau of Labor Statistics (2025). Office of Productivity and Technology Calculation. Industry sectoral output and hours methods; verified retrieval date 4 October 2026

[3] U.S. Bureau of Labor Statistics (2026). Productivity Overview. Labor productivity and multiple input interpretation; verified retrieval date 4 October 2026

RELATED CHAPTERS 066 · 067 · 071 · 078 · 079

CHAPTER 071

Economy wide output relative to labor hours

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN Q1 1947 to Q2 2026 for nonfarm business productivity

Long-run nonfarm business productivity establishes rising output per hour while recent output growth has greatly outpaced hours growth.

Choosing an economy wide production measure

Economy-wide output relative to labor hours should be implemented through a clearly defined production sector. The principal U.S. series here is BLS nonfarm business output per hour. It is a broad market-production measure rather than a literal account of every activity in the economy. Government, private household production, and several other activities are excluded or treated differently. Using the label economy-wide without identifying nonfarm business can suggest coverage the series does not have. [1, 3]

The numerator is an index of real output and the denominator an index of hours worked by all workers in the covered sector. BLS includes employees, proprietors, and unpaid family workers under its methods. Hours worked measure labor input more directly than payroll jobs and differ from paid hours, which can include holidays or other paid nonwork time. Output divided by hours yields labor productivity. [1, 3]

Real output is price-adjusted; a growth rate in current-dollar GDP is not interchangeable with it. GDP counts production within a domestic boundary, whereas global consolidated corporate revenue can reflect overseas activity and intermediate sales. Matching broad domestic production with domestic labor is essential. The series also differs from manufacturing sectoral output and from a firm's nominal revenue per employee.

Productivity describes output supported by labor in conjunction with other inputs. It cannot isolate what individual effort contributes. Capital, technology, organizational efficiency, and input composition help determine the result. OECD's productivity definition explicitly makes that distinction. [2]

The components should remain visible. Output per hour can rise when output increases and hours fall, when both increase at different rates, or even when both fall and hours fall more rapidly. These possibilities have different implications for prosperity and labor demand. A chart containing only the quotient conceals them.

The original graphs supplied during this research were useful for identifying the shape that deserved investigation. For reproducibility, the paper uses the underlying series and explicitly dates the observations. Screenshots do not provide all the information needed to reconstruct a vintage, identify survey breaks, or calculate changes accurately. Their evidentiary role is to motivate the inquiry, not replace the underlying records.

GDP per hour across the whole economy and nonfarm-business output per hour share an output-to-time concept but have different coverage. A chart that moves between them should state the boundary rather than treat a difference as a statistical contradiction. International comparisons also depend on the

accounting and hours standards used. Within this reference, the BLS nonfarm-business record supplies the U.S. historical anchor, while the OECD definition explains the general productivity concept. [2, 3]

Long term growth and the latest business cycle

The revised September 3, 2026 productivity release gives a long-run nonfarm business productivity growth rate of 2.1 percent annually from Q 1 1947 through Q 2 2026. The preceding business-cycle interval, Q 4 2007–Q 4 2019, grew at 1.5 percent annually. The current interval, Q 4 2019–Q 2 2026, again averages 2.1 percent. The recent rate therefore exceeds the immediately preceding cycle but matches the very long historical average. It does not establish unprecedented productivity acceleration. [1]

In the current cycle, output grows at a 2.5 percent annualized rate while hours grow at 0.4 percent. These paired components make the decoupling concrete: rising production has required relatively little additional aggregate human time within the covered sector. Hours have nevertheless increased over the interval. Presenting the result as falling economy-wide hours would misstate the data. [1]

The latest Q 2 2026 quarter records productivity up 1.4 percent at an annualized rate, with output up 1.7 percent and hours up 0.3 percent. Year over year, productivity is up 2.2 percent, output 2.5 percent, and hours 0.2 percent. Annualized one-quarter growth, four-quarter growth, and multiyear compound growth are three different quantities. They should occupy separately labeled rows rather than a common unlabeled growth column. [1]

The long-run productivity series meets the twenty-year criterion for declining hours per unit of output. It does not independently meet a claim that aggregate hours or employment have been declining for twenty years. Production has historically expanded enough to absorb additional work in many periods. A post-labor argument should specify whether it concerns production intensity, absolute work volume, distribution, or accessible good jobs.

A falling hours-per-unit ratio can be graphed as the inverse of output per hour. If output-per-hour productivity doubles, hours required for a fixed measured output fall one half, rather than by one hundred percent. The inverse chart can communicate the production constraint directly, but it should be accompanied by actual output and total hours so readers do not mistake a hypothetical constant-output requirement for an observed decline in aggregate work.

Window	Output growth	Hours growth	Productivity growth
Q4 2019 to Q2 2026 annualized	2.5 percent	0.4 percent	2.1 percent
Q2 2026 versus Q1 annualized	1.7 percent	0.3 percent	1.4 percent
Q2 2026 versus Q2 2025	2.5 percent	0.2 percent	2.2 percent

BLS nonfarm business productivity release. Rates rounded by the source. [1]

Human input intensity and the scale of demand

For the overarching post-labor framework, aggregate output and hours establish the economy's changing use of human time. When productivity rises, the amount of labor needed for a fixed measured production

volume declines. That trend can proceed for decades without aggregate employment disappearing because new demand, new products, population growth, and additional tasks expand the volume produced.

The arithmetic can be illustrated without a forecast. Suppose real output rises fifty percent over a decade and output per hour doubles. Required hours become seventy-five percent of their initial level. If instead real output triples while productivity doubles, hours rise fifty percent. The same labor-saving improvement supports either declining or rising aggregate labor depending on output demand. These hypothetical quantities clarify the production identity rather than predict a particular growth path.

Compaction can also occur through reallocation. Some industries reduce hours while others expand. The aggregate result combines both and can conceal narrower employment opportunities for particular workers. An economy with growing care or construction employment can simultaneously provide fewer entry positions in publishing or routine office work. A total-hours chart should therefore be paired with sectoral decompositions and worker transitions.

The distributional connection requires additional series. Rising output per hour increases the economic capacity to produce goods and services. Whether workers receive its benefits depends on compensation, ownership, bargaining, prices, taxes, and transfers. Aggregate productivity growth accompanied by falling labor share or weak typical pay supports a different account of prosperity from growth accompanied by broadly increasing real compensation.

The compensation identity helps keep this inference precise. The aggregate compensation bill equals covered hours multiplied by compensation per hour; the labor share compares that bill with nominal value added under the appropriate accounting boundary. Flat hours alongside growing real output establish rising output per hour. They do not, by themselves, establish a falling compensation bill or labor share, because compensation per hour and the output-price level can also change. BEA’s compensation concept includes wages and employer supplements, rather than only hourly cash earnings. [4] Display real compensation per hour, typical worker pay and the matched labor share beside the output-hours indexes when making a distributional claim. This allows production leverage and the distribution of its gains to be evaluated separately.

Technology is also broader than explicit automation spending. Better logistics, information systems, organizational methods, reusable knowledge, and improved capital use can raise output per hour. The historical measure tests the changing production requirement. Identifying the contribution of a particular technology requires additional adoption data and a credible comparison design.

The implications are asymmetric. A robust prime-age employment rate makes a claim of widespread inability to obtain any work harder to sustain. It is much less informative about obtaining appropriately skilled work, entering a chosen profession, recovering a former salary, or avoiding involuntary changes in hours. A worker who moves from a technical role to a less remunerative service job remains employed. An established worker and a graduate unable to secure a first professional position can also experience the same economy very differently without producing a dramatic movement in the national prime-age employment ratio.

Composition cycles and the productivity interpretation

Measured productivity often rises during downturns because low-productivity jobs disappear or firms retain fewer hours than the reduction in output. That movement can coexist with lower total production and severe worker harm. Conversely, hiring during an early recovery can depress a short-run productivity rate as firms

rebuild capacity. Comparing complete cycles reduces the risk of treating a recession adjustment as a permanent new technology effect.

Averages conceal worker and firm differences. If labor shifts from lower-output to higher-output activities, aggregate output per hour rises even without the same improvement inside continuing establishments. Changes in education, experience, occupation, and capital also contribute. Multiple-factor-productivity decompositions can separate measured input growth from the remaining residual, although the residual itself includes measurement error and other unobserved influences. [3]

Revisions are material. Output is revised as national accounts incorporate new information; labor-input estimates can also change. Annual seasonal adjustments affect historical quarterly patterns. Source releases distinguish preliminary and revised observations, and those labels belong in archival datasets. A dramatic chart annotation can change when the underlying official series is updated. [1]

International comparison needs comparable price and labor methods. OECD levels converted with purchasing-power parities help compare production per hour across countries. Domestic secular growth is better examined using each country's real volume series. A current-price cross-country level and a constant-price historical growth rate should not be placed on one unlabeled axis. [2]

An aggregate labor-intensity decline is established by sustained productivity growth. Broader labor-market compression requires evidence that output growth and new tasks increasingly fail to restore good opportunities, that access or pay weakens, or that income distribution depends more on ownership and transfers. The productivity record is the production foundation of that case; its labor-market implications remain empirically testable.

The manufacturing parallel becomes more informative when national observations are connected to industry output, recruitment, firm purchasing, and worker transitions. Aggregate resilience combines expanding and contracting activities; it cannot establish whether particular production systems still provide comparable routes into paid work.

Population and preferences affect the work volume that remains. More people, new services, desired convenience, and changes in hours preferences can raise demand for human time even as each unit becomes easier to produce. The aggregate record therefore tests an empirical balance between labor-saving capability and expanded activity. It cannot settle that balance by examining technical potential alone.

A reproducible aggregate output and hours chart

Use BLS nonfarm business output, hours, and labor-productivity indexes from the same historical workbook or release vintage. Preserve the full available quarterly path and confirm sector coverage. Rebase output and hours independently to a common historical quarter, then verify their ratio against the official productivity series. Do not combine nonfarm business output with total nonfarm payroll headcount and call the resulting ratio the same metric. [1, 3]

Present the long record, a 2007-based companion, and a 2019-based companion. Plot components together and the ratio separately. State whether each annotation is cumulative, annualized across years, annualized for one quarter, or year over year. Keep the latest observed quarter distinct from the publication date.

Monitor compensation, labor share, capital services, input composition, sector employment, and job quality alongside production and hours. Repeated output expansion with little additional work supports continued

compaction; broadly improving wages and accessible new jobs show that its rewards are reaching labor through other channels.

Update with each quarterly productivity release and compare revised historical estimates with the archived vintage. A monitoring log should record which endpoint changes and which changes revise the past. This metric is the broadest production-side anchor in the reference, connecting sectoral automation to the overall capacity to produce with less human time per unit.

Add a table of complete-cycle growth rates, using official peak-to-peak intervals, beside the indexed historical chart. This separates the secular ratio from short recession movements and recent acceleration claims. If output and hours both rise, the chart should say so explicitly even when productivity improves. The post labor hypothesis concerns how labor supports production and prosperity, so contrary evidence about total work volume belongs in the same monitoring record rather than being discarded.

SOURCES AND REPRODUCTION NOTES

[1] U.S. Bureau of Labor Statistics (2026). Productivity and Costs Second Quarter 2026 Revised. Nonfarm business cycle and long-term rates through Q2 2026; verified retrieval date 4 October 2026

[2] OECD (2026). GDP per hour worked. Definition and contribution of capital technology and organization; verified retrieval date 4 October 2026

[3] U.S. Bureau of Labor Statistics (2025). Office of Productivity and Technology Calculation. Output hours compensation and productivity accounting methods; verified retrieval date 4 October 2026

[4] U.S. Bureau of Economic Analysis (current edition accessed 2026). NIPA Handbook, Chapter 2: Fundamental Concepts. Employee compensation is remuneration for work; government compensation and transfers are separate entries. Consulted for accounting boundaries, not a new trend estimate. Verified for version two 4 October 2026.

RELATED CHAPTERS 065 · 066 · 067 · 070 · 074

CHAPTER 072

Company revenue per employee

EVIDENCE STATUS **Short history** · OBSERVATION SPAN Public annual company observations through fiscal 2026 where available

Selected company disclosures show large variation in nominal revenue supported by each direct employee and provide bounded examples of changing staffing intensity.

The intuitive ratio and its preferred operational version

Revenue per employee divides a company's annual recognized revenue by an employee count. Public reports commonly provide closing headcount, so a public-data ratio should be labeled annual nominal revenue per year-end employee. It mixes a flow covering a full year with a stock measured on one date. Internal dashboards can improve the denominator by using average FTE or actual hours over the same revenue period.

Revenue is gross sales rather than value added. A retailer or device seller includes purchased goods in revenue; a service provider can include subcontracted work; and a platform can recognize different revenue depending on principal-versus-agent accounting. Comparisons across business models therefore require interpretation. A higher ratio does not alone establish higher technological efficiency, greater social value, or better worker performance.

An operational real organic version removes acquired or divested activities under a declared policy, controls exchange rates, and removes price changes through product-level quantity and base-price information or an appropriate deflator. Those adjustments are rarely fully available in public annual reports. Public ratios remain useful because they disclose a real relationship between the company's recorded sales and its direct workforce.

The numerator is recognized external revenue from continuing, comparable operations, stated in constant currency and constant prices, with intercompany revenue eliminated. The denominator is average employee FTE over the identical period, not year-end headcount.

Revenue comes from the general ledger, consolidation, billing, and order-management systems. Unit, realized-price, discount, and product-mix data come from transaction and product systems. Currency comes from Treasury. Acquisition and divestiture flags come from Corporate Development and Finance. FTE comes from HCM, payroll, and timekeeping.

Report the enterprise value and segment it by business model, operating segment, geography, and product family. Show the nominal-to-real bridge, price-volume-mix bridge, acquisition exclusions, and constant-currency bridge. The organic policy should state how long an acquired business remains outside the comparable series and should restate prior periods consistently where practical.

A simple decomposition clarifies the problem. Let R denote revenue, P an appropriate output-price measure, Q output volume, N the employee count, and H employee hours. With a sufficiently consistent output

definition, R = P × Q and H = N × average hours. Rising R/N can therefore reflect higher prices, more output per hour, longer hours per employee, or combinations of these changes. Acquisitions and outsourcing can also move the ratio by changing what the consolidated entity contains. Public accounts rarely permit all components to be separated.

Six dated company snapshots and their boundaries

The following snapshots use each company's latest verified annual observations available at the cutoff. Fiscal periods differ and are printed beside the values. The ratios are author calculations, stated in nominal U.S. dollars per closing employee or FTE. They should not be combined into a national productivity index.

Microsoft fiscal 2026 reports revenue of $331.839 billion and approximately 223,000 full-time employees, yielding about $1.49 million per employee. Meta calendar 2025 reports $200.966 billion and 78,865 employees, about $2.55 million. Apple fiscal 2025 reports $416.161 billion and approximately 166,000 FTE, about $2.51 million. NVIDIA fiscal 2026 reports $215.938 billion and approximately 42,000 employees, about $5.14 million. Accenture fiscal 2026 reports approximately $74.2 billion and 814,000 people, about $91,000. TCS fiscal 2026 reports $30.017 billion and 584,519 employees, about $51,000. [1, 2, 3, 4, 5, 6]

The differences largely reflect business models, labor geography, purchased inputs, pricing, and market position. NVIDIA relies on manufacturing partners; Apple uses extensive suppliers; software and advertising platforms can scale reusable systems; consulting providers sell labor-intensive implementation and expertise. A ranking of these values would mix those production boundaries and compensation environments.

Historical context should use repeated observations within each company. The earlier Microsoft comparison showed revenue and staffing growing together in one interval and much weaker headcount growth in another. TCS and Accenture illustrate why payroll cost and contracted work must also be observed. A large revenue-per-employee gain can coexist with substantial labor expenditure and later renewed hiring.

The sample also cautions against a false uniformity in the term technology work. A business selling access to a scalable digital product may expand differently from one delivering labor-intensive implementation projects. A supplier can sell systems that reduce employment at its customers while increasing its own workforce. A customer can add employees while reducing freelance purchases. The appropriate unit for the eventual national conclusion is the connected production system, not whichever corporate boundary happens to produce the most striking ratio.

Each company's fiscal-year label must remain attached to its observed period. Nvidia's fiscal 2026 ends in January 2026, Microsoft's in June, Accenture's in August, and Apple's verified fiscal 2025 in September 2025; Meta uses the calendar year. These are legitimate latest annual snapshots at the cutoff, but they are not a synchronized experiment conducted during the same twelve months. A cross-company table should preserve those dates before interpreting the ranking. [1–6]

Company and annual period	Revenue billions USD	Closing workforce	Nominal revenue per worker USD
Microsoft FY2026	331.839	223000 full time	1488067
Meta CY2025	200.966	78865 employees	2548230

Company and annual period	Revenue billions USD	Closing workforce	Nominal revenue per worker USD
Apple FY2025	416.161	166000 FTE	2506994
NVIDIA FY2026	215.938	42000 employees	5141381
Accenture FY2026	about 74.2	about 814000 people	about 91155
TCS FY2026	30.017	584519 employees	51353

Rounded author ratios; global company workforces and different fiscal dates. These are revenue per closing worker, not real output per hour. [1–6]

What rising revenue per employee contributes

A company can become commercially larger without creating proportionately more employee positions. That is directly relevant to the post-labor inquiry, even when the ratio is only nominal. The observation challenges a habitual staffing assumption that more business necessarily brings similar workforce expansion. It invites measurement of which production tasks scale and which continue to demand additional people.

The distinction between a level and a trend is essential. A high level can reflect an established business model or market power. An increase within a stable business can indicate changing production intensity, pricing, hours, capital, or sourcing. A before-and-after comparison becomes more informative when customers served, transactions, output quality, or other volume measures confirm that activity actually expanded.

An increase is also an enterprise result with several possible destinations for its gains. The business can lower prices, broaden product scope, increase profit, pay remaining staff more, or reinvest in technology. A shareholder can benefit without the pool of accessible jobs expanding. Conversely, workers can receive higher compensation even while direct headcount grows slowly. Payroll counts and labor's total income require separate observation.

The best interpretation therefore connects revenue per employee to total work cost, value added, operating profit, recruitment, and customer outcomes. The first ratio identifies a staffing relationship; the companions determine whether it reflects genuine production leverage, price effects, outsourcing, or underinvestment.

Payroll supplies a second decomposition. If W is employee compensation expense and average compensation is represented by w, then W is approximately N × w, with adjustments for the difference between average and year-end headcount and for accounting recognition. Revenue can outgrow N while W/R remains stable. Such a company may support fewer additional positions per sales dollar without transferring a larger fraction of sales away from employee compensation. Distribution within W can still become more unequal, but that requires evidence on its components.

The CEO uses RO-RPE to question whether growth should continue to trigger proportional hiring, which segments can absorb more demand without headcount, and where the operating model has failed to scale.

The principal gaming risks are aggressive pricing, M&A, intercompany transfers, period-end workforce cuts, deferred-revenue timing, and replacement of employees with contractors. Pair the metric with Total Work Cost Share, customer retention, service levels, first-pass quality, backlog, overtime, and regrettable attrition.

Firm boundaries acquisitions and selective examples

Company cases are purposive examples. Microsoft, Meta, Apple, NVIDIA, Accenture, and TCS do not constitute a representative sample of all employers. Successful scalable firms are especially likely to produce striking ratios. A secular claim requires a broader panel that retains failed firms, entrants, traditional employers, and companies whose staffing still expands proportionally.

Closing employee counts can be moved by layoffs late in the year. Revenue earned earlier may still reflect work performed by people who have already departed. Acquisitions introduce the reverse timing problem: closing headcount includes all acquired staff, while the annual revenue contains only the acquired business's partial-year contribution. Average hours and a constant business perimeter correct much of this distortion.

Supplier labor can be critical. Direct payroll reductions can move unchanged tasks to vendors. A firm purchasing AI infrastructure also relies on work producing chips, electricity, data, integration, and maintenance. Public headcount captures none of that total automatically. It can accurately show the company's direct employee leverage while overstating system-wide labor saving if interpreted beyond that boundary.

Quality and sustainability qualify the operating interpretation. A short-term ratio can rise while service deteriorates, backlogs grow, overtime increases, or innovation capacity is depleted. Subsequent revenue losses can reverse the apparent gain. A durable productivity claim requires accepted output and customer outcomes across multiple periods.

The same criteria preserve counterevidence. A company that increases employee and supplier work alongside growth should remain in the sample. A reduced employment intensity inside one winner can coexist with growing employment across its production network. The eventual macro conclusion must reconcile these layers.

The direction of the resulting bias cannot be settled by a generic statement that acquisitions inflate growth. A purchased business brings both revenue and employees, and these do not enter annual flows and year-end stocks on the same schedule. Integration can subsequently eliminate duplicate functions, while acquired products can keep generating sales. A rigorous organic comparison would reconstruct revenue and average workforce for a constant business perimeter. That reconstruction is beyond the public figures used here.

A public panel and an internal dashboard

For public research, collect annual consolidated revenue, workforce definition, closing headcount, fiscal date, acquisition events, contractor disclosures, and a business-volume measure. Preserve the report URL and page location. Compute revenue per worker transparently and use consistent currency labels. A longer historical panel should track companies under stable definitions and retain observations that contradict a simple compression story.

For internal analysis, use real organic revenue divided by period-average FTE, with hours as the higher-fidelity companion. Show nominal-to-real, currency, and acquisition bridges. Reconcile employees with contractors and outsourced-work expenditure. Keep the public closing-headcount proxy separate from this operational measure.

Plot revenue and workforce indexes as well as their quotient. A ratio alone can hide whether revenue expanded, employees fell, or both declined. Track rolling multiyear windows, service quality, backlog, pay, and recruitment. If additional output repeatedly requires few additional total human hours, the evidence for persistent scaling leverage strengthens.

This metric links company success with the quantity of direct positions it supports. Its usefulness comes from that concrete relationship, while a complete post-labor case combines it with production measures, total human work, and worker outcomes.

An increase means that the payroll workforce supports more real organic revenue. It does not reveal whether the cause was AI, ordinary process improvement, better pricing, product mix, customer demand, offshoring, or a reduction in service quality. A sustained increase materially above the firm's own pre-AI trend and close peers is probative. It is not dispositive by itself.

RO-RPE reports an enterprise outcome. It does not require a counterfactual to be true. A claim that AI caused its movement does. The minimum attribution package includes a pre-intervention trend, intervention and release dates, a peer or untreated comparison where available, and workflow evidence showing how output rose or labor requirements fell.

Treat outsized revenue-per-employee levels as prompts for business-model analysis. A product business with purchased manufacturing or infrastructure can have a small payroll boundary; a consultancy's delivery remains concentrated in employees. The public comparison is most useful when it leads to time-series and supplier questions rather than a universal efficiency league table.

A total workforce companion divides the same real organic external revenue by average employee plus observable controlled nonemployee FTE. Keep this version separate from payroll employee RPE and disclose the external workforce coverage. This is an operational scope variant of the Critical Path decision map, rather than a new official national series. A narrow payroll ratio can rise simply because work moves to suppliers. [7]

SOURCES AND REPRODUCTION NOTES

[1] Microsoft Corporation (2026). Form 10 K for the fiscal year ended June 30 2026. Revenue and full-time global employee disclosure; verified retrieval date 4 October 2026

[2] Meta Platforms Inc (2026). Meta Reports Fourth Quarter and Full Year 2025 Results. Calendar 2025 revenue year-end headcount and ad volume; verified retrieval date 4 October 2026

[3] Apple Inc (2025). Form 10 K for the fiscal year ended September 27 2025. 2025 net sales and full-time equivalent employees; verified retrieval date 4 October 2026

[4] NVIDIA Corporation (2026). Form 10 K for the fiscal year ended January 25 2026. Fiscal 2026 revenue and global employees; verified retrieval date 4 October 2026

[5] Accenture plc (2026). Accenture Reports Fourth Quarter and Full Year Fiscal 2026 Results. Fiscal year ended August 31 2026 results released October 1; verified retrieval date 4 October 2026

[6] Tata Consultancy Services Limited (2026). Integrated Annual Report 2025 26. Revenue workforce and employee and consultant expense categories; verified retrieval date 4 October 2026

[7] David Shapiro and Critical Path Consulting Group (2026). The jobs that never appear Measuring and capturing the enterprise AI productivity dividend. Unpublished supplied manuscript September 2026 edition Version 2.0; Appendix A and chapter 16 decision map; framework source rather than independent empirical evidence; consulted 4 October 2026

RELATED CHAPTERS 073 · 074 · 075 · 076 · 077

CHAPTER 073

Revenue workforce growth elasticity

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Repeated firm and sector windows with selected Microsoft comparisons from fiscal 2019 to fiscal 2025

Workforce elasticity tests whether expanding real activity requires proportionate additions to human labor rather than relying on a single revenue per employee level.

Elasticity of workforce to output growth

Revenue-workforce elasticity measures the proportional change in human labor associated with a proportional change in output across a specified interval. For an endpoint calculation, elasticity equals the logarithmic change in labor divided by the logarithmic change in real organic revenue or output. Labor can be total hours, average total-workforce FTE, or a clearly labeled employee proxy. Using hours gives the closest production-input interpretation.

For example, a hypothetical business increases real output twenty percent while human hours increase five percent. Its endpoint elasticity is log(1.05) divided by log(1.20), about 0.27. That is a descriptive comparison of two observed growth rates. It does not mean that an additional sale causally produces precisely that fraction of a job. Demand, product mix, capital, and organizational change jointly affect both variables.

Values near one indicate roughly proportional scaling; values between zero and one indicate labor growing more slowly than output; zero indicates unchanged labor with changing output; negative values can indicate expanding output with contracting labor. Interpretation requires the direction of the numerator and denominator. A negative elasticity produced by falling output and rising labor describes a different situation.

A rolling regression can estimate the association more systematically, using log labor and log output alongside seasonality, product mix, acquisition events, and lagged demand. Its coefficient remains a descriptive association unless an identification design supplies a causal interpretation. A firm choosing hiring based on expected demand can also lead rather than lag recorded revenue.

The ratio becomes unstable when output growth is close to zero and confusing when output is falling. The dashboard should suppress the scalar when absolute real-output growth is below a disclosed threshold and instead display the two underlying growth rates. It should never turn a division-by-a-small-number artifact into a strategic claim.

Endpoint elasticities are descriptive, not structural demand parameters. Output and employment respond jointly to demand, prices, capital, technology, and the business cycle. A negative historical elasticity can result from a long-run industry contraction in employment alongside growth in measured output; it does not mean an additional sale causally destroys a fixed fraction of a job. Period selection also matters: recovery from a recession may yield a different relationship from a mature expansion. These are reasons to show the calculation transparently, not reasons to treat all historical benchmarking as meaningless.

The identity connecting elasticity with productivity is helpful. In logarithmic changes, growth in output per labor unit equals output growth minus labor growth. When output is expanding and labor's endpoint elasticity is below one, the ratio rises. The elasticity describes the staffing response to expansion, whereas the productivity ratio describes the resulting intensity. Their consistency is an arithmetic check rather than two independent confirmations of the same underlying observations.

What the existing company comparison demonstrates

The earlier Microsoft case compares two consecutive three-year intervals rather than a twenty-year secular trend. Fiscal 2019 revenue was $125.843 billion with approximately 144,000 full-time employees; fiscal 2022 revenue was $198.270 billion with 221,000; fiscal 2025 revenue was $281.724 billion with 228,000. These nominal annual revenues and closing global employee counts supply a public-data illustration, not a real-organic total-hours measure. [1, 2, 3]

From 2019 to 2022, revenue grew approximately 57.6 percent and headcount 53.5 percent. Logarithmic endpoint elasticity is about 0.94. From 2022 to 2025, revenue grew approximately 42.1 percent and headcount 3.2 percent, giving elasticity about 0.09. The equal-length intervals show a marked change in additional direct staffing associated with commercial growth. [1, 2, 3]

The first period includes pandemic expansion and the second consolidation after it. Acquisitions affect the perimeter. The comparison cannot identify how much resulted from automation, pricing, product mix, or purchased labor. Its contribution is to make the change in staffing response concrete and reproducible. The recent 2026 snapshot belongs in an update using a consistent revenue and labor definition rather than an unannounced extension of this older comparison.

For a secular test, construct repeated windows over at least twenty years or a sufficiently long panel of comparable businesses. Compare changing elasticities across industries and continuing establishments. Include firms with proportional hiring and firms that close. Otherwise, a small set of highly scalable winners can be mistaken for the whole economy.

The choice of periods matters. The first interval includes unusually rapid pandemic-era expansion and should not be called a timeless hiring norm. It nevertheless supplies a recent, concrete example of the company growing sales and staffing together. The second interval establishes that subsequent sales expansion did not require a comparable extension of that workforce. Describing the entire change as an adjustment following pandemic hiring does not settle whether the resulting staffing relationship will persist. An initial cyclical correction and a subsequent structural change can occur in sequence.

Microsoft interval	Nominal revenue growth	Closing employee growth	Log endpoint elasticity
FY2019 to FY2022	57.6 percent	53.5 percent	about 0.94
FY2022 to FY2025	42.1 percent	3.2 percent	about 0.09

Author calculations from annual reports. Short history, nominal revenue, year-end workforce and changing company perimeter. [1–3]

Why a changing staffing response matters

A high revenue-per-employee level can reflect one-time restructuring. Elasticity asks what happens as demand subsequently grows. If the organization repeatedly serves more real output with little additional

human time, it reveals a more durable change in scaling. This distinction is valuable for post-labor economics because a temporary workforce cut and a structurally lower hiring requirement have different implications for future entrants.

A hypothetical business initially requires ten new FTE for each additional million units of a service. After redesign it requires two, while maintaining quality. It can still hire as sales grow, yet offer fewer additional positions than under the earlier relationship. Labor-market compression can therefore develop through foregone expansion rather than a large immediate layoff. Elasticity makes that margin visible.

The output-labor relationship also connects to demand expansion. A lower labor requirement per unit can reduce prices and open new markets. The firm may end up with more employees overall if sales expand sufficiently. Tracking both the elasticity and absolute growth identifies whether scaling gains are accompanied by more total jobs. These outcomes should not be collapsed into one sign.

Elasticity is especially useful for comparing phases of the same enterprise. A new product may require substantial development staff before revenue arrives, then scale with modest further hiring. A mature consulting business may need labor almost proportionally with projects unless reusable systems or supplier changes intervene. A long historical panel distinguishes these ordinary lifecycle patterns from a broad secular change.

Workforce elasticity measures structural decoupling. It says more than a single RPE level because it shows how the staffing requirement changes as the business grows. It says less than a causal study because demand, capital investment, product mix, outsourcing, and ordinary process changes also affect the relationship.

The most useful attribution comparison is the firm’s pre-intervention elasticity versus its post-intervention elasticity, reinforced by an untreated segment, matched peer, or staggered rollout. Staffing often lags demand, so the model should test reasonable lag structures rather than assuming labor and revenue move in the same month.

The CEO uses elasticity to challenge automatic headcount formulas, decide whether a growth plan is operationally scalable, and distinguish an organization that has raised a ratio through one-time cuts from one that has changed the ongoing relationship between demand and labor.

Lagged hiring demand shocks and manipulation risks

Staffing does not adjust instantly. Employees may be hired before launch, retained during a temporary downturn, or added months after demand recovers. A short window can show zero elasticity even when a later hiring catch-up restores the older relationship. Track several lag structures and consecutive windows rather than publishing only the most favorable endpoint.

The denominator can become unstable when output barely changes. Dividing a modest labor change by an almost-zero output change creates an extreme coefficient with little strategic meaning. The reporting policy should specify a minimum growth threshold and replace unstable estimates with the underlying component rates. A graph of log workforce against log output can reveal the problem more clearly than a headline number.

Outsourcing biases employee-only elasticity downward when suppliers take over work. Offshoring can reduce domestic headcount while global labor grows. Wage changes alter expenditure even when hours are constant. The most defensible labor input includes employees and observable external FTE or hours under a declared boundary, with purchased-work cost as a fallback for opaque suppliers.

Seasonality, customer composition, capital additions, M&A, and pricing require explicit treatment. An organic constant-price series addresses some of these problems, but product quality and complexity still matter. An organization that accumulates backlog or worsens service may temporarily appear scalable while deferring work into the future.

A causal automation claim needs observed deployment timing, task change, an untreated or credible comparison group, and a pretrend. Persistent low elasticity is descriptive evidence of reduced staffing intensity. It does not by itself identify the technology that produced it.

Gaming risks include choosing a favorable window, suppressing contractor growth, benefiting temporarily from vacancies, allowing backlogs to accumulate, or claiming scalability before the hiring lag arrives. Pair the metric with backlog, cycle time, customer retention, overtime, quality, vendor work cost, employee health, and a multiyear durability test.

For acquisitions, a perimeter bridge can show organic output and workforce changes separately from the purchased business. Without it, an acquisition of a highly scalable product can lower consolidated elasticity even if neither organization changed its internal staffing relationship. A consistent segment history or a continuing-establishment panel can address that composition effect. Any restated history should retain the archived reported values for reproducibility.

A monitoring specification for workforce elasticity

Build monthly or quarterly labor and output series with stable definitions and an effective-dated organizational perimeter. Use actual hours or period-average FTE wherever available. Record contractor coverage, acquisitions, product launches, major demand shocks, and technology deployment. Maintain both the raw public proxy and any adjusted internal measure.

Report twelve-, twenty-four-, and thirty-six-month endpoint elasticities, plus a rolling regression with disclosed controls and uncertainty. Display the component growth rates and suppress coefficients when output growth is too small for stable interpretation. Compare pre-intervention and subsequent windows with equivalent elapsed time and business composition.

A secular research chart should extend at least two decades, use multiple demand cycles, and include absolute output and labor paths. It should distinguish persistent low labor response from recession corrections and product-lifecycle effects. A company dashboard can use shorter windows for operational monitoring while labeling them accordingly.

Pair elasticity with quality, backlog, overtime, total work cost, profit, and worker entry. The joint evidence asks whether an expanding business has changed its ongoing need for human input, whether economic gains are retained, and whether future growth still opens comparable employment opportunities.

The metric uses the same real organic output and total-workforce series as the preceding measures. It also needs intervention dates, acquisitions, reorganizations, major product launches, capacity additions, and known demand shocks.

The primary grain is segment-month, reported using trailing twelve-, twenty-four-, and thirty-six-month windows. FP&A owns the model and its assumptions; HR validates the workforce history; the business owner explains structural breaks.

Report uncertainty for regressions and disclose the number of observations in each rolling window. A very short window with several controls can produce unstable estimates even when an endpoint quotient looks precise. The confidence interval should reflect the model actually estimated, while alternative periods and lag structures belong in a separate sensitivity display.

SOURCES AND REPRODUCTION NOTES

[1] Microsoft Corporation (2019). Microsoft 2019 Annual Report. Fiscal 2019 revenue and full-time workforce; verified retrieval date 4 October 2026

[2] Microsoft Corporation (2022). Microsoft 2022 Annual Report. Fiscal 2022 revenue and full-time workforce; verified retrieval date 4 October 2026

[3] Microsoft Corporation (2025). Microsoft 2025 Annual Report. Fiscal 2025 revenue and full-time workforce; verified retrieval date 4 October 2026

RELATED CHAPTERS 072 · 074 · 075 · 077

CHAPTER 074

Real value added per total workforce equivalent

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Enterprise monitoring specification with no verified universal twenty year series

A declared value-added and workforce boundary can distinguish real production leverage from revenue inflation and payroll outsourcing.

Value added and the full labor denominator

Real value added per total workforce equivalent measures the value a defined production system creates relative to all observable human labor supporting it. The standard value-added numerator is gross output less intermediate consumption. BEA also expresses value added through the incomes and costs generated in production. The concept removes purchased inputs that can inflate sales without increasing retained production. [1]

At a firm, constructing the numerator requires recognized output, inventories where relevant, purchased materials, energy, technology, business services, and consistent treatment of other intermediate inputs. Real measurement requires suitable output and input price adjustments. Dividing nominal revenue by the consumer price index is usually too crude for a business whose products, purchased inputs, and quality differ from household consumption.

The denominator combines average employee FTE or actual hours with observable external workforce under a declared production boundary. An FTE equivalent is a standardized amount of time, not necessarily one person. Part-time work, overtime, and differing productive-hours conventions change the conversion. The preferred analytic companion remains real value added per actual hour. [2]

Adding contractors introduces a central accounting choice. A standard firm-value-added numerator subtracts their purchased services. If their human time is then added to the denominator without adjusting the numerator's boundary, the result can deduct the work's value and also count the same work as an internal input. The measure must therefore specify how contractors enter both sides.

This wording matters. Standard firm GVA subtracts purchased external services. If the organization also places a contractor’s FTE in the denominator, subtracting the entire contractor invoice from the numerator can count the same labor input twice. The dashboard must use one of three explicit boundary methods:

Retained-value method: subtract all purchased intermediate services and divide by employee FTE only. This measures value retained inside the legal entity.

Controlled-workforce method: include controlled contractors in the denominator and exclude their identifiable labor component from the intermediate-input deduction. Nonlabor vendor cost and margin remain intermediate inputs.

Cost-only fallback: when contractor FTE cannot be observed, report retained GVA per employee together with Total Work Cost Share. Never invent an equivalent headcount from a vendor's deliverables.

The FTE convention should also specify whether it uses paid, worked, or productive hours. Paid leave affects paid time; training and maintenance can be necessary work even when no immediate client output appears; unpaid owner or family work can fall outside payroll records. An operational denominator limited to billable time answers a different question from total human time used. Publish the conversion standard and do not silently replace the broader denominator with whichever convention produces the largest ratio.

Why this is a specification rather than a secular dataset

The available public evidence does not establish a universal twenty-year company series of real value added per total-workforce FTE. Companies commonly disclose revenue and employee counts, while complete supplier labor time is rarely public. This entry is therefore a proposed measurement architecture. Its status prevents an analytically attractive metric from being mistaken for an already verified macro trend.

Official productivity accounts provide historical benchmarks for the underlying production concept. OECD defines labor productivity through output relative to human hours and emphasizes capital and other inputs. BEA defines value added consistently in the national accounts. These sources establish measurement foundations; they do not certify the custom extended-workforce formula as an official published series. [1, 2]

An illustrative enterprise produces 100 units of value added with 100 employee-equivalents. It then outsources twenty worker-equivalents. An employee-only ratio can rise even when the production system still uses the same hundred equivalents. If the supplier delivers the same service with five equivalents, total human input falls to eighty-five. These assumed quantities show why the supplier boundary determines the interpretation; they are not observations of a real company.

The controlled-workforce version can help compare these cases if external hours and invoice components are observable. Where they are opaque, retained firm value added per employee plus total work cost share is more defensible than an invented supplier headcount. A vendor charging for an outcome does not reveal how many people worked on it. Price divided by an arbitrary salary is a model assumption rather than workforce measurement.

A historical research project could build the metric from linked company accounts, supplier transactions, and time records. Every year would require consistent perimeter and coverage. Existing company examples show why that work is worthwhile, while their revenue and payroll disclosures cannot supply every needed quantity.

Consider a deliberately stylized example. A business produces a fixed volume of service using 100 employee-equivalents. It subsequently retains 80 employees and purchases services that require 20 equivalent workers at a supplier. Its revenue per employee increases by 25%, although the production system still requires 100 workers. If the supplier instead delivers the same services using five worker-equivalents, total direct and purchased labor falls to 85. Finally, if improved service and lower prices expand demand sufficiently, the business and its suppliers could together employ more than 100 people despite using fewer workers per transaction. These are arithmetic possibilities, not estimates of any actual company.

What the improved ratio reveals about compaction

Value added improves on revenue because it addresses pass-through production. A reseller can expand revenue by buying and selling more purchased goods with little additional staff. A consulting provider can resell subcontracted services. A manufacturer can buy expensive components. Revenue per employee increases even when retained value grows less. The value-added numerator identifies the production contribution remaining within the chosen boundary. [1]

Including observable external human input then addresses a separate issue: how much work was moved beyond payroll. Together the numerator and denominator make the production-leverage claim more specific. A sustained increase indicates more real value supported by each unit of total included human work. It is compatible with automation, capital deepening, improved organization, and product changes; determining which mechanism dominates requires additional evidence.

The metric also changes sourcing decisions. A business may outsource to obtain cheaper labor, to access expertise, to use a superior automated provider, or to avoid managing a function. These options can produce similar payroll reductions but different system-wide human requirements. The corrected boundary helps distinguish buying human time from buying a less labor-intensive service.

The distributional interpretation remains separate. An efficient production system can pay higher wages, reduce prices, increase owner returns, or retain larger surpluses. It can also employ fewer people or create new demand. Value added per human unit describes capacity, while wage shares, hiring, ownership, and transfers describe how that capacity supports livelihoods.

For a post-labor framework, this proposed metric is especially useful as a falsification tool. If a striking revenue-per-employee gain disappears after adjusting intermediate inputs and external time, the original claim becomes narrower. If a large gain survives those adjustments and quality remains stable, the evidence for genuine compaction becomes stronger.

An increase means the organization or defined extended production system creates more real retained value per unit of human labor. It corrects important RPE distortions in low-margin and pass-through-revenue businesses. It is still affected by capital intensity, product mix, vendor economics, and the accuracy of intermediate-input allocation.

The CEO uses it to make make-buy-automate decisions, determine whether outsourcing has created genuine economic leverage, compare business models with different pass-through revenue, and identify where externally purchased inputs are absorbing the automation dividend.

The original registry preserves two explicit formulas. Retained GVA per employee FTE is real organic output minus all purchased intermediate inputs, divided by average employee FTE. Adjusted GVA per total workforce FTE is real organic output minus nonlabor intermediate inputs minus external work not represented in the denominator, divided by average employee plus observable controlled nonemployee FTE. The second is a proposed extended production boundary, with its matched external work retained in the numerator and counted in the workforce. It is not the official legal entity GVA definition. State which formula is used before comparing firms or time periods. [4]

Price accounting and contractor coverage constraints

Real company value added is difficult to calculate when output changes in quality or when prices are unavailable. The numerator may require separate deflation of gross output and intermediate purchases, rather than a single headline deflator. Services with customized deliverables require complexity and quality adjustment. Chained aggregate measures also cannot always be added arithmetically across components. Official statistical methods provide useful discipline without eliminating firm-level data gaps. [3]

Contractor invoices can include labor, software, equipment, management overhead, and vendor margin. Excluding the identifiable labor component under a controlled-workforce method requires evidence. Counting the whole invoice as human labor overstates it; treating an AI-intensive managed service as pure software can understate remaining human work. An unclassified category and coverage percentage are necessary when exact allocation is unavailable.

Double counting must be prevented across supply chains. A supplier's employee can also appear in a customer's extended-workforce denominator. That may be appropriate for a customer-level operating analysis, but a national total must count the underlying work once. If production systems overlap, aggregating their ratios or FTE counts can create artificial labor volume.

Period and organization alignment matter. Workers and vendors change assignment, acquisitions alter the reporting group, and shared services support several segments. Effective-dated identities and allocation methods preserve comparisons. Segment totals should reconcile to consolidated accounts rather than independently claim the same benefit.

Evidence would weaken a strong automation interpretation if gains depended mainly on excluding unmeasured suppliers, understating quality losses, or changing classification. It would strengthen the interpretation if measured hours fell at comparable output and quality across a stable production boundary with high contractor coverage.

The main gaming risks are classifying purchased labor as software, moving costs between COGS and operating expense, changing shared-service allocations, including contractor FTE while subtracting the same labor invoice, and excluding difficult-to-measure vendors. Pair it with supplier concentration, service quality, total work cost, switching ability, customer outcomes, and operating profit.

Implementing and reproducing the metric

Start with a written boundary policy: retained legal-entity value or a controlled extended workforce. State whether the denominator is average FTE or hours, which suppliers are included, how mixed invoices are classified, and how real prices are constructed. Keep the policy visible beside every published ratio.

Join general-ledger, procurement, contract, workforce, timekeeping, inventory, and output records over the same period. Reconcile external revenue and intermediate purchases to accounts. Reconcile worker hours to HR and vendor records. Show excluded supplier spend and coverage so the reader can assess what remains outside the denominator.

Publish the raw components, nominal and real numerator, employee and external labor components, and the ratio. Use trailing twelve-month trends for an internal dashboard; use at least twenty years of

comparable observations before treating the metric as secular empirical evidence. Preserve a versioned definition and restate historical comparisons when the boundary changes.

Pair the result with total work cost share, profit per workforce equivalent, customer outcomes, and workforce elasticity. The combination can determine whether real value is increasing per included human unit, whether savings survive supplier costs, and whether growth continues to create additional work.

The numerator requires revenue or output, materials, energy, inventory change, purchased business services, subcontractors, BPO, agency and consulting spend, and a stable classification of labor versus nonlabor intermediate inputs. Sources are the general ledger, accounts payable, procurement, inventory, vendor management, contracts, and billing.

The denominator requires employee and observable nonemployee hours or FTE from HCM, payroll, VMS, timesheets, purchase orders, and supplier reports. The Controller owns the value-added classification; Procurement owns external-service taxonomy; HR owns workforce hours; business-unit Finance approves allocations.

A validation reconciliation can compare retained value added with the incomes generated inside the chosen legal entity. A controlled-workforce extension should then show every numerator adjustment and every added external labor component. This bridge lets a reviewer identify whether an apparent gain comes from real output, prices, intermediate costs, workforce time, or a boundary change. The method remains proposed until the requisite observations are collected with consistent coverage.

SOURCES AND REPRODUCTION NOTES

[1] U.S. Bureau of Economic Analysis (2018). Value added. Definition of gross output less intermediate inputs; verified retrieval date 4 October 2026

[2] OECD (2026). GDP per hour worked. Definition and contribution of capital technology and organization; verified retrieval date 4 October 2026

[3] U.S. Bureau of Labor Statistics (2025). Office of Productivity and Technology Calculation. Output hours compensation and productivity accounting methods; verified retrieval date 4 October 2026

[4] David Shapiro and Critical Path Consulting Group (2026). The jobs that never appear Measuring and capturing the enterprise AI productivity dividend. Unpublished supplied manuscript September 2026 edition Version 2.0; Appendix A1 retained and adjusted gross value added definitions; proposed firm measurement framework rather than independent empirical evidence; consulted 4 October 2026

RELATED CHAPTERS 072 · 073 · 075 · 076

CHAPTER 075

Total human work cost share

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Enterprise accounting specification with selected fiscal 2024 to fiscal 2026 public disclosures

Counting employee and purchased work costs together tests whether apparent payroll leverage survives the outsourcing boundary.

The share and the costs included

Total human work cost share is the cost of employee work, contingent labor, and purchased work-like services divided by organic external revenue over the same accounting period. Multiply the ratio by one hundred to express a percentage. The expanded numerator answers a sourcing question: how much commercial income is absorbed by human work whether the people performing it appear on the buyer's payroll or on a supplier's payroll.

This proposed enterprise measure differs from the official macroeconomic labor share. Labor share usually compares compensation with value added, while this measure compares a broader purchaser cost bundle with external revenue. Value added excludes intermediate purchases. A vendor invoice includes costs and margins that may be outside the buyer's value added and may extend beyond wages. The two ratios therefore have different boundaries and cannot be substituted for one another. [3]

The word human needs particular care. Observable contractor invoices can identify actual labor hours and rates. An outcome contract with a consultancy or managed-service provider may combine people, software, capital, overhead, and margin. Counting that entire invoice is a useful conservative work-like cost measure, but it does not identify the supplier's exact human compensation. Publish the human component when observable and the broader purchased-work component separately when it is opaque.

Use nominal costs and nominal revenue in the same currency for the core share. This retains changes in the relation between work costs and selling prices. A multinational comparison also needs a constant-currency bridge, because exchange rates can change the proportion without an operational change. Real revenue and human hours provide a separate production-intensity comparison rather than replacing the accounting share.

Employee work cost includes salary, wages, bonus, commissions, employer payroll taxes, benefits, overtime, and recognized stock compensation. Contingent labor includes temporary workers and individual contractors. Outsourced work-like cost includes agencies, consultancies, managed services, BPO, and other purchased services that substitute for or augment an internal function.

The share normally uses nominal numerator and denominator in the same currency because the relative change between work cost and selling prices is economically meaningful. Multinational reporting should use constant currency, and the dashboard may show a real cost index separately.

What public company accounts currently reveal

The available disclosures support partial calculations rather than a verified universal total-work share. Accenture's fiscal 2025 report identifies payroll costs of $45.679 billion on revenue of $69.673 billion, against $42.582 billion on $64.896 billion in 2024. The calculated payroll-to-revenue shares are approximately 65.56 and 65.62 percent. Its separate nonpayroll category includes subcontractors alongside other costs and cannot all be counted as labor. [1]

TCS's April 2026 fact sheet reports employee costs of 154,994 crore rupees on revenue of 267,021 crore for fiscal 2026, compared with 145,788 on 255,324 for fiscal 2025. The corresponding employee-cost shares rose from approximately 57.1 to 58.0 percent. These categories are narrower than the proposed full-work numerator. [2]

These cases provide useful counterevidence to an automatic inference from improved revenue per employee. A direct workforce ratio can rise while the cost share remains stable or increases, because pay, benefits, work intensity, or business mix changes. The examples show why employee counts and employee costs deserve separate observations. They do not establish a broad twenty-year increase or decline in purchased human work.

A complete public-data comparison would require consistent employee compensation, temporary labor, subcontracting, consulting, managed services, and mixed contract categories. Companies disclose different slices and sometimes revise segment definitions. An analyst should report the observable subtotal and its coverage rather than silently fill the remainder with assumptions. The same limitation applies to comparing a labor-intensive consultancy with a hardware company whose purchased components contain substantial labor elsewhere.

For a secular study, the data must extend over at least two decades with a consistent boundary. Public accounting archives may enable a narrower employee-cost share history for particular firms. They seldom supply a complete outsourced-work decomposition for every year. That historical research opportunity is distinct from evidence already collected.

Public subtotals can still be useful longitudinal anchors if the omitted categories are tracked consistently. The disclosure table should identify whether each row includes benefits, stock compensation, contractors, or managed services, and mark unavailable categories. A coverage column prevents a narrower employee measure from acquiring the full-work label merely because it is the easiest number to obtain.

Company and period	Observable employee cost share	Boundary
Accenture FY2024	65.62 percent	Payroll divided by revenue
Accenture FY2025	65.56 percent	Payroll divided by revenue
TCS FY2025	57.1 percent	Employee costs divided by revenue
TCS FY2026	58.0 percent	Employee costs divided by revenue

Author arithmetic from reported cost and revenue categories. These are employee cost subtotals and are not estimates of total human work share. [1, 2]

Why this addresses production and distribution

A falling share can indicate that more revenue is supported with less expenditure on people and work suppliers. This is one channel through which production gains can increase the income retained elsewhere in the enterprise. It also tests whether an apparent labor saving merely moves cost from payroll to procurement. A stable employee numerator with a growing supplier numerator supplies a very different account from a fall in both.

Consider a hypothetical organization with revenue of one hundred, employee work cost of forty, and purchased work cost of ten. Its combined share is fifty percent. It outsources a function, reducing employee cost to thirty while purchased work rises to twenty. The share remains fifty percent even though employee cost and payroll staffing may appear substantially lower. If a redesigned supplier delivers the function for five additional cost units, combined cost falls to forty-five. These assumed quantities demonstrate the accounting distinction, rather than documenting an actual automation result.

The interpretation also depends on prices. Raising selling prices can reduce the share even if work hours and compensation are unchanged. Lower wages can have the same ratio effect as fewer hours at unchanged pay. A shift toward products with stronger margins can reduce the consolidated share while each product's delivery system remains the same. Component charts of hours, pay per hour, purchases, units, and prices help locate the source of the change.

For post-labor economics, the cost share connects production intensity with the enterprise's distribution of revenue. It is still a purchaser-level measure rather than an economy-wide income allocation. A supplier's invoice can support workers elsewhere, while profit can finance investment and future work. Household income, macro labor share, and capital ownership remain necessary companions when evaluating who ultimately receives the gains.

A durable reduction in work cost alongside stable quality and expanding real output would strengthen evidence of economic compaction. It would be particularly informative if both payroll and purchased work declined relative to output, and if the result survived changes in wage rates and contract classification.

A falling share means less revenue is being consumed by internal and external human work. It is resistant to the simplest outsourcing game because the vendor invoice remains visible after payroll headcount falls. It does not establish that AI caused the change. Offshoring, wage suppression, changes in seniority mix, ordinary automation, or a shift toward higher-margin products can also reduce the share.

For a client hiring an AI-intensive consultancy such as Critical Path, this measure is more honest than guessing how many researchers, developers, or marketers the vendor “equals.” The client measures the purchased work cost and accepted outcome. The vendor measures its own labor productivity. The AI dividend may appear as a lower client price, greater scope or speed, higher vendor margin, or some combination.

Classification capitalized labor and compensation

Supplier classification is the largest practical vulnerability. Software subscriptions can contain implementation services, support, or bespoke human delivery. Consulting invoices can contain substantial technology pass-through costs. An agency can bill a fixed outcome rather than a worker's time. A defensible taxonomy distinguishes observable contingent labor, purchased work, mixed human-machine services,

software and cloud, and nonwork inputs. Opaque allocations should remain visible rather than be assigned to whichever category produces the desired trend.

Capitalized employee development cost requires a consistent policy. A business can move paid work from current expense into an asset, lowering a narrow expense numerator while still paying the same people. An operational work-cost view should disclose current human resource use alongside its reconciliation to recognized expense and subsequent amortization. The distinction is important when investment rises ahead of a product launch. It does not make capitalization improper; it makes the chosen measurement boundary explicit.

Stock compensation, benefits, employer taxes, commissions, overtime, and severance should follow a stated policy. Omitting major compensation categories understates the cost of direct labor. Combining cash compensation with some recognized noncash expenses without explanation makes peer comparisons unstable. Severance and transition costs can be reported separately, while retaining the all-in total needed to evaluate whether a change saved resources over its full implementation period.

Double counting is also possible when temporary labor appears in payroll records and an agency invoice. Procurement and HR identifiers should establish a single origin for each charge. Shared services need allocation rules whose segment totals reconcile to the consolidated business. Acquisitions, outsourcing transfers, and exchange-rate movements need bridges so the historical comparison preserves meaning.

A lower share would support a weaker production interpretation if it resulted mainly from wage suppression, unpaid overtime, falling service quality, or a favorable sales mix. Those cases can still matter to bargaining power and job quality, but they should not be reported as verified reductions in human time per comparable unit.

Gaming risks include shifting employee work into capital projects, hiding work inside software contracts, double-counting temporary labor in payroll and AP, selectively excluding stock compensation, and replacing skilled workers with lower-paid labor while degrading the operation. Pair it with cost per valid outcome, quality, customer retention, supplier concentration, resilience, wage and skill mix, and operating profit.

A reproducible work cost monitoring record

Build the record from payroll, benefits, equity compensation, procurement, invoices, contracts, and the general ledger. Assign an effective-dated classification to each expense origin. Record the amount covered by observable worker hours, the opaque work-like category, and excluded supplier expenditure. Keep both the exact employee subtotal and the expanded total visible.

Calculate monthly and trailing-twelve-month shares on a stable organic perimeter. Plot employee, contingent, and outsourced components as separate contributions. Show revenue, total work cost, and their growth alongside the share. A percentage alone cannot reveal whether the business grew or simply cut activity.

For a secular research chart, require twenty years of comparable categories or clearly mark definition breaks. For enterprise management, a shorter series can still guide sourcing, compensation, and automation decisions. Label its status as an operating instrument until its historical and cross-firm coverage warrants broader conclusions.

Pair the share with total hours, real value added, operating profit per workforce equivalent, supplier quality, wage and skill mix, and accepted customer outcomes. This combination can establish whether the savings survive procurement costs and whether they reflect reduced human requirements, lower compensation, or changing commercial prices.

Payroll, benefits administration, equity compensation, the general ledger, accounts payable, procurement, contracts, and VMS provide the data. Every supplier line needs a service-category code and one of five composition flags: observable contingent labor, fixed-price outsourced work, mixed human-machine managed service, pure software/cloud/data, or nonwork input.

For mixed services, allocate only when the method is defensible and documented. Otherwise keep the amount in an opaque work-like bucket and display the percentage of total supplier spend that is classified with confidence.

The CFO, CHRO, and Chief Procurement Officer jointly own this measure. Finance reconciles the total; HR and Procurement own classification.

SOURCES AND REPRODUCTION NOTES

[1] Accenture plc (2025). Annual Report on Form 10 K for the year ended August 31 2025. Segment payroll and nonpayroll costs and consolidated operating income in fiscal 2024 and 2025; verified retrieval date 4 October 2026

[2] Tata Consultancy Services (2026). TCS Financial Results Quarter IV and Year Ended FY 2025 26. Consolidated Ind AS income statement and employee costs; 9 April 2026 release; verified retrieval date 4 October 2026

[3] U.S. Bureau of Economic Analysis (2018). Value added. Definition of gross output less intermediate inputs; verified retrieval date 4 October 2026

RELATED CHAPTERS 072 · 073 · 074 · 076 · 080

CHAPTER 076

Operating profit per workforce equivalent

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Enterprise specification with a fiscal 2024 to fiscal 2025 Accenture employee proxy

Profit per included human unit tests whether apparent production leverage remains after suppliers technology and operating costs are paid.

The operating result and workforce boundary

Operating profit per workforce equivalent divides operating income for a specified period by average employee and observable external FTE supporting the same business. FTE converts human time to a standard work-year equivalent; it does not necessarily count distinct people. Actual total hours are a useful companion because overtime, part-time arrangements, and productive-hours conventions can change the conversion.

The numerator should reconcile to reported operating income. This excludes financing and tax effects while including the operating costs recognized under the company's accounting policy. Recurring technology expenditure, human review, support, supplier fees, transition costs, and depreciation belong in the relevant operating result when recognized. A normalized companion can explain unusual items, but the reported-to-adjusted bridge must remain visible. Segment reporting requires an equally clear reconciliation to consolidated accounts. [2]

When external FTE cannot be observed, publish operating profit per employee as a narrower proxy and pair it with total work cost share. Operating income already deducts purchased service expense, so a supplier's cost remains in the numerator even if the supplier's people cannot be counted in the denominator. This makes the ratio economically more informative than revenue per payroll employee alone, while leaving the workforce-boundary problem partly unresolved.

The unit is currency per FTE-year when a year's profit is divided by the average workforce serving that year. Annual profit divided by closing employees is a public snapshot proxy. It can differ substantially from the average-workforce version during rapid hiring, a late-year restructuring, or an acquisition. State the exact denominator beside each observed value.

The numerator should be GAAP- or IFRS-reconciled operating income after recurring AI run cost and transition cost. The dashboard may show a consistently defined normalized value beside it, but the reported value must remain visible. The denominator uses employee plus observable nonemployee FTE under the declared workforce boundary.

Where external-work FTE is not observable, use operating profit per employee together with Total Work Cost Share. Operating profit already deducts contractor and vendor expense, which makes it more resistant than revenue to pure payroll outsourcing even when the denominator remains employees.

Public evidence and an honest partial proxy

Accenture reported operating income of approximately $9.596 billion in fiscal 2024 and $10.226 billion in fiscal 2025. Closing workforce counts were approximately 774,000 and 779,000. Dividing the reported annual operating results by these closing counts gives approximately $12,398 and $13,127 per employee, respectively. These are nominal employee-only snapshots. [1]

The arithmetic indicates more operating income per direct employee over that one-year comparison. It cannot identify how much human work was supplied by contractors, how average staffing differed from year-end staffing, or what fraction of the change resulted from technology. Its purpose here is to demonstrate a reproducible public proxy while preserving the stronger measure's data requirements. The observed interval is far shorter than the user's twenty-year secular criterion.

Profit ratios need a longer history across demand cycles. A high current value can reflect scarce products, pricing power, temporary utilization, or an unusually favorable product mix. A negative value during development can reflect investment in future capability rather than low technical productivity. A period of layoffs can lift profit per closing employee before transition costs or service consequences fully appear.

The proposed total-workforce ratio would require average external time and a consistent profit allocation. Public company reports typically supply only part of that record. A credible panel should therefore preserve separate columns for the complete internal metric and the public proxy, rather than present estimates of supplier workforce as reported data.

Historical official productivity measures provide a conceptual comparator. Output per hour and operating profit per FTE describe different stages of the economic process: production capacity and the enterprise income retained after operating expenses. A firm can become more productive while competition transfers the gains to customers. It can also earn greater profit through pricing without using fewer hours per unit. [3]

The proxy's increase should be tested against its components before interpretation. Higher operating income with stable employee count differs from lower profit accompanied by a still larger workforce cut. Showing the two indexed components also exposes how a closing-workforce denominator can amplify a late-year reduction. Where monthly averages are unavailable, retain that limitation visibly rather than imply that the public ratio has the precision of an internal hours-based measure.

Accenture fiscal year	Operating income	Closing workforce	Nominal profit per closing employee
2024	$9.596 billion	approximately 774000	$12398
2025	$10.226 billion	approximately 779000	$13127

Author calculations using reported operating income and closing employees. Average employee and supplier FTE are not observed in this proxy. [1]

Economic capture of labor saving capacity

The ratio asks whether a more scalable delivery model generates retained economic value after its operating costs. Revenue per employee can rise while model usage, cloud, integration, supplier fees, security, or human review absorb the additional revenue. Operating profit per included human unit incorporates the expenses

recognized in producing that result. It therefore supplies a check on claims that reducing direct staffing automatically produces a financial dividend.

Consider a hypothetical business with operating profit of twenty and one hundred workforce-equivalents, giving 0.20 per equivalent. A redesign reduces the workforce to eighty but introduces ten of additional annual technology and supplier cost. If other revenue and costs remain unchanged, profit falls to ten and the ratio falls to 0.125. Human input declined, yet the operating benefit did not materialize. If additional revenue or other savings instead raise profit to twenty-four, the ratio rises to 0.30. These assumptions distinguish technical labor leverage from economic capture.

For a post-labor framework, persistent high profit supported by a relatively small included human workforce could explain how commercial capability and owner income expand without proportional direct hiring. The ratio itself does not determine the distribution among owners, creditors, governments, consumers, and workers. Wage share, compensation, capital returns, tax payments, and transfer receipts provide the broader distributional account.

Business models also matter. A consulting provider may earn profits primarily from a large workforce's expertise and utilization. A software provider can replicate an existing product at low additional cost. A manufacturer may own expensive productive equipment. Comparing their profit per FTE without capital requirements and risk can mistake a business-model difference for a recent automation transition. The stronger longitudinal test compares the same activity under a stable boundary.

Evidence of genuine economic compaction becomes stronger when real output rises, included human hours grow slowly or fall, customer outcomes remain stable, and the resulting operating gains persist after technology and transition costs. A favorable ratio without those component observations leaves the production mechanism unresolved.

An increase means each unit of human labor supports more operating profit after the expenses recognized in the numerator. It answers whether labor leverage was economically captured rather than consumed by inference, vendors, software, support, or organizational overhead.

The CEO uses this measure to allocate AI capital, compare segments, determine whether apparently productive workflows are economically worthwhile, and decide whether a platform should scale, be renegotiated, or be retired.

Accounting choices capital costs and quality

Operating profit recognizes capital costs through depreciation and amortization rather than necessarily through the cash paid during the current period. A technology project can require substantial investment before those charges appear fully in the income statement. Pairing the ratio with capital expenditure, cash flow, and return on invested capital can reveal whether current profit depends on an expensive new asset base. This is a measurement distinction rather than a claim that either accounting or cash is always superior.

Stock compensation and recurring support costs can materially affect the numerator. Excluding them in a preferred adjusted profit measure can overstate the retained benefit relative to an all-in operating result. Restructuring can generate genuine future savings while requiring present cost. The comparison should show both transition years and subsequent steady-state years, with a consistent rule for what is called exceptional.

Shared AI platforms create allocation problems. If central technology cost is excluded from the benefiting segment while revenue and labor savings remain inside it, segment profit per FTE can appear artificially high. A transparent allocation driver could use transactions, calls, reserved capacity, or supported workflows. The allocations must sum to the origin charge and remain consistent over time. IFRS 8 provides the formal segment-reporting context; the operational allocation policy still requires explicit analytical choices. [2]

Workforce measurement has analogous risks. Moving work to suppliers, excluding unpaid overtime, or using closing rather than average staff can lift the ratio without reducing the total work used. A reduction in demand can also remove low-margin activity, raise average profit intensity, and leave fewer jobs. That is different from serving more comparable demand with less human time.

Quality and resilience guardrails are essential to interpretation. Delayed work, weaker support, unresolved incidents, or deferred maintenance can improve current reported profit while creating later liabilities. The measure should follow accepted outcomes and durable service, not just a favorable accounting window.

It remains noisy. Pricing, demand, restructuring, depreciation policy, acquisition accounting, and cost allocation all affect operating profit. AI attribution therefore requires the same trend and comparison evidence used for RPE, supplemented by an explicit AI cost and benefit bridge.

Gaming risks include centralizing AI cost away from the beneficiary segment, capitalizing development, excluding stock compensation, declaring recurring support “one time,” shifting costs below the chosen profit line, or counting restructuring savings before transition costs. Pair it with reported-to-adjusted reconciliation, free cash flow or return on invested capital, quality, customer outcomes, incident loss, and technology-cost-per-valid-outcome.

Closing and monitoring the operating ratio

Finance should reconcile operating income at each close, using the same business perimeter as the workforce ledger. HR should validate average employees and hours; procurement should validate observable external FTE and coverage. Technology-cost owners should reconcile model, software, cloud, integration, and support charges to invoices and shared-service allocations.

Publish monthly and trailing-twelve-month values, while preserving annual reported results. Display operating income, average employee and external FTE, hours where observed, and the quotient. Include a bridge for pricing, product mix, acquisitions, currency, restructuring, technology costs, and material accounting changes.

A longitudinal research chart requires a comparable record across at least twenty years before supporting a secular claim. Internal deployment monitoring can use shorter intervals, with a clearly labeled comparison design. Unadjusted public proxies should remain separate from complete total-workforce measurements.

Read this metric alongside revenue per employee, real value added per human unit, total work cost share, workforce elasticity, capital intensity, customer outcomes, and compensation. Each ratio tests a distinct step: activity, retained production, resource cost, additional hiring, operating capture, and distribution. Consistency among those components makes the economic account more persuasive than any single headline.

The numerator comes from the general ledger and consolidation system. Required supporting fields include segment allocations, depreciation and amortization, stock compensation, restructuring, software licenses, cloud and model expense, data licenses, integration, evaluation, security, monitoring, change management, support, human review, and capitalized development.

The workforce denominator comes from the workforce ledger. AI resource cost comes from the AI cost ledger and must reconcile to invoices. Shared platform cost needs a documented allocation driver, such as transactions, calls, reserved capacity, active applications, or supported workflows. Cost allocated to initiatives must sum back to the origin charge.

Finance owns the metric and certifies it at monthly close and on a trailing-twelve-month basis. CIO/CTO and FinOps own the technology-cost allocation. HR and Procurement own the workforce denominator.

For a loss-making segment, report the negative ratio and its cause instead of omitting the segment from a consolidated success comparison. Development expenditure and transition cost can precede later gains. Including those periods lets the full economic record test whether the proposed operating benefit ultimately survives its investment and implementation burden.

SOURCES AND REPRODUCTION NOTES

[1] Accenture plc (2025). Annual Report on Form 10 K for the year ended August 31 2025. Segment payroll and nonpayroll costs and consolidated operating income in fiscal 2024 and 2025; verified retrieval date 4 October 2026

[2] IFRS Foundation (2026). IFRS 8 Operating Segments. Segment reporting standard and disclosure overview; verified retrieval date 4 October 2026

[3] U.S. Bureau of Labor Statistics (2025). Office of Productivity and Technology Calculation. Output hours compensation and productivity accounting methods; verified retrieval date 4 October 2026

RELATED CHAPTERS 072 · 073 · 074 · 075 · 077 · 080

CHAPTER 077

Avoided hiring and historical staffing benchmarks

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Historical professional services baseline from 2015 to 2019 compared with 2022 to 2026 and enterprise workload methods

Counterfactual staffing can make reduced hiring requirements visible while remaining conditional on a disclosed model rather than an observed count of eliminated jobs.

The staffing counterfactual and observed work

Avoided hiring compares observed human input with an estimate of the input an earlier production relationship would have required at actual subsequent demand. At the workflow level, estimate baseline human hours for the observed volume, complexity, service level, and quality. Subtract actual human hours, then divide by standard productive hours per FTE if an FTE equivalent is needed. The difference is conditional on the baseline model.

A sectoral historical benchmark uses a simpler relationship. Let Y denote real output, L payroll employment, and P equal Y divided by L. Estimate the annual growth of P during a disclosed historical window. Project that growth from the chosen base date to the endpoint, then divide actual endpoint output by projected output per employee. The resulting benchmark employment can be compared with actual payroll employment. It is an accounting scenario rather than a measured number of people who lost employment.

The crucial condition is actual demand. A canceled workforce plan during a downturn does not establish that production became less labor intensive. The counterfactual should ask what the earlier system would have required to serve the demand actually experienced, including its complexity and quality requirements. Government impact-evaluation guidance emphasizes defining the baseline and comparison and considering experimental or quasi-experimental designs. [3]

Released capacity, avoided hiring, reduced payroll cost, and layoffs are different records. Hours saved may absorb growth or reduce backlog without changing staff. A canceled requisition can avoid future hiring; reduced overtime can lower paid hours; an external contract reduction can lower supplier cost. Each disposition needs evidence and should be counted once.

Avoided FTE begins with a workload model: counterfactual labor hours at actual volume, mix, service level and quality, minus actual labor hours, divided by the standard productive hours per FTE for that period. A positive estimate measures less required capacity under the specified counterfactual; it does not itself identify a removed paid position. [4]

The estimated baseline human labor requirement is the human labor hours the pre-intervention production system would have required at the actual post-intervention volume V, mix and complexity M, service level S, and quality Q, using parameters estimated before the intervention.

Cancelled vacancies, unfilled backfills, reduced overtime, lower temporary labor, and lower vendor spend can qualify when supported by records. A theoretical reduction in required work does not become cash merely because the arithmetic produced an FTE equivalent.

A freshly reproduced professional services scenario

This reference recomputes one historical benchmark using the September 30, 2026 BEA value-added vintage and October 2 BLS payroll vintage. Professional, scientific, and technical services had real value added of 1,381,164 million chained 2017 dollars at annual rate in 2015 Q 4 and 1,670,591 million in 2019 Q 4. Average seasonally adjusted quarterly payroll employment was 8.7513 million and 9.6222 million. Output per payroll employee therefore grew at approximately 2.41 percent annually over those four years. [1, 2]

Starting from 2022 Q 4 real value added of 2,077,614 million and payroll employment of 10.6564 million, project that historical ratio growth for three and a half years. At actual 2026 Q 2 output of 2,367,283 million, the model implies approximately 11.1699 million benchmark payroll jobs. The observed quarterly mean was 10.8194 million. The conditional gap is approximately 350,400 payroll jobs. [1, 2]

This is a model-based short-window comparison, not an official BLS estimate, a count of layoffs, or a causal estimate of AI displacement. The same observed output could have required a different workforce under a different historical productivity path, demand equilibrium, supplier boundary, or product mix. The scenario holds observed output fixed, even though employment, costs, prices, and demand would interact in a true alternative economy.

The user's earlier research used an older data vintage and a 2026 Q 1 endpoint. Updated output revisions and the later endpoint change the calculation. Do not splice an archived conditional gap onto this new series or interpret the difference as employment loss during one quarter. Preserve every baseline, vintage, and endpoint as part of the scenario's identity.

The example gives a concrete way to study foregone hiring in a growing activity. Its historical calibration is four years and its comparison window is three and a half years. Neither independently meets the twenty-year secular threshold.

The benchmark's units also deserve attention. Output in millions and employment in thousands produce a per-job quotient with an implicit factor of one thousand. The benchmark division returns employment in thousands, so a gap of 350.429 in that calculation corresponds to about 350429 positions. Reporting the full intermediate units helps prevent a visually plausible number from being wrong by three orders of magnitude.

Quarter	Real value added million chained 2017 dollars SAAR	Quarterly payroll mean thousand
2015 Q4	1381164	8751.333
2019 Q4	1670591	9622.200
2022 Q4	2077614	10656.367
2026 Q2	2367283	10819.433

FRED tables with original BEA and BLS series. Quarterly payroll means use all three monthly observations. Benchmark jobs 11169.863 thousand; conditional gap 350.429 thousand. [1, 2]

Compaction through growth that creates fewer openings

A labor market can experience a weaker hiring response without a corresponding wave of immediate layoffs. An organization may retain existing employees while serving more demand through improved systems. Growth then produces fewer vacancies than under the earlier delivery model. This margin matters particularly for entrants, returners, and workers seeking to move into better roles. Their opportunities depend on new openings as well as on incumbent employment.

Consider a hypothetical service that previously needed ten human hours for each accepted case and later needs six, with unchanged case complexity and quality. At one thousand cases, the earlier system would require ten thousand hours and the later system six thousand. The difference is four thousand hours of conditional released capacity. If demand rises sufficiently, the organization can use all existing people while avoiding expansion. The arithmetic establishes a staffing requirement under assumptions; it does not establish the subsequent employment outcome.

Capacity disposition therefore connects the production mechanism with realized labor-market consequences. Redeployment can preserve employment and create useful new output. A vacancy cancellation can reduce entry opportunities. Reduced overtime can improve working conditions and lower income for workers who depended on it. Reduced contractor purchases can shift adjustment outside the employer's direct workforce. A single avoided-FTE number conceals those differences unless linked to actual events.

For the post-labor framework, the historical benchmark tests whether output growth continues to distribute employment opportunities at the earlier rate. It is most useful when combined with observed hiring, requisitions, worker transitions, contractor expenditure, and service quality. A gap that persists across demand cycles and baselines would support a stronger account of reduced labor requirements. A gap that closes during a hiring rebound would support a temporary adjustment interpretation.

Technology attribution requires a further step. Capital additions, ordinary software, organization, offshoring, worker experience, and product composition can all change output per job. Recording automation deployment and task redesign helps identify the mechanism, while an appropriate comparison can assess whether those interventions changed the staffing relationship.

Gross released capacity is the positive difference between counterfactual and actual human hours after quality and service requirements have been met. Capacity realization rate is released hours with an evidenced disposition divided by validated gross released hours. Retain the unclaimed remainder and the named destination of every realized hour. [4]

Realized labor expense reduction equals removed paid hours times the approved cost per hour, plus observed reductions in external work expense, minus transition cost not already included. Count each reduction once. Future hiring cost avoided belongs in a separate counterfactual category; an FTE equivalent is not an observed cash saving without a corresponding expense change. [4]

Sensitivity baselines and the limits of missing jobs

The baseline is a choice with economic consequences. A period of unusually rapid productivity growth projects a lower staffing requirement than a slow-growth period. A recession, labor-hoarding episode, or recovery can distort both endpoints. Publish several defensible windows and their projected paths, and

explain the primary choice before looking at the desired result. A sensitivity range represents alternative assumptions; it is not automatically a statistical confidence interval.

A fixed-output scenario also differs from an equilibrium counterfactual. If the older production method were more expensive, prices and demand could differ. Firms could enter, exit, change products, or relocate. The scenario deliberately asks a narrower question about labor intensity at observed output. Calling its gap jobs destroyed by automation would add a causal conclusion that the arithmetic has not identified.

Employee counts omit external labor and changes in hours. A firm can hire fewer employees while existing staff work longer, or while suppliers add workers. Sector value added includes activity supported by a broader labor boundary than payroll jobs alone. The professional-services example is an output-per-payroll-job scenario, not a complete total-human-hours estimate. Observed contractor records and hours can strengthen a more detailed analysis.

Workflows introduce quality and complexity risks. Self-reported time savings can overstate available capacity. A new system may remove easy cases while leaving difficult exceptions and new review tasks. Measuring completed attempts rather than accepted outcomes can exaggerate improvement. Baseline and actual hours should include correction, checking, exception handling, and the work needed to sustain the agreed service level.

An approved hiring plan supplies corroboration, but plans may be aspirational or canceled for unrelated budget reasons. The evidentiary bridge should connect the modeled workload requirement with recorded requisitions, backfills, overtime, vendor contracts, or named redeployment. That bridge is the difference between theoretical capacity and an observed economic consequence.

An approved hiring plan is evidence, but it is not a sufficient counterfactual. Demand may change, plans may be aspirational, and the organization may impose a general hiring freeze. The counterfactual should apply the old production relationship to actual post-intervention demand, mix, and service obligations.

Gaming risks include inflated baselines, self-reported time, counting convenience as capacity, attributing a demand decline or hiring freeze to AI, claiming the same hours across nested automations, ignoring new exception work, and lowering quality. Pair it with actual volume, mix, valid-output quality, SLA, backlog, overtime, exception burden, employee outcomes, and a Finance-certified disposition record.

Reproducing and monitoring the counterfactual

For the sector example, download USPROBUSRQGSP and CES 6054000001, retain their vintages, and average the three payroll months in each quarter. Calculate historical ratio growth as the fourth root of the 2019 Q 4 output-per-job ratio divided by its 2015 Q 4 value, minus one. Project that growth from 2022 Q 4 for three and a half years, divide actual 2026 Q 2 output by the projected ratio, and subtract observed payroll employment.

Chart actual payroll and several benchmark paths with an explicitly labeled conditional gap. Show real output and output per employee separately. Preserve archived calculations rather than overwriting older publications with revised observations. The raw inputs and formulas belong beside the chart or in a reproducible research note.

For enterprise use, establish baseline task time and valid output before deployment. Track demand, mix, complexity, quality, paid hours, external work, vacancies, and capacity dispositions. Use randomized or staggered comparison where feasible; otherwise disclose the weaker design. Monitoring evidence and causal attribution should retain separate labels. [3]

Pair the result with workforce elasticity, entry-level hiring, backlog, total work cost, and employee outcomes. A durable reduction in staffing required for comparable output is the production finding; recorded hiring and cost events determine how much of that capacity became fewer openings, redeployment, or financial savings.

The measure requires pre- and post-intervention volume, mix, complexity, human touch time, quality, rework, SLA, backlog, overtime, contractor use, and staffing. It also requires the approved workforce plan, requisitions, vacancies, expected hiring, attrition, backfill decisions, actual workforce, and each capacity-disposition event.

The grain is workflow or initiative-week, reconciled monthly. Baselines, functions, and inclusion rules must be signed before broad rollout and versioned rather than retrofitted after results appear.

Retain the hypothetical and observed columns in the same data table. A model update should state whether it changed the historical growth assumption, the starting intensity, the endpoint output, or actual employment. Those four sources can move the conditional gap independently. Historical comparison windows should be selected on economic grounds and registered in the research note before examining the most favorable gap.

SOURCES AND REPRODUCTION NOTES

[1] U.S. Bureau of Economic Analysis via FRED (2026). Real Gross Domestic Product Professional Scientific and Technical Services 54 in the United States. USPROBUSRQGSP; quarterly real value added millions chained 2017 dollars SAAR; 30 September 2026 vintage; verified retrieval date 4 October 2026

[2] U.S. Bureau of Labor Statistics via FRED (2026). All Employees Professional Scientific and Technical Services. CES6054000001; monthly seasonally adjusted employees thousands; quarterly means; 2 October 2026 vintage; verified retrieval date 4 October 2026

[3] HM Treasury and Evaluation Task Force (2026). Guidance on the Impact Evaluation of AI Interventions. Baseline business as usual experimental and quasi experimental impact evaluation guidance; verified retrieval date 4 October 2026; current HTML edition updated 15 May 2026

[4] David Shapiro and Critical Path Consulting Group (2026). The jobs that never appear Measuring and capturing the enterprise AI productivity dividend. Unpublished supplied manuscript September 2026 edition Version 2.0; Chapters 13 and 14 and Appendix A capacity accounting and realized expense definitions; framework source rather than independent empirical evidence; consulted 4 October 2026

RELATED CHAPTERS 068 · 072 · 073 · 074 · 075 · 076 · 100 · 101

CHAPTER 078

Freelance job postings

EVIDENCE STATUS **Short history** · OBSERVATION SPAN Online platform studies around 2022 to 2023 technology releases

Project postings reveal early adjustment in purchased task demand but the evidence includes expanding complementary work and cannot establish a twenty year macro contraction.

What a project posting measures

Freelance job postings count newly advertised assignments on a specified marketplace over a week, month, or quarter. They measure expressed demand for purchased work, subject to the platform's listing rules. A project can involve an hour, a month, several people, or a recurring relationship. One posting therefore does not correspond to one payroll job, one employed person, or one standard amount of work.

The basic numerator is unique valid postings, after removing duplicates, reposts, canceled tests, and records outside the study boundary. A raw count has no labor-force denominator. Useful companion ratios include postings per active buyer, total advertised budget per buyer, applications per posting, the share in an exposed skill category, and the conversion from posting to accepted contract. Each addresses a different margin of demand and competition.

The classification of tasks matters. Writing, translation, image creation, coding, chatbot development, and manual or interactive services can be assigned to categories through tags, text, or statistical models. Categories should remain stable through time, and changes in terminology should not be mistaken for changes in work. A client may relabel an assignment as AI-related while commissioning tasks previously bought under a different label.

For an exposure comparison, separate the level of postings from relative change. A category can grow more slowly than a comparison category while still adding projects in absolute terms. It can also fall while total marketplace activity expands. Show the absolute path, the share of all activity, and the relevant comparison rather than treating one regression coefficient as the complete market trend.

This entry concerns a short observation history around recent tools. Freelance markets existed before these tools, and ordinary software had already changed task purchasing. The cited studies do not provide a comparable twenty-year time series of all freelance project demand. Their role is to investigate a mechanism within the larger multidecade account.

Short projects and purchased services can adjust without the procedures associated with eliminating permanent positions. A buyer can stop commissioning a category of work, reduce the number of assignments, or demand a more complex deliverable at the next purchase. Such changes need not produce a corporate layoff announcement. That makes contract markets potentially informative about the leading edge of substitution, while their flexibility also limits their representativeness for salaried work embedded in long-term organizations.

A posting can also bundle tasks differently as tools improve. Ten small requests may become a single larger contract, while a recurring retainer can generate transactions with no new public posting. Track the number of contracts, their scope, expected time, and total budget wherever possible. The count of advertisements is a market-access indicator, while the purchased hours and accepted outcomes supply the more direct production-input test.

Verified research findings and mixed demand

Demirci, Hannane, and Zhu's original platform study estimates a 21 percent relative decline in writing and coding postings within eight months of ChatGPT, compared with manual-intensive categories, and a 17 percent relative decline in image-creation postings after image tools. Remaining exposed projects had higher budgets and complexity, while bidding competition increased. These estimates concern assignments on a platform, with a short follow-up. [1]

The Oxford author-institution account of Teutloff and coauthors describes more than three million postings from January 2021 to September 2023. Demand weakened for substitutable writing and translation while chatbot and natural-language-processing work expanded. The pattern was differentiated by requested experience and skill. It supplies evidence of new complementary demand as well as losses in exposed services. [2]

Hui, Reshef, and Zhou provide the worker-outcome counterpart: exposed freelancers experienced weaker employment and earnings after text- and image-generation releases. Their outcomes connect platform demand to people, while remaining short-term and selected by platform participation. [3]

These results should not be added into a cumulative job-loss estimate. Their samples and periods can overlap; their task classifications differ; and some count postings while another follows workers. Independent methods can corroborate a channel without generating independent people who can be summed. The distinct outcome units are part of the evidence rather than an inconvenience to remove.

The findings also resist a uniform claim that technology simply eliminates freelance work. Complementary categories can grow, project budgets can increase, and platform demand can shift toward more complex outcomes. The worker question is whether the new opportunities are large enough, accessible enough, and remunerative enough to replace the work that disappears. None of the short studies settles that long-run adjustment.

The findings are early observations rather than a common longitudinal series. Extending follow-up could reveal persistence, recovery, or a new equilibrium of project scope. A research update should preserve the original sample definitions so later observations can assess those possibilities instead of repeatedly changing which categories are counted as exposed.

Research record	Observed outcome unit	Contribution
Demirci Hannane Zhu	Project postings and project attributes	Relative task demand and competition
Teutloff and coauthors	Skill classified postings	Substitution and complementary demand
Hui Reshef Zhou	Freelancer employment and earnings	Worker income consequences

The observations have different units and are not additive national job estimates. [1–3]

Why flexible purchased work can reveal compression

Project purchases can change quickly. A buyer can stop commissioning a recurring task, bundle several small tasks into one larger assignment, or request a more complex deliverable without formally eliminating an employee role. This creates a potential early adjustment margin: fewer market transactions for human work can precede visible changes in a company's direct staffing. It also means the effects can be spread across many freelancers rather than concentrated in one layoff event.

A hypothetical client formerly buys ten separate short writing assignments. After introducing a production tool, it performs drafts internally and buys two review assignments. Posting count falls eighty percent, while the remaining postings can offer higher budgets and require greater expertise. Whether total human hours fall depends on internal work, review time, tool support, and any additional content produced. This example shows why postings are a useful signal but an incomplete input measure.

Platform competition provides another channel. If fewer comparable assignments are offered to a stable group of sellers, applications per project can rise. Buyers can become more selective about experience and portfolios. The consequences can include unpaid bidding time, lower acceptance rates, and unstable utilization even when completed projects retain favorable fees. Paid transaction records alone can omit much of the adjustment experienced by unsuccessful bidders.

The post-labor connection is the commercial demand for human task delivery. Greater production capability can reduce the need to purchase a particular service while increasing output or creating other services. Long-run labor-market compression would require these changes to persist and spread without sufficient compensating demand. The platform studies make that hypothesis testable at a task level, while the macro case requires broader and longer evidence.

New complementary postings are especially informative as a countertest. If integration, oversight, customization, and other new demand create substantial work, automation can reallocate rather than uniformly contract labor demand. The relevant comparison should track the economic scale and human hours of both disappearing and expanding categories.

The three studies should not be treated as independent national employment estimates. Their periods overlap, their observations come from online contract markets, and they classify tasks differently. A posting may represent a small assignment or a substantial contract; an observed freelancer may perform many assignments. Nevertheless, comparing their outcomes yields a useful distinction. Task substitution can be visible even when platform activity expands, and favorable aggregate platform activity can conceal losses for established specialists. The scientific question becomes which categories expand, how large they are, and whether workers whose services become less scarce can supply the newly demanded services.

Platform selection cycle effects and missing transactions

An online marketplace is a selected market. Remote, divisible, electronically delivered assignments are easier to observe there than long-term organizational work or local physical services. Freelancers and buyers can also participate on several sites. Changes on one platform can reflect movement between platforms rather than changes in total demand. A national inference requires information about the platform's share and the destinations of departing participants.

Platform policy can independently affect postings. Fees, buyer acquisition, search ranking, contract products, anti-spam rules, direct invitations, and subscription bundles can change how demand is recorded. A change from open bidding to a retained contract can lower postings while paid hours remain stable. Listing and transaction records need a policy-change timeline and a common measurement definition.

The observation period also includes pandemic normalization, financing conditions, and changes in technology-sector demand. A relative exposed-category design addresses some common shocks, but comparison categories can have different pretrends and demand sensitivities. The credibility of an attribution claim depends on the design's particular assumptions, pretrend checks, and sensitivity rather than on the mere coincidence of a tool launch and weaker postings.

A project budget is an offer, not a realized wage. Its increase can reflect complexity, inflation, larger scope, or the disappearance of low-budget tasks. A posting can be canceled or never filled. To connect advertised demand to livelihood, follow completed contracts, paid hours, net earnings, application time, and worker exit. The earnings chapter makes those denominators explicit.

Evidence would weaken a broad compression interpretation if the lost transactions reappeared on other channels, if total paid human hours grew, or if affected workers entered complementary services with restored real income. It would strengthen the interpretation if comparable-output buyers persistently reduced purchased human time across platforms while exposed workers experienced sustained income losses.

That combination is economically informative. An increase in the average advertised price of surviving projects does not establish that workers collectively benefit. Suppose simpler assignments disappear while a smaller number of difficult projects command premiums. The observed average rises because the composition of transactions changes. Workers who formerly earned income from the missing assignments are not represented in the new average. The relevant distribution includes successful contractors, unsuccessful bidders, reduced workloads and people who leave the market. A prosperity assessment limited to the price of completed transactions can omit the central adjustment.

A chart and monitoring specification for postings

Construct a weekly or monthly panel of unique postings with platform, buyer, task category, skill tags, budget, anticipated hours, geography, invitation status, and eventual contract disposition. Preserve the classifier version and listing-policy timeline. Keep canceled and unfilled projects identifiable instead of treating every ad as completed demand.

Plot absolute postings and advertised expenditure by task category, then indexed paths for exposed and comparison groups. Show applications per posting and conversion to contracts separately. An event-study chart should display preperiod observations and uncertainty, with the chosen event date and comparison assumptions stated.

Extend the record with completed contract values, paid hours, worker earnings, and buyer output wherever possible. Distinguish buyer attrition from reduced purchasing among continuing buyers. A balanced-buyer panel and the full market both matter because each omits a different composition effect.

Retain short-history status until a comparable record meets the twenty-year criterion. Read postings alongside freelance earnings, purchased work and AI spending, direct hiring, workforce elasticity, and worker transitions. The combined evidence can show whether a reduction in advertised tasks represents smaller demand, fewer human requirements, a new transaction form, or activity moving to another channel.

A useful composition table separates continuing buyers, newly entering buyers, and departing buyers. Within continuing buyers, compare purchases of the same task at similar scope; for entrants, identify whether complementary work accounts for the expansion. This can show whether an aggregate decline reflects fewer buyers or less purchasing by each buyer. Preserve invitation-only work and retainer contracts as distinct categories if the platform exposes them.

SOURCES AND REPRODUCTION NOTES

[1] Ozge Demirci Jonas Hannane and Xinrong Zhu (2024). Who Is AI Replacing The Impact of Generative AI on Online Freelancing Platforms. CESifo Working Paper 11276; original accessible research version; relative posting effects and project composition; verified retrieval date 4 October 2026

[2] Oxford Internet Institute University of Oxford (2025). The Winners and Losers of Generative AI in the Freelance Job Market. Primary author institution account of Teutloff and coauthors research; January 2021 to September 2023 postings; 29 January 2025; verified retrieval date 4 October 2026

[3] Xiang Hui Oren Reshef and Luofeng Zhou (2024). The Short Term Effects of Generative Artificial Intelligence on Employment Evidence from an Online Labor Market. Organization Science original publication; 24 September 2024; short term freelancer employment and earnings outcomes; verified retrieval date 4 October 2026

RELATED CHAPTERS 025 · 073 · 077 · 079 · 080

CHAPTER 079

Freelance earnings

EVIDENCE STATUS **Short history** · OBSERVATION SPAN Early platform worker research with public marketplace indicators through 2026 Q2

Worker earnings determine whether disappearing assignments and changing project composition reduce livelihoods even when surviving transactions have higher average values.

Earnings rates paid work and the complete denominator

Freelance earnings measure income received by workers from independent assignments over a specified period. The most useful livelihood measure is real net earnings per worker over a month or year, including months with zero platform earnings. Gross project value, advertised budget, platform revenue, an hourly billing rate, and net worker income are different quantities. A precise series must specify which one is observed.

Gross worker receipts should be adjusted for platform charges, refunds, directly incurred business expenses, and any treatment of taxes that the analysis chooses. Real measurement requires an appropriate price index and consistent currency conversion. Multicountry platforms need local purchasing-power and exchange-rate considerations; a dollar-denominated receipt can change without an equal change in domestic living standards.

Earnings equal a price or rate multiplied by the amount of paid work, with additional fixed-project and expense complexities. A higher hourly rate can accompany fewer billable hours and lower monthly income. A worker can also spend more unpaid time searching, bidding, revising proposals, or maintaining reputation. Earnings per total work and search hour may weaken even when the published hourly rate improves.

The denominator should include the relevant cohort, not just workers who successfully completed a transaction. A continuing-worker panel can track established participants through zero-income periods. An all-active-seller series can describe current platform composition. A fixed entry cohort can evaluate opportunity for newcomers. Each reveals something the others omit, and the reporting boundary should be visible.

A credible post-labor earnings test would examine persistent real income and utilization over at least twenty years or through an appropriately long linked labor record. The research cited here concerns recent tool introductions and selected marketplaces. It is a short-history indicator of a potential adjustment channel, rather than proof of secular decline in all independent work.

For worker households, the timing of receipts also matters. A large project paid at completion can make monthly income appear volatile even when work was performed steadily. Measure accrual-based work and cash receipts separately when both are available, and use rolling annual totals for livelihood comparisons. Do not smooth away genuine periods without assignments. A participant's financial ability to bridge a payment delay can matter even when annual income ultimately recovers.

Worker evidence and current platform composition

Hui, Reshef, and Zhou's original study finds short-term reductions in employment and earnings for exposed freelancers after generative-model releases. Strong previous performance did not reliably protect exposed workers. The important outcome here is worker income rather than the count of available advertisements. The follow-up does not establish those workers' eventual recovery or total income outside the marketplace. [1]

Current marketplace disclosures offer a different unit. In 2026 Q 2, Upwork reported GSV of $966.4 million, down 3.6 percent year over year, and 763,000 active clients, down approximately four percent. Published trailing-year GSV per active client reached $5,230, up five percent, while AI-related GSV rose more than 22 percent. [2, 5]

Fiverr reported 2.676 million annual active buyers at June 30, 2026, against 3.425 million a year earlier, a 21.9 percent decline. Annual spend per buyer rose from $318 to $368, or 15.6 percent. These are buyer-side indicators and do not measure average seller take-home earnings. [3]

Both disclosures illustrate why averages among remaining participants can rise while the market's participation margin weakens. They are compatible with concentration in larger or more complex projects, changing buyer cohorts, and platform strategy. They do not establish the income of the typical freelancer or isolate automation as the cause of the observed market change.

Demirci and coauthors similarly find that surviving exposed project postings offered higher budgets and complexity while competition increased. An advertised project premium can coexist with lost earning opportunities for people who previously supplied simpler assignments. [4]

These records should remain separate: a worker-outcome study, company buyer activity, and project attributes. Their consistency can support an investigation, but none converts automatically into a national self-employment earnings series.

The public observations are the latest verified June-quarter marketplace releases available at the cutoff. They do not update the cited worker study to 2026, because company transaction totals and buyer averages cannot reproduce its freelancer cohort. A proper update would reobserve the workers or construct a new comparable panel, retaining zero-income months and off-platform destinations.

2026 Q2 indicator	Verified observation	What it does not measure
Upwork quarterly GSV	$966.4 million down3.6 percent year over year	Net worker earnings
Upwork trailing GSV per active client	$5230 up5 percent	Earnings per freelancer
Fiverr annual active buyers	2.676 million down21.9 percent	Number of sellers employed
Fiverr annual spend per buyer	$368 up15.6 percent	Seller income per year

Company reporting periods and denominators retained. Buyer averages and transaction volume are supporting context rather than direct freelancer earnings. [2, 3, 5]

How compression changes the distribution of income

A task market can contract at its extensive margin and improve at its intensive margin. Fewer people or buyers transact, while the remaining assignments become larger and more expensive. This combination can leave established specialists with strong incomes, reduce utilization for others, and narrow entry routes. A mean observed only among completed transactions can move upward as low-paid or unsuccessful participants disappear.

Consider a hypothetical cohort of one hundred freelancers, each previously earning one thousand per month. After a demand change, fifty earn fifteen hundred and fifty earn zero in the measured market. The mean among successful workers rises fifty percent, while cohort earnings fall from one hundred thousand to seventy-five thousand. The illustration shows why zero-income months and exits must stay in the denominator when assessing livelihoods.

Automation can affect price, quantity, and market access separately. A buyer may stop purchasing simple drafts, pay more for review, and increase total content production. An experienced reviewer may benefit while workers supplying the former drafts lose assignments. New integration projects can expand alongside these losses. The relevant distribution is the set of people and their cumulative income, not simply the average value of surviving projects.

Competition can also transfer productivity benefits. If freelancers use better tools, buyers may negotiate lower prices or expect more output for the same fee. A worker's productivity can rise without an equal increase in real income. Conversely, scarce expertise can command a premium and let a smaller set of providers capture more value. Those are distributional outcomes that productivity measures alone cannot resolve.

For the post-labor framework, freelance earnings test whether market income continues to reach people whose tasks become easier to reproduce. Persistent losses across cohorts would strengthen the concern about compressed access to remunerative work. Broad recovery through complementary assignments and restored real annual income would weaken that concern. The effect on individual transitions is therefore as important as the initial aggregate change.

That combination is economically informative. An increase in the average advertised price of surviving projects does not establish that workers collectively benefit. Suppose simpler assignments disappear while a smaller number of difficult projects command premiums. The observed average rises because the composition of transactions changes. Workers who formerly earned income from the missing assignments are not represented in the new average. The relevant distribution includes successful contractors, unsuccessful bidders, reduced workloads and people who leave the market. A prosperity assessment limited to the price of completed transactions can omit the central adjustment.

Distributional charts should show quantiles and shares, not just the mean. A small number of high-earning specialists can lift total receipts while the median worker loses paid hours. Conversely, a falling mean can occur when many new low-earning participants enter a growing market. Fixed cohorts, entry cohorts, and the current participant cross-section can distinguish these cases. Their differences are evidence about access and selection rather than a reason to choose the most favorable statistic.

Selection multi homing fees and recovery

Platform exit is ambiguous. A worker can leave because demand collapsed, because a better job became available, because work moved to direct clients, or because platform fees and policies became unattractive. Treating every exit as an income loss overstates deterioration; dropping every exit from the dataset understates it. A linked follow-up or survey can distinguish those destinations and preserve uncertainty where outcomes are unknown.

Multi-platform participation and direct invoicing further complicate the record. A decline on one marketplace need not be a decline in total freelance income. Tax or payment data can supply broader coverage, subject to reporting thresholds and lag. Household surveys can observe all work but may classify independent arrangements differently from platforms. Keep the worker, transaction, and survey definitions distinct rather than merge unmatched populations.

Expenses can change with technology. Software, model access, equipment, training, and additional review may lower gross hours per deliverable but increase business cost. Platform take rates and payment charges also affect net earnings. A stable gross receipt can therefore conceal lower net income. The measurement policy needs a consistent expense boundary and should show the costs that cannot be allocated confidently.

The public company indicators have their own breaks. Upwork refined GSV's definition in 2025 as its portfolio evolved. Its GSV per active client uses four quarters of transactions divided by the active-client count. Fiverr's annual buyer and spend measures also use a twelve-month window. Comparing those annualized ratios with current-quarter receipts creates a period mismatch, and comparing across platforms ignores different transaction scopes. [3, 5]

Worker recovery requires more than a return to any transaction. Track cumulative income lost during the adjustment, restored purchasing power, dependable paid hours, business expenses, and access to a viable advancement path. A highly paid occasional assignment may not replace a reliable annual livelihood. A successful move into direct consulting can be genuine recovery even if platform income remains zero.

Upwork's GSV includes value-added services such as AI-based offerings and bidding-related purchases as well as talent services. Its annual report states that the 2025 definition refinement did not change earlier reported amounts. The metric therefore remains useful commercial context, but its broader transaction boundary makes it even less suitable as a direct estimate of freelancer wages. [5]

Longitudinal charts for freelance livelihood

Build worker-month panels with stable anonymized identifiers, gross receipts, net receipts where available, paid hours, total work and search hours, task categories, applications, fees, expenses, and zero-income months. Follow continuing and entering cohorts separately. Record exits with observed destinations or an explicit unknown category.

Chart real net earnings distributions, cohort median and mean, the share with no receipts, and cumulative income relative to the preperiod. Include paid-hour and rate paths so changes in price and utilization can be distinguished. A completed-project price chart should have a separate label and denominator.

Use company GSV and buyer statistics as contextual demand series rather than substitutes for worker pay. Preserve metric-definition changes and trailing-year periods. A comparison design around tool introduction should include pretrends, task exposure, and a credible comparison group; longer follow-up should test recovery rather than extrapolate the initial effect indefinitely.

Pair earnings with postings, total work purchases, entry opportunities, worker transitions, and household security. The combined record can show whether task-market reallocation reaches workers as restored income, fewer paid hours, new costs, or persistent exclusion. Until a comparable twenty-year record exists, retain the short-history classification.

A cumulative-earnings chart can index each worker's preperiod real monthly income and accumulate the subsequent deviation. Someone who restores the former monthly rate after a long interruption can still have a large cumulative loss. Report recovery of the current rate and recovery of cumulative earnings separately. Where workers take payroll jobs or direct clients, include those observed receipts in a broader-income companion and leave the platform-only panel intact.

SOURCES AND REPRODUCTION NOTES

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RELATED CHAPTERS 025 · 027 · 073 · 078 · 080

CHAPTER 080

Purchased labor expenditure relative to AI expenditure

EVIDENCE STATUS **Short history** · OBSERVATION SPAN Selected purchaser transactions from 2021 to 2025 with companion adoption research published in 2026

Changing work purchases and AI bills can reveal a sourcing shift but they do not establish an equal output labor replacement rate or a secular macro trend.

What the two expenditure series include

Purchased labor expenditure relative to AI expenditure compares a buyer's purchases of outside work with its payments for AI systems over the same period. A direct quotient divides work-like expenditure by AI expenditure, while a more interpretable chart displays both levels and their shares of total observed spend. Near-zero initial AI expenditure can make the quotient unstable, so underlying amounts should remain visible.

The purchased-work boundary can include individual freelancers, temporary labor, consulting, agencies, managed services, or outsourcing. A platform-merchant version covers only payments identified with specified marketplaces. Those purchases can include fees and nonlabor delivery components. The AI boundary can cover model APIs, subscriptions, cloud, data, integration, evaluation, monitoring, and human support. A merchant-based source often observes a narrower set than this full resource bundle.

These are nominal expenditure measures. Lower outside-work cost can reflect fewer hours, lower prices, a supplier change, a different payment route, or reduced business activity. Higher AI cost can reflect greater usage, more expensive products, experimentation, or integration investment. Expenditure alone does not identify equivalent completed work or a technical substitution coefficient.

In national accounting terms, purchased services are intermediate inputs rather than direct employee compensation of the buyer. They can contain income supporting people elsewhere. BEA's value-added definition establishes why buyer revenue and work purchases have different accounting roles; it does not convert a particular vendor payment into a human-hour observation. [3]

This entry retains short-history status. AI-specific bills are recent and the cited transaction study covers about four years. Older software and outsourcing records might eventually support a twenty-year broader automation-sourcing series, but that would require a consistent expanded definition rather than relabeling the present sample as secular evidence.

The example clarifies why payroll expenditure, employee numbers, hours and outside purchases should remain separate variables. A business can reduce headcount while retaining its compensation budget by paying more for scarcer expertise. It can increase consultant spending because consultants charge higher rates, because it purchases more hours, or because the supplied service contains expensive software and equipment. The purchaser's invoice does not reveal the supplier's wage bill. Dividing consultant spending by

an arbitrary annual salary creates a labor estimate only by imposing assumptions about markups, nonlabor costs, hours and occupational composition.

For mixed managed-service invoices, distinguish a contractual outcome price from observable labor time. A fixed fee can fall because the vendor became more automated, accepted a lower margin, or renegotiated scope. The buyer can observe price and accepted output; the vendor can observe its labor and technology inputs. Linking both sides provides more information than assigning an assumed headcount to the invoice.

Verified transaction evidence and a workforce companion

Stevens's selected Ramp-customer panel covers 2021 Q 3 to 2025 Q 3. Identified online-labor-marketplace expenditure fell from 0.66 percent of observed spend in 2021 Q 4 to 0.14 percent in 2025 Q 3, while identified model-provider expenditure rose from zero to 2.85 percent. The sample selects established customers with earlier marketplace purchases; its AI merchants are OpenAI and Anthropic. [1]

This records a substantial shift in observed purchasing categories. It does not cover all firms, all outside work, all AI products, or all payment channels. A buyer's existing employees can remain in place while its outside purchases change. A marketplace supplier can lose demand without appearing in the buyer's payroll statistics.

The linked Ramp and Revelio analysis provides a useful competing observation. High-intensity AI adopters experienced roughly ten percent relative employment growth after adoption, while lower-intensity adopters had no statistically significant change. Adopters also differed before adoption. This is selected firm-level evidence of employment expansion alongside the procurement concern. [2]

The two results need not conflict. A firm can expand its employees while buying less freelance work, or expand total activity enough to require more labor despite efficiency gains. Different samples and treatment definitions can also yield different relationships. Reconciliation requires the same firms, suppliers, output, human hours, and prices over the same period.

The original user's concern is therefore properly framed at the connected production-system level. A customer's hiring gain and a supplier's purchasing loss cannot each be interpreted as the whole economy. This short transaction record makes that missing boundary concrete and suggests a research design capable of testing it.

Selected Ramp panel category	2021 Q4 share	2025 Q3 share
Identified online labor marketplaces	0.66 percent	0.14 percent
Identified model providers	0 percent	2.85 percent

Shares of expenditure observed through the selected Ramp panel, not shares of the national economy or total labor costs. Different merchant categories and selection rules matter. [1]

Sourcing change and the economic production system

A purchaser can combine employee work, freelancers, conventional software, and new model services in changing proportions. Task substitution may occur at any of these boundaries. Tracking procurement helps

reveal work demand that disappears without a direct layoff. It also reveals whether automation benefits are captured by the buyer or transferred to a technology provider, integrator, or managed-service supplier.

Consider a hypothetical business that buys fifty thousand of freelance services and later buys twenty thousand of those services plus five thousand of model access. The nominal expenditure difference suggests a purchasing reduction, but the resource saving is unknown. Existing staff may spend more time reviewing results, the business may produce fewer accepted outcomes, or integration cost may exceed the visible subscription bill. A matched output and full-cost record would be needed to turn this sourcing observation into a measured production gain.

A different hypothetical case retains the same paid human hours but increases output substantially with new software. AI spend rises and the expenditure quotient falls, even though no work was eliminated. A third case reduces freelance purchases by switching to a direct contract paid outside the observed channel. These possibilities show why the same chart can arise through different mechanisms.

For post-labor economics, the informative hypothesis is that comparable useful output becomes less dependent on purchased human time and that demand expansion does not fully offset the saving. Procurement data can test part of this hypothesis when linked to units, quality, supplier inputs, and internal labor. The pure spending ratio remains a signal of sourcing behavior rather than a complete measure of total human requirements.

The distribution of gains depends on competitive and contractual conditions. Buyers can obtain lower prices or broader scope, vendors can retain greater margins, employees can absorb more skilled work, and former suppliers can lose income. Following the transaction network and worker outcomes identifies which of these consequences actually occurred.

Those purchasing shifts are worth investigating, but a ratio of spending changes does not measure the technical rate at which software replaces labor. To interpret a dollar reduction in external work as a measured efficiency gain, the researcher would need to show that comparable work continued to be completed, at comparable quality and volume, using the observed AI expenditure. Additional employee time, integration costs and other computing expenses would have to be included. The disappearance of a marketplace payment could instead reflect a change of supplier or payment method, insourcing, a discontinued product, or a smaller volume of business.

Supplier concentration can rise as sourcing shifts. Lower current cost may be accompanied by greater dependence on a platform or technology provider and reduced ability to switch. Recording contract flexibility and supplier alternatives makes the economic capture question more complete without equating every expenditure reduction to an equal durable gain.

Selection event timing and the causal limits

The transaction panel's established-customer and continued-spending rules select surviving businesses and exclude entrants or exits under those rules. Merchant identification is imperfect, and broad vendors can bundle AI with other products. A stable panel improves one comparison while limiting representativeness. The estimated pattern should be reported with its coverage rather than extrapolated to total national labor purchases.

The original paper acknowledges problematic pretrends. Its text places ChatGPT's introduction in October 2022 and its displayed treatment begins in 2022 Q 3. OpenAI's actual introduction was November 30, 2022. The mismatch and the pretrend complicate the event-based causal reading; the observed expenditure paths remain descriptively useful. [1, 4]

A common denominator can also change the two shares. If total observed expenditure grows, marketplace share can decline even with constant marketplace dollars. If AI spending grows rapidly, the quotient can fall mechanically. Publish absolute amounts and continuing-buyer changes in addition to expenditure shares. Payment-route changes require explicit bridges where the data can observe them.

Regression coefficient ratios are not engineering conversion rates. A ratio of estimated spending changes does not show that each dollar of AI replaces a known dollar of equally effective human work. Prices, volumes, quality, internal effort, fixed integration cost, and supplier margins can all vary. A controlled matched-work comparison can estimate a more concrete cost difference, while a merchant spending regression answers a broader behavioral question.

Complementarity remains a live alternative. AI purchases can support new work, higher output, customer acquisition, and hiring. The linked workforce evidence makes that possibility empirically relevant. A stronger compression account would require falling total human hours or purchased human services relative to comparable output after accounting for those expansion channels.

For a comprehensive test, a linked firm–worker–supplier panel would combine real output or carefully deflated sales, employee hours, compensation, new and replacement hiring, occupational composition, external labor purchases, and subsequent worker earnings. Suppliers would be identified by service type and location. Acquisitions, outsourcing transitions and changing reporting boundaries would be recorded explicitly. Adopters would be compared with credible counterfactual firms, and competitor effects would be estimated instead of assumed away. The aim would be to reconcile the parts into a total while preserving their different economic meanings.

Building a reproducible purchasing dashboard

Join procurement, card and bill-payment data with a versioned merchant and service taxonomy. Identify individual labor, opaque work-like contracts, mixed human-machine services, pure technology, and unclassified expenditure. Record which payment routes and supplier categories are covered. Preserve the sample-entry and sample-retention rules.

Plot nominal outside-work and AI expenditure levels, their shares of observed spend, and component categories. Use a common period and organizational perimeter. Show zero-spending buyers, entries, exits, and changes among continuing purchasers separately. A ratio with a zero AI denominator should be left undefined rather than filled with an arbitrary number.

Add accepted output, quality, internal employee hours, supplier hours where observed, integration costs, and worker earnings. Calculate cost per valid unit only when the units and all relevant costs are comparable. Use an explicit intervention design for causal attribution, with pretrends and uncertainty available for review.

Read the expenditure shift alongside total work cost share, real value added per human unit, workforce elasticity, direct hiring, freelance earnings, and supplier outcomes. This combination can reconcile buyer

success with the demand supplied to people across organizational boundaries. Retain short-history status for the present AI-specific record and use broader, comparable automation records for any twenty-year secular claim.

Four outcomes would materially weaken the concern developed in the earlier research: sustained recovery in labor demand alongside output; broad improvements in workers' real earnings rather than only company averages; expansion of complementary work sufficient to offset displaced tasks; and successful movement of affected workers into those opportunities. Four opposite outcomes would strengthen it: persistent output growth with declining hours across linked firms and suppliers; reduced entry and replacement hiring; lower earnings after movement; and weakening technical-supplier employment despite continued investment by their clients. These are competing predictions, not predetermined conclusions.

An index of purchased-work dollars is best paired with a constant-scope contract sample. Compare recurring deliverables of similar complexity and service obligations, tracking changes in price, human touch time, and exceptions. A broad merchant series remains useful for the spending boundary, while the matched sample can assess whether a change in dollars corresponds to a change in the human resources needed for the same work.

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[2] Lisa K Simon Ara Kharazian and Ryan Stevens (2026). The Companies Spending the Most on AI Are Also Spending the Most on Humans. Primary Ramp and Revelio Labs linked spending and workforce analysis published 30 June 2026; verified retrieval date 4 October 2026

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RELATED CHAPTERS 072 · 073 · 074 · 075 · 076 · 078 · 079

CHAPTER 081

Employment per new establishment

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN March 1994 to March 2025

New United States private establishments begin with roughly half as many payroll employees as they did three decades earlier.

What employment per new establishment measures

Employment per new establishment measures the average payroll size of a newly operating business location. For the version used here, divide employment at United States private establishments less than one year old by the number of establishments in that age category. Both quantities come from the same March observation in the Bureau of Labor Statistics Business Employment Dynamics establishment age tables. The result is employees per establishment, rather than a percentage, a rate of employment growth, or the number of entrepreneurs. Using the same source and observation date for numerator and denominator is essential. Mixing a calendar year employment total with a March establishment count would produce a different and difficult to interpret measure.[1][2][3]

An establishment is a workplace or operating location. A firm can own several establishments, so a newly opened supermarket branch can enter the young establishment category even when its parent company is decades old. Consequently, the measure concerns the payroll attached to new operating units. It should be described as average employment at establishments under one year old. Calling every observation a newly founded company would attribute corporate expansion to independent entrepreneurship. Firm birth and establishment birth answer related questions, but they are separate organizational events.[1]

The age classification follows administrative employment records. It does not measure the time since an owner first conceived the business, incorporated it, purchased equipment, or submitted an application for an employer identification number. A business may spend years developing before it appears as an employer. Similarly, a business operated entirely by its owner without covered payroll employees belongs outside the numerator and denominator. An owner working full time can therefore generate economically useful output without adding a counted employee to this series.[1]

Payroll size also has a narrow employment boundary. Contract cleaners, outsourced bookkeeping staff, platform workers, and suppliers may help a new establishment operate while appearing on another organization's payroll. The metric records the employees directly attached to the establishment, rather than everyone contributing to its output. This boundary becomes analytically useful when it is explicit: the series can reveal smaller direct employment commitments at business entry, while companion measures investigate whether work moved elsewhere or was eliminated. The measure should never be converted automatically into the amount of human effort required to launch a business.

The average is an arithmetic mean across establishments, so a small number of large openings can influence it strongly. It does not describe the median entrant or the payroll of a randomly selected employee. If ten tiny workplaces employ two people each and one factory employs two hundred, the mean is twenty employees

even though most entrants employ two. These invented figures illustrate why a change in the frequency of large openings can move the mean. A median, size distribution, or employment weighted comparison would help determine whether smaller payrolls characterize most new operating units or mainly a changing upper tail.

The thirty one year empirical record

The verified BLS tables cover March 1994 through March 2025 for establishments under one year old. In March 1994, the age category contained 569,387 establishments and 4,127,123 employees, yielding 7.25 employees per establishment. In March 2025 it contained 980,333 establishments and 3,532,614 employees, yielding 3.60. These ratios are calculations from the published counts, rounded to two decimal places. The average declined by approximately 50.3 percent across thirty one years. The March 2025 observation is the latest verified endpoint in these age tables as retrieved on 4 October 2026.[2][3]

The intermediate observations establish that the change was already substantial before the pandemic and widespread use of generative artificial intelligence. Average employment was 6.92 in March 2000 and 4.05 in March 2019. The recent endpoint is therefore an extension of an established change in the staffing scale of new establishments. The early decline does not identify a particular technology, but it rules out an explanation that attributes the entire movement to a technology introduced after 2020. BLS's January 2024 historical discussion likewise identifies a long decline in the average size of establishment startups.[2][3][4]

The trend is neither an annual straight line nor a guarantee of continued decline. The current tables imply approximately 3.52 employees per young establishment in March 2023, 3.55 in March 2024, and 3.60 in March 2025. Small increases at the end of a long fall are relevant evidence. They should be retained in a chart rather than hidden by choosing an earlier endpoint. A secular criterion asks whether a long historical change exists; it does not require every successive observation to move in the same direction.[2][3]

The establishment counts and employment counts also tell different stories. More young establishments existed in 2025 than in 1994, despite fewer employees being attached to that age category at the March observation. An economy can therefore show vigorous formation of small operating units while obtaining fewer payroll jobs per unit. This observation prevents a simple inference from business counts to employment opportunity. It also means that average startup size should be displayed with the number of establishments and their total payroll employment: each reveals a distinct margin of change.[2][3]

March observation	Establishments under one year	Employees at those establishments	Employees per establishment
1994	569387	4127123	7.25
2000	674530	4664457	6.92
2019	770523	3116850	4.05
2023	1049106	3697345	3.52
2024	988310	3506370	3.55
2025	980333	3532614	3.60

Calculated from BLS establishment age Tables 5 and 6 [2][3]. Each row uses the same March snapshot.

Why smaller starting payrolls matter

A startup is one place where the economy translates a new productive idea into new claims on labor. If the same business concept can begin operating with fewer employees, the connection between entrepreneurial activity and payroll creation becomes weaker at the entry margin. This is an economically meaningful form of labor compression even when the business survives and subsequently expands. The relevant claim is limited: the initial organization of new production has become less intensive in direct payroll employment. Subsequent growth requires its own cohort evidence.

Several changes could produce that outcome. Software can handle accounts, scheduling, inventory, payments, marketing, and customer communication that once required dedicated employees. Equipment can perform production tasks with a smaller operating crew. Standardized cloud services can replace work formerly built and maintained inside each establishment. These examples explain mechanisms rather than establish their historical contributions. To demonstrate an automation effect, researchers would need to relate establishment staffing to technology adoption while separating the effects of industry, demand, funding, and ownership. The aggregate average by itself contains no technology identifier.

A second mechanism is externalization. A new operation can buy accounting, fulfillment, design, and technical services instead of employing the people who deliver them. Some of those suppliers achieve economies of scale that reduce total human work across their customers. Others simply pool employees under different organizational boundaries. The first case is consistent with reduced labor intensity across a production network; the second mainly changes where employment is recorded. Both make new establishments smaller, so tracing purchased services and contractor use would improve the interpretation considerably.

Hypothetical arithmetic illustrates the distinction. Suppose one thousand new establishments each formerly hired seven employees and now hire four. Direct startup employment falls from seven thousand to four thousand. If a shared service provider hires three thousand additional workers, total employment in the combined network remains unchanged. If the provider adds five hundred employees because it uses standardized software, the network employs two thousand five hundred fewer people. These illustrative quantities are not observations. They show why a direct payroll measure can identify an important organizational change while leaving the economywide displacement effect unresolved.

Alternative explanations and useful tests

Industry composition is a major competing explanation. A larger share of small professional offices, online businesses, or specialized service locations could reduce the national average even if the typical establishment within each industry retained its earlier staffing scale. An increasing share of capital intensive factories could move the average in the opposite direction. A useful extension calculates the measure within consistent industries and then holds industry weights fixed. This separates a change in the kinds of establishments entering from a change in the payroll required to start a comparable operating unit.

Funding and demand affect the same measure. Businesses started with limited capital may deliberately hire fewer people, postpone expansion, or rely on the founder's unpaid effort. Weak consumer demand can reduce staffing without changing technical requirements. Conversely, a period of abundant funding can encourage large opening payrolls despite unchanged technology. Comparing observations at similar stages of

the business cycle helps, but it cannot eliminate financing and demand effects. Following birth cohorts for several years would establish whether small initial payrolls persist, grow rapidly, or mainly reflect delayed hiring.

Measurement changes also deserve attention. Business Employment Dynamics uses longitudinal administrative records to distinguish employment changes and operating events. Establishment identification, reporting changes, and corrections can alter historical totals. The March 2023 counts in the current tables differ slightly from the counts printed in the January 2024 spotlight. That discrepancy is consistent with using different data vintages and is a reason to calculate the entire chart from a single current download. A historical chart should record its retrieval date and preserve its underlying source files so revisions remain visible.[1][2][3][4]

The post labor interpretation would strengthen if shrinking opening payrolls also appeared within industries, at comparable sales, and after accounting for purchased labor services. It would weaken if most of the aggregate decline resulted from a changing industry mix, if outsourced employment fully offset internal reductions, or if smaller entrants routinely reached historical staffing levels soon afterward. These tests concern the significance of the series rather than its existence. The verified decline remains a real description of direct employment at entry, even when its causes turn out to be more complex than automation alone.

Founder labor is another important boundary. Smaller payrolls could coexist with longer hours worked by owners and their families. A new online business might buy software and employ nobody while requiring substantial unpaid administration by its founder. That is organizational compression without demonstrated elimination of human effort. Conversely, the same founder could operate with fewer hours because software handles routine work. The employee series treats these examples similarly. Time use, owner earnings, and hours supplied by self employed people would distinguish them and connect an administrative employment measure to the broader requirement for human labor in production.

Charting and monitoring the entry margin

Build the main chart from the less than one year row in BLS Tables 5 and 6. Align years explicitly, remove commas from the numerical fields, and divide employment by establishments. Plot employees per establishment on the vertical axis and March observation year on the horizontal axis. A second panel should plot the establishment count and total employment separately. The ratio panel communicates staffing intensity; the other panels show whether changes reflect fewer entrants, smaller entrants, or both. Label the latest point March 2025 rather than 2026.[2][3]

Keep all available observations and use a simple rolling average only as an additional line. The raw series should remain visible, particularly its recent small increases. Starting the chart in 1994 uses the earliest available startup age observation and avoids selecting the late 1990s maximum. If an index chart is desirable, set 1994 to one hundred and disclose the unindexed values in the caption. An index makes changes easy to compare with employer firm entry, but it obscures the concrete number of employees per operating unit.

Monitor updated age tables, their coverage, and any revision notices. For a research extension, reproduce industry specific ratios and follow comparable birth cohorts after entry. Report separately any analysis using firms rather than establishments. Related chapters on firm birth rates, gross job flows, and task displacement explain why entry volume, initial payroll intensity, and technological substitution should be monitored

together. This metric contributes a distinct question to the framework: how many direct employees accompany the creation of a new operating unit, and how has that organizational commitment changed?

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RELATED CHAPTERS 082 · 083 · 084 · 091

CHAPTER 082

Employer firm birth and startup rates

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN 1978 to 2023

United States employer firm startup rates remain below their early historical levels after a long decline and a meaningful recovery after 2010.

What counts as an employer firm birth

The employer firm startup rate measures how frequently new employers enter the population of existing employers. A basic version divides the number of firms classified as age zero during a year by the total number of employer firms in that year, expressing the result as a percentage. The Census Bureau Business Dynamics Statistics provides annual firm age data for the United States from 1978 through 2023 in the latest verified release. Firm age follows employment records and the age of associated establishments. A startup in this system begins employing workers; incorporation, a business idea, and an application for a tax identifier are different events.[1][2]

The rate differs from the startup count. Five hundred thousand new employers can represent a high entry rate in a small population of existing firms and a low rate in a larger population. The denominator therefore matters when assessing whether entrepreneurship is replenishing the employer economy. The measure is also distinct from the establishment birth rate. A firm can open new branches without being newly founded, while an independent new employer can begin with one location. Consolidating establishments under common ownership gives the firm measure a different economic meaning from a count of operating locations.[1]

Employment weighted entry measures answer another question. Divide employment at new firms by total employment to measure the payroll contribution of entrants. Two periods can have the same firm startup rate but different entrant employment shares if startup firms begin with different staffing levels. This chapter concerns the incidence of new employer organizations. Chapter 81 separately examines employees per new establishment. Combining entry incidence with entrant employment gives a fuller account of the job creation channel, while keeping their denominators distinct prevents an ambiguous single startup indicator.

The Business Formation Statistics measures applications and subsequent transitions to employer activity using a separate system and higher frequency information. Applications can include businesses that never become payroll employers. Forecast or realized formation measures can also use timing conventions different from the annual Business Dynamics Statistics employment snapshot. Application volume is valuable leading information, especially around sudden economic changes, but it should be labeled precisely. A surge in applications cannot by itself establish a matching increase in employer births or payroll positions. Census methodology documents the differences between these sources.[3]

Firm entry can be measured by industry, region, or employer size, but the selected population must be specified before comparisons begin. A sector entry rate uses that sector's employer population as its denominator. A regional rate concerns firms operating in the area under the source's geographic

conventions. A firm with locations in several states makes geographic attribution more complicated than a single local workplace. Researchers should therefore preserve the official classification rather than allocate the same firm independently to every place and then add the resulting counts. The national total and regional subtotals are not automatically interchangeable observations.

Long decline followed by partial recovery

The historical pattern satisfies the twenty year criterion, but its recent direction is mixed. A May 2026 Federal Reserve Bank of St Louis analysis of the Census series describes employer firm startup rates above twelve percent in the late 1970s, declining to approximately seven percent around the post financial crisis trough. Rates subsequently recovered. Its verified observations are 7.9 percent in 2019, 8.7 percent in 2022, and 8.4 percent in 2023. The contemporary finding is a level below the early historical range alongside a meaningful recovery from the trough.[4]

The observation year and publication year must stay separate. The Census source currently identifies 2023 as the endpoint of its annual Business Dynamics Statistics, with the verified release dated 25 September 2025. The Federal Reserve analysis published in 2026 discusses that lagged history. Labeling an annual line as the 2026 startup rate would incorrectly assign the publication date to the economy being measured. Monthly business applications offer more recent information, but their different universe cannot simply be appended to an annual employer startup line.[2][3][4]

The rate's long decline and rebound complicate a narrative of progressively vanishing entrepreneurship. Lower entry rates persisted for decades, yet young employers have regained some ground. This is relevant counterevidence to any claim that every measure of economic dynamism is continuously worsening. It is entirely compatible with smaller direct payrolls per new establishment, because the number of employers and their initial staffing intensity can move differently. A growing population of small new employers can increase the firm birth rate without restoring the employment intensity of earlier business generations.

Geographic comparison adds another dimension. The Federal Reserve's analysis finds the recent recovery spread across metropolitan areas rather than being confined to a few coastal technology centers. Its comparisons also show that the relationship between city size and entry changed over the longer history. Geographic variation matters because a national recovery may still leave some places with little replacement employer activity. The national rate should therefore be supplemented by area specific rates, using consistent boundaries and carefully separating changes in local employer counts from changes in local population.[4]

Period or observation	Verified employer firm startup rate	Interpretation
Late 1970s	Above 12 percent	Early historical range reported in Federal Reserve analysis
Around the post crisis trough	About 7 percent	Low point in the long decline
2019	7.9 percent	Recovery had begun before the pandemic
2022	8.7 percent	Strong pandemic era recovery
2023	8.4 percent	Below 2022 and above 2019

Rates are shares of employer firms started within the past year as reported by the Federal Reserve Bank of St Louis using Census BDS [4]. Approximate historical checkpoints are not exact annual data points.

How employer entry connects to labor opportunity

New employers can create employment opportunities outside established hierarchies. They may enter underserved markets, commercialize new products, provide local alternatives, or compete for workers. A lower rate of entry can leave a greater share of employees dependent on mature firms and their existing structures. This can matter for bargaining power and access to desirable jobs even when the total number of jobs grows. The economic contribution depends on which entrants survive, how they expand, and whether their jobs provide attractive compensation, rather than on the entry count alone.

A lower birth rate can also reduce the frequency with which a new productive idea becomes a new payroll organization. One possible technological mechanism is consolidation: scalable incumbents supply services to more customers without needing a new independent employer in each locality. Another is specialization, where new businesses purchase shared services instead of building broad internal teams. These mechanisms can coexist with high business application volume. They are hypotheses that connect entry statistics to changing production structures; identifying them requires evidence about entrants, incumbents, technology adoption, and purchased services.

Demographic change supplies a separate channel. A slowly growing customer base and workforce may support fewer new firms even if technology is unchanged. A stable population requires less new retail capacity, housing related business, and local service provision than a rapidly expanding population. The appropriate post labor inference therefore depends on whether entry is unusually weak relative to demand and the available workforce. Comparing the entry rate with population growth and industry demand helps avoid interpreting every decline in organizational turnover as technological substitution.

Hypothetical cases demonstrate why the rate belongs in a broader framework. An economy with one hundred thousand employers and ten thousand entrants has a ten percent startup rate. If the employer population doubles while entrants remain unchanged, the rate falls to five percent without any decline in the absolute number of new firms. If entrants instead rise to fifteen thousand, the rate is 7.5 percent: more new employers, but slower replenishment relative to the enlarged population. These examples show how a ratio can reveal changing economic structure while avoiding a false statement that business creation disappeared.

Boundaries and competing explanations

A decline in entry can represent deteriorating opportunity, greater efficiency, or both. Fewer independent retailers might reflect an incumbent's distribution advantages. Fewer new employers in a shrinking area might reflect weak demand. Fewer entrants facing licensing or financing obstacles might indicate institutional barriers. The rate does not assign weights to these explanations. The relevant question is whether the underlying change lowers access to production, employment, and prosperity, and through which channel. That question requires more information than a count of age zero firms.

The quality and survival of entrants matter. A large increase in tiny employers with low pay and high failure rates can raise the startup rate while providing limited durable employment. A smaller cohort of productive firms can generate more lasting opportunity. Follow birth cohorts and distinguish immediate employment,

survival, subsequent payroll growth, and compensation. The startup count, first year employees, and employment after five years are separate outcomes. Their joint movement can reveal whether the apparent recovery in formation restores a meaningful employment escalator.

Administrative and organizational changes can also affect classification. Mergers, ownership changes, spin offs, reorganization, and changes to establishment identifiers require careful treatment when determining firm age. Census methods provide the relevant statistical construction rather than assuming that every new business identifier represents new production. Industry classification changes complicate long comparisons, especially at narrow levels. A chart based on consistent broad industries is often more reliable than one combining detailed categories whose definitions changed during the study period.[1]

The post labor reading strengthens when employer entry remains weak after adjusting for population and demand, when the employment contribution of entrants falls, and when technological scale advantages explain the pattern. It weakens when employer births rebound broadly, new cohorts create durable well paid jobs, or demographic changes account for much of the decline. The recovery since 2010 should be treated as information that constrains the claim. It does not erase the earlier secular decline, and it does prevent using an outdated continuously descending description for the current economy.

An additional comparison examines owner employment and payroll employment together. Entrepreneurship may provide an alternative livelihood for people who cannot obtain a suitable salaried job. More sole proprietorships or new businesses can therefore indicate both productive initiative and adaptation to limited employment alternatives. Business accounts, owner earnings, survival, and employee hiring help distinguish successful independent production from unstable replacement livelihoods. The startup rate cannot reveal an entrepreneur's motive. It can become more informative when the analysis asks whether new business ownership improves household security and whether those businesses create opportunities for others as they grow.

Reproducing the startup rate responsibly

Use the Census firm age dataset and identify the age zero category and the total employer firm population for each year. Check whether the chosen published rate uses the current total or an average population convention; reproduce the source's denominator exactly. Download one current vintage across the whole period and document the 2023 observation endpoint. Use a percentage scale for the main line. Separate absolute entrant counts and employment at entrants into additional panels, because counts, rates, and employment contributions describe distinct margins.[1][2]

A second chart can compare national and regional entry rates after harmonizing geography. Avoid connecting precise annual values to approximate historical checkpoints such as above twelve percent. Those checkpoints belong in explanatory text until exact annual data have been downloaded. Add a clearly labeled companion panel for Business Formation Statistics applications when recent leading information is useful. Its axis and caption should state applications, rather than employer startups. Distinguish actual formations from projected formations where forecasts are part of the selected series.[3]

Monitor revised Census releases, entry recovery, and the size and survival of successive cohorts. The most informative comparison for the framework is whether restored organizational entry also restores employment opportunity. Related chapters on employment per new establishment, gross job reallocation,

wage premiums, and local employer concentration supply those complementary tests. This metric contributes a specific institutional question: how readily does the economy replenish its population of payroll employers, and are new employers creating a durable route into productive and well compensated work?

SOURCES AND REPRODUCTION NOTES

[1] United States Census Bureau (Current methods). Business Dynamics Statistics Visualization Tools Glossary. Firm and establishment boundaries age definitions and job creation rates; verified 4 October 2026.

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RELATED CHAPTERS 081 · 083 · 086 · 091

CHAPTER 083

Job creation destruction and reallocation

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN Third quarter 1992 to fourth quarter 2025

United States establishment job flows have become smaller relative to employment over a long period while retaining substantial cyclical variation.

The difference between gross and net job change

Gross job creation measures employment added at expanding and opening establishments during a specified interval. Gross job destruction measures employment removed at contracting and closing establishments. Their difference is net employment change. Their sum is gross job reallocation, an indicator of how much the distribution of payroll employment changes across workplaces. These quantities can be reported as counts or as rates relative to employment. The United States Bureau of Labor Statistics Business Employment Dynamics program produces quarterly administrative measures beginning in the third quarter of 1992, allowing more than three decades of comparable observation.[1][2]

The unit is the establishment's employment change between quarterly snapshots. Suppose a workplace increases from twenty to twenty five employees. It contributes five jobs to creation, even if it hired twelve people and seven departed during the interval. The measure captures the change in the number of positions filled at the establishment rather than every hiring and separation transaction. Hiring and separation data from other programs measure worker movements more directly. Confusing the two can lead to a claim about falling worker turnover when the selected chart actually measures changes in establishment payroll size.[1]

A rate divides gross flows by an employment base. BLS uses an average of employment at the beginning and end of the quarter for its gross flow rates. This treatment handles openings and closings symmetrically and keeps growth calculations comparable. The reallocation rate is the creation rate plus the destruction rate using the same denominator. Excess reallocation removes the magnitude of the net change from the total flow, emphasizing simultaneous gains and losses beyond what the aggregate employment movement alone requires. Researchers should state which of these constructions they use.[2]

Net change can conceal radically different employment environments. In a hypothetical economy, creation of ten million positions and destruction of nine million produces the same one million net increase as creation of three million and destruction of two million. The first involves many more workplaces expanding and contracting; the second involves less organizational turnover. People experience those economies differently because opportunities to enter growing organizations and risks of displacement differ. Gross flows therefore complement net payroll statistics rather than acting as a substitute for them. Their relevance lies in the structure of opportunity and disruption.

The same person can be involved in more than one labor market event during a quarter, yet gross establishment flows are not a count of unique people affected. A worker leaving an expanding workplace can be replaced without contributing to its gross destruction total. A person hired at a contracting workplace can likewise join an establishment whose recorded contribution is a loss. The statistic measures changes in filled payroll positions attached to workplaces. Individual transition records are required to identify unemployment

spells, simultaneous jobholding, earnings changes, and whether a movement represents advancement or deterioration for the person involved.

The verified history and current endpoint

BLS's historical chart reports a private sector quarterly reallocation rate of 15.7 percent in the third quarter of 1992 and 11.6 percent in the first quarter of 2023. The intervening series shows a sustained decline before the pandemic, alongside recessions and temporary increases. The latest verified release covers the fourth quarter of 2025 and was published on 29 July 2026. It reports gross job creation of 5.9 percent and destruction of 5.5 percent, implying a combined reallocation rate of 11.4 percent from the rounded published rates.[3][4]

The latest release reports approximately 7.838 million gross gains and 7.245 million gross losses, leaving 593,000 net additional private payroll positions in that quarter. These are quarterly establishment flows, seasonally adjusted. They should not be compared directly with a monthly employment estimate without accounting for differences in coverage, timing, and revisions. The current release's endpoint also predates the date of this reference. As of the 4 October 2026 cutoff, the verified next quarterly release was scheduled for later October. A calendar date on the report is therefore not a contemporaneous measurement of gross flows.[4]

The national reallocation rate's long decline does not mean that layoffs continually accelerated. Both creation and destruction contributed to weaker gross flows. Falling destruction can represent greater stability for existing workers, while falling creation can reduce access to new opportunities. Separating the two lines is essential to evaluating the balance. BLS's detailed discussion finds a broad decline across industries over the longer history, while also documenting exceptions and differences across firm age, firm size, geography, and time periods.[5]

The pandemic is an exceptional interruption rather than a reason to erase the long record. BLS's historical chart shows a sharp spike in the second quarter of 2020, followed by normalization. Its scale reflects an extraordinary shutdown and subsequent reorganization of employment. A chart that chooses this spike as its starting point would produce an apparently dramatic decline with a very different interpretation from the movement beginning in the 1990s. Retain the spike, identify its context, and compare the underlying series before and after it.[3]

Quarter	Gross creation rate	Gross destruction rate	Combined reallocation rate
Third quarter 1992	See historical component series	See historical component series	15.7 percent
First quarter 2023	See historical component series	See historical component series	11.6 percent
Fourth quarter 2025	5.9 percent	5.5 percent	11.4 percent from rounded rates

Historical combined rates from BLS January 2024 spotlight [3]; latest components from July 2026 release [4]. These checkpoints do not replace the full quarterly series.

What declining flows contribute to the framework

Employment opportunity depends partly on whether workplaces expand and new employers appear. A worker seeking to leave a poor job needs alternatives, and a young worker needs an entry point. A smaller creation rate can narrow those channels even in a period of modest positive net employment growth. This provides a potential connection to labor market compression: fewer expanding organizational positions relative to the stock of existing employment can intensify competition for the positions that do become available. The metric helps distinguish an expanding payroll stock from a dynamic opportunity structure.

Automation can influence establishment flows in several directions. A firm that automates a task may contract its payroll, initially increasing measured destruction. A highly productive firm can subsequently expand without hiring proportionately, reducing the employment response to its output growth. Standardized software can also allow new entrants to operate with smaller payrolls. These channels connect technology to gross job flows, but they predict different short run movements. An aggregate decline in both creation and destruction cannot be attributed to one automation mechanism without additional firm and industry evidence.

Market structure supplies another possible connection. A productive incumbent can win customers from smaller competitors, concentrating production. If its employment requirements are lower, the redistribution of sales need not create payroll gains that match losses elsewhere. Conversely, a new entrant offering a labor intensive service can create many positions and increase reallocation. Linking employment flows to output, ownership, and productivity would reveal which structure is prevailing. The gross flow series alone identifies payroll adjustments rather than the economic value or labor intensity of the production changing hands.

Reduced destruction has real benefits that should enter the interpretation. Workers can retain income, experience, benefits, and workplace relationships when employment is stable. Lower disruption can therefore improve some dimensions of job quality while fewer creation opportunities weaken advancement. These effects can coexist. The useful question is whether stability becomes a platform for prosperity or a condition in which workers remain attached to existing employers because alternatives are scarce. Wage progression, job to job mobility, hiring at new firms, and displacement outcomes help distinguish those possibilities.

Worker fluidity supplies a complementary observation. A person can change employer while both establishments keep unchanged employment totals; conversely, an establishment can expand without demonstrating that workers gained access to better matches. Molloy, Smith, Trezzi, and Wozniak document common declines across worker and job-turnover measures dating to at least the early 1980s. Their findings attribute only part of the pattern to demographic change and reject the secular industry-composition shift as its explanation. The historical research endpoint remains separate from this chapter’s current BED release. [6]

Davis and Haltiwanger likewise find substantial declines within worker demographic groups and establishment categories. Aging workers and the shift away from younger and smaller employers contribute, but are not their main explanation. Their estimates connecting fluidity with employment rates use an identification strategy with its own assumptions; neither the within-group pattern nor the estimated relationship independently establishes automation as the cause. [7]

For monitoring, pair gross establishment job creation and destruction with hires, separations, direct employer changes, and transitions between employment, unemployment, and nonparticipation. Report each rate's source and denominator. A decline in forced job loss can improve security, while fewer voluntary employer changes can reduce opportunities to bargain for higher pay. The post-labor interpretation is strongest when weaker opportunity flows coincide with lower wage progression and diminished access to good jobs. More stable matches with rising pay and benefits would support a different interpretation, even if turnover remained low.

What the series cannot identify alone

Demographic slowing can reduce business turnover without technological displacement. A workforce and customer base growing more slowly require less rapid expansion of payroll capacity. Established industries can also mature, with fewer large expansions and contractions than during their early development. A long decline in flows might therefore describe a maturing economic structure. Evaluate the rate alongside population growth, labor force growth, employer entry, and output demand. These comparisons help determine whether the creation channel weakened more than underlying growth conditions would suggest.

Changes in establishment organization can affect recorded flows. Consolidating payroll reporting, changing ownership, splitting operating units, or outsourcing functions can alter the appearance of gains and losses. BLS uses longitudinal matching and methods designed to distinguish genuine operating events from administrative changes, but a research analysis should still inspect methodological notes and revisions. The distinction between a temporary closing and a confirmed establishment death is particularly relevant around sudden shocks. Administrative data provide extensive coverage without making every business event economically self explanatory.[1][2]

Industry mix also changes national rates. Industries differ in the frequency and magnitude of expansion, contraction, opening, and closing. A shift toward sectors with stable payrolls can reduce the national flow rate even when within industry behavior is unchanged. Plot industry specific rates and calculate a constant industry composition comparison where definitions allow it. Breaking the series down by employer age can similarly distinguish the aging of the firm population from lower turnover within young and mature business groups. Those decompositions turn an aggregate pattern into a more informative structural diagnosis.

The interpretation strengthens if creation weakens relative to output growth within comparable industries and if reduced opportunities coincide with weaker advancement or replacement earnings. It weakens if slower demographic growth explains most of the movement or if workers experience improving pay and access despite less churn. A rate of change is not a direct measure of productive capacity, social welfare, or the quantity of valuable work. Use it to describe how employment positions are redistributed, then combine that finding with the outcomes experienced by workers.

A useful normalization compares gross creation with real output growth over several years. The comparison asks whether additional production is accompanied by expansion of payroll opportunities. Use consistent industry and geographic coverage and avoid dividing by output growth in a single near zero quarter, which can create unstable ratios. A regression or rolling multiyear comparison is usually more interpretable than a raw quotient. Even then, the result combines technology, demand, hours, and organizational change. Its value is to reveal when production and employment opportunities increasingly follow different paths and to identify the sectors requiring closer investigation.

Building a reproducible flows chart

Download the BLS seasonally adjusted private sector gross gains and losses and their corresponding rates from a single release vintage. Plot creation and destruction as separate lines, with a second panel displaying their sum. Keep quarterly frequency for cyclical context and add a four quarter moving average to clarify the longer movement. Show net employment change in a separate panel or annotation, because subtracting two large flows answers a different question from adding them. State the average employment denominator in the caption.[2][4]

The historical chart should begin with the available 1992 observation rather than a recent recession spike. Identify the 2020 disruption and retain it. If plotting excess reallocation, subtract the absolute net change using compatible units and the same denominator. Do not call that result gross reallocation. Also avoid replacing establishment creation with hires from a worker flow survey. The choice of rate should remain consistent across time and across national, industry, and regional comparisons.

Monitor new quarterly releases and annual revisions. Preserve exact figures before rounding and recompute derived rates when source values change. The latest checkpoint in this chapter is fourth quarter 2025, published July 2026; future releases should update both the data and the caption. Related chapters on employer entry, initial payroll size, lost wage premiums, and local employer concentration explain whether reduced flows signal weaker opportunities, greater stability, or a mixture. Together they establish how easily workers can enter growing production and how that access changes over time.

SOURCES AND REPRODUCTION NOTES

[1] United States Bureau of Labor Statistics (Current methods). Handbook of Methods Business Employment Dynamics Concepts. Definitions of gross gains losses openings closings and establishment boundaries; verified 4 October 2026.

[2] United States Bureau of Labor Statistics (Current methods). Handbook of Methods Business Employment Dynamics Calculation. Symmetric employment denominator and longitudinal methods; verified 4 October 2026.

[3] Akbar Sadeghi United States Bureau of Labor Statistics (2024). Business Employment Dynamics Twentieth Anniversary. January 2024 historical job reallocation series third quarter 1992 through first quarter 2023; verified 4 October 2026.

[4] United States Bureau of Labor Statistics (2026). Business Employment Dynamics Fourth Quarter 2025. 29 July 2026 release Table A; fourth quarter 2025 gross flow rates and counts; verified 4 October 2026.

[5] United States Bureau of Labor Statistics (2022). The Decline in Employment Dynamism Over the Last Three Decades. Historical industry age and size decomposition of employment flows; verified 4 October 2026.

[6] Raven Molloy, Christopher L. Smith, Riccardo Trezzi, and Abigail Wozniak (2016). Understanding Declining Fluidity in the U.S. Labor Market. Original worker-and-job-turnover research documents declines from the early 1980s; demographics explain only part, and industry composition does not. Verified for version two 4 October 2026.

[7] Steven J. Davis and John Haltiwanger (2014). Labor Market Fluidity and Economic Performance. Original 2014 research finds substantial within-group declines; demographic and employer-age composition contribute but are not the principal explanation. Verified for version two 4 October 2026.

RELATED CHAPTERS 081 · 082 · 086 · 091

CHAPTER 084

Automation displacement and task reinstatement

EVIDENCE STATUS **Historical evidence** · OBSERVATION SPAN 1947 to 1987 compared with 1987 to 2017

A published United States decomposition finds a later historical balance of stronger automation displacement and weaker creation of new tasks for human labor.

The task balance as an economic measure

Automation displacement and task reinstatement describe opposite changes in the allocation of productive work. Displacement occurs when capital becomes able to perform tasks previously assigned to people. Reinstatement occurs when production acquires new tasks in which people perform the work. The proposed indicator compares the contributions of those changes to labor demand over time. It concerns what humans are asked to do within production, rather than only how productive an unchanged workforce becomes. The principal verified long period study is Acemoglu and Restrepo's 2019 analysis of United States industry data.[1]

A task is an activity required to deliver a product or service. A job typically bundles several tasks, and a production process involves tasks spread across several jobs and organizations. Automating one task can remove a fraction of a position, permit a position to concentrate on other work, or eliminate an entire occupation's central function. Creating a task can likewise appear inside an existing job without generating a new occupational title. The balance therefore cannot be measured simply by subtracting the number of disappearing job titles from the number of newly named occupations.

Labor demand in the published decomposition is represented through the wage bill, combining employment and compensation. The framework separates productivity, sector composition, substitution associated with factor prices, and changes in task allocation. Changes in task content are inferred from industry data and modeling assumptions, rather than counted directly from a national task registry. This distinction governs the units: reported contributions to labor demand are estimated changes in the wage bill channel. They should not be relabeled as an observed percentage of jobs removed or a physical count of tasks transferred to machines.[1]

There is no simple universal numerator and denominator comparable to a labor force participation rate. A practical research version uses estimated displacement and reinstatement contributions per year and their difference. A monitoring version would require consistent task level observations linked to employment, compensation, and output. Until such information is available, the historical decomposition serves as a mechanism indicator with a dated research endpoint. BLS's own examination of technology measurement identifies the importance of task changes and the difficulty of observing them directly through existing labor statistics.[2]

The allocation of a task and its economic weight are separate concepts. Moving a minor administrative activity to software has a different effect from transferring the central production activity of a large industry, even if both count as one task. A national indicator therefore needs weights such as hours, compensation, value added, or contribution to output. Each weighting answers a different question and can change over time. Counting every task equally would give a rare activity the same importance as an activity performed by millions of workers. The published decomposition uses economic information precisely because a simple task count cannot capture labor demand.

The historical change in balance

Acemoglu and Restrepo estimate that displacement reduced labor demand by approximately 0.48 percent annually over 1947 to 1987, while reinstatement contributed approximately 0.47 percent annually. Over 1987 to 2017, the corresponding estimates are a 0.70 percent annual displacement reduction and a 0.35 percent annual reinstatement contribution. The near balance in the earlier forty year period therefore becomes a negative task allocation contribution in the later thirty year period. The later cumulative task content shift is estimated to reduce labor demand by approximately ten percent.[1]

These numbers describe a model based decomposition, not an official statistical series regularly updated each quarter. The published paper appeared in 2019, and its later observation window ends in 2017. It provides evidence about a change already underway before widespread generative artificial intelligence. It does not establish the task balance prevailing in 2026. Presenting the original endpoint matters especially because a later acceleration in new tasks, a change in adoption, or a different industry composition could alter the balance after the study period.

The two historical periods are useful because each exceeds the twenty year criterion and because the comparison distinguishes automation's presence from its balance with other innovation. Earlier automation could be substantial while new human tasks kept labor demand broadly involved in production. The later period can therefore reflect a changing mix of innovation rather than the sudden invention of automation. That distinction is central to the historical post labor claim. It explains why evidence of old mechanization by itself is insufficient, while a shift in how replacement opportunities compensate for mechanization is more informative.

The calculated difference between annual contributions is close to zero in the earlier period and approximately minus 0.35 percentage points in the later period. This arithmetic is a concise description of the reported estimates. It should not be treated as a forecasting rule or mechanically compounded to predict a future employment total. Productivity effects and other changes can raise aggregate labor demand even when task allocation shifts against labor. The balance indicator isolates one channel within a broader economic process rather than claiming to account for every change in employment and pay.

Estimated annual contribution	1947 to 1987	1987 to 2017
Automation displacement	Minus 0.48 percent	Minus 0.70 percent
Task reinstatement	Plus 0.47 percent	Plus 0.35 percent
Approximate task balance	Minus 0.01 percentage points	Minus 0.35 percentage points

Published estimates from Acemoglu and Restrepo 2019 [1]. Contributions refer to modeled labor demand through the wage bill; they are not job loss counts.

Why a task balance explains compression

The task balance supplies a concrete way to discuss the proposition that technology historically created replacement work. Replacement is an economic outcome that depends on the kinds of innovations introduced and the demand for their outputs. If new tasks expand rapidly enough, displaced people can gain roles in new production. If task creation weakens relative to displacement, productivity can grow while human opportunities expand less strongly. This is a mechanism that can connect falling labor shares, weaker wage growth, and shrinking direct employment requirements without assuming that every innovation has the same consequences.

Consider a hypothetical service organization with one hundred workers. Software removes work equivalent to twenty positions, while a new service creates tasks requiring eighteen positions. The direct task balance is a reduction equivalent to two positions before considering increased demand. If the next generation of software removes twenty positions and new services require only five, the direct balance is much more negative. These invented quantities illustrate the difference between a process containing both displacement and creation and a process in which their relative scale changes. The amount of new work matters as much as its existence.

Productivity can offset part of a negative task balance through lower prices, increased demand, and expansion of tasks that remain human. That channel must be considered separately. A large productivity improvement might create enough additional activity to expand payroll despite displacement. A modest improvement might mainly reduce staffing. The relevant empirical question is whether human tasks, output growth, and pay together generate sufficient labor demand. Measuring technology adoption alone does not answer it, because adoption can change task allocation, productivity, and the size of the market simultaneously.

The balance is also useful for examining good jobs. New tasks may require different skills, arise in different places, or offer different compensation from tasks that disappear. Even an equal number of new and old positions would not guarantee a smooth transition for displaced workers. A former clerical worker may lack the credentials for a new technical role; a new service position may pay less than a lost production role. Combining task balance with occupational polarization and replacement earnings therefore makes the post labor interpretation more specific about access to prosperity rather than relying entirely on an aggregate headcount.

Identification and the limits of decomposition

The principal limitation is that task changes are inferred partly from residual movements in industry labor shares after accounting for other channels. Residuals can incorporate model error, measurement error, unobserved changes in market power, and omitted organizational developments. The original study checks its interpretation against additional indicators of automation and new work, but the estimates remain dependent on assumptions. A robust presentation should therefore label the results estimated displacement and reinstatement contributions. The precision of a numerical estimate does not turn it into a direct count of technology replacing humans.[1]

A second issue is simultaneous change. Industries can automate existing tasks and create new human tasks during the same period. Their net labor share movement might conceal large offsetting changes. Aggregation

can therefore understate both gross displacement and gross reinstatement, even when their difference is more visible. Shorter intervals and task level data would help identify both channels. However, finer data are only useful if task descriptions remain comparable; changes in terminology alone can create the appearance of new work without a genuinely new productive activity.

Other research shows why new work must remain in the analysis. Autor and coauthors' study of 1940 to 2018 documents continuing emergence of occupational work and changing locations of new opportunities. Its evidence is compatible with a less favorable balance for some workers without implying that new tasks stopped appearing. That study provides a different measurement approach using occupational titles and innovation exposure. The two research designs can inform each other, but their units and historical windows should remain distinct rather than being merged into a single uninterrupted line.[3]

A stronger post labor interpretation would require updated data confirming that displacement continues to outrun reinstatement and that productivity expansion does not restore comparable human earnings opportunities. A weaker interpretation would follow if new tasks and market expansion broadly offset substitution while workers obtain improving real compensation and access. Policy, business investment choices, and institutions may influence which technologies are developed and adopted. The historical balance therefore supports a diagnosis of past changes, while leaving room for different future outcomes and for active changes in the direction of innovation.

The distinction between labor substitution and productivity improvement also affects policy interpretation. Two technologies producing identical cost savings may have different effects on human opportunity. One assists employees so they can handle more demand; another transfers their tasks to equipment. Both can improve output per hour, while their direct effects on task allocation differ. New product demand can subsequently change either outcome. A monitoring system should therefore ask which work shifted, which work was created, and whether demand expanded, rather than classifying every productivity improvement as displacement. This separates the production mechanism from its final employment and compensation outcomes.

Displaying the balance and updating the evidence

Use a paired bar chart showing displacement below zero and reinstatement above zero for each of the two historical periods. Add a separate marker for their approximate difference. The caption should identify the United States private sector, the publication year 2019, the two observation windows, and the wage bill interpretation of labor demand. Avoid a line chart suggesting annual observations if only period average contributions have been transcribed. Reproducing the paper's annual decomposition requires its data and methodology rather than interpolating between averages.[1]

For monitoring, maintain a research log of studies that update task allocation, automation exposure, and new work. Record the data endpoint separately from the working paper revision date. A new publication using the same old observations adds a new interpretation rather than a new observation year. Direct firm surveys and detailed occupational data could complement the decomposition, but keep adoption, task transfer, new task incidence, employment, and pay as separately labeled measures. This prevents evidence about one stage of the mechanism being substituted for another.

Related chapters examine the number of employees accompanying new production, the rate of employer entry, the distribution of new occupations, and the erosion of wage premiums. Together they show whether productive expansion continues to produce attractive human opportunities. The distinct contribution of task balance is explanatory: it identifies the competition between technology that reallocates existing activity to capital and innovation that expands useful activity for humans. That competition provides a historically grounded bridge between automation and the changing economic role of labor.

SOURCES AND REPRODUCTION NOTES

[1] Daron Acemoglu and Pascual Restrepo (2019). Automation and New Tasks: How Technology Displaces and Reinstates Labor. Journal of Economic Perspectives 33 number 2 Figures 3 and 5; observation windows 1947 to 1987 and 1987 to 2017; verified 4 October 2026.

[2] United States Bureau of Labor Statistics (2020). Assessing the Impact of New Technologies on the Labor Market Key Constructs Gaps and Data Collection Strategies for the Bureau of Labor Statistics. Official assessment of task based technology measurement and available data; verified 4 October 2026.

[3] David Autor Caroline Chin Anna Salomons and Bryan Seegmiller (2024). New Frontiers: The Origins and Content of New Work, 1940–2018. Author hosted original research published in Quarterly Journal of Economics 2024; occupational new work through 2018; verified 4 October 2026.

RELATED CHAPTERS 081 · 085 · 086 · 088

CHAPTER 085

New work creation and occupational polarization

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN United States 1940 to 2018

New work has continued to emerge across eight decades, while its location shifted away from accessible middle paid occupations after 1980.

New work as a measurable flow

New work creation measures the emergence of activities requiring new forms of human expertise. It is different from employment growth in an existing occupation, and different again from adding fashionable words to a job advertisement. The central question is whether the economy develops substantial new labor using specialties as established tasks become cheaper to automate. A useful indicator follows both the arrival of specialties and the number, pay, and accessibility of positions associated with them. Counting titles alone cannot establish the economic scale of the opportunities.

The strongest historical evidence in this entry is a reconstruction by Autor, Chin, Salomons, and Seegmiller covering the United States from 1940 through 2018. The authors compare successive Census occupational indexes, link new specialties to employment records, and distinguish patent exposure that augments occupational outputs from exposure that substitutes for task inputs. Their research provides evidence of ongoing new work alongside a shift toward professional and lower paid service occupations after 1980. The historical record therefore concerns changing composition, rather than a demonstrated cessation of occupational invention. [1]

A practical dashboard needs separate numerators. The title creation rate divides qualifying additions by the existing stock of titles. An employment weighted new work share divides estimated employment associated with newer specialties by total employment in the relevant population. A good job creation measure adds a wage, benefits, hours, and entry requirements threshold. These answer different questions. A specialty employing a small number of people can count as an innovation without substantially improving employment prospects for displaced workers. All units should identify whether the observation represents a title, an occupation, a task, or a worker.

Occupation classifications create an important boundary. Broad occupations can contain both old and new tasks, while a newly named specialty can describe something practiced earlier. Census indexes guide the coding of respondents' descriptions; they are not a real time registry of inventions. Changes in the official codes and aggregation rules require crosswalks before comparing employment across decades. The Census Bureau documents these changes and provides occupation code lists and conversion guidance. A researcher should preserve the original vintage as well as the harmonized series. [2]

This entry belongs beside task reinstatement because it gives a more tangible representation of the positive side of technological change. It also stands separately from ordinary occupational polarization. Employment can polarize because middle occupations contract, even if no genuinely new work appears at either end.

Conversely, a large flow of new specialties can reproduce an unequal structure if the best paid opportunities require credentials or experience inaccessible to the workers leaving declining activities. The relevant object is the distribution of opportunity created by economic change, not the novelty of the vocabulary.

Eight decades with changing opportunity

The verified observation window spans 78 years and comfortably meets the twenty year criterion. It contains two particularly useful comparison periods: 1940 to 1980 and 1980 to 2018. These are historical estimates, published in final journal form in 2024. They do not describe a measured annual flow through 2026. The later publication date should remain in the source note, while the chart ends at the actual observation boundary. Treating the title of a recent article as a recent labor market reading would create a false impression of freshness. [1]

The historical comparison is informative because a changing occupational structure can be examined over more than one technological regime. The later period covers computerized offices, increasingly automated production, and several waves of digital services. It reaches far beyond the brief history of generative AI. The appropriate longitudinal question is whether new activities maintain the former supply of broadly accessible, adequately paid positions. A positive total of newly recorded specialties provides only the starting point for that test. It does not say how many workers could realistically enter them.

The timing of occupational losses is another longitudinal dimension. Jaimovich and Siu connect job polarization with jobless recoveries over approximately 35 historical years. Their original research finds that routine occupations account for the persistent joblessness underlying slow aggregate employment recovery, and that essentially all routine employment loss in their study occurs during downturns. [4] This supports a ratchet hypothesis: recessions can concentrate a structural reorganization that is not reversed when output recovers. It does not require smooth deterioration in every expansion. The result concerns routine occupational employment, whereas the new-work research concerns the creation and employment content of specialties; the two provide distinct views of renewal and loss. Plot routine employment per relevant population alongside its employment share and the time required to regain pre-recession levels. Preserve harmonized occupation codes and distinguish a rebound in employment elsewhere from recovery of the lost routine roles. The cited study is historical and predates the pandemic. Its pattern should not be declared universal for 2020 or extended through 2026 without a comparable update. Nor does recession timing alone identify automation as the cause of every missing routine job.

The research also estimates that roughly 60% of 2018 employment was associated with job specialties added to the Census indexes since 1940. This is an imputation: within each broad occupation, the share of new micro-titles is multiplied by its employment. The Census does not directly count workers by every micro-title. The headline should therefore describe estimated employment in newer specialties, rather than claim that 60% of entire broad occupations did not exist in 1940. [5]

This positive result is a substantive check on any assertion that the economy has stopped creating human work. Its distribution remains the issue: many new specialties can emerge while accessible, adequately compensated pathways become less common. The paper’s patent-linked analysis also finds that automation’s demand-reducing effects intensified in the later four decades, while augmentation’s demand-increasing effects did not. These are historical estimates using constructed exposure measures, rather than a current count of tasks completed by machines. Together, the findings support measuring both new expertise

and the scale and accessibility of the jobs it creates. An employment-weighted estimate, a title flow, and an observed worker transition should remain separate series. [5]

Use a checkpoint table to record the scope and direction of the evidence, rather than manufacturing an annual numerical series. The research does not justify interpolating smoothly between decades. Decennial counts can be sensitive to when Census coders incorporate a specialty into the index. An interval with few additions may reflect delayed recognition as well as slow creation. The analysis should show additions as flows over the actual comparison intervals and employment as a stock at the associated survey date. Doing so makes the two time concepts visible.

A newer occupational employment release can update the size and wages of familiar occupations, but it cannot automatically extend this historical new work series. An extension requires applying a consistent title identification method, documenting classification changes, and separating new activities from renamed categories. Current BLS employment projections also include prospective occupational staffing changes. They should be displayed separately from realized historical data, because a projection embodies assumptions about future demand rather than evidence of an observed secular process. The agency explains its multi stage projection framework in its methods documentation. [3]

Window	Verified interpretation	Observation boundary
1940 to 1980	New specialties included substantial middle paid production and clerical work	Historical Census comparison
1980 to 2018	New work shifted toward professional work and secondarily lower paid services	Historical Census and ACS comparison
2024 publication	Final journal research reporting the historical record	No extension of observations beyond 2018

Qualitative checkpoints from the original research [1]; no annual values are inferred.

Why new work matters for compression

New work is the principal reason a fixed inventory of tasks is an inadequate model of long run employment. When a technology improves a product, it can generate demand for expertise in design, repair, coordination, regulation, and use. When it makes an existing task unnecessary, it can release workers without creating a comparably accessible successor activity. The balance depends on the kind of innovation, the expansion of demand, and the capacity of workers to acquire the relevant skills. This is a mechanism to test rather than an automatic equilibrium guarantee.

The post labor interpretation becomes stronger when the economy continues creating work but supplies fewer routes into stable middle incomes for people with ordinary educational resources. That is a more precise proposition than saying there are no new jobs. The distinction matters because a growing professional sector can coexist with increased competition for jobs that do not require a degree. A displaced production worker cannot instantaneously become a specialist clinician or engineer. Meanwhile, growing personal services may absorb labor while providing less bargaining power or less predictable income.

Consider a hypothetical economy that loses one hundred established middle income positions. It creates forty specialist positions, eighty service positions, and twenty maintenance positions. Aggregate employment can rise while accessible middle income opportunities fall. The example proves nothing about actual quantities; it shows why net employment, new title counts, and job quality need separate denominators. A

longitudinal assessment should ask how many successor positions preserve earnings for the displaced population, how much training they require, and how frequently workers actually move into them.

Geography can amplify the mismatch. New specialties may cluster around universities, research institutions, or expensive metropolitan labor markets, while displaced tasks are distributed across industrial towns. National totals then overstate the opportunity available to a particular household. Occupational mobility can also be constrained by health, caregiving, age, licensing, or the inability to finance a period without earnings. These barriers are part of the economic transmission mechanism. They explain why a technologically successful industry can contribute little immediate relief to a community losing its established work.

This measure also helps specify what would count as a favorable development. Broadly accessible new technical, maintenance, care, and skilled service roles could counter compression even if routine production employment continues falling. Improving wages and career progression in existing service work can be equally relevant; a job need not have a new title to distribute prosperity. The most useful claim is therefore conditional: automation contributes to post labor pressures when displacement outpaces the creation or improvement of opportunities that the affected population can reach. That condition must be evaluated empirically.

Interpretations that the indicator cannot settle

The historical survival of new work is meaningful counterevidence to a strong claim that technology simply exhausts a fixed stock of human tasks. This chapter should preserve that result. The weaker claim about compression of accessible good jobs remains compatible with it, but needs evidence on wages, employment scale, entry requirements, and transitions. Treating every new specialty as a disguised pointless job would replace measurement with a judgment about unfamiliar work. Neither an unusual title nor an indirect contribution establishes an absence of economic or social value.

The recorded date of a specialty is also imperfect. An activity can exist informally before becoming common enough to receive a separate label. A new label can reflect changes in professional organization, licensing, or reporting rather than a major technological advance. Conversely, an occupation can undergo substantial task transformation while retaining its familiar name. The official classification documentation supports a careful approach to these discontinuities. Researchers need to distinguish the arrival of a label from the arrival of the underlying activity, and to publish decisions about ambiguous cases. [2]

The causal relationship between innovation and occupational demand can run in both directions. An expanding industry may induce inventors to develop useful technologies, while the technology itself expands the industry. Trade, demographic change, public spending, and consumer preferences can generate new specialties without automation being the dominant cause. A convincing design needs a source of innovation exposure that is not simply a reflection of contemporaneous growth. Even an identified occupational effect does not measure the whole economy's response, because spending and labor can move between sectors.

Wage ranks introduce another risk. Defining the middle using current wages can move an occupation between categories after its pay changes. Defining it using initial wages makes the comparison stable but can conceal the development of a better paid occupation. Both views are useful if clearly labeled. Job quality also includes benefits, safety, scheduling, autonomy, and career progression. An index based only on hourly wages can mistake a job with adequate pay but unstable hours for a secure replacement opportunity. A transparent dashboard should publish those dimensions separately.

Evidence would weaken the compression interpretation if new work increasingly offered strong earnings and entry pathways to the groups leaving automated tasks, or if their actual transitions preserved lifetime income. Evidence would strengthen it if new opportunities remained concentrated behind rising credential or geographic barriers, while the accessible replacements had persistent pay penalties. The relevant test follows people as well as classifications. That prevents a change in the composition of occupations from being mistaken for an identical change in the prospects of every worker.

Charting and extending the record

Use paired charts. The first displays new specialty creation by broad occupational wage tier over the verified historical intervals. The second displays employment and real earnings in those tiers, split by educational attainment. Preserve the research's harmonization and interval definitions. Do not draw an annual 1940 to 2026 line from a handful of decennial comparisons, or join a forecast to the end of the observed series. A separate panel can show the latest occupational staffing data without presenting it as an extension of the title creation measure. [1][3]

For an update, archive successive Census indexes and code lists, document a reproducible matching procedure, and review additions that appear to be spelling changes or subdivisions. Link accepted specialties to employment using a stated allocation rule. Then add wage and accessibility information, with uncertainty when employment cannot be assigned precisely. Preserve decisions and rejected cases so another researcher can distinguish a genuine change in new work from a change in the coding process. Official crosswalks should accompany the data files. [2]

Connect this entry to task displacement and reinstatement, loss of wage premiums, urban opportunity, and perceived socially useless work. Those chapters ask whether tasks expand, whether jobs preserve earnings, whether opportunities are geographically accessible, and whether workers see a contribution in what they do. None is interchangeable with a count of new specialties. This entry's contribution is to evaluate the quality and location of economic renewal, while retaining the historically important fact that renewal continues.

SOURCES AND REPRODUCTION NOTES

[1] David Autor, Caroline Chin, Anna Salomons and Bryan Seegmiller (2024). New Frontiers: The Origins and Content of New Work, 1940–2018. Author manuscript of Quarterly Journal of Economics research; Census title and employment analysis 1940 to 2018; verified 4 October 2026.

[2] United States Census Bureau (2020). Recent Changes in the Census Industry and Occupation Classification Systems. Technical Paper 78 on occupation and industry coding revisions; verified 4 October 2026.

[3] Bureau of Labor Statistics (2026). Employment Projections Methods Overview. Current projection methodology; forecasts are separate from observed title creation; verified 4 October 2026.

[4] Nir Jaimovich and Henry E. Siu (2012 working paper, 2018 revision, 2020 publication). Job Polarization and Jobless Recoveries. Original research on routine employment losses and their concentration in recessions; recession effects are distinguished from a continuous annual trend. Verified for version two 4 October 2026.

[5] David Autor, Caroline Chin, Anna Salomons, and Bryan Seegmiller (2024 final journal article; author manuscript revised December 2023). New Frontiers: The Origins and Content of New Work, 1940–2018. Author manuscript revised December 2023, final journal article 2024; approximately 60% is imputed employment in newer specialties, not broad occupations. Verified for version two 4 October 2026.

RELATED CHAPTERS 024 · 084 · 086 · 088 · 096

CHAPTER 086

Automation and loss of wage premiums

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN United States 1980 to 2016 with separate January 2026 displacement outcomes

Automation can remove better paying positions and the earnings premiums attached to them, producing compression that employment counts alone cannot reveal.

The premium attached to a position

A wage premium is the additional compensation a worker receives in a particular job relative to a relevant alternative. This chapter focuses on premiums above the worker's outside option, rather than higher wages explained by greater skill, dangerous conditions, inconvenient hours, or other compensating differences. The economic question is whether automation removes positions that allow ordinary workers to share organizational surplus. If displaced workers find another job with substantially lower pay, employment has recovered while access to that surplus has diminished.

The premium requires a counterfactual denominator. A simple wage difference between two industries is insufficient because the workers, hours, and working conditions may differ. Better measurement follows the same workers across employers or estimates pay differences while controlling for observable and persistent worker characteristics. Even those methods must distinguish a genuine employer premium from a productivity match unique to a particular job. The measure can be expressed as a percentage difference, a log wage gap, or the share of earnings attributed to a premium. The chosen unit should remain consistent through time.

Acemoglu and Restrepo study automation and rent dissipation using United States data from 1980 to 2016. Their November 2025 version examines how displacement from tasks paying premiums changes wages and inequality. The authors attribute 52 percent of the rise in between demographic group inequality to automation in their framework; rent dissipation accounts for about one fifth of that modeled contribution. These are estimates for a specified decomposition, not the share of all inequality or a direct count of jobs automated. Their long historical window meets the secular criterion. [1]

A separate descriptive measure is the earnings recovery rate among displaced workers who return to full time wage and salary employment. BLS asks about pay in the lost and replacement jobs. This is a useful outcome indicator because it directly captures whether reemployment restores earnings, but it does not identify automation as the reason for job loss. The survey includes closures, insufficient work, and abolished positions. Its technical note specifies the population, retrospective reporting, and comparison rules. The two measures should therefore be presented alongside each other with different labels. [2][3]

The distinction between a premium and a high wage is essential to interpretation. A specialized occupation can earn more because training and scarcity make its labor highly productive. A bargaining agreement can also allow workers to claim more of a jointly produced surplus. Automation may affect both, but the mechanisms differ. An assessment should identify which component is disappearing, whether the

replacement tasks use comparable skill, and whether other workers gain access to the freed surplus through prices, wages, or ownership. Those questions determine the distributional consequence.

A historical mechanism and a current outcome

The research record and the official survey have different observation clocks. The automation analysis covers 1980 through 2016, even though the manuscript was revised in 2025 and the journal publication is recent. BLS's latest displacement release available at the cutoff was published on 27 August 2026. It describes job losses during January 2023 through December 2025 and employment status in January 2026. The recent survey can show whether earnings recovery is a current problem; it cannot independently update the causal automation decomposition. [1][2]

BLS reports 3.3 million long tenured workers displaced in the 2023 to 2025 window. Of these, 66.1 percent were reemployed in January 2026. Among reemployed full time wage and salary workers who reported earnings on the lost job, approximately 49 percent earned as much or more in the replacement job. The corresponding share in the January 2024 survey was approximately 62 percent. The earnings comparison has a conditional denominator: it excludes people who were not reemployed in the relevant kind of job or did not supply the necessary earnings information. [2]

These results should not be translated into a claim that half of all displaced workers recovered their former pay, or that the latest deterioration is a forty year trend. The latest pair of surveys describes a short comparison across overlapping retrospective windows. Changes can reflect the industries affected, macroeconomic conditions, inflation, worker age, or the timing of job losses. The long historical survey program makes further longitudinal work possible, but a harmonized secular earnings recovery series would require examining definitions and samples across vintages. The contemporary release is a checkpoint, not that completed reconstruction. [3]

The table keeps model based historical attribution separate from an official contemporary outcome. This is useful because readers can otherwise confuse a modeled percentage contribution to inequality with a probability of individual earnings loss. An attribution share can be large even when many workers remain employed, while an earnings recovery rate can deteriorate for reasons unrelated to automation. Displaying the concepts together supports a more complete account of labor market compression without asking either statistic to answer the other's question.

Measure	Observation window	Verified checkpoint
Automation and premium dissipation research	1980 to 2016	Long historical decomposition of wages and between group inequality
Long tenured worker reemployment	January 2026 after 2023 to 2025 losses	66.1 percent reemployed
Earnings recovery among qualifying reemployed workers	January 2026	About 49 percent earned as much or more
Earlier earnings recovery comparison	January 2024	About 62 percent earned as much or more

Historical research [1] and BLS August 2026 release [2]; the denominators and time windows differ.

How automation can compress good jobs

An employer evaluating automation compares the cost of the machine or system with the compensation required to retain workers in the affected tasks. If those workers receive a premium above the earnings available elsewhere, replacing them can be privately attractive even when their underlying contribution remains valuable. The displaced worker loses both the task and access to the premium. This creates a second earnings channel beyond the reduction in demand for the worker's skills. The framework helps explain why a person can move promptly into a new position and still experience a durable economic loss.

A hypothetical example makes the distinction concrete. Suppose a worker earns thirty units per hour in a stable production role and could earn twenty two in another locally available job. A new system eliminates the former position. The worker's unemployment spell might be brief, yet annual income falls if hours remain unchanged. The eight unit difference is not automatically a rent: some could compensate for difficult conditions or reflect a productive match. Establishing the premium requires evidence. The example shows why reemployment alone cannot establish full economic recovery.

This mechanism fits a version of post labor economics centered on the distribution of prosperity. The economy can keep producing the same goods with fewer positions that pay workers a share of organizational surplus. It may create replacement work in settings with narrower margins or weaker collective bargaining. Total work remains abundant, while fewer positions provide a reliable route to accumulated wealth. A dashboard focused on unemployment would overlook this shift. Real earnings, benefits, tenure, and the distribution of employer premiums provide the relevant complementary evidence.

Ownership changes the incidence. Lower production costs can benefit consumers, owners, or remaining workers depending on competition, pricing, and bargaining. A displaced worker who owns substantial capital may receive part of the gain through investments; a worker living primarily on earnings may not. Public transfers can replace part of the lost income, but that is a change in distribution through institutions rather than restoration of the former job's premium. The household outcome therefore depends on assets, taxes, prices, and benefits as well as the technology installed at the workplace.

The mechanism should not imply that every premium ought to be preserved indefinitely. Some premiums arise from exclusionary rules or organizational inefficiency, while others support training, stability, or a fair division of surplus. The useful research question is whether eliminating a premium creates sufficient social gains and whether displaced workers share in them. A privately profitable automation project does not supply that answer by itself. Comparing cost savings with productivity, consumer prices, and workers' subsequent earnings makes the welfare assessment more concrete.

Competing causes and identification limits

Automation is one possible cause of premium loss. Outsourcing, trade exposure, the dissolution of bargaining arrangements, a change in ownership, or the closure of a high paying employer can produce a similar pattern. Stansbury and Summers develop a broader declining worker power explanation for several United States macroeconomic changes since the early 1980s. That account makes institutions and bargaining an important competing or interacting mechanism. A falling premium therefore supports a distributional compression argument more directly than it supports an exclusive technological explanation. [4]

The automation research uses an explicit framework and exposure measures rather than an administrative register that marks each automated job. Its conclusions depend on how task displacement, worker groups, and wage changes are measured and on the assumptions required for causal attribution. An estimate for between group inequality cannot be generalized to within group inequality or wealth inequality without additional analysis. The empirical contribution is a plausible mechanism tested over a long window; the percentage attribution should remain attached to the authors' definition and specification. [1]

Survey earnings losses require similarly careful handling. Weekly earnings can change because hours change, and reported former earnings refer to a job held at an earlier date. Nominal comparisons can miss a loss in purchasing power. The people successfully reemployed full time are a selected group; those still jobless or working fewer hours may have larger income losses. A complete recovery measure should examine inflation adjusted hourly pay, hours, benefits, and cumulative earnings, while preserving the published BLS measure as its own series. The survey documentation identifies the comparison population. [3]

The direction of sorting also matters. Some workers leave a formerly high paying employer voluntarily for better conditions, more flexibility, or lower living costs. A lower wage need not imply lower welfare. Involuntary displacement provides a stronger setting for examining lost opportunity, but even there the alternative jobs can differ in amenities and hazards. Analysts should avoid assuming that the entire pay difference is a pure surplus premium. Information about job characteristics and worker preferences helps distinguish economic loss from changes in the compensation package.

The post labor reading would strengthen if automated task exposure predicted persistent earnings and benefit losses after controlling for worker characteristics, local demand, and competing shocks. It would weaken if affected workers broadly regained comparable lifetime earnings through new tasks, training, or better matches. It would also weaken if declining premiums were mainly attributable to institutional changes unrelated to labor saving technology. The most informative future research would trace affected workers over several years and identify who ultimately receives the associated cost savings.

A monitor of recovery and premium access

Use one historical research panel showing changes in estimated employer or task premiums by automation exposure, preserving the original 1980 to 2016 endpoint. Use a second panel for the BLS earnings recovery measure across harmonized survey vintages. Annotate the latest observation as January 2026 and the release as August 2026. Do not join the two panels into one numerical index: they have different units, populations, and causal meanings. A nominal recovery series should be labeled explicitly and accompanied by an inflation adjusted measure when reproducible. [1][2]

Reproduction requires the paper's group definitions, exposure construction, wage sample, and decomposition rules. A contemporary monitoring file should archive each BLS release and technical note, record whether tenure restrictions and earnings questions changed, and retain denominator counts alongside percentages. Where microdata permit, calculate outcomes for workers not reemployed full time as well as the published conditional comparison. Report the additional results as analyst calculations and publish the exact sample filters. This makes losses hidden by the conditional denominator visible. [3]

Read this chapter with good job availability, task displacement, earnings segregation, and transfer dependence. Together they distinguish the disappearance of a task, loss of access to a high paying

organization, household income recovery, and institutional compensation for that loss. The specific contribution here is that automation can compress earnings opportunities even when a worker finds replacement employment. The strength of that interpretation depends on measured premiums and credible attribution, not simply on a contemporary layoff announcement.

SOURCES AND REPRODUCTION NOTES

[1] Daron Acemoglu and Pascual Restrepo (2025). Automation and Rent Dissipation: Implications for Wages, Inequality, and Productivity. Manuscript dated 21 November 2025; United States observations 1980 to 2016; inequality attribution is between demographic groups; verified 4 October 2026.

[2] Bureau of Labor Statistics (2026). Worker Displacement: 2023–2025. Released 27 August 2026; January 2026 reemployment and earnings results; verified 4 October 2026.

[3] Bureau of Labor Statistics (2026). Displaced Workers Technical Note. CPS displaced worker supplement definitions and earnings comparison denominator; verified 4 October 2026.

[4] Anna Stansbury and Lawrence H Summers (2020). The Declining Worker Power Hypothesis. Original authors' research listing for the institutional explanation of secular worker power changes; verified 4 October 2026.

RELATED CHAPTERS 024 · 084 · 085 · 087

CHAPTER 087

Earnings segregation between employers

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN United States 1978 to 2013

Workers with similar earnings increasingly cluster at similar employers, making access to particular organizations an important part of the distribution of opportunity.

Measuring inequality across organizational boundaries

Earnings segregation between employers describes how workers with different earning capacities are distributed across organizations. In a less segregated structure, higher and lower paid employees often work inside the same employer. In a more segregated structure, each employer contains a narrower segment of the earnings distribution. This can arise when organizations specialize, outsource particular activities, or recruit increasingly similar workforces. The resulting pattern is a characteristic of employment organization, not simply an increase in the national wage gap or in the size of the largest firms.

The basic descriptive decomposition separates the variance of individual log earnings into a component between employer means and a component within employers. Employment weighting is essential: a small specialist firm should not count as much as a large employer merely because each is one observation. The between component can increase because employer pay policies diverge, because different workers sort into different organizations, or because employers employ more homogeneous workers. Those possibilities require separate analysis. An employer's average pay is not automatically a wage premium available to any person who joins it.

Song, Price, Guvenen, Bloom, and von Wachter examine matched United States worker and employer records from 1978 through 2013. About two thirds of the increase in log earnings variance occurred between firms. Their decomposition attributes that development to increased worker sorting and segregation, rather than a growing dispersion of firm specific pay after accounting for workforce composition. This distinction is the entry's most important empirical qualification: a widening gap between average firm earnings does not establish that employers themselves increasingly pay different premiums to equivalent workers. [1]

A useful segregation metric follows the distribution of estimated worker earning capacity across employers. The worker component can be estimated from longitudinal earnings and job changes, with controls and connectedness requirements stated explicitly. The measure can then describe the covariance between worker and employer components and the dispersion of worker composition across firms. The statistical meaning depends on the model, sample, and treatment of people who never change employers. A public dashboard should distinguish the raw between firm variance from these adjusted estimates.

Employer boundaries matter. A cleaner employed directly by a technology firm appears inside that firm's wage distribution. The same cleaner performing the same work through a separate contractor appears at another employer. Earnings segregation can therefore rise without a physical change in the workplace. An establishment, an enterprise, and a payroll employer are different units. Administrative employer identifiers

need consistent treatment across mergers, outsourcing, and organizational changes. This makes the metric particularly useful for studying access to the economic benefits of being inside a prosperous organization.

A long historical record with a firm endpoint

The verified research window lasts 35 years, satisfying the secular rule. The journal article appeared in 2019, but the observations end in 2013. The contemporary date on the Federal Reserve research page does not update that endpoint. A chart should show the original historical series and identify its data coverage. It should not imply that the same decomposition has been measured continuously through 2026. The publication establishes a historical pattern; extending it requires a comparable linked administrative dataset and replication of the original definitions. [1]

The raw between employer component is a useful starting point because it places organizational boundaries into an inequality accounting exercise. Yet the adjusted decomposition is necessary before interpreting the pattern as employer power or employer generosity. If a firm increasingly hires workers with specialized skills, its average earnings can rise even if its pay policy is unchanged. If another organization increasingly employs workers in lower paid occupations, its average can fall relative to the first. The observed separation of workers is economically important even when the adjusted employer premium does not widen.

The current Census Longitudinal Employer Household Dynamics program provides related public statistics through the Quarterly Workforce Indicators. National QWI includes employment, hiring, separations, gross job flows, and average earnings. These data can monitor changes by industry and workforce groups. They are aggregated products, however, and cannot reproduce a person and firm effect decomposition merely by comparing published cell averages. The national documentation also describes imputation, confidentiality protection, revisions, and uncertainty. Such features should be retained when constructing a contemporary companion dashboard. [2]

The research requires individual links between workers and employers over time. Census describes restricted LEHD data access separately from the public tables. A proper extension should identify the exact administrative universe and approved research dataset rather than treating public averages as interchangeable with microdata. Changes in coverage, employer identifiers, or earnings definitions can alter measured sorting. Maintaining a stable panel or testing alternative universes helps distinguish a genuine longitudinal change from a change in the statistical system. [3]

Item	Window or vintage	What it establishes
Original linked earnings analysis	1978 to 2013	A secular rise in segregation and sorting across employers
Final journal publication	2019	Historical findings with no automatic post 2013 extension
Public QWI monitoring	Quarterly releases with revisions	Related employment and earnings cells rather than worker firm decomposition
Restricted linked data	Access and coverage dependent	Potential basis for a comparable updated decomposition

Original paper [1] and Census data documentation [2][3]; public cells are not substitutes for the underlying historical decomposition.

Segregation as a channel of compression

This indicator contributes an organizational perspective to post labor economics. A society can create substantial value in prosperous firms while many workers remain employed outside those firms' career ladders, internal labor markets, benefits, and profit sharing arrangements. If ordinary support activities move into contractors with thinner margins, the workers may retain their tasks while losing proximity to the organization capturing the surplus. Employment survives, but the institution through which it distributes prosperity changes. That interpretation requires evidence on actual compensation and access, not only a variance calculation.

A hypothetical firm illustrates the distinction. Initially, engineers, administrators, maintenance staff, and cleaners share one payroll employer. The firm later retains engineers and contracts the other services. Even if every person keeps the same hourly wage, the distribution of employer average earnings becomes more unequal. If benefits, promotion routes, or wage progression subsequently deteriorate for contracted workers, the organizational shift also changes opportunity. The first event is measurable segregation; the second is a distributional consequence that must be documented separately. The example prevents the accounting identity from carrying an unsupported welfare conclusion.

Segregation can influence bargaining and learning. Workers inside one organization may have access to information about pay, collective representation, and internal vacancies. A workforce divided among multiple employers can face separate negotiations and narrower promotion routes even when it shares a physical site. High earning workers can also concentrate in organizations with more resources for training and career development. Those channels could make sorting self reinforcing. The present indicator identifies a setting in which such mechanisms can operate; it does not by itself estimate their magnitude.

The relationship with automation is indirect. Technology can make outsourcing easier by standardizing tasks, monitoring performance remotely, or separating activities formerly performed inside an integrated enterprise. It can also raise the value of specialist skills and make complementary workers cluster together. These are plausible mechanisms, but trade, procurement, management practices, and legal rules can produce similar organizational changes. To claim a technological contribution, an analysis needs variation in adoption or exposure that predicts segregation beyond those competing forces. A national trend alone cannot identify which channel dominates.

This measure is especially useful when paired with access to good jobs. If employers with high average earnings account for a small or shrinking share of accessible vacancies, an expanding economy may still leave many workers competing for positions at lower paying organizations. The relevant question is whether workers can move between segments and carry their earning capacity with them. Mobility, retention, and earnings after transitions reveal whether employer segregation represents benign specialization, persistent barriers, or the fragmentation of a previously broader distribution system.

Why between firm inequality is not a premium

A common interpretive error is to read every increase in between firm earnings variance as a rise in employer pay premiums. The original research directly cautions against that inference through its adjusted results. Its contribution is stronger when the qualification remains central. The raw separation of workers may indicate an increasingly stratified employment structure, but the extent to which equivalent workers receive different

pay requires worker controls and credible comparisons. An employer containing highly skilled workers can have a high average wage without offering an unusually large premium. [1]

Annual earnings also combine wage rates, paid hours, weeks worked, and spells of nonemployment. A growing gap in annual earnings can arise through scheduling and continuity of work even when hourly rates diverge less. For a post labor dashboard, that is a meaningful form of compression, but it should be labeled correctly. Related public QWI measures have their own reference periods and job attachment definitions. Analysts should inspect those definitions before comparing their averages with an annual administrative earnings variance. Keeping hours and attachment measures separate clarifies the source of household income differences. [2]

Worker and employer effects depend on longitudinal identification. Movers connect firms in a statistical network, but their transitions may reflect changing skills, health, career goals, or matches. People who never move provide less information about the relative premium at alternative employers. Measurement error and limited mobility can bias variance components unless the estimation addresses them. A sound replication should report its connected sample, exclusions, and correction methods. The estimated worker component is a statistical summary of persistent earnings differences, not a direct observation of inherent ability.

Employer composition can change because education rises, production becomes more specialized, or high productivity workers benefit from working together. Such changes may improve output. Segregation is therefore not intrinsically evidence of economic waste or technological unemployment. Its significance for post labor depends on the consequences for access, lifetime earnings, and bargaining. If workers outside prosperous firms receive adequate pay and benefits, or can move readily into them, segregation can coexist with broad opportunity. If organizational boundaries become durable economic barriers, the same statistic has a more concerning interpretation.

The strongest additional evidence would connect changes in employment organization to workers' subsequent earnings, benefit coverage, advancement, and transition probabilities. An outsourcing event study could follow the same occupation before and after the payroll boundary changes. An automation study could distinguish technology induced specialization from other restructuring. Evidence would weaken the compression reading if separation rose while earnings mobility and the quality of lower paying jobs improved. The chapter should preserve both possibilities instead of treating any between employer difference as proof of declining opportunity.

Monitoring organizational access to prosperity

Use a decomposition chart with total log earnings variance, the raw between employer component, and the within employer component. A separate panel should distinguish worker sorting, worker segregation, and adjusted employer premiums. Preserve the original research endpoint and label every unit. Do not place the employer premium line under a title implying that all between firm inequality is caused by firms. Where only the published historical decomposition is available, reproduce the verified record rather than estimating unseen recent values. [1]

A contemporary companion chart can use QWI earnings, employment, and transition measures by industry, firm size, and demographic group where available. Archive one complete release because Census revises the time series; its documentation recommends avoiding mixtures of separate vintages. Record the observation

quarter, release quarter, disclosure treatment, and uncertainty. Those public statistics help track the structure of opportunity but should retain their own definitions. A full updated sorting decomposition requires linked confidential records and the relevant research access. [2][3]

Connect this metric to loss of wage premiums, firm entry, good jobs, employer concentration, and urban opportunity. Together they ask whether prosperous organizations employ a broad workforce, whether entry creates alternative routes, and whether workers can access those routes. Earnings segregation adds the distribution of workers across organizational boundaries. It supports a historical picture of a more stratified employment system while leaving the technological cause and the welfare effects open to specific additional tests.

SOURCES AND REPRODUCTION NOTES

[1] Jae Song, David J Price, Fatih Guvenen, Nicholas Bloom and Till von Wachter (2019). Firming Up Inequality. Original paper landing page and final journal citation; matched United States earnings observations 1978 to 2013; verified 4 October 2026.

[2] United States Census Bureau (2026). National Quarterly Workforce Indicators Data. Public indicators, aggregation, imputation, revisions and release lag documentation; verified 4 October 2026.

[3] United States Census Bureau (2026). LEHD Data. Restricted linked worker employer data documentation and access boundaries; verified 4 October 2026.

RELATED CHAPTERS 024 · 082 · 086 · 088 · 091

CHAPTER 088

Urban wage opportunity for noncollege workers

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN United States wage gradients 1970 to 2015 with separate employment comparisons 2000 to 2021

The urban wage advantage for workers without a four year degree weakened over several decades even while metropolitan employment advantages persisted.

The wage return to a denser labor market

Urban wage opportunity asks whether workers can improve earnings by participating in a denser local labor market. The central measure in this chapter is the relationship between local population density and real hourly earnings for workers without a four year college degree. It can be shown as a wage gradient across commuting zones or as a premium relative to less dense locations. The measure is distinct from a city's average wage, the number of available jobs, or an individual's earnings gain after moving. Each of those requires a different comparison.

David Autor's 2019 research examines United States occupational and wage patterns from 1970 to 2015, with the endpoint constructed from pooled 2014 to 2016 ACS observations. It documents a pronounced weakening of the noncollege urban wage gradient alongside the erosion of urban middle skill production and office work. The college wage gradient follows a different pattern. The result supports a claim about the changing accessibility of urban prosperity, rather than a claim that cities ceased to offer opportunities to everyone. The underlying decades long comparison meets the secular rule. [1]

Noncollege requires an explicit educational boundary. A worker with some college but no four year degree may differ substantially from a worker without a high school diploma. Combining them can conceal changes in the group's composition. A useful dashboard therefore shows high school graduates, workers with some college, and workers with less than high school separately when the data permit. It should also distinguish age, sex, and nativity. Earnings comparisons need a common price adjustment and consistent rules for hours, employment status, and outlying wage observations.

Geography is equally important. A commuting zone is designed to represent a local labor market and can include urban and rural territory. A metropolitan statistical area is another geographic construct, while the Census urban and rural classification describes settlement geography. These categories should not be treated as synonyms. Census provides historical metropolitan delineations and explains their revision as population and commuting patterns change. A long time series needs fixed or harmonized boundaries so that an area becoming metropolitan does not masquerade as an economic improvement. [3]

The wage premium is also different from purchasing power. A dense location can pay more while requiring substantially more spending on housing and commuting. An opportunity measure should examine real wages in a national price sense and, separately, earnings after relevant local costs. The first asks how employers

value labor; the second asks what households can afford. Mixing them into one unreported adjustment would conceal the reason urban opportunity changes. Both are relevant to post labor economics because a higher nominal wage may no longer finance access to the place where the best opportunities concentrate.

Secular wages and persistent employment advantages

The wage evidence covers 45 years. Its publication in 2019 does not extend the observation endpoint to the publication year, and it certainly does not supply a 2026 reading. The study uses historical Census data and later ACS samples with harmonized occupations and local labor markets. Reproducing the result requires preserving those choices. The plotted endpoint called 2015 represents pooled survey years rather than one exact calendar year. That detail matters when comparing it with a business cycle event or a single year administrative release. [1]

A separate Federal Reserve analysis published on 19 January 2024 compares metropolitan and nonmetropolitan employment using the 2000 Census and 2017 to 2021 ACS estimates. For men aged 25 to 54, its metropolitan employment to population rate increases from 82.2 percent to 84.2 percent, while the nonmetropolitan rate falls from 78.7 percent to 76.2 percent. The latter endpoint is a pooled ACS estimate, labeled 2021 in the article. These observations provide useful counterevidence to a blanket claim that urban opportunity deteriorated on every dimension. [2]

The wage and employment findings can coexist. A location can remain the better place to find a job while offering a smaller earnings premium to less educated workers than it once did. Conversely, a smaller labor market can have a lower employment rate and lower wages without explaining the entire national deterioration in job quality. The choice of outcome determines the question answered. A comprehensive dashboard should show the probability of work, compensation conditional on working, and household purchasing power without allowing one measure to substitute for the others.

Occupational comparisons need special care across decades. The Census Bureau publishes code lists and crosswalks, but a mapping can merge distinct occupations or split an older category into newer ones. A researcher should use a consistent occupational classification and test whether broad results survive alternative aggregations. The geographic wage gradient should also be reported with uncertainty, because smaller education and location groups can have limited samples. The empirical strength comes from the persistence of a pattern across comparable groups, not from selecting an especially dramatic city. [4]

Measure	Earlier observation	Later observation
Noncollege urban wage gradient	1970 historical Census baseline	Weaker gradient by pooled 2014 to 2016 endpoint
Metro prime age male employment rate	82.2 percent in 2000	84.2 percent in pooled 2017 to 2021
Nonmetro prime age male employment rate	78.7 percent in 2000	76.2 percent in pooled 2017 to 2021

Wage gradient from Autor [1]; employment rates from the Federal Reserve's original analysis [2]. Different geography and outcome definitions prevent direct numerical combination.

A geographic route into labor compression

Dense labor markets have historically offered workers several kinds of opportunity: more employers, specialization, productive matching, and access to industries supporting a broad internal division of labor. When high productivity activities colocate clerical, administrative, production, and professional employees, workers with different credentials can share in the same economic ecosystem. Automation and organizational restructuring can weaken those links by eliminating supporting tasks or moving them to other employers and locations. The result can be a prosperous city with a narrower set of accessible well paid roles.

This is a plausible post labor channel because it concerns the distribution of productivity gains within a place. A city can become more productive while its most accessible jobs become service activities with weaker earnings progression. Highly paid residents can sustain demand for restaurants, cleaning, delivery, and personal care, but the scale of that demand does not guarantee that those roles inherit the pay of the office and production jobs that disappear. The mechanism should be evaluated through actual wages and career paths, rather than an assumption about the value of services.

A hypothetical comparison clarifies the stakes. A worker can choose a smaller labor market paying twenty units per hour or a city paying twenty six. If the city previously paid thirty, its relative wage opportunity has declined even though it still pays more. If housing costs also increase, the remaining premium may provide little additional household purchasing power. This example does not establish a real numerical trend. It shows why an urban advantage can persist while the practical return to accessing it becomes less attractive for a particular worker.

Geographic concentration can interact with credential crowding. If the best compensated metropolitan activities increasingly require a degree, workers without that credential may compete for the remaining accessible roles. A national increase in professional employment then overstates the expansion of opportunity available to them. Moving alone may not resolve the mismatch. Training can help, but its costs, duration, completion probability, and wage payoff need to be considered. The relevant measure follows actual outcomes for specific educational groups, including those who cannot readily undertake additional education.

The mechanism also links to transfer dependence and household costs. If market earnings no longer compensate sufficiently for the costs of living near productive employment centers, households may need housing assistance, income support, shared accommodation, or longer commutes to remain there. Those responses can preserve labor supply while changing the means of distributing prosperity. They are possible downstream consequences, not findings established by a wage gradient. Connecting local earnings to costs and transfers helps test whether geographic productivity has become less effective at financing ordinary workers' lives.

Migration prices and competing explanations

The density wage relationship is not the causal wage gain from moving. People choose locations, and workers with different skills or preferences can sort into cities. A changing gradient can therefore reflect composition as well as changes in the rewards offered to comparable workers. An analysis should control for observable characteristics, examine subgroups, and where possible follow movers. Even a worker fixed effect model may

face selection when a person moves because their career trajectory changes. The distinction between a place effect and a population difference should remain visible.

Housing supply can alter opportunity without a technological change. If productive cities restrict construction or experience other housing constraints, rising rents can prevent lower income workers from accessing their labor markets. A shrinking earnings premium can also reflect trade exposure, the reorganization of firms, union decline, or changes in public employment. These mechanisms can interact with automation. A descriptive wage gradient supports a geographical distributional finding; assigning that finding to a single technology requires an identification strategy beyond the longitudinal correlation.

The metropolitan employment comparison demonstrates why the entry is classified as mixed evidence. The observed metro advantage for prime age men persists and widens over the separate 2000 to 2021 window. That does not refute a weaker noncollege wage premium, because the outcomes and samples differ. It does refute a careless extension from wage compression to a statement that cities offer no employment advantage. The chapter should preserve the favorable employment evidence while assessing whether the quality and purchasing power of accessible jobs have changed. [2]

Changing geographic boundaries can create artificial improvement or deterioration. A growing county can enter a metropolitan area; an employer can relocate just outside a city boundary while remaining in the same commuting market. Historical delineation files help researchers identify these events. For a longitudinal density comparison, fixing geography to a baseline or consistently harmonizing commuting zones prevents administrative reclassification from driving the result. Current boundaries can be shown in a separate cross section when the objective is to describe today's choices. The two geographic methods answer different questions. [3]

The compression interpretation would weaken if less educated workers increasingly gained high quality jobs in productive places, if their earnings premium recovered after adjusting for composition, or if lower costs offset the smaller premium. It would strengthen if wages, benefits, career progression, and disposable income all lagged for comparable noncollege workers while the local productivity frontier advanced. An updated record is important because the verified wage study ends before the pandemic, remote work changes, and several recent labor market shifts. Those later developments should be tested rather than inferred.

A dashboard of accessible urban prosperity

Chart real hourly earnings against fixed baseline commuting zone density in several historical panels, split by educational attainment. Add an occupational composition panel showing where noncollege employment sits within the wage distribution. Preserve the source's pooled endpoint and use a distinct annotation for publication date. A second chart can show metro and nonmetro employment rates under the Federal Reserve's definitions. Do not splice the latter onto the wage gradient as though both measured the same object. [1][2]

To update the record, obtain comparable Census or ACS microdata, harmonize occupation and geography, apply stated hours and wage filters, and calculate uncertainty for each educational group. Publish both raw and composition adjusted gradients. Retain a national real wage measure and a separate local cost comparison; identify the treatment of housing explicitly. Archive geographic delineations and occupation

crosswalks with the analysis so changes in administrative categories can be audited. Contemporary metropolitan definitions should be recorded rather than silently applied to earlier populations. [3][4]

Connect this chapter with good jobs, new work, earnings segregation, housing burdens, and employer concentration. Together they test whether prosperity remains reachable through the labor market for workers outside highly credentialed occupations. The specific contribution here is a secular weakening in one geographic pathway to better pay, qualified by persistent urban employment advantages. It provides a more precise account of compression than a general claim that either cities or services have stopped generating economically valuable work.

SOURCES AND REPRODUCTION NOTES

[1] David Autor (2019). Work of the Past, Work of the Future. AEA Papers and Proceedings 109; figures 13 to 16 and occupation comparisons 1970 to 2015; endpoint ACS pool 2014 to 2016; verified 4 October 2026.

[2] Andrew Dumont Board of Governors of the Federal Reserve System (2024). Changes in the U.S. Economy and Rural-Urban Employment Disparities. Published 19 January 2024; table 8 uses 2000 Census and 2017 to 2021 ACS; verified 4 October 2026.

[3] United States Census Bureau (2026). Metropolitan and Micropolitan Statistical Area Delineation Files. Historical and July 2023 area delineations; geography consistency documentation; verified 4 October 2026.

[4] United States Census Bureau (2026). Industry and Occupation Code Lists & Crosswalks. Official occupation harmonization source; verified 4 October 2026.

RELATED CHAPTERS 024 · 085 · 087 · 091

CHAPTER 089

Premature deindustrialization

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN Country specific historical series mainly 1950s or 1960s to 2010 or 2012 with separate UNIDO 2024 output checkpoint

Many later developing economies reached manufacturing employment peaks at lower incomes and smaller employment shares than earlier industrializers, with important regional exceptions.

When industrial employment peaks too early

Premature deindustrialization describes a change in the historical development path. Manufacturing employment begins to shrink as a share of total employment before a country reaches the income level or industrial employment share achieved by earlier industrializers. The word premature refers to that comparison, rather than to a universal threshold defining the correct number of factory jobs. The useful metrics are the peak manufacturing employment share, income per person at the peak, and the subsequent trajectory of employment and output. They need to be measured separately for each country.

Manufacturing employment share divides people employed in manufacturing by all employed people in the specified economy. It is different from manufacturing's share of GDP, manufacturing output per person, or the absolute number of manufacturing workers. A country's share can fall while its manufacturing workforce grows if employment in other sectors grows faster. It can also fall while real manufacturing output rises because productivity increases. International reporting needs consistent treatment of self employment, informality, industry classifications, and the reference population. The United Nations indicator metadata sets out the definition for SDG indicator 9.2.2. [2]

Rodrik's original research uses long country histories to compare the manufacturing employment and output paths of earlier and later industrializers. Its main panel includes 42 countries, with country specific coverage commonly beginning in the mid twentieth century and ending around 2010 or 2012. The paper finds lower manufacturing peaks at lower income levels in many later developing economies, while Asian manufacturing exporters are important exceptions. The pattern extends the labor compression question internationally, but does not establish that every economy follows an identical trajectory. [1]

A comparable income measure should adjust for purchasing power and price changes. Using current dollar GDP per person would confuse exchange rate movements with development. A peak estimate also needs a rule for smoothing short fluctuations and handling a sample endpoint. The largest observed share is not necessarily the true structural peak if the country is still industrializing. Analysts should distinguish observed maxima from model estimated turning points, state the income base year, and avoid treating countries with short or broken coverage as if they supplied equivalent historical evidence.

This entry is broader than manufacturing's familiar employment decline in wealthy economies. Its distinctive question is whether the pathway that formerly moved large numbers of workers from low productivity activities into relatively productive formal employment has narrowed for poorer countries. That makes it relevant to access to good jobs and to the distribution of global productivity gains. It should be assessed

alongside the quality of expanding service employment. An economy leaving manufacturing behind can still succeed if other activities provide strong productivity, wages, and opportunities for broad groups of workers.

Historical peaks and current industrial growth

The original historical panel contains many decades and meets the secular criterion at the country level where coverage is adequate. There is no single worldwide start and end date shared by every observation. A dashboard should record the range for each country instead of assigning the full study window to all of them. The article appeared in 2016, with an online publication date in late 2015. These are research dates, not observation extensions. The historical findings should remain anchored to the actual endpoint in the data appendix. [1]

Manufacturing output remains economically important. UNIDO's International Yearbook of Industrial Statistics 2025, released on 20 November 2025, reports global manufacturing expansion of 2.9 percent in 2024. Its description also notes uneven employment gains and the role of middle income economies. That current output checkpoint does not overturn the historical employment peak evidence, because output and employment shares measure different objects. It does caution against presenting deindustrialization as the disappearance of industrial production worldwide. Productive capacity can continue expanding while the employment intensity and geographic distribution change. [3]

The appropriate historical presentation uses country trajectories, grouped by development cohort or region, rather than one pooled decline line. An exporter gaining manufacturing employment can offset losses elsewhere in a global aggregate while leaving the development prospects of other countries weaker. Conversely, an employment share decline in one country can reflect trade relocation rather than technological labor saving at the global level. Showing regional exceptions makes the comparison more informative: it helps identify the conditions under which industrial work remains a successful route into prosperity.

The official employment share indicator offers a way to extend descriptive country histories, but it does not by itself reconstruct the original research's turning point estimates. An update would need consistent income data, country coverage, classification decisions, and the original model specification. Employment observations can come from different survey systems or include modeled estimates. The statistical metadata should identify source type and comparability. A clean longitudinal analysis should use verified years only, preserve gaps, and report when a later observation is not directly comparable with the earlier industrial series. [2]

Evidence	Observation coverage	Interpretive role
Historical development panel	Country specific decades mainly ending 2010 or 2012	Compare peak employment share and income across industrialization cohorts
Asian exporter exceptions	Within the historical study	Reject a universal decline claim
UNIDO global output checkpoint	2024 output reported in November 2025	Manufacturing still expands even when employment gains are uneven
SDG 9.2.2	Annual country employment shares where available	Potential descriptive extension with documented definitions

Historical research [1], official indicator metadata [2], and current UNIDO publication [3]; output growth does not measure employment peaks.

A global route into post labor pressures

Manufacturing can provide a development ladder when it absorbs workers from activities with low output per hour and supports formal employment, training, and wage progression. If later industrializers require fewer workers to produce a competitive quantity of goods, that ladder can accommodate fewer people at a given output level. The post labor interpretation concerns the declining employment capacity of a historically important route to prosperity. It does not require every manufacturing task to disappear. It requires evidence that rising industrial capability no longer creates comparable accessible opportunities at scale.

A hypothetical example illustrates the employment intensity channel. An earlier industrializer needs one thousand workers to serve a particular market. A later entrant can serve the same demand with three hundred workers using more advanced equipment. The later entrant may produce efficiently and become wealthier, yet industrialization offers fewer positions to people leaving subsistence or informal work. The example is not an estimate of actual displacement. It explains why adopting the best available production technology can improve output while limiting the employment gains normally associated with industrial development.

Trade makes the interpretation more complicated and more interesting. A country competing against highly productive international suppliers faces their prices and production methods even if it has not installed the same equipment. Labor saving innovation abroad can change the employment opportunities available at home through imports and export competition. The transmission is therefore not restricted to domestic robot adoption. To establish it, researchers need to distinguish technology, relative prices, trade exposure, and policy. The industrial employment peak provides the structural outcome; it does not directly measure the contribution of each force.

The quality of successor activities determines whether the shift represents compression. Productive tradable services can employ workers and export output without following the classic factory pathway. Health, education, infrastructure, and other services can also provide valuable formal work. The concern is sharper when workers move into fragmented low productivity services with low earnings, limited protection, and weak progression. A complete development dashboard should therefore pair manufacturing trajectories with service productivity, formal employment, real compensation, and entry requirements. A falling industrial share alone cannot establish the absence of a successful alternative.

Public distribution institutions may become more important if the economy's productive frontier creates limited broad employment. Tax capacity, social insurance, and public services influence whether rising output improves household living standards despite a narrow formal job base. That relationship connects this chapter to transfer dependence without treating every transfer as proof of technological displacement. Many poorer countries have limited fiscal resources, so the same production change can have different household consequences across jurisdictions. International comparisons should examine the distribution system rather than assuming the United States institutional response applies everywhere.

Development policy and alternative readings

The historical pattern is compatible with several causes. Domestic policy, exchange rates, infrastructure, education, demand, resource exports, and the organization of international supply chains can influence industrialization. A low manufacturing employment peak can arise because a country never developed sufficient competitive industrial capacity, rather than because automation displaced workers from an

otherwise successful sector. The post labor interpretation is strongest when real output and productivity advance while the capacity to generate accessible jobs weakens. Separating these trajectories prevents stagnation from being mislabeled as technological abundance.

A further structural-change mechanism comes from Huneeus and Rogerson. Their model reproduces heterogeneous industrialization paths and finds that differences in agricultural productivity growth can account for much of the variation in peak industrial employment shares. This is a distinct addition to the technology-and-trade account: a smaller industrial peak need not arise solely because factories adopt unusually labor-saving production. The path by which an economy moves workers out of agriculture also matters. The published study appeared in the Review of Economic Studies in 2024, following a 2020 working paper. [4]

For interpretation, distinguish an industrial sector shedding workers while real output expands from an economy that never develops a large industrial workforce. Both can produce a low employment peak, yet they place different demands on the post labor explanation. A useful extension pairs country peak estimates with agricultural productivity, the pace of movement out of agriculture, industrial value added, and the quality of destination service jobs. This adds a mechanism to test rather than treating every premature peak as an independent measurement of factory automation.

Relative prices are another boundary. Manufacturing's nominal GDP share can decline because goods become cheaper relative to services, even when real industrial output rises. Employment shares can decline because workers move into expanding services rather than because they lose work. Absolute employment, real value added, and nominal shares should therefore appear in separate panels. Comparing a nominal output decline in one country with an employment decline in another would obscure the structural process. The indicator metadata helps establish the employment denominator, but additional output statistics are required for the production comparison. [2]

Informal activity creates comparability problems. Manufacturing work in household enterprises, repair activities, and small workshops may be undercounted or classified differently from factory employment. A shift toward formal registration can raise measured manufacturing employment without a comparable increase in actual work. Survey redesigns and new statistical standards can also introduce breaks. Analysts should examine country notes, retain the source classification, and avoid filling missing years with an unexplained smooth line. A well documented shorter comparable interval is preferable to an apparently long series assembled from incompatible definitions.

Regional exceptions matter because they offer information about mechanisms. Sustained industrial employment expansion among exporters can indicate that scale, market access, capabilities, and policy still overcome labor saving pressures in some settings. A universal post labor thesis that excludes such outcomes would be too strong. A conditional thesis can ask why successful cases differ and whether their path remains replicable for later entrants. This makes the evidence useful for identifying changing development constraints, rather than simply collecting every manufacturing decline as support for one predetermined conclusion.

The interpretation would weaken if countries with declining manufacturing shares developed equally accessible, productive, and well compensated successor activities. It would strengthen if comparable countries repeatedly reached smaller industrial employment peaks at lower incomes and then struggled to build broad formal opportunities despite improving productive capacity. A credible update needs both

successes and failures, with common definitions and controls for development conditions. The recent global output growth checkpoint should remain visible because it helps separate the decline of a jobs pathway from the decline of an entire productive sector.

Reproducing country trajectories

Use small multiple country charts with manufacturing employment share on the vertical axis and income per person on the horizontal axis. Add a time based companion chart for absolute manufacturing employment and real value added. Mark observed peaks and distinguish them from model estimated turning points. Group countries by region or industrialization cohort without suppressing successful exporters. The historical data appendix should determine each country's plotted years, and the publication date should remain in the caption rather than at the end of the time axis. [1]

For monitoring, retrieve annual employment shares under SDG 9.2.2 and preserve country source notes, industry classification, and any breaks. Combine them with a stated purchasing power adjusted real income series and verified output data. Maintain separate columns for observation year, release vintage, survey or modeled status, and coverage. UNIDO's current yearbook is a useful source of industrial context, but its newest publication year does not mean every country employment observation is equally recent. Verify individual endpoints before updating a comparative peak calculation. [2][3]

Read this entry with manufacturing output and labor input, new work, formal job quality, firm entry, and transfer dependence. Its distinctive contribution is to ask whether labor saving production changes the development opportunities of countries entering the industrial economy later. The long historical evidence supports that question and reveals important exceptions. It establishes a narrowing of one route into broad employment in many settings, while leaving open the possibility that other sectors and institutions can distribute prosperity effectively.

SOURCES AND REPRODUCTION NOTES

[1] Dani Rodrik (2016). Premature deindustrialization. Journal of Economic Growth 21 pages 1 to 33; country specific long histories and appendix coverage; verified 4 October 2026.

[2] United Nations Statistics Division and International Labour Organization (2026). SDG Indicator 9 2 2 Manufacturing employment as a proportion of total employment. Official numerator, denominator, classification and reporting methodology; verified 4 October 2026.

[3] United Nations Industrial Development Organization (2025). International Yearbook of Industrial Statistics 2025. Released 20 November 2025; global manufacturing output growth checkpoint for 2024; individual employment endpoints differ; verified 4 October 2026.

[4] Federico Huneeus and Richard Rogerson (2024). Heterogeneous Paths of Industrialization. Published article in Review of Economic Studies 91(3), pages 1746–1774; abstract identifies agricultural productivity as a major source of industrialization differences. Verified for version two 4 October 2026.

RELATED CHAPTERS 024 · 081 · 084 · 085

CHAPTER 090

Firm markups

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN United States publicly traded firm research 1955 to 2016 with measurement review revised July 2026

A prominent long run estimate finds rising average price to marginal cost ratios concentrated in the upper tail, but markup measurement and causal interpretation remain contested.

Price relative to marginal cost

A firm markup is the ratio of the price received for output to the marginal cost of producing an additional unit. A ratio of one means price equals marginal cost; a ratio above one means price exceeds that incremental cost. The measure is useful because it asks how much revenue exceeds the resources required at the margin. It is different from an accounting profit margin, which also reflects overhead, fixed costs, financing, and other expenses. A firm can have a high markup while earning little net profit if substantial fixed expenditure must be recovered.

Marginal cost is usually not directly observed in company accounts. Researchers therefore estimate markups using assumptions about production, input adjustment, or demand. In a production approach, a chosen input's output elasticity is compared with its share of revenue. The resulting estimate depends on which input is assumed to adjust freely and on how the production relationship is specified. A cost category in a financial statement can contain several types of expenditure. Treating all of it as a single variable input can change the inferred ratio even when underlying market behavior is unchanged.

De Loecker, Eeckhout, and Unger's final author manuscript reports United States publicly traded firm data from 1955 through 2016. Their estimated average markup rises from approximately 1.21 in 1980 to 1.61 in 2016. The increase is concentrated in the upper tail, with an unchanged median and reallocation toward higher markup firms. These are the published version's endpoints; an older NBER abstract retains different values. The result is a long historical estimate, not an official current markup series for every United States business. [1]

Aggregation requires a weighting rule. A simple mean describes the average firm in the sample, while a sales weighted mean describes the markup associated with a larger share of economic activity. Reallocation can increase the weighted mean even if most firms' individual ratios are stable. The median, upper percentiles, and weighted aggregate should therefore be shown together. A broad claim that every employer increasingly extracts rents is stronger than the evidence supplied by a rising upper tail. The distribution matters for both the production and household interpretations.

This entry is a proposed supporting channel for post labor economics, rather than a direct measure of workers being displaced. A higher markup can indicate that productive activity increasingly generates surplus controlled by owners, or that firms with scalable technologies account for more output. It can also reflect the recovery of fixed innovation costs or measurement problems. To evaluate its contribution, the dashboard

needs accompanying evidence on net profits, investment, prices, compensation, and entry. The ratio helps ask who captures gains but cannot answer that entire distributional question alone.

Long history with changing estimates

The verified United States research span covers 61 years, with the principal rising period from 1980 to 2016 lasting 36 years. It meets the secular rule. The final manuscript is dated 15 November 2019 and underlies the 2020 journal publication. The observation endpoint remains 2016. A chart should identify both the paper version and the sample. Updating a reference to a recent discussion of the paper would not supply new firm observations. A contemporary extension would require a consistent dataset and estimation procedure. [1]

The ratio also needs a careful verbal translation. A markup of 1.61 means price is 61 percent above marginal cost, not that 61 percent of sales is profit. The gross difference between price and marginal cost as a share of price is approximately 37.9 percent in that numerical example, calculated as one minus one divided by 1.61. This arithmetic illustrates the units; it is not an accounting profit estimate. Fixed and other costs must still be paid. Confusing these percentages can greatly exaggerate a claim about the share of income accruing to owners.

A current methodological review by Fernald, Gandhi, Ruzic, and Traina was initially released in September 2025 and revised on 15 July 2026. It emphasizes that production based markups are residual estimates and that misspecification or measurement can generate substantially different trends from similar data. This is a material qualification rather than a minor footnote. The long historical rise in a prominent specification should be retained, alongside a visible statement that its magnitude and economic interpretation are not settled across methods. [2]

An independent Federal Reserve industry analysis published on 8 March 2024 examines rising markups and declining dynamism over 1980 to 2016. Its industry comparisons do not support a simple inference that industries with larger markup increases necessarily experienced larger dynamism declines. That finding limits a common causal narrative built from the two aggregate trends. It is possible for both aggregates to move while the cross industry relationship differs. A secular dashboard should preserve this disagreement and distinguish correlation at the whole economy level from evidence about a mechanism. [3]

Checkpoint	Verified value or event	Meaning
1980	Estimated aggregate markup about 1.21	Published author version price to marginal cost ratio
2016	Estimated aggregate markup about 1.61	End of the original observed firm sample
2020	Final journal publication	No new observation endpoint implied
July 2026	Measurement review revised	Current assessment of estimation uncertainty

Published author manuscript [1] and Federal Reserve methodological review [2]; older working paper abstracts use different endpoints.

Rents scale and the distribution of gains

A markup can rise when a firm develops an unusually desirable product, controls an important asset, faces limited competition, or operates with substantial scale economies. Technology can contribute to several of

these conditions. Software, data, intellectual property, and automated processes can support large output with relatively modest incremental resource use. If the firm retains a substantial part of the difference between price and incremental cost, income may grow without proportional expansion of payroll. This is a plausible connection to post labor economics, but it is conditional on prices, costs, and ownership.

The production mechanism differs from a straightforward substitution of machines for people. A firm can employ more workers and still have a rising markup if revenue expands faster than variable costs. It can also reduce employment while lowering prices enough that its markup stays stable. The appropriate test examines output, labor input, compensation, and margins together. A high ratio alone cannot establish whether production became less labor intensive. It provides evidence about the revenue and cost relationship that can affect how productivity gains are distributed.

A hypothetical digital service makes the distinction clear. The developer spends heavily on initial engineering and infrastructure, then serves an additional customer at low incremental cost. Its price can substantially exceed the marginal cost without generating equivalent net profit, because the original investment must be recovered. If adoption expands, the firm may eventually earn substantial surplus while hiring relatively few additional workers. The first fact concerns the technology's cost structure; the second concerns profit and distribution. A dashboard should measure both rather than treating the initial markup as sufficient evidence of rent extraction.

Market power can also limit output and employment relative to a competitive benchmark. If a firm maintains a higher price by restricting sales, fewer inputs may be used than if price moved closer to marginal cost. That is a mechanism through which rents can compress opportunities independently of technical labor saving. It would support a broad institutional account of post labor distribution, but it should not be described as proof that machines made the work unnecessary. The technology and competition channels can interact while remaining analytically distinct.

The household significance depends on who receives the surplus. Dividends, retained earnings, asset appreciation, wages, and lower consumer prices distribute gains through different routes. Broad ownership can make a high productivity, high markup firm more beneficial to ordinary households than concentrated ownership would. Taxes and public services can also spread the gains. The metric is therefore most informative beside wealth concentration, labor share, and transfer dependence. It asks whether production creates revenue beyond incremental costs and which institutions translate that revenue into broadly shared living standards.

Why a markup is not a complete diagnosis

Fixed costs are a leading competing explanation. Firms investing in research, brands, organizational systems, and infrastructure may require substantial revenue above incremental cost merely to break even. A shift toward such activities can raise average measured markups without an identical rise in excess profit. The relevant comparison includes the user cost of capital and the economic treatment of intangible expenditure. Accounting practices can classify investment as current expense or omit parts of organizational capital. An analyst should examine several profit and cost measures before identifying the entire markup as a rent.

The measurement review explains why production estimates need particular caution. The residual can absorb errors in the production function, revenue deflation, input choice, or the treatment of technology. A change

in the ratio may partly capture a change in how the firm transforms inputs rather than a change in its pricing power. Transparent replication should therefore report alternative flexible inputs, production specifications, samples, and weights. A result that survives these choices is more persuasive than one that appears only under a single accounting interpretation. [2]

The sample is another boundary. Publicly traded firms differ from small private firms, owner businesses, and public institutions. Their evolving composition can influence a long time series. Entry onto a stock exchange, acquisitions, foreign operations, and reporting changes need to be considered before calling a listed firm measure economy wide. The original research's historical result can remain useful while retaining that boundary. A current update should compare publicly traded estimates with broader administrative or industry evidence where available, rather than assuming the same trajectory for every sector. [1]

Concentration is not an interchangeable measure. A market can become more concentrated because an efficient entrant expands and lowers prices. A firm can charge a large markup in a differentiated niche even when many competitors exist. Product markets and labor markets also have different geographic and occupational boundaries. The industry dynamism evidence further cautions against deriving a universal causal sequence from parallel aggregate trends. A convincing mechanism requires measurements at a relevant market level, plus a design that separates changes in competition from changes in technology and demand. [3]

The post labor interpretation would strengthen if robust markup estimates rose alongside higher net surplus, declining labor input per output unit, and weak access to the gains among workers. It would weaken if the rise mainly recovered fixed investment costs, reflected measurement changes, or coincided with broadly distributed compensation and consumer benefits. The entry's mixed status preserves a real secular empirical claim while preventing it from becoming a catch all explanation for labor share, job quality, dynamism, and inequality. Each outcome requires its own evidence.

A transparent distributional chart

Chart the sales weighted mean, median, and upper percentiles from one stated paper version, ending in 2016. Add a separate panel for net profitability or total cost measures rather than labeling the markup ratio a profit margin. State the sample, input definition, production specification, and weights in the caption. If displaying alternative estimates, keep their lines separate and explain the methodological changes. A prominent final version checkpoint should use 1.21 and 1.61 rather than the older abstract's values. [1]

For updates, archive the original company observations, apply a reproducible accounting map, and publish alternative assumptions about variable inputs and intangible costs. Record observation year and release version. Use the 2026 review to identify sensitivity checks rather than to infer a fresh trend. Compare the results with evidence on product prices, investment, labor intensity, and business entry. Differences across methods should remain visible; averaging incompatible markup concepts into a single index would conceal the uncertainty that the metric most needs to communicate. [2][3]

Connect markups to labor share, capital ownership, firm entry, productivity dispersion, and local employer concentration. The distinctive contribution is a possible rise in surplus per unit of incremental cost and a shift of activity toward firms exhibiting that structure. It is supporting evidence about the distribution system and

production organization, with contested magnitude. It does not independently demonstrate automation, fewer good jobs, or the disappearance of economically useful work.

SOURCES AND REPRODUCTION NOTES

[1] Jan De Loecker, Jan Eeckhout and Gabriel Unger (2020). The Rise of Market Power and the Macroeconomic Implications. Final author manuscript dated 15 November 2019; public firm sample 1955 to 2016; published endpoints 1.21 and 1.61; verified 4 October 2026.

[2] John Fernald, Amit Gandhi, Dimitrije Ruzic and James Traina (2026). Micro and Macro Perspectives on Production-Based Markups. Federal Reserve Bank of San Francisco Working Paper 2025 20; first September 2025 and revised 15 July 2026; verified 4 October 2026.

[3] Board of Governors of the Federal Reserve System (2024). Rising Markups and Declining Business Dynamism: Evidence from the Industry Cross-Section. Published 8 March 2024; industry comparison over 1980 to 2016; verified 4 October 2026.

RELATED CHAPTERS 082 · 083 · 091 · 092

CHAPTER 091

Local employer concentration

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN United States broad employment concentration 1976 to 2014 and manufacturing research 1978 to 2016

Concentrated local markets can limit worker alternatives, but broad long run evidence includes declining local concentration and cannot support a universal secular rise.

Counting the employers workers can reach

Local employer concentration measures how employment or vacancies are distributed among employers within a defined labor market. A common measure is the Herfindahl Hirschman Index, calculated by squaring each employer's share and adding the results. Shares expressed as fractions produce an index between zero and one; shares expressed as percentages produce values up to ten thousand. The concentration of existing employment and the concentration of current vacancies are separate measures. One describes the stock of positions, while the other describes visible hiring opportunities over a particular interval.

The labor market definition must specify both geography and the type of work. An occupation by commuting zone market may approximate a worker's realistic alternatives better than an industry across the whole country. An industry measure can include jobs that require unrelated skills; an occupational measure can omit jobs into which a worker could transition. Geographic boundaries should also account for commuting, remote work, and feasible migration. There is no universally correct market for all workers. A transparent measure reports several plausible boundaries and examines whether the conclusion survives them.

The employer unit needs comparable treatment. Multiple establishments belonging to one enterprise may offer several physical workplaces while sharing compensation policy and control. Counting them as separate competitors can understate concentration. Conversely, treating every franchise under one brand as a single employer can overstate common control when franchisees make independent hiring decisions. Payroll identifiers, enterprise ownership, and workplace locations should be recorded distinctly. The index should identify which unit is used and how mergers, contractor arrangements, and ownership changes are incorporated.

A hypothetical calculation illustrates the units. Four employers with equal shares have a fractional HHI of 0.25. If their shares are forty, thirty, twenty, and ten percent, the HHI is 0.30. The latter market is more concentrated even though the employer count is unchanged. The inverse of the index can be described as an effective number of equally sized employers, but it is an arithmetic summary rather than a count of actual alternatives. These examples are definitions, not observations about any real labor market.

The metric matters for post labor economics because accessible outside options influence workers' bargaining position and the quality of replacement opportunities. Yet concentration is only a proxy for employer power. Travel constraints, search costs, scheduling needs, lack of wage information, and differences between jobs can give employers power even in a market containing many firms. Conversely, a market with few employers can pay well if entry is easy or workers have credible alternatives elsewhere. The

chapter therefore separates observed concentration, estimated wage markdowns, and causal effects on compensation.

Longitudinal evidence points in different directions

Macaluso, Hershbein, and Yeh's 2019 original paper examines employment concentration using Census business records from 1976 through 2014. In its broad employment weighted local measure, concentration declines by approximately 28 percent over that 38 year window. Manufacturing differs from the broader pattern, with higher concentration and an increase after the mid 1990s. National and local concentration move differently. This is substantive counterevidence to a claim that broad local employer concentration necessarily rose throughout the same decades as labor market compression. [1]

Benmelech, Bergman, and Kim's final 2022 research uses manufacturing Census data from 1978 through 2016. It finds a negative relationship between local concentration and wages, examines merger related concentration changes, and identifies stronger wage effects where unionization is lower. Its scope supports the significance of concentrated manufacturing labor markets, rather than a conclusion about every occupation or sector. The final paper's observation window differs from its earlier working paper. A reference should preserve the version and avoid combining their endpoints into an invented continuous record. [2]

A further original manufacturing study by Yeh, Macaluso, and Hershbein estimates wage markdowns rather than relying solely on concentration. Its 2022 author summary describes employer power declining from the late 1970s to the early 2000s and increasing thereafter. It emphasizes that markdowns and concentration have weak relationships across markets and different time paths. That result means a concentration series cannot automatically be relabeled a series of employer power. It also limits an explanation that assigns a steadily falling labor share entirely to steadily rising monopsony. [3]

All three histories exceed twenty years, but their conclusions and universes differ. The secular criterion qualifies the observation length; it does not require the direction to support post labor. A dashboard should retain the broad decline, the manufacturing exception, and the difference between concentration and power. This is why the entry is mixed evidence. It is an important mechanism and diagnostic, with adverse effects in specific settings, but the available historical record does not justify a simple universal upward concentration chart.

Study and measure	Window	Main boundary
Broad local employment HHI	1976 to 2014	Approximately 28 percent decline in one employment weighted specification
Manufacturing local concentration and wages	1978 to 2016 final paper	Sector specific evidence of adverse wage relationships
Manufacturing wage markdowns	Late 1970s through the research endpoint	Power falls then rises after the early 2000s
Online vacancy cross sections	Shorter recent windows	Useful hiring snapshot with no independent twenty year history

Original studies and author summaries [1][2][3]; concentration and wage markdowns are different metrics.

How fewer alternatives can change job quality

When workers have few credible alternative employers, a firm can face less pressure to raise wages or improve conditions. Losing one of the available employers can matter even if total employment changes little. A merger might preserve positions while combining the organizations that previously competed for the same workers. A plant closure can remove a high paying option and leave lower paying employers as the practical alternatives. The resulting compression concerns the quality and bargaining structure of work, rather than simply the count of employed people.

Automation could contribute if it allows fewer organizations or facilities to serve the same market. An industry can maintain output while consolidating production into a smaller network of workplaces. For workers tied to a particular location or skill, the number of acceptable alternatives may shrink. However, the same technology can also support small entrants or remote work, expanding alternatives. The direction must be measured. A narrative about scalable firms is insufficient without evidence that relevant local employment opportunities actually become more concentrated or less contestable.

A hypothetical merger makes the distinction concrete. Two regional employers each account for a quarter of a particular occupation's local employment. Combining their ownership increases the HHI if all other shares remain unchanged, even if every job survives. The effect on wages depends on workers' outside options, bargaining arrangements, and the merged firm's behavior. It is possible for compensation to fall, remain unchanged, or rise with productivity. The index identifies an organizational change that could affect competition; it does not identify the outcome by mathematical necessity.

Workers' constraints can make concentration unevenly important. A specialist with national recruitment opportunities may have credible alternatives beyond a local market. A caregiver needing a predictable nearby schedule may not. Lower paid workers may lack the savings required to move, while licensing rules can make crossing a jurisdiction costly. A market definition based only on commute distance can miss these differences. A useful post labor assessment links concentration with mobility, job requirements, wage posting, and the characteristics of people who cannot readily access alternatives.

The indicator also connects to firm entry and the good job ladder. New employers can provide a route away from an established firm even when their initial employment share is small. A decline in entry can reduce the future contestability of a market without immediately changing its HHI. Conversely, a large national firm entering many localities can raise national concentration while providing an additional local option. This explains why national corporate scale and local worker alternatives should be measured separately. The geography of entry determines the practical effect on bargaining.

Concentration power and the secular test

Cross sectional adverse wage relationships do not establish a worsening aggregate trend. A concentrated market may pay less than a competitive one while the economy gradually shifts toward less concentrated markets. Both statements can be true. The historical broad decline therefore must remain visible when evaluating the contribution to post labor. A mechanism can explain persistent disadvantages in some places without explaining the national direction of wages over decades. The analytical task is to quantify how much employment is exposed and how that exposure changes through time.

Market definitions strongly affect the level of the index. A narrow occupation and county combination often appears more concentrated than a broad occupation and metropolitan area. Neither result is inherently wrong; they describe different alternatives. An index can also rise because employment declines at small employers while a stable large employer remains. That event is different from a merger or the exercise of new employer power. Robust analysis should decompose changes into entry, exit, growth, contraction, and ownership consolidation, keeping the underlying counts alongside the index.

Vacancy data have additional limitations. Posted jobs can be duplicated, remain unfilled, omit informal recruitment, or represent a firm's precautionary search. A recruitment platform can change coverage through time. The vacancy share of one employer is therefore not the same as its share of hires or employment. A platform series shorter than twenty years remains a short history even if the associated theory is older. It is useful to compare postings with realized hires and administrative employment, rather than treating online visibility as a complete register of alternatives.

Estimated markdowns also require assumptions about production and labor supply. They provide information different from an HHI, but they are not directly observed deductions from a worker's paycheck. Technology, input adjustment costs, revenue measurement, and the specification of productivity can affect the estimate. The original authors' warning about different concentration and markdown paths is particularly useful. It means evidence for employer power should be evaluated on its own terms, with sensitivity analysis, instead of inferred mechanically from a concentration threshold. [3]

The post labor interpretation would strengthen if automation exposure predicted a durable loss of reachable employers, reduced job to job movement, and lower compensation after accounting for local demand. It would weaken if technological change expanded remote alternatives, stimulated entry, or coincided with declining concentration and improving wages for affected groups. The historical evidence permits both favorable and adverse local changes. Maintaining the mixed classification makes this entry a test of the argument rather than a statistic recruited automatically to support it.

A monitor of actual alternatives

Use separate charts for employment HHI, vacancy HHI, employer count, and estimated wage markdowns. Plot broad employment weighted local concentration alongside sector specific results, preserving the 1976 to 2014 and 1978 to 2016 observation windows. Include a national concentration panel only with a clear distinction in geography. A historical chart should not imply that recent national mergers or current vacancy snapshots extend the underlying long series. The comparison is most useful when it reveals different paths rather than forcing them into one index. [1][2][3]

For reproduction, publish market boundaries, occupational crosswalks, ownership consolidation rules, weights, and the treatment of small cells. Preserve employer counts and employment totals so a change in the denominator is visible. Test broader commuting areas and alternative occupation groupings. In a contemporary dashboard, link postings to hires where possible and record platform coverage changes. An updated confidential administrative analysis is needed to extend the historical universe consistently; publicly available aggregates may support related descriptive measures but cannot reproduce every employer market cell.

Connect this chapter to firm entry, worker mobility, wage premiums, earnings segregation, and urban opportunity. The common concern is whether workers have practical access to a better position. Local concentration contributes a structural measure of alternatives, while the other indicators describe transitions and outcomes. Its long history includes meaningful counterevidence to a universal rise. The strongest post labor use is to identify where labor saving change or consolidation removes credible options, with compensation effects verified independently.

SOURCES AND REPRODUCTION NOTES

[1] Claudia Macaluso, Brad Hershbein and Chen Yeh (2019). Concentration in U.S. Local Labor Markets: Evidence from Vacancy and Employment Data. Original manuscript dated 14 June 2019; employment HHI 1976 to 2014, figure 3 and manufacturing comparison figure 4; verified 4 October 2026.

[2] Efraim Benmelech, Nittai Bergman and Hyunseob Kim (2022). Strong Employers and Weak Employees: How Does Employer Concentration Affect Wages?. Original final research listing; manufacturing Census data 1978 to 2016; earlier working paper has a different endpoint; verified 4 October 2026.

[3] Chen Yeh with Claudia Macaluso and Brad Hershbein research (2022). Measuring Labor Market Power in the U.S. Manufacturing Sector. Original author summary of Monopsony in the US Labor Market; separates concentration from markdowns and describes nonmonotonic history; verified 4 October 2026.

RELATED CHAPTERS 024 · 082 · 086 · 087 · 088

CHAPTER 092

Frontier and laggard productivity

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN United States manufacturing dispersion 1987 to 2021 with separate OECD frontier comparison 2003 to 2020

A decades long United States record shows wider productivity dispersion within manufacturing industries, while shorter international evidence documents divergence between leading and other firms.

Productivity differences inside an industry

Frontier and laggard productivity measures the distance between the most productive businesses and the rest. It asks whether technological and organizational advances spread through the business population or remain concentrated in a limited set of producers. The distance can be measured using percentile gaps, ratios, standard deviations, or growth indices for groups of firms. It is different from the average productivity of an industry. An average can improve while many businesses stagnate, or remain weak while a small frontier advances rapidly. Distributional measures expose that difference.

Labor productivity divides real output by labor input, often hours worked or workers. It can be high because of capital intensity, intermediate inputs, technology, product quality, or organizational efficiency. Total factor productivity attempts to account for multiple inputs and is a different concept. Neither should be read as a direct measure of an individual worker's effort. A firm or establishment may also sell a different product mix than its peers. Deflating revenue with a common industry price index does not fully remove differences in prices or quality across producers.

The joint BLS and Census Dispersion Statistics on Productivity program supplies a useful long United States record. Its September 2024 manufacturing release covers 86 four digit industries over 1987 to 2021, using consistent 2017 NAICS classifications. It reports distributions of establishment real gross output per hour and total factor productivity. The observations are establishment level, rather than automatically firm level. Its measures include log productivity percentile gaps and versions weighted by activity. This 34 year universe meets the secular duration rule independently of the shorter international frontier comparisons. [1]

An interquartile range of log productivity is the difference between the seventy fifth and twenty fifth percentiles. Exponentiating that difference gives the ratio of their productivity levels. This translation can be more intuitive than the log gap, but both should be labeled. A gap of zero would mean those two percentile positions have equal productivity. It does not mean every establishment is identical. Activity weighting changes the question by giving more importance to workplaces accounting for larger shares of hours or inputs. An unweighted distribution instead emphasizes the spread across establishments.

The word frontier requires a separate rule. OECD research defines global frontier firms as the most productive five percent within two digit industries across countries in a given year. That group can change membership. A percentile based frontier is therefore not necessarily a fixed cohort of enduring leaders. It is also different from the BLS interquartile range, which compares the middle half of establishments. Keeping

those definitions separate allows the two records to illuminate productivity diffusion without pretending they are interchangeable measurements. [3]

A secular United States record and a shorter global one

The BLS manufacturing chart reports the average industry hours weighted interquartile log gap rising from 0.754 in 1987 to 0.937 in 2021. Exponentiating those values yields approximate productivity ratios of 2.13 and 2.55 respectively, calculated from the published data. The latter ratio means the seventy fifth percentile establishment produces substantially more real gross output per hour than the twenty fifth percentile within the average industry under that weighting. The trajectory contains fluctuations and should not be described as a smooth increase every year. [1]

Unweighted results are informative too. The published average industry interquartile gap is 0.850 in 1987 and 0.954 in 2021. These observations describe the dispersion of establishments without hours share weighting. Different weighting produces a different level and degree of change because small and large workplaces contribute differently. Analysts should show both rather than selecting the more dramatic comparison. Sampling rotations and composition can influence short term volatility; the agency cautions against reading individual dips and rises too literally. The long record is the relevant basis for the secular assessment. [1]

OECD's current frontier summary covers 2003 to 2020. It describes labor productivity at global leading firms increasing much faster than at laggards in manufacturing and services. That 17 year comparison is useful international supporting evidence but does not independently satisfy the user's twenty year rule. A 2025 report or a current website carrying the chart does not lengthen its observation history. The appropriate status of the international component remains shorter history, alongside the independently longer United States manufacturing record. [3]

The observation endpoint and release date should be separate in a monitoring file. The main United States manufacturing release is dated September 2024, with observations ending in 2021. The documentation supplies downloadable files and distinguishes measure availability and construction. New sector releases can broaden coverage without automatically extending the manufacturing endpoint. A dashboard should inspect each file's year range and vintage rather than assume that every product linked from the current landing page covers the same industries or most recent calendar years. [2]

United States mean industry labor productivity IQR	1987	2021
Hours weighted log gap	0.754	0.937
Approximate ratio from hours weighted gap	2.13	2.55
Unweighted log gap	0.850	0.954

BLS Census manufacturing chart data [1]; ratios are analyst calculations exp log gap, rounded to two decimals. This compares percentiles within industries, not a fixed cohort of frontier firms.

Diffusion and the labor distribution system

A productivity frontier can advance without creating equivalent improvement in most workplaces. If the best producers automate effectively or develop scalable processes, their output may grow faster than their labor requirements. Workers employed elsewhere may not gain access to the same technology, training, wages, or organizational resources. The economy's technical capability then improves while the experience of a typical worker changes more slowly. This is a plausible post labor mechanism centered on uneven access to productive organizations rather than a claim that every firm has eliminated work.

There are two distinct channels to test. First, technology may diffuse slowly, leaving lagging employers with low productivity and limited capacity to pay. Second, labor and output may reallocate toward leading employers, which can produce a larger share of goods with relatively few additional workers. The first concerns improvements within businesses; the second concerns changes in economic weights. A widening productivity gap alone cannot tell which dominates. Employment growth, output shares, entry and exit, and compensation at different parts of the distribution provide the additional evidence.

A hypothetical industry shows why the distinction matters. Two groups initially produce at the same output per hour. One doubles productivity while maintaining employment; the other remains unchanged. Industry output rises and dispersion widens. If the leading group instead cuts labor while maintaining output, the same gap can arise with a different aggregate employment effect. If the lagging group adopts the technology later, the gap can subsequently narrow. The example illustrates possible paths; it supplies no actual estimate. Longitudinal workplace data are needed to distinguish them.

The wage relationship is also conditional. Higher productivity can support higher pay, but competition, bargaining, ownership, and workforce composition determine the pass through. Employees at productive organizations may earn more because they have different skills, receive an employer premium, or both. A person unable to enter those organizations may not benefit directly from the advancing frontier. Productivity dispersion therefore connects naturally to earnings segregation and urban opportunity. Those indicators can test whether organizational differences create durable barriers to sharing the gains through labor income.

Diffusion failures could increase the importance of nonlabor distribution channels. If a narrow set of organizations captures a large share of productive growth, household welfare may depend increasingly on capital ownership, taxes, public services, and transfers. That outcome is possible but not entailed by dispersion. Consumers can gain through lower prices even when their employers lag, and competitive entry can spread useful methods. A comprehensive assessment should track prices and household income sources alongside employer productivity so that the benefits and costs of an uneven frontier remain visible.

Dispersion is not automatically wasted capacity

Businesses differ for legitimate reasons. They can serve different markets, operate at different ages or scales, offer different quality, and use different combinations of inputs. A small specialized producer can have lower measured output per hour while supplying a valuable niche product. A new establishment can initially appear inefficient while learning or building capacity. Dispersion is therefore not a direct count of obsolete businesses or economically pointless jobs. Its meaning depends on the persistence of gaps, the underlying product differences, and the prospects for improvement or reallocation.

Revenue based measures can mix productivity with demand and prices. A producer receiving a higher price for a differentiated product may appear more productive under a common deflator. An employer with market power may also have high revenue per hour without an equivalent physical output advantage. The BLS program describes its gross output and input construction, while the downloadable documentation distinguishes its measures from standard industry productivity series. Analysts should preserve those definitions and compare labor productivity with total factor productivity rather than label all revenue dispersion technological efficiency. [1][2]

The frontier group can change composition as firms enter, exit, merge, or move across the ranking. A widening gap between the current top group and current laggards does not establish that the same firms pulled ahead continuously. Following fixed cohorts helps identify persistent leadership, while repeated percentile rankings describe the current distribution. Both are useful. The OECD top five percent definition and the BLS establishment percentile gaps answer related but distinct questions. A chart combining their levels without adjustment would create a false quantitative comparison. [3]

Sector coverage limits generalization. United States manufacturing supplies a strong long record, but it does not describe every service industry. International company datasets can have uneven coverage of small firms and countries. Changes in data availability can alter an apparent frontier. A twenty year conclusion should rely on a stable statistical universe or explicit correction for coverage. The 17 year OECD comparison should remain short in the secular audit even though its findings are relevant and the production theories supporting it extend much further into history.

The post labor interpretation would strengthen if widening gaps coincided with reduced labor absorption at productive firms and persistent barriers preventing other workers from gaining access. It would weaken if laggards subsequently caught up, if productive organizations expanded broadly accessible high quality employment, or if consumer gains materially improved ordinary households' welfare. Better diffusion can also be a policy and management issue rather than evidence of an inevitable technological endpoint. The metric is most useful for testing how productive capability spreads through the labor distribution system, not for forecasting the disappearance of work.

Plotting gaps and tracking diffusion

Use a long United States chart of within industry labor productivity interquartile gaps, showing hours weighted and unweighted versions. Provide a second scale or companion panel translating log gaps into ratios, with the calculation explicit. Add total factor productivity dispersion separately. End the verified manufacturing series in 2021 and annotate the September 2024 release. A separate OECD panel can show frontier and laggard growth indices over 2003 to 2020 with a visible shorter history label. These should not be joined into a single international numerical series. [1][3]

For reproduction, archive the complete DiSP release and README, keep industry codes consistent, and state whether the reported mean is across industries or across establishments. Preserve activity weights and the choice of output and input measure. Calculate ratio transformations from published log gaps without interpreting them as differences in worker effort. For an updated diffusion study, follow workplace entry, exit, employment, and wage changes alongside productivity rankings. Record observation and release years for each sector instead of assigning the landing page's current date to all files. [2]

Connect this chapter to markups, earnings segregation, firm entry, job reallocation, and task displacement. Together they distinguish advancing technical capability, movement of economic activity, and the opportunities available to workers. The specific contribution is evidence that productivity gains are unevenly distributed across producers over a genuinely long United States window. The shorter international frontier evidence adds context while retaining its duration limit. Neither series establishes automation as the only cause or implies that all lagging employment lacks economic value.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics and United States Census Bureau (2024). Dispersion Statistics on Productivity. Manufacturing release 12 September 2024; 86 four digit industries, 1987 to 2021; chart 1 and chart 2 data; verified 4 October 2026.

[2] Bureau of Labor Statistics and United States Census Bureau (2024). Dispersion Statistics on Productivity README. File definitions, availability and construction of the downloadable experimental product; verified 4 October 2026.

[3] Organisation for Economic Co operation and Development (2026). Productivity and business dynamism. Current official research summary; global top five percent frontier comparison observes 2003 to 2020, a 17 year window; verified 4 October 2026.

RELATED CHAPTERS 082 · 083 · 084 · 087 · 090

CHAPTER 093

Industrial robot installations and stock

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN Global robot database 1993 to 2025 with verified historical checkpoints 2005 and 2025

The industrial robot population expanded substantially over two decades, demonstrating sustained automation deployment while leaving its net employment consequences to separate analysis.

Installations stock and intensity

Industrial robot deployment has three useful measures. Annual installations count newly supplied or installed units during a year. Operational stock estimates the number still in use at the end of a year. Robot density divides stock by a labor denominator, commonly manufacturing employees. These are related but distinct. A country can install fewer robots this year while its stock continues growing, and density can rise partly because the workforce shrinks. The dashboard should retain the levels and denominators instead of treating every increase in density as equivalent new investment.

An industrial robot is a defined equipment category rather than a synonym for all automation. The International Federation of Robotics applies a standardized concept of reprogrammable multipurpose manipulators. Software automation, conventional machine tools, fixed dedicated production systems, and many service robots fall outside the industrial robot count. This boundary is useful for consistency but means the statistic measures one observable segment of a much larger technological process. A low robot count does not demonstrate an absence of labor saving technology, and a high count does not identify all tasks affected.

IFR's World Robotics database advertises annual installation and operational stock coverage from 1993 through 2025, broken down by country, application, and industry. Detailed historical data require the relevant database access. Public executive summaries and releases provide verified checkpoints, but they do not justify fabricating missing annual observations. The latest industrial release available at the cutoff was published on 24 September 2026 and describes calendar 2025 deployment. It should be treated as an observed checkpoint, while the outlook figures in the same release remain forecasts. [1][2]

Stock is not simply cumulative purchases. Units are retired, replaced, relocated, and sometimes reclassified. Historical estimates use assumptions about operating life where direct retirement observations are unavailable. A robot can also spend different numbers of hours working or perform different tasks than another unit. Equipment counts therefore measure installed capability only approximately. Utilization, operating hours, payload, accuracy, and the production process determine the labor services actually supplied. A unit of stock is not a unit of displaced employment.

Density needs a stated labor population. Dividing industrial stock by all national employment produces a different comparison from dividing by manufacturing workers or the workforce in robot using industries. An automotive producer can be intensely automated while the national average remains modest because services employ many people. International comparisons should use comparable industry classifications and

employment sources. The most useful labor compression question is whether observed robot intensity predicts changes in labor input per unit of output and in accessible job quality, rather than whether the robot count exceeds an arbitrary threshold.

A twenty year deployment comparison

The historical IFR executive summary for World Robotics 2007 reports a minimum operational stock of approximately 923,000 units at the end of 2005 and approximately 951,000 at the end of 2006. That vintage discusses uncertainty in service life assumptions, so the earlier minimum estimate should retain its label. The latest 2026 release reports a global operational stock of approximately five million units in 2025. The comparison spans exactly twenty years and shows substantial expansion, while differences in vintage and retirement assumptions prevent treating it as a precision growth calculation. [2][3]

The latest release reports more than 600,000 new industrial robot installations during 2025, an eleven percent increase, while operational stock rises nine percent. China accounts for 354,000 installations and approximately 59 percent of the global annual total. The United States installs almost 38,500. These observations establish substantial current deployment and uneven geographic concentration. They are calendar 2025 data published in September 2026, rather than a count of what was installed during 2026. The release's subsequent demand forecasts should remain outside the observed time series. [2]

A long rise in global stock can contain cyclical declines in investment and substantial differences across countries. Annual installations depend on industrial demand, financing, factory construction, and replacement cycles. A downturn can reduce new purchases while accumulated capability remains high. Conversely, a burst of installations can reflect an expansion of production capacity rather than replacement of an existing workforce. The stock and flow charts should therefore be shown together, with country and industry breakdowns where available. That presentation separates structural adoption from the timing of capital spending.

The database's 1993 to 2025 coverage supports a longer reconstruction, but the public checkpoints used here do not constitute that completed annual reconstruction. A reproducible chart should use an authorized consistent database export or verified report tables. The historical executive summary is the original IFR document hosted in a university teaching archive, preserving its older definitions and assumptions. It should not be silently combined with present data as if every value had been retrospectively revised under one methodology. The archive provenance and vintage differences belong in the caption. [1][3]

Observation	Verified deployment	Important qualifier
2005 operational stock	About 923,000 units	Historical minimum estimate with service life assumptions
2006 operational stock	About 951,000 units	Reported in World Robotics 2007
2025 operational stock	About 5 million units	Latest September 2026 release
2025 annual installations	More than 600,000 units	Flow rather than stock
Database coverage	1993 to 2025	Detailed annual reconstruction requires verified tables or export

Original historical IFR summary [3] and latest IFR release [2]; vintage differences should remain explicit.

What deployed machines imply for labor

Robot installations provide direct evidence that firms adopt physical systems capable of performing production tasks. This is more concrete than a forecast of technical feasibility or a demonstration video. The post labor connection is that a growing stock can deliver repetitive manipulation, processing, handling, or inspection with less human labor per unit of output. The economic consequence still depends on demand expansion, complementary tasks, and the distribution of gains. A robot can replace a task, improve quality, or relieve a bottleneck without eliminating an entire occupation.

A hypothetical factory illustrates several possible outcomes. A robot reduces the labor required for a particular operation by half. If orders remain unchanged, the factory may reduce hours or move employees to other activities. If lower costs allow sales to double, labor in complementary operations may expand. If the factory gains business from competitors, employment can rise at the adopting plant while contracting elsewhere. The same installation can therefore produce different workplace, industry, and economy wide employment effects. Equipment counts identify the exposure; outcome data determine the net effect.

The labor compression thesis is strongest when deployment permits output expansion without comparable creation of accessible good jobs. That condition can arise even if adopting employers grow. A highly automated factory can increase employment while displacing a larger volume of work at competing facilities, or while demanding credentials different from the previous workforce. The relevant analysis follows output, hours, wages, occupational composition, and competitors. It should distinguish a worker's immediate job loss from an employment opportunity that would otherwise have been created as production expanded.

Robots also support human work. They can reduce dangerous lifting, improve consistency, allow smaller production runs, and make domestic production viable where it would otherwise be uncompetitive. Maintenance, integration, quality assurance, and programming create complementary demands. Whether those demands compensate for displaced tasks depends on their scale and accessibility. Counting one technician role against an unspecified number of replaced production tasks provides no reliable balance. A good dashboard measures both sides and follows the workers whose skills and locations connect them to the affected process.

The international distribution matters. Deployment in one country can alter prices and competitive conditions elsewhere. A worker may experience pressure from robot produced imports without their own employer installing a unit. Conversely, automated production can support exports and preserve domestic industries. Global counts therefore belong beside local and industry exposure measures. The long expansion in stock is evidence of an ongoing technological process, while the post labor interpretation requires tracing how that process changes the labor distribution of prosperity across firms, households, and jurisdictions.

Employment effects remain an empirical question

A robot count cannot be converted into displaced workers using a universal ratio. Machines vary in task scope, operating hours, and complementary staffing. A new robot can replace an older robot rather than a person. Some are installed in newly built capacity that would not otherwise have existed. Others address labor shortages or improve quality without reducing headcount. A credible displacement estimate needs a comparison with the production and employment path absent adoption. Reporting a count multiplied by an assumed jobs per robot coefficient would obscure those differences.

Graetz and Michaels' original cross country research examines robot use across seventeen countries from 1993 to 2007. It finds productivity and output gains, no statistically significant overall employment effect in its aggregate specification, and evidence of adverse effects on lower skilled labor. The study provides meaningful counterevidence to an automatic aggregate job destruction interpretation. Its fourteen year causal window is separate from the longer deployment history. The employment result should remain attached to that study's countries, period, specification, and measure rather than treated as a timeless guarantee. [4]

The U.S. evidence identifies a materially different outcome. Acemoglu and Restrepo examine industrial-robot exposure across commuting zones over 1990–2007. Their local estimates imply that an additional robot per thousand workers reduced the employment-to-population ratio by about 0.39 percentage points and wages by 0.77 percent. Incorporating modeled spillovers between regions gives smaller aggregate effects: about 0.2 percentage points and 0.42 percent respectively. These are estimates from an exposure design and economic model, rather than a count of workers physically replaced at each installing plant. The local and aggregate numbers should not be interchanged or applied as universal coefficients to later technologies. [5]

Dauth and coauthors study Germany over 1994–2014 and find manufacturing displacement offset by service employment, with much of the adjustment falling on young entrants. Incumbents frequently remain with their original plants and move into different tasks; several measures indicate higher-quality positions. Earnings outcomes differ between retained workers and those forced to leave. This adds more than an aggregate employment counterexample: it identifies entry, retention, task change and worker transitions as separate adjustment margins. [6]

Taken together with the cross-country study, these results favor a dashboard of mechanisms. Service absorption may preserve employment while changing the opportunities available to entrants, but it should not automatically be labeled inferior or unproductive. Nor should incumbent upgrading erase losses experienced by workers who leave. The post labor question is which groups obtain durable earnings and useful new work after production changes, and whether those gains compensate for displaced or foregone opportunities.

Robot density can also rise because manufacturing employment falls for unrelated reasons. Trade shocks, recessions, offshoring, and changes in industry mix can shrink the denominator. A density chart should therefore include the stock and employment series separately. If the objective is to identify technology's contribution, an analysis must account for the fact that growing or productive firms may be more likely to adopt robots. Comparing adopters with nonadopters without addressing selection can mistake an existing growth advantage for an effect of the equipment.

Historical stock uncertainty is material. Operating life assumptions affect how many older units remain in service, and supplier coverage or reporting practices can change. Counts do not fully quality adjust the improvement in capabilities over time. An older unit and a newer unit may perform very different quantities and varieties of work. These issues do not erase the observed expansion, but they limit a precise numerical statement about automation services. The dashboard should retain source revisions and avoid presenting approximate historical stock estimates with more precision than the provider supplies. [3]

The post labor interpretation would strengthen if long deployment histories predicted lower labor requirements, weaker wage progression, and fewer accessible replacement roles after credible controls for demand and trade. It would weaken if expanding output and complementary activities broadly restored

earnings and opportunity for the affected groups. Rising equipment adoption remains a valid secular automation indicator under either outcome. Its role is to establish what is being deployed, then support a disciplined investigation of how that deployment changes production and distribution.

Charting stock flows and labor intensity

Create separate annual charts for installations and operational stock, using a consistent IFR vintage wherever possible. Add robot density only with its manufacturing employment denominator specified. Public checkpoints can be displayed as dated points; do not interpolate an annual series from executive summaries. Label 2025 as the latest observation and 24 September 2026 as the release date. Show forecasts after the observation boundary with a separate style and explicit label, or omit them from the secular evidence chart. [1][2]

For reproduction, obtain the country industry export, archive source definitions and retirement assumptions, and record revisions. Combine it with consistent employment, hours, and real output data. Analyze adoption intensity within comparable industries before drawing national conclusions. Distinguish new installations, replacement units, and the stock where the source permits. Historical minimum estimates should remain separate from modern point estimates unless a provider supplies a revised comparable series. Publish denominators and industry crosswalks alongside the chart so that apparent density increases can be audited. [3]

Connect industrial robots to manufacturing labor intensity, task displacement and reinstatement, new work, firm productivity, and premature deindustrialization. Together they establish deployed automation, its task balance, and its effect on access to prosperity. Keep humanoid prices and AI cost measures in their separate short history chapters. Industrial robotics supplies a genuine decades long deployment record; the newer technologies can extend the frontier, but their brief commercial histories should not be used to manufacture the secular evidence this measure already provides.

SOURCES AND REPRODUCTION NOTES

[1] International Federation of Robotics (2026). World Robotics. Database description states installations and operational stock 1993 to 2025; detailed historical export requires access; verified 4 October 2026.

[2] International Federation of Robotics (2026). Five Million Robots now Operate in Factories Globally. Released 24 September 2026; observations for calendar 2025; forecasts labeled separately; verified 4 October 2026.

[3] International Federation of Robotics (2007). World Robotics 2007 Executive Summary. Original IFR executive summary archived by Sapienza University; 2005 and 2006 stock estimates and service life assumptions; verified 4 October 2026.

[4] Georg Graetz and Guy Michaels (2015). Robots at Work. Original CEP Discussion Paper 1335; seventeen country analysis 1993 to 2007; productivity and employment findings; verified 4 October 2026.

[5] Daron Acemoglu and Pascual Restrepo (2020). Robots and Jobs: Evidence from US Labor Markets. Studies U.S. robot exposure, 1990–2007; distinguishes local employment and wage estimates from smaller model-implied aggregate effects after regional spillovers. Verified for version two 4 October 2026.

[6] Wolfgang Dauth, Sebastian Findeisen, Jens Suedekum and Nicole Woessner (2021). The Adjustment of Labor Markets to Robots. Finds German manufacturing displacement offset by service employment, 1994–2014, with important differences between entrants, retained workers and those leaving plants. Verified for version two 4 October 2026.

RELATED CHAPTERS 084 · 085 · 089 · 092 · 095

CHAPTER 094

AI capability relative to cost

EVIDENCE STATUS **Short history** · OBSERVATION SPAN Verified language model cost windows November 2022 to October 2024 and April 2024 to November 2025

The cost of achieving a fixed level of benchmark performance fell rapidly in short recent windows, while the cost of running the most capable models can rise.

The price of a specified capability

AI capability relative to cost asks how much it costs to obtain a defined level of useful performance. A robust version specifies a task, a success standard, an operating configuration, and the full resources needed to deliver an acceptable result. The simplest commercial measure uses API prices, but price per token is only an input price. Models can consume different numbers of tokens to complete the same task and can differ in error rates, speed, or required review. The economically relevant denominator is a successful result under a stated quality threshold.

Fixed performance cost is different from the cost of the latest frontier. A newer model can reach an earlier benchmark score cheaply while a more ambitious frontier model uses more computation to achieve a higher score. Both trends can occur simultaneously. A dashboard should therefore show the cheapest system meeting a fixed capability threshold and the cost of operating the highest performing system under a defined test. Combining them into one statement that AI always gets cheaper would conceal a meaningful change in the quantity and ambition of computation purchased.

Stanford's AI Index 2025 reports that inference cost for a system at roughly GPT 3.5 performance fell by more than 280 times from November 2022 to October 2024. This is a verified short technology price performance comparison. It is neither a twenty year macroeconomic trend nor a measure of the cost of employing a complete autonomous worker. The benchmark, configuration, and price unit must remain attached to the result. The existence of earlier computing progress does not lengthen this particular language model observation series. [1]

Gundlach, Lynch, Mertens, and Thompson's original research, revised on 23 March 2026, examines benchmark run prices from April 2024 to November 2025. It estimates fixed performance price declines of about five to ten times per year across several benchmarks, while reporting rising costs of running frontier systems. The study includes actual benchmark token consumption, making it more economically informative than a token price alone. Its short observation window remains explicit even though its implications concern the longer automation process. [2]

A practical capability measure should avoid mixing benchmark scores with labor productivity without a bridge. A score describes performance under a specific evaluation. A workplace result includes integration, data access, permissions, communication, and consequences of error. A model can perform well on a test while needing substantial human supervision in a real workflow. Cost per accepted output should include that supervision. The measure belongs in the reference as a monitor of technological feasibility and adoption

incentives, with short history status rather than as established evidence that labor compression has accelerated for decades.

Rapid recent changes with limited duration

The verified cost windows last approximately two years and less than two years respectively. They fail the secular duration rule. Their importance lies in the speed of recent changes and the possibility that they alter the economics of tasks previously expensive to automate. The chart should keep the short horizontal axis visible. Projecting an annual decline over several decades would assume continuity that the observed record cannot establish. A reference intended to evaluate a decades old thesis should distinguish this leading technology indicator from its longer historical outcome measures.

The 2026 revision of the original price performance research introduces an especially useful distinction: frontier model run prices rise by roughly three to eighteen times per year in the measured setting even as fixed performance becomes cheaper. The different ranges correspond to benchmark and model choices. They should not be read as guaranteed future rates or universal cost changes in every application. The paper's observations end in November 2025, despite the March 2026 revision. Retaining both dates avoids confusing a recent manuscript with a continuously updated commercial price index. [2]

Stanford's 2026 AI Index provides a current broader assessment of technical performance during 2025 and early 2026. Its summary emphasizes both strong gains and uneven reliability across tasks. This supports the choice to track capability dimensions separately rather than equate one high score with general job competence. The report's presence does not automatically update the older fixed GPT 3.5 cost comparison to a new endpoint. For a longitudinal extension, the underlying cost threshold, benchmark version, and price construction must be reproduced explicitly. [3]

The table records verified windows without fabricating a twenty year series. The recent technology evidence can still matter to an established secular framework: it may identify a new margin of task exposure or lower adoption barriers. Yet the historical thesis should be supported by labor intensity, task displacement, job quality, and distribution measures with longer observations. The cost indicator helps explain a possible next phase. It does not supply the historical starting date or demonstrate a measured change in economy wide employment by itself.

Measure	Observed window	Verified finding
Fixed GPT 3.5 level inference comparison	November 2022 to October 2024	More than 280 fold price reduction in AI Index 2025
Benchmark run price performance study	April 2024 to November 2025	Fixed performance prices fall while frontier run prices can rise
Research revision	23 March 2026	New manuscript date with unchanged short observation span
AI Index 2026	Primarily 2025 and selected early 2026 readings	Broader capability context rather than a twenty year cost history

Original price performance research [2] and Stanford reports [1][3]; every window remains below the secular threshold.

Adoption incentives and task substitution

The basic mechanism is a changing price comparison. An employer may adopt a system when the cost of obtaining acceptable machine output falls below the cost of producing the same output with human labor and associated organizational resources. That decision depends on more than technical performance. It includes integration, supervision, security, reliability, latency, and the cost of failure. A substantial decline in model inference prices can make adoption worthwhile for additional tasks, while a high review burden can keep the total cost above the human alternative.

A hypothetical example shows the denominator problem. A model call costs one unit but succeeds only half the time, requiring retries and review. Another costs two units and succeeds reliably enough that little review is needed. The cheaper call can be the more expensive route to an accepted result. If a reasoning model improves reliability by using more tokens, its token price can fall while its cost per run rises. A meaningful labor substitution calculation records successful output and human time rather than choosing the smallest advertised input price.

Lower fixed performance costs can support augmentation as well as displacement. A worker may use the system to draft, classify, search, or check information while retaining responsibility for the result. The worker can produce more per hour, serve more clients, or improve quality. Alternatively, the employer may reduce staffing for a fixed volume of work. Demand expansion and the creation of new tasks determine how much of the initial time saving becomes fewer positions. The cost indicator identifies an incentive that can activate either path; task and employment data establish what actually happens.

Capability thresholds can matter more than smooth average score gains. A system that becomes reliable enough to complete a whole bounded workflow may cross an adoption threshold even if its score improvement appears small. Another system can gain substantially on academic benchmarks while remaining unsuitable for a workflow requiring consistent handling of unusual cases. A dashboard should therefore measure completion at a specified quality level on representative tasks. Success rates, interventions, error severity, and the frequency of unusual cases are economically relevant complements to cost and speed.

The post labor connection is strongest when lower cost systems allow businesses to expand output without proportional growth of accessible good jobs. It can also influence bargaining before full substitution occurs if a credible alternative changes employers' willingness to pay for a task. Those channels need separate evidence. Rapid technical improvement is not itself a measured wage loss, and a lower API bill is not evidence of total social resource savings. The indicator belongs beside actual adoption, labor input, compensation, and task creation to test how technical possibility becomes an economic outcome.

Benchmarks prices and hidden labor

Benchmark design creates comparability limits. A test can become saturated, leaked into training material, or altered to address earlier weaknesses. Prompting, tool access, time limits, and evaluation rules can change measured performance. A model tested with substantial reasoning expenditure is not directly comparable with one tested under a small budget. A longitudinal chart needs a stable test and operating rule or an explicitly documented bridge across versions. Replacing a difficult test with an easier one can produce apparent improvement without an equivalent gain in useful capability.

Commercial price is different from underlying resource cost. Providers can subsidize services, change margins, offer temporary promotions, or charge different prices by usage tier and region. Open model operation also depends on hardware utilization, batching, memory, energy, and administration. A falling posted price can reflect competition as well as technical efficiency. That is economically relevant to adoption, but it should not be mislabeled as a pure improvement in algorithms. The original research's decomposition addresses these distinctions under stated assumptions; a dashboard should preserve the uncertainty of any attribution. [2]

Hidden human labor is another boundary. Data preparation, labeling, evaluation, red teaming, integration, and ongoing review can sit outside the inference invoice. Some costs are fixed investments; others scale with use or exceptions. A firm can report fewer visible workers in the target department while paying contractors or platform workers elsewhere. A full resource comparison should include these activities where measurable. The purpose is to evaluate actual labor saving and productivity, rather than infer a complete autonomous service from the price of one software component.

Reliability and consequences differ across workflows. An imperfect draft can be useful when a competent worker quickly checks it. A flawed transaction or overlooked exception can create a loss exceeding the nominal time saving. The 2026 AI Index's emphasis on uneven capability supports a task specific approach. Analysts should track error distributions and review requirements alongside mean success. A single aggregate intelligence score can hide the weak capability that determines whether a system is deployable in the particular workflow under study. [3]

The interpretation would weaken if apparent price performance gains disappear under realistic review and integration costs, or if cheaper systems mainly expand demand for complementary human work. It would strengthen if accepted output becomes cheaper across stable real world tasks while human intervention falls and output grows with fewer labor hours. Even then, the metric remains a short technology history until enough comparable years accumulate. The honest contribution is an observed recent change in the frontier of economic feasibility, connected to a longer automation process through independently measured outcomes.

Cost per accepted result as the monitor

Chart minimum cost to achieve several fixed benchmark thresholds over the verified short windows. Add a separate line or panel for frontier run cost. State model version, input and output token accounting, tools, reasoning budget, and the success threshold. Use logarithmic scales when necessary and retain real dates. A workplace companion chart should plot total cost per accepted result and human intervention time. Avoid a twenty year extension based on assumed exponential progress or a line joining incomparable benchmark generations. [1][2]

For reproduction, archive prices and evaluation outputs with timestamps, because current price pages cannot reconstruct previous commercial terms reliably. Preserve retries, failed runs, and token consumption. Add integration, human review, and resource costs in a separately documented calculation. Apply the same tasks and quality rules across model versions; report a second series when the task basket changes. A current capability report can identify relevant evaluations, but its publication date should not replace the date of the underlying observation. [3]

Connect this entry to task displacement, new work, startup employment intensity, robot deployment, and enterprise outcome guardrails. Those measures establish what businesses do with cheaper capability and whether the resulting services remain effective. The specific contribution is a recent change in the price of machine performance that may extend the scope of automation. Its short history status protects the secular thesis from relying on a technology series that has not existed long enough to test the required two decade trend.

SOURCES AND REPRODUCTION NOTES

[1] Stanford Institute for Human Centered Artificial Intelligence (2025). The 2025 AI Index Report. Takeaway 7; fixed GPT 3.5 performance inference cost comparison November 2022 to October 2024; verified 4 October 2026.

[2] Hans Gundlach, Jayson Lynch, Matthias Mertens and Neil Thompson (2026). The Price of Progress: Price Performance and the Future of AI. Original research revised 23 March 2026 version 2; benchmark price observations April 2024 to November 2025; fixed performance and frontier costs distinguished; verified 4 October 2026.

[3] Stanford Institute for Human Centered Artificial Intelligence (2026). The 2026 AI Index Report. Current technical capability and reliability context; older price threshold endpoints are not automatically extended; verified 4 October 2026.

RELATED CHAPTERS 081 · 084 · 085 · 093 · 095

CHAPTER 095

Humanoid robot cost and useful capability

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Commercial product snapshots retrieved October 2026 and IFR calendar 2025 shipments

Published humanoid prices and demonstrations provide short history checkpoints, but a reproducible measure of cost per useful autonomous output is still needed.

Useful output rather than the purchase price

Humanoid robot cost and useful capability asks whether a human shaped machine can deliver acceptable physical work at a competitive total cost. The appropriate economic numerator includes purchase or lease expense, integration, software, energy, maintenance, supervision, remote operation, and the consequences of failure. The denominator is accepted output or useful autonomous operating time under a stated task standard. Purchase price alone omits most of the conditions that determine whether a machine is an economical substitute or complement for human labor. The entry is a proposed metric because standardized longitudinal outcome data remain limited.

Humanoid appearance is a design choice, not a general productivity measure. A human shaped system may fit doors, stairs, tools, or workstations designed for people. A specialized arm, conveyor, mobile platform, or other machine may perform the same bounded task more efficiently. The relevant comparison is between complete workflows meeting the same quality standard. Counting joints, demonstrating balance, or lifting an object reveals capability dimensions, but it does not establish reliable throughput in a customer's environment. Those demonstrations should remain distinct from independently measured operational results.

Unitree's current G1 product page lists a starting price of 13,500 United States dollars, excluding tax and shipping. It distinguishes the base model from the education configuration and notes that some showcased functions remain in development or testing. That is a verified vendor price and specification checkpoint, not a fully configured labor replacement cost. A reference should record the product variant, included hardware, commercial terms, and observation date. It should avoid assigning the base price to demonstrations using optional capabilities or a different configuration. [1]

1X's NEO announcement lists early access at 20,000 dollars and a later subscription offering at 499 dollars per month. Its current product description includes foundational autonomy and scheduled expert guidance for tasks the system does not know. These are vendor claims about an offered product and service model. They do not supply measured autonomous hours, intervention rates, or a delivered customer's cost per completed chore. The presence of remote expert work makes human labor accounting particularly important when evaluating the automation claim. [2][3]

A useful physical capability record specifies task, environment, load, speed, success criteria, intervention, and duration. Moving a familiar object in a prepared room differs from identifying and handling varied objects in

an ordinary workplace. The machine's output should be evaluated at a quality level comparable with the human or specialized machine alternative. The denominator must exclude time spent charging, recovering, awaiting assistance, or performing unsuccessful attempts. Those definitions make the proposed measure capable of distinguishing a low sticker price from an actual decline in the cost of useful automation.

Recent commercial checkpoints with no secular series

The current humanoid commercial record is short. Current product observations and calendar 2025 market reporting do not satisfy the twenty year requirement. Earlier robotics research and industrial automation history provide context, but they do not create a comparable two decade price performance series for these products. The chapter therefore retains proposed metric status. It belongs in the glossary because it identifies an important future monitoring question, with explicit limits on what the available evidence can establish about a post labor process already underway for decades.

IFR's service robotics release of 30 September 2026 reports approximately 7,000 full size humanoids above 140 centimeters sold globally during 2025. It describes specialized applications and frequent human teleoperation, alongside unresolved business case and integration challenges. The height and application boundary matter: the figure is not a count of all human shaped machines, all prototypes, or autonomous workers in operation. It is also a shipment observation rather than a measure of useful hours delivered. The release provides a current market checkpoint, not a secular deployment trend. [4]

The three commercial checkpoints should be kept in separate categories. A posted hardware price is an offer under specified terms. A subscription price is a service offer whose included assistance and operating limits need to be inspected. A shipment count describes market activity under a provider's classification. None supplies the cost of a successful task. Combining them into a single robot affordability index would require assumptions about configuration, utilization, lifespan, service coverage, and performance. Those assumptions should not be hidden behind the apparently concrete nature of the price figures.

Historical comparison also requires quality adjustment. A later robot with a lower price may have a different payload, reach, hand configuration, computing system, durability, or intended use. A prototype price estimate and a commercially offered base platform are especially poor substitutes for one another. A credible time series should follow comparable configurations or use transparent task based performance standards. The observation date belongs in the record because vendor terms and features can change rapidly. Archived product versions are needed before claiming a longitudinal cost decline.

An earlier analyst estimate supplies an additional cost checkpoint. In February 2024, Goldman Sachs Research reported humanoid manufacturing costs falling from roughly $50,000–$250,000 to $30,000–$150,000 per unit, approximately a 40 percent reduction. These were research estimates of manufacturing costs across configurations, rather than a repeated price index for an unchanged robot or independently observed customer costs per useful hour. The same publication treated a general-purpose commercial business case as unproven. [5]

This evidence belongs beside the vendor offers as a dated indication that the engineering cost base can change quickly. It should not be spliced into a continuous series with starting retail prices or interpreted as a 40 percent fall in the cost of replacing a worker. To test that latter proposition, maintain comparable task requirements, configurations, operating lives and human assistance. A lower production cost can improve

deployment economics, but the amount passed through to purchasers and the useful work delivered must be observed separately.

Checkpoint	Verified observation	What remains unmeasured
Unitree G1 current offer	From 13,500 dollars excluding tax and shipping	Configured workflow cost and useful autonomous output
1X NEO early access offer	20,000 dollars with stated 2026 priority delivery	Delivered customer performance and intervention requirements
1X NEO later subscription offer	499 dollars per month	Comparable all inclusive operating cost
IFR 2025 full size shipments	About 7,000 units above 140 centimeters	Autonomous useful hours and labor displaced

Vendor documents [1][2][3] and IFR September 2026 release [4]; offers, shipments, and operational outcomes remain distinct.

The economic threshold for physical tasks

The prospective post labor mechanism is a decline in the cost of performing physical tasks in environments designed for people. If a flexible machine can move between tasks without extensive reconstruction, it may broaden automation beyond tightly standardized production cells. That possibility could affect warehousing, handling, inspection, facilities work, and some household activities. The mechanism is conditional on reliability, safety, dexterity, and economics. Human appearance alone does not establish the required capability, and an impressive demonstration does not show that the machine crosses a commercial cost threshold.

A hypothetical ownership calculation shows why utilization matters. Suppose annualized hardware and fixed support cost twenty thousand units. At two thousand useful hours, that component costs ten units per hour. At five hundred useful hours, it costs forty. Energy, maintenance, supervision, and error costs still need to be added. The numbers are illustrative rather than estimates for a named robot. They show that the same purchase price can support very different economic conclusions depending on useful operating time. A machine sitting idle or awaiting assistance delivers little labor substitution despite being inexpensive to buy.

Remote operation changes the labor balance. A robot can move the physical location of work while a person still performs the judgment or manipulation elsewhere. That can be valuable: it may reduce travel, allow flexible staffing, or place an expert at a distant site. It is not equivalent to eliminating the human labor input. A complete dashboard records operator time, simultaneous systems per operator, intervention frequency, and task completion. Learning from teleoperation can eventually reduce assistance, but the future improvement should remain a forecast until measured in delivered use.

The effect on employment depends on the workflow. A robot relieving a bottleneck can allow human staff to produce more, while a system covering a whole repeated task may reduce the staffing required for a fixed volume. Maintenance, supervision, and integration can create complementary roles. Demand expansion can offset immediate labor saving. The measure should therefore follow accepted output, human hours, and compensation before and after deployment. It should also examine contractors and remote operators, preventing a reduction in onsite headcount from being mistaken for an equivalent reduction in total labor.

Household use raises a separate distributional question. Replacing unpaid domestic work can increase leisure, reduce caregiving burdens, or make paid employment more feasible without directly reducing a

firm's payroll. Those benefits are economically significant but differ from factory displacement. If useful systems remain costly, access may initially favor affluent households or organizations. A post labor framework should distinguish reduced unpaid work, paid task substitution, and the ownership of productive capability. The same physical technology can affect each through different channels, and those outcomes need different denominators.

Capabilities that a demo cannot establish

A demonstration is selected evidence. It can show that a task is possible under particular conditions, but viewers may not observe failed attempts, preparation, operator involvement, or maintenance between runs. The task may use familiar objects and a controlled environment. A commercial assessment needs repeated trials across representative variation, with all attempts included. Throughput, intervention, recovery, and output quality should be recorded over sustained operation. This does not diminish the engineering achievement; it distinguishes technical possibility from the performance denominator needed for an economic claim.

Purchase offers also require configuration discipline. Optional hands, computing modules, software access, batteries, warranties, support, and integration can alter both capability and price. Vendor pages can describe future functions alongside current specifications. The Unitree and 1X documents demonstrate why those details matter. The glossary should label offered features, developing functions, and measured customer outcomes separately. A low advertised starting price should not be used as a universal cost for a general purpose autonomous worker without verified operating evidence and a clearly defined task basket. [1][3]

Failure costs can dominate apparently cheap operating time. A machine may need to avoid damaging goods, injuring people, interrupting production, or exposing sensitive information. Different tasks have different tolerance for errors. A slow reliable system may be economically preferable to a faster inconsistent one. The proposed metric should record quality adjusted accepted output and the distribution of failures, rather than only mean speed. Labor comparison should include the quality and adaptability of the human alternative under the same environment and workload, not an artificially easy robot test.

The shipment universe is another limit. A manufacturer can ship platforms for training, integration, or exploration before customers establish repeatable commercial use. A count of units intended for professional work does not identify their utilization or autonomy. IFR's current assessment describes an early market with specialized applications and teleoperation. That evidence supports monitoring, while limiting claims of broad substitution. Published forecasts of future humanoid populations should remain separate from observed shipments and useful task hours. An expanding market can exist before a stable standardized productivity measure does. [4]

The post labor interpretation would strengthen when independently documented deployments repeatedly deliver accepted output at lower total cost, with declining human intervention and durable utilization across customers. It would weaken if systems rely heavily on remote labor, remain economically inferior to specialized machines, or require costly adaptation for each task. In either case, the short commercial record cannot establish a twenty year trend. The chapter's value is a precise measurement agenda that can test future developments without importing assumed capability or labor displacement into the current evidence base.

A proposed monitor of useful automation

Use a structured scorecard by task and delivered configuration. Show total cost per accepted unit, useful autonomous hours, human intervention minutes, success rate, uptime, throughput, and output quality. Record whether each value is a vendor claim, a demonstration, a customer observation, or an independent repeated evaluation. Plot verified values only. Purchase prices and shipment counts can appear in separate context panels, with the offer or observation date and exclusions. A missing operational denominator should appear as missing rather than as an assumed full workday. [1][2][4]

Reproduction requires logs of all trials and operating periods, documented task conditions, cost allocation, and a comparable human or specialized machine baseline. Include failures and assistance. Separate fixed acquisition expense from costs that scale with use, and test utilization assumptions explicitly. Archive software version and hardware configuration because updates can materially change capability. For teleoperated work, count the remote person's time and disclose how many robots they supervise. This procedure converts a broad claim about robot affordability into a testable economic measure.

Connect this entry to industrial robot deployment, AI capability cost, task displacement, new work, and operational outcome guardrails. Industrial robotics supplies a decades long deployment history; this chapter identifies a newer possible extension into less structured physical environments. Its honest contribution is the definition of cost per useful capability and verified short commercial checkpoints. Treating it as a proposed indicator allows the framework to monitor technological change without making current promotional claims carry a secular macroeconomic conclusion.

SOURCES AND REPRODUCTION NOTES

[1] Unitree Robotics (2026 retrieval). Unitree G1. Current product price from 13,500 dollars excluding tax and shipping; configuration and developing function notes; verified 4 October 2026.

[2] 1X Technologies (2025 announcement retrieved 2026). 1X NEO Home Robot Order Today. Vendor early access and later subscription offers; delivery dates are company statements rather than verified delivered outcomes; verified 4 October 2026.

[3] 1X Technologies (2026 retrieval). NEO Home Robot. Current foundational autonomy, scheduled expert guidance and remote operation descriptions; no standardized useful hour denominator; verified 4 October 2026.

[4] International Federation of Robotics (2026). Global Sales of Professional Service Robots Surge 24%. Released 30 September 2026; calendar 2025 full size humanoid sales about 7,000 units above 140 centimeters; specialized applications and teleoperation; verified 4 October 2026.

[5] Goldman Sachs Research (2024). The global market for humanoid robots could reach $38 billion by 2035. Provides dated analyst estimates of humanoid manufacturing costs in February 2024; these differ from retail prices and costs per useful hour. Verified for version two 4 October 2026.

RELATED CHAPTERS 084 · 085 · 093 · 094

CHAPTER 096

Perceived socially useless jobs

EVIDENCE STATUS **Counterevidence** · OBSERVATION SPAN International repeated survey waves 1989 to 2015 with separate Europe 2005 to 2015 and United States 2015 studies

Workers' perceptions of social usefulness are measurable, but the strongest long record does not show a clear secular rise and shorter studies cannot establish one.

A perception measure with a precise boundary

Perceived socially useless jobs measures the share of employed respondents who report that their work lacks usefulness or a positive contribution under a particular survey question. The numerator is respondents classified by a stated response rule; the denominator is eligible employed respondents with valid answers, normally using survey weights. It measures workers' perceptions. It does not directly establish the economic output of a position, its social welfare effect, or whether an employer could remove it without consequences. Those are distinct questions requiring different evidence.

The terminology matters because several claims are often combined. A worker may dislike a job, feel disengaged, have too little to do, see no social contribution, or believe a task could be eliminated. These experiences overlap but are not identical. A position can create private revenue while imposing social costs. It can also create useful output whose contribution is difficult for the worker to observe. A survey asking about societal benefit should therefore be labeled as such rather than interpreted as a count of employees doing literally nothing or producing no market value.

Dur and van Lent's original research uses more than one hundred thousand workers across forty seven countries in the International Social Survey Programme's 1989, 1997, 2005, and 2015 work orientation waves. Its classification uses disagreement with a statement about the job's usefulness to society. The paper reports approximately eight percent in the 2015 sample and no clear upward trend across the repeated waves. The record spans 26 years and meets the duration requirement while supplying counterevidence to a presumed secular rise. [1]

Question wording and response coding are part of the metric. A neutral answer can represent uncertainty rather than a belief in uselessness. A question about feeling that one's work is useful can elicit a different response from a question about a positive contribution to the community or world. Combining neutrality with disagreement can substantially change the numerator. The dashboard should publish the exact question, response categories, and classification rule. Cross survey differences should remain separate until a validated bridge establishes that they measure comparable perceptions.

The entry is retained because it is a serious hypothesis and an important dimension of workers' experience, even when it fails to support the proposed macroeconomic trend. It can help evaluate the quality of work created as older tasks disappear. Its contribution to post labor economics would be stronger if long run evidence linked rising perceived pointlessness to labor saving change and weaker opportunity. The existing

secular record does not justify that conclusion. Preserving it as counterevidence makes the reference more informative than a catalogue limited to adverse findings.

Repeated waves and conflicting cross sections

The international long record covers four survey waves over 26 years. The research's publication date is separate from the latest observed year, which is 2015. Country participation changes across waves, requiring a stable country comparison or controls before interpreting aggregate movements. The authors examine that issue and still do not identify a clear rising pattern. The result should be charted at actual wave dates with its coverage stated, rather than interpolated into an annual trend. A later research publication cannot convert old survey responses into a contemporary reading. [1]

Soffia, Wood, and Burchell's original European analysis compares employee responses in the 2005, 2010, and 2015 European Working Conditions Survey. It finds a decline in its pointlessness measure over the decade, reaching approximately 4.8 percent in 2015. That ten year window falls below the secular threshold but provides additional evidence against assuming rapid growth. Its question and sample differ from the international study, so the levels should not be treated as measurements on one continuous scale. The article's 2022 publication still reports an earlier observed endpoint. [2]

Walo's 2023 original United States study analyzes a final sample of 1,811 respondents from the 2015 American Working Conditions Survey. More than nineteen percent meet its social usefulness classification. This supplies a higher level under a different survey design and explores occupational differences, but it is a single cross section. It cannot show that the share rose over time. The finding warrants attention to worker experience while leaving the secular direction unmeasured. A comparison with the lower European level cannot be relabeled a temporal increase. [3]

The evidence table therefore retains separate populations and concepts. A large level in one survey can coexist with a stable or declining trend in another. Differences in question wording, response thresholds, geography, occupation mix, and treatment of self employment can explain part of the variation. A credible longitudinal monitor should first establish measurement consistency and then evaluate the direction. Selecting whichever survey produces the highest percentage would not answer the user's question about a two decade macroeconomic trend.

Original evidence	Observation span	Conclusion relevant to the secular claim
Dur and van Lent international waves	1989 to 2015	No clear rising trend across a 26 year record
Soffia Wood and Burchell Europe	2005 to 2015	Declining measured pointlessness over ten years
Walo United States AWCS	2015 only	Higher measured level but no longitudinal direction
Publication years	2018/2019, 2022 and 2023	Research dates do not extend the survey endpoints

Original papers [1][2][3]; different questions and sample rules prevent a single spliced percentage series.

Meaning economic value and utilization

A perception of pointlessness can arise through several mechanisms relevant to work quality. Tasks can be fragmented so that a worker does not see the final beneficiary. Management can impose procedures whose purpose is poorly communicated. A person can have little autonomy or an unused skill set. An organization can also sustain a task because it serves a private incentive even if the worker questions its broader social benefit. These possibilities make the subjective measure meaningful without proving that the position lacks all economic justification.

The user's distinction between market justification and social usefulness is analytically useful. Someone approving a position normally expects some contribution to an organizational objective, but that decision does not demonstrate perfect utilization or social efficiency. Budgets, information, incentives, and coordination can be imperfect. A worker's judgment provides information about the experience of the task, while output, customer outcomes, and organizational results provide other information. A serious assessment considers both rather than assuming that either managerial approval or worker dissatisfaction settles the true value of the role.

A hypothetical administrative task illustrates the boundary. A worker repeatedly compiles reports that no manager reads. The activity could be wasteful if no other function relies on them. It could also satisfy a reporting obligation, maintain an audit trail, or provide information used during unusual events. Determining which applies requires examining the process and consequences of removal. The worker's sense of futility is still an important quality signal. It is not automatically a quantitative estimate of the output lost or resources saved if the job disappears.

Automation can change this experience in opposite directions. Eliminating repetitive paperwork can improve purpose and autonomy. It can also leave a person monitoring exceptions or performing fragmented residual tasks whose contribution feels less visible. New professions can create useful expertise, while poorly designed workflows can generate coordination overhead. These are plausible mechanisms to investigate. A secular post labor interpretation would require evidence that the net effect produced a rising perception measure over comparable surveys, and that the change was tied to labor saving transformation rather than unrelated management conditions.

Perceived pointlessness also differs from reduced labor intensity. A highly useful occupation can shrink because improved methods reduce the labor required to supply its service. An occupation with questionable social consequences can grow because demand or private incentives expand. The existence of the latter does not directly establish that the economy is inventing work to absorb surplus labor. Connecting this chapter to task creation helps keep the argument disciplined: new work needs to be evaluated for scale, accessibility, compensation, and outcomes, without assuming unfamiliar activities are inherently unnecessary.

Why this is counterevidence rather than proof

The strongest available long comparison does not demonstrate the assumed direction. That should carry real weight. A hypothesis of a rising economy wide share of pointless jobs cannot be supported by anecdotal reports alone when repeated surveys do not show a clear rise. The counterevidence does not prove every job is valuable or every organization is efficient. It narrows the claim: the particular perception metric has not

established the secular expansion proposed as an indicator of post labor. Other labor compression measures should stand on their own empirical records.

Subjective answers can change with expectations, communication, and social context even if tasks remain similar. A worker may become more critical of a familiar activity or learn how it benefits others. Survey mode, translation, response scales, and nonresponse can also influence the measure. Longitudinal comparability requires documenting those features. A change in a response should not automatically be interpreted as a change in objective economic value. The perception itself remains worth studying because it affects the experienced quality of employment and may identify organizational problems requiring investigation.

Single cross sections answer a different question from secular trends. The United States analysis's higher percentage indicates that a meaningful share of respondents report a concern under its definition. It does not establish a prior baseline, a direction, or a growth rate. Occupational associations can also reflect the kinds of people entering jobs, the organization of work, or other unmeasured factors. Repeated comparable observations would be needed before incorporating that level into a long run index. The current finding should remain a separate cross sectional chapter checkpoint. [3]

Private economic value and social welfare can diverge. Persuasion, intermediation, legal defense, compliance, and risk management can involve activities whose contribution is indirect or contested. Evaluating them requires specifying the counterfactual: whose outcome changes if the activity disappears, and how? A role that transfers resources between parties can have private value while its social net effect is debated. This is a different proposition from saying that labor saving technology caused jobs with no output to proliferate. The perception survey cannot adjudicate all those welfare questions.

The post labor interpretation would strengthen if a stable twenty year survey series showed a persistent rise, if composition and wording could not explain it, and if identified automation exposure predicted the change through residual task design or constrained alternatives. It would weaken further if comparable newer waves remained stable or declined while accessible employment improved. At present, the prudent use is as a work quality diagnostic and a testable hypothesis. The retained counterevidence avoids forcing a dramatic cultural narrative into a longitudinal framework that the data do not support.

A consistent survey monitor

Chart the international measure at its four actual wave dates, with separate lines for a stable set of participating countries where possible. Publish the question, disagreement threshold, weights, sample population, and treatment of neutral responses. A European panel can show the shorter decline, and a United States point can show the single year result. Do not connect those panels into a worldwide rising line. Their numerical differences measure survey and population differences as well as possible differences in experience. [1][2][3]

For an update, retrieve new comparable work orientation or working conditions microdata and inspect questionnaire changes before calculating the numerator. Preserve country specific results and uncertainty. Compare raw changes with changes adjusted for occupation, age, education, and employment status. Add autonomy, utilization, management quality, and visible beneficiary measures as separate dimensions rather than as substitutes for social usefulness. Any claim about objective waste needs process or outcome evidence beyond the worker perception question. Document that additional evidence independently.

Connect this entry to meaningful work and engagement, good jobs, new work creation, and enterprise service outcomes. Those measures can reveal whether employment remains fulfilling and productive without assuming all indirect work lacks value. The specific conclusion here is that perceived social uselessness exists, but the verified secular survey evidence does not show its clear rise. That is useful counterevidence within a broader post labor argument whose stronger claims concern labor intensity, access to good jobs, bargaining, ownership, and the distribution of prosperity.

SOURCES AND REPRODUCTION NOTES

[1] Robert Dur and Max van Lent (2018 working paper; 2019 journal publication). Socially Useless Jobs. IZA Discussion Paper 11927 dated October 2018, later published in 2019; ISSP waves 1989 1997 2005 2015; international coverage and subjective usefulness classification; verified 4 October 2026.

[2] Magdalena Soffia, Alex J Wood and Brendan Burchell (2022). Alienation Is Not 'Bullshit': An Empirical Critique of Graeber's Theory of BS Jobs. Original Work Employment and Society article; European Working Conditions Survey employee comparisons 2005 2010 2015; chapter reports direction and 2015 endpoint only because the 2005 narrative and table figures differ; verified 4 October 2026.

[3] Simon Walo (2023). 'Bullshit' After All? Why People Consider Their Jobs Socially Useless. Original Work Employment and Society article; 2015 United States AWCS final sample 1811; a cross section rather than secular trend; verified 4 October 2026.

RELATED CHAPTERS 024 · 032 · 085

CHAPTER 097

Capital services cost share

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN 1987 to 2024

The gross capital cost share rose over more than three decades, with the original 2024 value of 0.421 verified for private business rather than private nonfarm business.

Definition and sector boundaries

Capital services cost share measures the fraction of production costs assigned to capital in the BLS aggregate productivity accounts. Write it as capital cost divided by the sum of assigned capital and labor costs. It is a current dollar cost weight, expressed here as a percentage. The original first round figure of 0.421 for 2024 is verified for private business, equivalent to 42.1 percent. The corresponding private nonfarm business figure is 0.417, or 41.7 percent. FRED labels these series “Percent” while presenting fractional values; the chart must convert the observations consistently. [1] [2]

The numerator is broader than profits paid to owners. BLS assigns corporate capital income and an imputed capital component of proprietors’ income to capital. Corporate capital income includes capital consumption allowances, before tax profits, interest, inventory valuation adjustments, and relevant components of business taxes and other payments. Depreciation is therefore inside the measure. A company can devote substantial production income to replacing worn or obsolete assets without distributing that amount as spendable income to shareholders. [3]

The denominator also needs attention. The aggregate accounts use value added, rather than all spending on energy, materials, and purchased services. Labor costs include employee compensation and an allocated labor return for proprietors. Certain production taxes, including sales and excise taxes, are unassigned to either factor. The assigned capital and labor cost shares are normalized to sum to one. A share of this denominator should not be relabeled as the share of every dollar of GDP reaching capital owners. [3] [4]

Private business includes farms. Private nonfarm business excludes farms. Both productivity sectors exclude government enterprises, general government, nonprofits serving households, paid household employees, and owner occupied housing services under the relevant output boundaries. A labor share from another business sector may cover a different population, even when its title sounds similar. Matching sectors and assigned cost definitions is essential before treating the two shares as exact complements. [3] [4]

This measure is also distinct from a physical capital stock, a capital services quantity index, and the value of financial wealth. It records the economic weight used to combine production inputs. Forty two percent does not mean machines perform forty two percent of tasks or that forty two percent of workers can be removed. Its specific contribution is to show how the measured cost allocation between production factors has changed across a long period, alongside separate evidence about quantities, wages, and ownership.

Verified annual history and the original figure

The independently audited annual extracts run from 1987 through 2024 and were updated on 19 December 2025. In private business, the share increased from 0.332 to 0.421, an 8.9 percentage point rise after conversion to percentages. Private nonfarm business increased from 0.322 to 0.417, a 9.5 point rise. These are changes in the fraction of costs attributed to capital, rather than percentage growth rates in capital input. The span comfortably meets the twenty year secular criterion. [1] [2]

The endpoints conceal a changing pace. Private business was at 32.8 percent in 2000, close to its 1987 level, and reached 39.2 percent in 2010. It stood at 39.1 percent in 2019, before moving to 42.3 percent in 2023 and 42.1 percent in 2024. The increase is therefore stronger across the full record than a simple claim that the share rose continuously every year. The two sectors tell a similar broad story while preserving the effect of their different coverage. [1] [2]

The original quoted observation is accurate within that record. Its proper label is “private business capital cost share, 2024, December 2025 vintage.” Substituting the more familiar phrase private nonfarm business would silently change the series and overstate that sector’s endpoint by 0.4 percentage points. This difference is modest economically but useful methodologically: careful tracking should preserve a stable definition before discussing a trend’s significance. [1] [2]

The 2024 endpoint is intentional. A subsequent preliminary aggregate productivity estimate does not automatically provide a comparable updated full annual cost share extract. Retrieval in October 2026 is a statement about when the evidence was checked; it does not convert the final observation into a 2026 measurement. Keep any newer preliminary estimate separate until the share, coverage, and revision status can be verified against its own source. The BLS methods distinguish preliminary productivity calculations from the later full calculation. [3]

The historical pattern supports a durable shift in the gross factor cost allocation. It does not establish a single cause for that shift. The long rise predates current generative AI deployment by many years, making it relevant to the broader automation framework. Recent years may also reflect pandemic disruptions, business composition, financing conditions, prices, and revisions. The chart should let readers see those fluctuations rather than converting an endpoint comparison into a claim of uninterrupted acceleration.

BLS series MPU4900131 and MPU4910131 through FRED. Annual fractional observations multiplied by 100; December 2025 vintage. [1] [2]

Year	Private business percent	Private nonfarm business percent
1987	33.2	32.2
1990	33.5	32.7
2000	32.8	32.3
2010	39.2	38.8
2019	39.1	38.8
2023	42.3	41.9
2024	42.1	41.7

Connection to production and distribution

Capital cost share links the quantity side of production to its accounting weights. BLS growth accounting combines changes in real capital services and composition adjusted labor using their cost shares. In the labor productivity decomposition, capital services per hour contribute to growth after multiplication by the average capital share in adjacent years. The cost share therefore tells the reader how heavily capital deepening enters that calculation. It is a weight applied to growth, rather than an additional source of growth that can be added independently. [3] [4]

Consider an explicitly hypothetical production system in which capital services per hour grow by two percent. A capital weight of one third produces a contribution of roughly two thirds of a percentage point; a weight of two fifths produces roughly four fifths. This illustration holds other components constant and uses the usual small change approximation. It explains why the share matters when interpreting a capital deepening chapter. It does not estimate the observed contribution in any year, which requires the actual quantity changes and BLS calculation.

For post labor economics, the strongest reading combines several observations. If capital services per human hour increase, the capital cost share rises, and output grows faster than human work at stable quality, production is becoming more reliant on capital relative to labor under those measures. If labor compensation then fails to distribute the resulting prosperity broadly, the distributional dimension becomes clearer. Each step requires its own evidence. The capital cost share alone supplies the factor allocation component of that chain.

Ownership adds a separate mechanism. Returns assigned to productive capital can accrue to households indirectly through pensions, retirement accounts, business ownership, or other claims. When ownership is concentrated, a shift in the factor allocation may distribute gains differently from an increase in wage income. Yet depreciation, taxes, retained earnings, and corporate financing prevent a direct mapping from gross capital cost to household cash receipts. Household capital income and ownership concentration are therefore companions, rather than conversions of this percentage into an identical household outcome. [3]

Capital can also complement labor. Expensive machinery or software may raise the output and wages of workers who remain essential to its use. A larger capital weight is consistent with that complementarity as well as with task substitution. The proposed interpretation is consequently specific: the production accounts give capital a larger gross cost weight over the verified period. Evidence that individual tasks require less human input strengthens an automation explanation; evidence of broad wage gains and new productive work changes the distributional interpretation without erasing the accounting observation.

Alternative readings and accounting sensitivity

Depreciation is the first major alternative reading. An asset mix tilted toward equipment and software with shorter useful lives can increase replacement requirements. Gross capital cost can rise even when the net return available for household consumption changes less. A report concerned with who receives distributable prosperity should compare this gross measure with net operating surplus, profits, household capital income, and saving. Those measures need their own coverage checks; simply subtracting an unrelated economy wide depreciation series would create a new denominator problem. [3]

Barkai's distinction between required capital costs and pure profits provides a different decomposition of the income residual. For U.S. nonfinancial corporations over 1984–2014, he estimates annual capital costs from

asset stocks and required returns that incorporate financing, depreciation, expected asset-price changes and taxes. Both the labor share and this capital-cost share decline in his estimates, while the pure-profit share rises by 13.5 percentage points in the main specification. [5]

This finding does not contradict a rise in the BLS gross capital cost share, because the accounts answer different questions. BLS assigns broad nonlabor income to its capital side; the research decomposition separates the estimated required payment for capital services from the remaining surplus. It therefore challenges the claim that every fall in labor's share demonstrates increased spending on productive machinery. The size of the surplus depends on required-return estimates and the treatment of omitted intangible assets. For interpretation, compare the published BLS allocation with separately labeled research estimates; do not subtract Barkai's historical nonfinancial-corporate values from a different business-sector series. [5]

Prices and financing are another source of movement. BLS capital services aggregation uses rental prices built from asset prices, depreciation, returns, expected capital gains, and tax considerations. The cost allocation reflects those economic prices as well as underlying productive assets. A changing relative price can therefore alter the share without an equivalent change in the fraction of workflow steps performed by capital. Real capital services per hour helps distinguish a quantity shift from a nominal cost shift, although it also relies on measured asset quality. [3]

Proprietors' mixed income requires an imputation. A self employed business owner may supply both work and equipment, while the national accounts initially report a combined income amount. BLS uses assumptions about labor and capital returns and reconciles the allocation to the available income control. Changes in noncorporate business activity can affect the aggregate share through this estimation. The methods issue is particularly relevant when comparing a whole private business series with a corporate labor share that avoids some mixed income allocation. [3]

Industry composition can also change the aggregate. If activity shifts toward industries with larger capital cost shares, the overall measure can rise without every industry changing its internal allocation. Market power, bargaining, international production arrangements, and tax or accounting conventions are additional hypotheses that need direct evidence. A gross factor share identifies the outcome to be explained; it does not separate these explanations by itself. A useful next analysis would compare within industry changes with shifts in the industries' weights under a consistent value added framework. [4]

Within its own assigned cost denominator, the capital share and labor share are arithmetic complements. Counting both as independent confirmation would overstate the information in the evidence set. The long capital share increase remains informative because it gives a distinct BLS production accounting perspective and a direct connection to growth weights. Its causal interpretation becomes stronger when supported by separately measured human hours, automation adoption, output, wage distribution, and task changes. A declining net capital return, broadly shared ownership, or strong labor complementarity would qualify the prosperity argument while leaving the gross cost series intact.

Chart design and reproducible monitoring

Download annual observations for MPU4900131 and MPU4910131 and archive the extraction date, update date, source notes, and sector labels. Retain the raw fractional values in one column and create a separate displayed percentage column by multiplying by 100. A value of 0.421 must appear as 42.1 percent on the

presentation chart. Record that unit transformation explicitly because the FRED metadata displays a generic percent label. Missing future observations should remain missing. [1] [2]

Plot both series on the same percentage scale with annual markers and a legend that spells out their coverage. A main chart spanning the entire verified record makes the pre AI history visible. Use a compact companion table for dated checkpoints and show the change from the start in percentage points. Avoid rebasing the shares to an index of 100: that would obscure the factor allocation the metric is designed to measure. Shade recessions only if they come from a separately documented source.

When an update arrives, compare revised historical values with the archived vintage before interpreting the new endpoint. Keep preliminary and full estimates labeled separately. Check whether changes arise from new income components, revised sector output, or capital and labor allocations. These checks are especially important when a share is used as a weight in a separate productivity decomposition. BLS explains how preliminary methods and later source revisions can differ. [3]

The monitoring set should connect this chapter to capital services per labor hour, capital deepening's growth contribution, productive capital stock, intangible investment, corporate profits, and capital ownership. Use labor compensation measures to investigate the distributional complement while recognizing their overlap. The evidence standard is a persistent verified shift in gross production cost allocation, followed by separately supported explanations of the mechanism and recipients. This series meets the duration requirement; it does not measure automated task coverage or establish that current AI caused the historical rise.

SOURCES AND REPRODUCTION NOTES

[1] U.S. Bureau of Labor Statistics via Federal Reserve Bank of St. Louis (2025). Private Business Sector: Capital Share (MPU4900131). Annual observations 1987 to 2024; updated 19 December 2025; 2024 0.421 interpreted as fraction 42.1 percent; verified retrieval 4 October 2026

[2] U.S. Bureau of Labor Statistics via Federal Reserve Bank of St. Louis (2025). Private Nonfarm Business Sector: Capital Share (MPU4910131). Annual observations 1987 to 2024; updated 19 December 2025; 2024 0.417 interpreted as fraction 41.7 percent; verified retrieval 4 October 2026

[3] U.S. Bureau of Labor Statistics (2020). Handbook of Methods Productivity Measures: Business Sector and Major Subsectors Calculation. Costs of production, labor compensation, capital costs, aggregation and preliminary calculation methods; verified retrieval 4 October 2026

[4] U.S. Bureau of Labor Statistics (2020). Handbook of Methods Productivity Measures: Business Sector and Major Subsectors Concepts. Value added boundaries, capital and labor cost share weights and capital deepening decomposition; verified retrieval 4 October 2026

[5] Simcha Barkai (2020). Declining Labor and Capital Shares. Separates estimated required capital costs from residual pure profits for U.S. nonfinancial corporations, 1984–2014; assumptions affect the decomposition. Verified for version two 4 October 2026.

RELATED CHAPTERS 049 · 050 · 051 · 052 · 053 · 054 · 057 · 059 · 060 · 063 · 064

CHAPTER 098

Prime age male employment to population ratio

EVIDENCE STATUS **Secular evidence** · OBSERVATION SPAN 1948 to 2023 comparable annual history with 2025 exceptional annual and September 2026 unadjusted updates

Prime age male employment has a lower multidecade baseline despite cyclical recoveries while the matching female trajectory is substantially different.

Definition and distinct employment boundary

The prime age male employment to population ratio measures the number of employed civilian noninstitutional men ages 25 to 54 divided by the civilian noninstitutional male population in those same ages, multiplied by one hundred. Its unit is percent. A person with several jobs appears once in the numerator. The measure describes the fraction of the covered population attached to employment, regardless of whether the person works a short schedule or holds a highly paid full time position. It is therefore a population work rate rather than a count of jobs or a measure of employment quality. [1]

The employment boundary is consequential. The CPS includes people who did any work for pay or profit during the reference week, qualifying unpaid family workers, and people who held a job but were temporarily absent under the survey rules. The denominator excludes the institutional population and people on active military duty. Changes in incarceration, institutional residence and military membership can therefore change who is represented. The statistic should not be described as the fraction of all American prime age men doing economically useful activity, because unpaid household care and other nonmarket production lie outside its employment definition. [1]

Male participation and male employment require separate chapters because participation includes unemployed people seeking work while the employment ratio does not. For a common population and measurement period, the employment ratio equals the participation rate multiplied by one minus the unemployment rate expressed as a fraction. This accounting relationship permits decomposition of a lower work rate into lower labor force attachment and unemployment among participants. The decomposition establishes categories; it does not identify why people move between them. Independently rounded survey statistics can introduce small arithmetic differences. [1]

Aggregate prime age employment combines men and women using their population weights. A substantial female expansion can offset a male decline, leaving the combined rate stable. The male series therefore tests a distinct historical experience that an aggregate chart can conceal. At the same time, the matching female series belongs beside it: a claim that employment opportunities have contracted uniformly across the prime age population would need to explain opposing trajectories. Equal age boundaries and comparable frequencies make that comparison interpretable.

This entry treats the male work rate as secular evidence of a lower historical attachment level, with important cyclical recoveries. It contributes an observed employment outcome to the post labor framework. It does not turn the entire nonemployed fraction into involuntary displacement or identify a fixed number of jobs that employers would otherwise have created.

Comparable male and female history

The BLS historical table supplies annual employment ratios for both sexes at ages 25 to 54 from 1948 through 2023. Male employment was 94.1 percent in 1948 and 95.3 percent in 1953. It was 94.1 percent in 1965, 91.1 percent in 1979 and 89.0 percent in 2000. These observations show a decline extending far beyond a single recession or the arrival of contemporary generative AI. They also establish that the historical male participation high near 97 percent must not be mislabeled as an employment rate. [2]

The subsequent history contains substantial contraction and recovery. The male annual work rate fell to 81.0 percent in 2010, recovered to 86.4 percent in 2019, fell to 81.8 percent in 2020 and returned to 86.3 percent in 2023. The latest annual table reports 86.2 percent in 2025. That last value excludes October, when CPS data were not collected during the federal shutdown, and BLS warns that it is not strictly comparable with normal annual averages. Annual pandemic values also average across very different monthly conditions. [2][3]

Women followed a different long trajectory. Their matching prime age employment ratio rose from 33.7 percent in 1948 to 43.3 percent in 1965 and 74.2 percent in 2000. It fell to 69.3 percent in 2010 and recovered to 75.1 percent in 2023, a high in the historical report. The 2025 eleven month female ratio was 75.0 percent. This counterexample demonstrates why male decline and stable aggregate prime age employment can coexist. It also shows why a sex specific deterioration cannot automatically become a claim about every worker. [2][3]

The current supplemental monthly table reports September 2026 employment ratios of 86.6 percent for prime age men and 75.5 percent for prime age women. Both are not seasonally adjusted. The covered male population was 63.996 million, with 55.402 million employed; the covered female population was 66.278 million, with 50.048 million employed. These timely observations should appear as a separate monthly record rather than being attached to an annual trend as if frequency and adjustment were unchanged. [4]

Comparing the 1953 and 2023 annual male ratios gives a decline of 9.0 percentage points, an original subtraction of published rates. Comparing 2000 and 2023 gives 2.7 percentage points. The choice of starting period affects the magnitude, which is why the full path matters more than a dramatic endpoint chosen in isolation. [2]

BLS ages 25 to 54 civilian noninstitutional population within sex; annual history [2], exceptional 2025 average [3], unadjusted current month [4]

Observation and frequency	Male prime age employed share	Female prime age employed share
1948 annual	94.1 percent	33.7 percent
1965 annual	94.1 percent	43.3 percent
2000 annual	89.0 percent	74.2 percent

Observation and frequency	Male prime age employed share	Female prime age employed share
2010 annual	81.0 percent	69.3 percent
2023 annual	86.3 percent	75.1 percent
2025 eleven month average	86.2 percent	75.0 percent
September 2026 unadjusted	86.6 percent	75.5 percent

Mechanisms and the good job connection

The work rate is an outcome of both labor demand and labor supply. A reduction in tasks historically performed by men can lower employment directly through layoffs and indirectly through declining search, migration or retraining incentives. If replacement opportunities pay less, require unfamiliar credentials or lie far from home, some workers may accept worse jobs while others leave employment. The work rate registers the latter response, whereas wage and occupational data are needed to observe the former. This is an inference about plausible channels, not a causal conclusion from the national ratio alone.

The CEA investigation through May 2016 emphasized the concentration of declining male participation among men with less education and examined labor demand, disability and institutional explanations. It supplies a research basis for considering heterogeneous attachment rather than treating prime age men as interchangeable. Its participation findings should not be recast as a new causal estimate for the employment ratio or extended automatically through 2026. The current work rate is an independent observed outcome that can be compared with the report's historical mechanisms. [5]

The post labor interpretation becomes more convincing when the work rate is paired with the replacement path. A community might lose a stable production base but retain high employment because former workers move into less rewarding services. Another might experience persistent nonemployment. Those are different adjustments to potentially related changes in production. Track real earnings after separation, desired hours, benefits and occupational movement alongside the work rate. The framework concerns access to prosperity through labor, so the number working and the rewards available to them should remain separate observable dimensions.

The sex comparison improves the mechanism test. Industries, occupations and household responsibilities have different male and female employment compositions. Their divergent histories can reflect sectoral restructuring, changes in education, reduced barriers to female employment and altered household choices. A universal technology narrative must allow these forces to operate simultaneously. The rise of female employment does not erase a male decline, and a male decline does not show that new work failed to appear anywhere. A more precise claim asks which populations lost access, what work replaced the old pathways and whether that replacement supported comparable household security.

A useful household extension examines whether a lower male employment rate coincides with more single earner households, greater reliance on transfers, or reduced family income after controlling for household composition. An increase in partner employment can preserve resources while changing how paid and unpaid work are shared. Connecting individual work rates to household outcomes avoids assuming that every employment exit represents the same economic loss.

Alternative explanations and stronger tests

Prime age boundaries reduce the influence of ordinary retirement and teenage schooling, but they do not remove all composition effects. The shares of men in their late twenties and early fifties can change within the bracket. Education, migration, family structure, health and institutional residence can also shift. An age standardized ratio holds the detailed age weights fixed while allowing group employment rates to vary. A separate education standardized series can answer a different question about changing credentials. Neither adjustment should replace the observed aggregate without showing what was held constant.

Preference and constraint are difficult to separate. A man may be out of paid employment while studying, caring for family, recovering from illness or relying on accumulated assets. These activities can be valuable. The same measured state can also follow discouragement, inaccessible work, declining expected wages or repeated rejection. Population employment alone cannot distinguish them. Report stated reasons, desire for work, disability and recent employment transitions, while recognizing that a stated reason may coexist with economic constraints. The definition describes observable status rather than a judgment about motivation. [1]

Historical institutions deserve attention. A comparison with the early postwar period embeds different military arrangements, family norms, educational choices and disability systems. Applying an old employment rate to today's population is a descriptive benchmark exercise. For example, a hypothetical population of one million men would have ninety thousand fewer employed people at 86.3 percent than at 95.3 percent. That arithmetic illustrates the rate difference; it does not establish ninety thousand available vacancies, willing applicants, or jobs eliminated by automation. Treat a missing employment estimate as a counterfactual requiring assumptions, not as directly observed displaced jobs.

Stronger evidence would combine the national history with identified shocks. Compare places or cohorts more exposed to a specific production change with credible comparison groups, follow individuals after displacement and examine whether earnings and employment recover. Account for trade, local demand, housing access and health changes where relevant. The national ratio supplies external context for those studies, but cannot distinguish overlapping shocks by itself. A persistent work rate decline in exposed groups together with lower replacement wages would provide a more specific compression result.

Evidence weakening a simple displacement reading includes durable recovery toward prior expansion highs, increased employment following better access to care or accommodation, and stable work rates after relevant composition adjustment. Recent recovery is already visible in the published history. The chapter therefore preserves the long lower male attachment baseline and the meaningful improvement after recession troughs, instead of interpreting one as a reason to suppress the other. [2]

Chart design and continuing monitoring

Build the historical chart from the BLS annual table using men and women ages 25 to 54 on the same percentage axis. Mark the source report's observation endpoint, 2023, separately from its June 2025 publication date. Add the 2025 annual table value with an explicit eleven month label, or show it as a separate checkpoint. Do not interpolate the missing October observation. A second panel can display current monthly observations on a consistent seasonal adjustment basis. [2][3]

The verified September 2026 sex specific table is unadjusted. Preserve that designation in the stored record and compare it with matching months when using unadjusted historical data. If a seasonally adjusted series is obtained directly from BLS, verify its age, sex, units and identifier before inserting it. The aggregate prime age seasonally adjusted ratio cannot substitute for the male series. Archive the downloaded table, retrieval date, release date and any later revision rather than relying on a changing current webpage. [4]

An accompanying decomposition should show male participation, unemployment among male participants and the resulting employment ratio over a common period. Use consistent frequencies and denominators. Add detailed age and education panels when the data support them, together with sampling uncertainty. Population control changes and revised weights should be documented, particularly when converting rate differences into headcounts.

Monitor expansion comparisons as well as current momentum. Compare several years around strong labor markets rather than a recession trough against a boom. Then connect this entry to prime age male participation, aggregate prime age employment, underemployment, real earnings, disability and transfer dependence. The male work rate supplies a distinct population outcome within that evidence set. A complete assessment asks whether men regained paid work, what kind of work they obtained and whether labor restored access to a secure standard of living.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Concepts and Definitions CPS. Employment population and labor force definitions; employment includes covered people at work or temporarily absent; verified retrieval date 4 October 2026

[2] Bureau of Labor Statistics (2025). Women in the labor force 2023 women and workplace flexibilities. June 2025 Report 1114 chart 2 contains comparable male and female ages 25 to 54 annual employment ratios 1948 to 2023; verified retrieval date 4 October 2026

[3] Bureau of Labor Statistics (2026). Employment status of the civilian noninstitutional population by age sex and race. Annual table 3 updated 20 February 2026; 2025 is an eleven month average excluding October and not strictly comparable with other annual averages; verified retrieval date 4 October 2026

[4] Bureau of Labor Statistics (2026). A13 Employment status of the civilian noninstitutional population by age sex and race. September 2026 supplemental household table; all observations not seasonally adjusted; published with 2 October release; verified retrieval date 4 October 2026

[5] Council of Economic Advisers (2016). The Long Term Decline in Prime Age Male Labor Force Participation. Historical analysis through May 2016; participation mechanisms rather than an updated employment ratio series; verified retrieval date 4 October 2026

RELATED CHAPTERS 001 · 002 · 004 · 008 · 010 · 099

CHAPTER 099

Demographic dependency ratios

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN 2000 to 2020 decennial history and separate Vintage 2025 update through July 2025

The older population rose relative to working ages across two decades while child dependency fell and demographic ratios remain distinct from economic support burdens.

Age composition and alternative denominators

Demographic dependency ratios compare population counts in specified ages. They describe the age structure relevant to potential support needs. In the Census decennial convention used here, the old age ratio is people ages 65 and older divided by people ages 18 to 64, multiplied by one hundred. The child ratio uses people under 18 over the same denominator. Their sum is the total age dependency ratio. Each is expressed as people in the designated dependent ages per one hundred people in the designated working ages. The denominator is an age population, regardless of actual employment. [1]

The international World Bank convention uses a different boundary: children ages 0 to 14 and older people ages 65 and above, with people ages 15 to 64 in the denominator. Its total series is SP. POP. DPND. Moving ages 15 to 17 from the child numerator into the denominator lowers the measured total ratio, even though the underlying people are unchanged. Country comparisons must preserve that definition through time. An international series cannot be spliced onto a domestic ages 18 to 64 chart merely because both are called dependency ratios. [2]

Age dependency is a demographic shorthand rather than a direct observation of financial dependence. Some older people work, own productive assets and support relatives. Some people in the working age bracket study, care for family, face illness or lack employment. Children and retirees also perform nonmarket activity. Consequently, a ratio of older people to working age people cannot be relabeled retirees per worker or beneficiaries per taxpayer. The World Bank metadata makes this distinction explicit. [2]

An economic support ratio requires a different calculation. One simple measure divides people outside the labor force by people inside it, including children in the nonparticipant group when the source population covers them. The BLS employment projections program publishes such an economic dependency ratio, expressed per hundred labor force participants. It incorporates participation behavior and an age composition component. A further variant could use employed people, paid hours, earnings or net resource contributions as the denominator. Each variant answers a different question and requires its own units and source boundary. [4]

This entry retains demographic ratios as supporting context for post labor analysis. Population aging can increase care and transfer needs while changing participation mechanically. It can therefore explain part of a larger transfer share or a lower aggregate work rate without any decline in demand for tasks. It also clarifies the scale of the population whose living standards must be supported by a changing production and distribution system.

Twenty year history and the latest vintage

The Census decennial history records an old age ratio of 20.1 in 2000, 20.7 in 2010 and 27.5 in 2020, using the ages 18 to 64 denominator. Across the same years, the child ratio fell from 41.5 to 38.2 to 36.1. The total ratio moved from 61.6 to 58.9 to 63.6. The twenty year change therefore contains a substantial shift toward older dependent ages, together with fewer children relative to the working age population. Total dependency did not rise continuously or by the full size of the old age increase. [1]

The latest verified domestic age counts come from Vintage 2025 estimates released on 25 June 2026. The national July 2025 counts are 72.021 million people under 18, 64.617 million ages 65 and above, and 205.146 million ages 18 to 64, with the last quantity obtained by summing the published 18 to 24, 25 to 44 and 45 to 64 categories. Original calculations from these counts give child dependency near 35.1, old age dependency near 31.5 and total dependency near 66.6 per hundred working age people. [3]

The same vintage supplies a revised April 2020 base. Original calculations within that product give a 2020 child ratio near 36.5, old age ratio near 27.5 and total ratio near 64.1. These differ from the decennial brief, especially in the child and total ratios. Census incorporates revised demographic detail and updates the full estimates time series with each vintage; it advises comparisons within the same vintage. The decennial twenty year record and the estimates five year update should therefore be displayed in separate series with their source labels intact. [1][3]

The BLS economic dependency table provides a useful different benchmark. Its historical total ratio rose from 95.9 nonparticipants per hundred labor force participants in 2000 to 98.9 in 2010 and 103.4 in 2020. This is not comparable numerically with the age ratios because it includes nonparticipants within working ages and uses actual labor force participation in the denominator. Its 2030 value, 107.6, is a projection published in 2021 and cannot be treated as an observed extension. [4]

The historical evidence supports demographic aging across at least two decades. The current estimates reinforce that direction, but neither series proves that automation caused aging or that a given age ratio implies economic distress. The falling child component is material counterevidence to an undifferentiated claim of continuously increasing demographic dependency.

Source and observation	Child per 100 ages 18 to 64	Older per 100 ages 18 to 64	Total per 100 ages 18 to 64
Decennial 2000	41.5	20.1	61.6
Decennial 2010	38.2	20.7	58.9
Decennial 2020	36.1	27.5	63.6
Vintage 2025 base April 2020 calculated	36.5	27.5	64.1
Vintage 2025 July 2025 calculated	35.1	31.5	66.6

Decennial Census published ratios [1] and author calculations from Vintage 2025 national counts [3]; the two products are separate records

Production capacity and distribution of support

The demographic ratio describes a potential change in who needs resources and who is in customary working ages. It does not specify how those resources are produced. A smaller working age population can coexist with rising output when output per hour increases, more people participate, paid hours change or capital supplies more productive services. These channels are analytically distinct. The support problem depends on production capacity, the composition of needs and distribution, rather than on age headcounts alone.

A hypothetical example makes this clear. Begin with one hundred working age people and thirty older people. If the older population rises to thirty five while productive resources available to the community rise by twenty percent, a higher old age ratio need not mean less aggregate material capacity per person. Whether households benefit depends on prices, ownership, taxes, pension arrangements and access to services. This example is arithmetic for interpretation, not an empirical estimate or a forecast. It explains why a demographic indicator should sit beside productivity and income distribution measures.

Aging can change the composition of demand. Older people may need more health and care services, while fewer children can reduce some education and childcare requirements. Those activities draw on different skills, facilities and budgets, so offsetting changes in total headcounts do not imply an effortless resource substitution. A school building cannot automatically become a care workforce. Measuring age groups separately makes the institutional adaptation visible without assuming that every person in a group has identical needs.

The connection to transfer dependence is particularly useful. More people reaching eligibility ages can raise pension or health benefits even when employment among younger adults remains strong. A decomposition of transfer receipts should hold age composition fixed or separate age linked programs from other transfers before attributing the full rise to jobs failing as a distribution mechanism. Conversely, an aging population supported increasingly by weak earnings and insecure work could place greater pressure on households and public systems. The demographic ratio provides context for testing that combined hypothesis.

The post labor question concerns whether more productive systems can support prosperity without relying primarily on ever more paid hours from each working age person. Aging can make automation economically desirable by reducing some scarce labor requirements. It can also create new employment in care and adaptation. Those possibilities mean that demographic aging can coexist with labor shortages, employment growth and compressed access to attractive jobs in particular occupations. This metric identifies the population structure within which those competing adjustments occur.

Economic burden forecasts and competing readings

A higher old age ratio may reflect improved longevity as well as cohort size and lower fertility. Longer lives are a social gain, while the resources required during those lives depend on health, care needs and accumulated assets. Calling older adults a burden without examining these differences obscures the underlying economics. A resource weighted support measure would apply age specific consumption and production profiles, but it would be a new metric with assumptions beyond the headcount ratio. The chapter preserves the demographic series as the simpler observable record.

Participation among older people and women can alter economic support without changing the demographic ratio. Immigration can change age composition and labor force participation together, while internal migration can redistribute support needs across regions. A country or region with the same age ratio can therefore have a different employment base, earnings distribution and tax capacity. Comparisons should include those variables and the institutional setting rather than ranking places by one age statistic alone.

The 2026 Census international release illustrates the importance of distinguishing levels and forecasts. It reports 18.9 percent of the US population and 29.7 percent of Japan's population as ages 65 and older in 2025. These are population shares, not old age dependency ratios. Its projected US older share of 23.4 percent in 2060 describes a future scenario; the projected change in global older share from 10.5 to 19.6 percent likewise cannot supply additional observed years for a secular trend. The relevant demographic model and vintage belong in the forecast caption. [5]

Forecasts can help assess capacity requirements, but they should not be presented as inevitable economic outcomes. Fertility, mortality and migration assumptions change the population path. Participation, productivity, health costs and policy choices change the economic implications of that path. A forecast of people at particular ages does not by itself forecast pension solvency, required tax rates or the number of workers needed. Economic scenarios should show the additional assumptions explicitly and keep them separate from historical demographic observations.

Evidence strengthening the support pressure reading would include sustained age specific growth in unmet care needs, greater required family caregiving, or rising real support costs relative to resources after controlling for health and eligibility. Evidence weakening a simple scarcity reading would include productivity gains, improved healthy aging, broader income from capital and stable material living standards. The observed age ratio remains valid under either outcome; its interpretation changes when the production and distribution evidence changes.

Reproduction and the demographic control panel

Use two clearly labeled domestic charts. The historical panel should show decennial child, old age and total ratios for 2000, 2010 and 2020 under the ages 18 to 64 convention. A current panel should calculate the same formulas from the complete Vintage 2025 counts, keeping its April 2020 base and July 2025 endpoint together. Show observed points only where observations have been retrieved. Do not manufacture annual interpolation from three census checkpoints. [1][3]

For the current calculation, sum the three working age categories, divide each dependent age count by that total and multiply by one hundred. Retain exact population counts in the reproduction file and round only the display. The child and old age ratios should sum to the total before rounding. Archive the vintage identifier, release date, reference dates and geographic coverage. A later Census vintage can revise the entire postcensus path, so compare its observations internally before replacing the stored historical version. [3]

Place economic dependency, age specific participation, employment, real output per hour and transfer composition in companion panels. Keep their different denominators visible. If an international comparison uses the World Bank ages 15 to 64 convention, reproduce that definition for every country and year. Label projections with dashed lines or a separate panel and name the model vintage rather than letting future estimates resemble observed history. [2][4][5]

This panel should help answer whether a change in aggregate labor attachment or transfer dependence follows demographic composition, behavior within ages, or both. It also connects population needs to the labor market's capacity to distribute resources. The ratios are valuable controls and planning measures within the reference, while the evidence for labor market compression comes from the additional employment, earnings, job quality and distribution records.

SOURCES AND REPRODUCTION NOTES

[1] U S Census Bureau (2023). Age and Sex Composition 2020. May 2023 C2020BR06 pages 16 to 20; decennial dependency history 2000 2010 2020 using ages 18 to 64 denominator; verified retrieval date 4 October 2026

[2] World Bank (2026). Metadata Glossary Age dependency ratio percent of working age population. SP. POP. DPND uses ages 15 to 64 denominator and explicitly distinguishes age composition from economic dependency; verified retrieval date 4 October 2026

[3] U S Census Bureau (2026). Populations in All Age Groups Growing in the South Driven by Outlying Counties in Metro Areas. 25 June 2026 Vintage 2025 table 1 national population age counts April 2020 and July 2025; within vintage comparisons only; verified retrieval date 4 October 2026

[4] Bureau of Labor Statistics (2021). Economic dependency ratio. Table 3.5 historical 2000 2010 2020 per hundred labor force participants; 2030 is a projection from the 2020 to 2030 vintage; verified retrieval date 4 October 2026

[5] U S Census Bureau (2026). Global Older Adult Population Projected to Nearly Double by 2060. 31 August 2026 An Aging World 2025 release; 2025 age shares and future 2060 projections explicitly distinguished; verified retrieval date 4 October 2026

RELATED CHAPTERS 002 · 003 · 004 · 007 · 098

CHAPTER 100

AI enabled gross margin

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Enterprise measurement specification with recent supporting evidence and no comparable twenty year national series

Incremental margin can test whether automation creates profitable new activity while requiring a credible no intervention baseline complete direct costs and a cannibalization adjustment.

The incremental commercial outcome

AI-enabled gross margin measures the incremental gross profit associated with an offering or feature relative to a specified no-intervention baseline. The formula in the user's original enterprise framework is actual AI-enabled revenue minus counterfactual revenue, minus actual direct cost minus counterfactual direct cost, minus cannibalized gross margin. All components use the same period, currency, organizational boundary, and revenue-recognition policy.

Here margin is a currency amount. A percentage requires a separately stated denominator, such as recognized offering revenue. An incremental profit amount divided by incremental revenue can become unstable when the revenue difference is close to zero. Keep the underlying amount and the full revenue-cost bridge visible rather than allow a percentage to conceal that problem.

The counterfactual estimates the revenue and direct cost that would have occurred without the offering or feature. It can include continuing sales of an older product, changes in demand, planned price adjustments, and the cost of serving actual business under the previous method. Cannibalized margin captures lost profit from business displaced elsewhere. If that loss is already included in an enterprise-wide counterfactual, subtracting it again would double count the same effect.

Use recognized revenue from accepted transactions and contracts. Orders, pipeline, bookings, and user engagement can support commercial forecasting, but they have different timing and certainty from recorded revenue. IFRS 15 provides the accounting foundation through performance obligations and recognition as those obligations are satisfied. It does not certify the additional claim that revenue was caused by AI. [1]

The original framework distinguishes AI-native offerings, AI-required expansion, AI-influenced sales, and incidental internal use. Assign each transaction or product cohort to a single category under a versioned rule. The classification identifies the proposed commercial mechanism; evidence about incremental demand and cost establishes the amount attributable to it.

The no-AI revenue and direct-cost terms are estimated revenue and direct cost without the AI-enabled offering or feature. Direct AI cost includes model and cloud usage, retrieval and storage, data licenses, direct human review, customer support, vendor fees, refunds, service credits, and other delivery cost.

Gross and contribution margin also require separate labels. Direct production cost belongs in the gross calculation; incremental sales, service, and support burdens that sit outside that boundary belong in a further

contribution calculation. Some organizations classify similar expenses differently in financial statements. Show the operational full-cost bridge alongside the reported presentation so a change in classification cannot masquerade as an improvement in economics. The same resource must enter the bridge once even if several functions own it.

Why this remains an enterprise specification

No verified comparable twenty-year national dataset of AI-enabled incremental gross margin is available in this research. The entry preserves an explicitly named enterprise instrument from the user's earlier framework. Its proposed status matters because the required baseline, direct-cost allocation, and product classification are custom observations rather than fields supplied by a standard macroeconomic release.

The underlying economic questions predate current AI. Automation can enable a new product, expand a market, increase conversion, reduce prices, or change delivery cost. Financial accounts can record the resulting revenue and costs. Establishing which part is incremental to an intervention requires a comparison. A firm's current gross margin is therefore an observable accounting outcome, while its AI-attributed increment remains an analytical claim that needs additional evidence.

A hypothetical example makes the calculation concrete. An offering generates 150 currency units of recognized revenue and 70 of direct cost. A credible baseline estimates 100 revenue and 60 direct cost for the same period without the intervention. The direct gross-profit difference is 40. If the offering displaces 5 of margin from another product and that loss is outside the baseline, AI-enabled incremental margin is 35. These numbers are assumed arithmetic rather than observations of a real company.

An opposite hypothetical illustrates why revenue association is insufficient. Suppose recognized revenue rises 50 while direct delivery cost rises 55 and a related product loses 5 of margin. The incremental result is negative 10. A commercially popular feature can consume resources even when adoption and revenue grow. Actual inference, review, support, credits, and delivery expenses determine whether growth is profitable.

The proposed record can be collected monthly by product and customer cohort, preserving the launch, release version, treatment status, and allocation rule. Repeated observations through normal selling cycles can test durability. They still do not become twenty-year secular evidence simply because they explain a plausible mechanism linking automation and economic growth.

An AI-native product can have a zero product-level baseline while still displacing other company offerings or competing providers. Zero baseline revenue does not imply that its entire gross profit is new to the enterprise or economy. Record the organizational boundary and the displaced activity. A project can be commercially successful for its producer and redistribute existing customer expenditure rather than enlarge aggregate demand.

Hypothetical component	Amount in common currency units
Actual revenue less baseline revenue	50
Actual direct cost less baseline direct cost	10
Cannibalized gross margin outside the baseline	5

Hypothetical component	Amount in common currency units
Incremental gross margin	35

Illustrative assumed arithmetic under the proposed formula. No company observation is asserted.

Profitable new demand as a counterweight to contraction

The metric captures a major alternative to a simple labor-contraction story. Better production systems can make new services viable, expand demand, or enable a business to serve more customers. Profitable additional activity can finance investment and complementary hiring. An automation framework that observes only layoffs or reduced work purchases would miss this expansion channel.

The employment implications depend on the human input required for that expansion. A product can create substantial incremental margin with little additional delivery labor, supporting capital income and future investment. Another can require a larger implementation, sales, support, or review workforce. The same favorable margin amount can therefore accompany different staffing responses. Workforce elasticity and total human work per accepted output provide the necessary companions.

Pricing determines who receives the production gain. A firm may retain lower delivery cost as margin, cut its price to pursue volume, provide more scope at the old price, improve quality, or increase compensation. A low incremental margin can therefore reflect a deliberate transfer to customers rather than failure of the technology to improve production. To assess the mechanism, show units, prices, scope, direct inputs, and customer outcomes alongside the financial result.

Cannibalization also has an economic interpretation beyond the accounting adjustment. A successful new offering can replace an older labor-intensive product. Enterprise revenue might remain stable while the production system changes. An organization-level comparison should follow the displaced offering and its workforce rather than declare all new-product income additional to the economy. Across firms, competitors can lose business as an adopter grows; a company result does not identify the national net effect.

For post-labor economics, durable positive incremental margin with low additional human requirements would show how useful commercial output and retained income can scale faster than paid work. Durable expansion in complementary human work would support a different adjustment path. The proposed metric helps distinguish these outcomes when linked to labor and distribution records.

An increase means AI is helping create profitable commercial activity. It is the principal counterweight to treating automation solely as headcount reduction.

The CEO uses the metric to fund, price, scale, redesign, bundle, or retire AI-enabled offerings and to distinguish revenue theater from profitable new growth.

Attribution full delivery cost and delayed consequences

A launch comparison should account for demand, customer composition, seasonality, competing products, pricing, and simultaneous sales changes. Randomized product access, phased launches, or well-matched untreated cohorts can supply a more credible baseline than an optimistic forecast. HM Treasury's guidance

emphasizes defining business as usual and the comparison before evaluating an intervention. The guidance supplies evaluation principles rather than a published AI-margin estimate. [2]

Direct AI cost can include model usage, cloud, retrieval, storage, data licenses, human review, customer support, and service credits. Fixed setup and transition cost also matter to the investment decision. A recurring gross-margin series should disclose how those costs are recognized and show a separate bridge to contribution margin and operating profit. Capitalized development and shared platforms can change the timing and location of recognized expense.

Allocation must reconcile. A central platform serving several offerings needs a documented driver such as calls, transactions, reserved capacity, or supported workload. The individual product allocations must sum to the origin charge. IFRS 8 establishes the segment-disclosure context, while this operational allocation is an explicitly chosen analytical policy. A beneficiary segment cannot claim all of the sales uplift while placing the entire delivery cost elsewhere. [4]

Retention and defects can mature after the initial sale. An apparently favorable launch can generate later refunds, support, repeat work, or churn. Track customer cohorts long enough to observe these outcomes. NIST's measurement framework calls for evaluating systems under conditions like deployment, demonstrating validity and reliability, and monitoring behavior in production. Those principles support the quality boundary for the proposed margin calculation. [3]

Double counting can arise when one mechanism produces several reported benefits. A workflow's time saving may enable new volume whose profit enters the margin result. Preserve the causal chain, but count the terminal economic gain once rather than add notional wage value to the same realized margin. This is a ledger-design choice necessary for a coherent commercial record.

Gaming risks include relabeling an existing product, ignoring cannibalization, omitting inference and support, assigning shared cost elsewhere, using pipeline instead of recognized revenue, and allowing weak service to create short-term sales followed by churn. Pair it with contribution margin, retention, refunds, complaints, model cost per unit, service quality, risk, and customer lifetime value.

Sensitivity analysis should change the assumed no-intervention sales, direct cost, retention, and cannibalization separately. A range produced by these alternative assumptions is a scenario range; it becomes a statistical interval only when supported by an appropriate estimated model. Show which assumptions drive the result and when future cohort evidence can resolve them. The finance record should preserve the original baseline so it cannot be rewritten after the desired margin appears.

A reproducible commercial margin dashboard

Join contracts, recognized revenue, product and feature identifiers, customer cohorts, treatment status, accepted units, discounts, delivery costs, credits, and refunds. Reconcile the recognized amounts to finance records and the operating quantities to product and service records. Keep the no-intervention estimates and their uncertainty in separate visible columns.

Plot actual and counterfactual revenue and direct cost, then show the incremental margin bridge and any cannibalization adjustment. Distinguish AI-native, required expansion, influenced, and incidental categories.

Preserve the allocation version, experiment design, customer mix, and observation horizon. A recent pilot should retain its shorter-history label.

Display contribution margin and operating profit beside the gross result when commercial, support, or shared costs are material. Include retention, complaints, valid-output quality, human work per unit, and workforce elasticity. These companions establish whether profitable demand expansion depends on proportionate additions to human work or reflects greater production leverage.

The long-run research contribution is a mechanism to test, not a newly demonstrated secular national trend. A consistent enterprise panel could eventually show which products expanded demand, which displaced earlier activity, and how much additional human work was required. Until then, the metric is useful for concrete decisions about pricing, funding, scaling, and product redesign.

Required fields include product, SKU and feature flags; customer cohort; contract and order; recognized revenue; units; price and discounts; treatment status; direct materials; human delivery and review; model/API/cloud usage; data licensing; support; returns; refunds; service credits; and cannibalization.

The primary grain is transaction or customer-product-month, reported monthly and quarterly.

The chart should distinguish reported accounting results, model-based attribution, and hypothetical forecasts through explicit series labels. Customer cohorts need a common maturity horizon before their margins are compared. An early launch can be monitored usefully, while its unobserved renewal and support burden remains outside a claim of sustained profitability.

SOURCES AND REPRODUCTION NOTES

[1] IFRS Foundation (2026). IFRS 15 Revenue from Contracts with Customers. Original standard overview; revenue recognition and performance obligations; methodological source rather than an AI margin dataset; verified retrieval date 4 October 2026

[2] HM Treasury and Evaluation Task Force (2026). Guidance on the Impact Evaluation of AI Interventions. Original evaluation guidance; baseline business as usual experimental and quasi experimental comparisons; verified retrieval date 4 October 2026; current HTML edition updated 15 May 2026

[3] National Institute of Standards and Technology (2023). Artificial Intelligence Risk Management Framework AI RMF 1.0. NIST AI100-1; MEASURE 2.3 to2.5 deployment context validity reliability monitoring and human oversight; verified retrieval date 4 October 2026

[4] IFRS Foundation (2026). IFRS 8 Operating Segments. Operating segment disclosure overview; business and consolidated accounting boundary; verified retrieval date 4 October 2026

RELATED CHAPTERS 072 · 073 · 075 · 076 · 077 · 101 · 104 · 109 · 111

CHAPTER 101

Human work per valid unit

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Enterprise measurement specification with recent supporting evidence and no comparable twenty year national series

Measuring all human touch time per accepted outcome tests whether a workflow actually becomes less labor intensive after review rework and exception handling are included.

Touch time accepted output and the workflow boundary

Human work per valid unit divides total included human touch minutes by accepted valid outputs over a common workflow period or cohort. A touch is substantive human activity needed to produce, review, correct, route, approve, or sustain the outcome. The unit is human minutes per accepted outcome. The inverse expresses accepted output per included human minute, so it connects directly to the general output-per-hour concept used in productivity accounts. [4]

The numerator should cover employees, observable contractors, and other included people across the end-to-end process. Front-line handling, checking, exception work, manager coordination, and downstream corrections can all contribute. Separate shared maintenance and evaluation time with an explicit allocation. Unmeasured supplier work should be reported as missing coverage rather than assumed to use zero minutes.

The denominator is a business outcome satisfying a predeclared quality, completeness, service, and risk definition. Examples could include a resolved customer issue, an accepted invoice, a policy issued under the agreed controls, or a release accepted under its tests. A generated draft, an attempted transaction, an automatically closed case, and a useful accepted outcome are separate states. The validity policy must identify who accepts the output and when later failures change that classification.

Touch time differs from elapsed cycle time. A case can wait for hours while consuming only minutes of human activity. Conversely, several people can work simultaneously during a short elapsed interval. Capture person-time rather than sum machine timestamps or treat the interval between open and close as continuous labor. Concurrent chats and multi-person work need a clear allocation rule.

The denominator must align with the numerator's cohort. Work spent on failed or abandoned attempts is a real production input. A comprehensive resource-efficiency version includes that time in the cost of producing the cohort's accepted outputs, with failure and abandonment volumes reported separately. A successful-case-only average answers a narrower question and should retain that label.

The unit of analysis is the workflow rather than a personal performance score. People handle different cases, collaborate, train others, and maintain the system that makes completion possible. A process-level numerator can include these contributions without pretending that every minute belongs uniquely to one employee's output. Where work supports several workflows, publish the allocation rule and a reconciliation to total observed time.

Recent measured evidence and the missing secular series

Brynjolfsson, Li, and Raymond's revised original study follows a staggered AI-assistant introduction among 5,172 customer-support agents. It estimates approximately 15 percent more issues resolved per hour, with substantial differences by experience and skill. The assistant supports human agents; the finding measures assisted production rather than fully autonomous completion. Quality measures were not available for every subcontractor observation. [1]

This is valuable empirical evidence that a workflow's useful output can rise relative to human time. It remains a particular support setting and a relatively short intervention horizon. It does not establish the same gain for every service, a twenty-year decline in national human touch time, or an observed number of jobs eliminated. Demand and capacity disposition determine the later staffing response.

For a simple illustration, a hypothetical workflow produces one thousand accepted outcomes using ten thousand human minutes. Its intensity is ten minutes per valid unit. After redesign, direct handling uses five thousand minutes and review, exception, and downstream work use three thousand. The complete numerator is eight thousand and intensity is eight. The reduction is twenty percent, even though direct handling alone fell one half.

If a vendor reports only the direct handling improvement, the claim can exaggerate the reduction in net human work. If it counts machine-generated attempts as accepted outputs, the denominator can exaggerate it again. Observing both the full time boundary and acceptance process makes the proposed measurement testable.

No comparable national longitudinal dataset of this exact workflow metric is verified here. Official industry productivity accounts use broader output and hours concepts; enterprise event and time records can provide a more specific mechanism measure. A future long panel would need stable outcome definitions, labor coverage, and workflow composition before it could support the user's twenty-year secular criterion.

The inverse relationship is multiplicative. In a hypothetical matched process, output per human hour rising fifty percent implies minutes per output falling one third, because the new time requirement is one divided by 1.5. Subtracting the same percentage from minutes would be incorrect. Report the original numerator and denominator as well as any derived inverse, especially when agent-level averages and aggregate ratios use different weighting.

Hypothetical workflow component	Before redesign minutes	After redesign minutes
Direct handling	10000	5000
Additional review exception and downstream time	0 in this assumed baseline	3000
Total included human time	10000	8000
Accepted outcomes	1000	1000
Human minutes per valid unit	10	8

Illustrative arithmetic under an assumed stable outcome and quality boundary. The table is not a vendor observation.

The mechanism between capability and staffing

This metric provides the most direct operational link between an automation intervention and reduced human requirements. Tool adoption and staff perceptions describe use or experience. Time per accepted outcome describes a production relationship. A persistent decline at comparable complexity and quality indicates that the process requires less included human activity for each useful unit delivered.

The aggregate consequence still depends on volume. A hypothetical workflow cuts human minutes per unit by twenty percent. If accepted volume rises twenty-five percent, total human minutes remain unchanged because 0.8 multiplied by 1.25 equals one. The same labor-intensity gain can therefore support stable employment and larger output. If volume rises less, released capacity becomes available; if it rises more, additional work may be required.

Capacity has several possible destinations. It can absorb actual demand growth, reduce backlog, improve service, support named new work, reduce overtime or supplier purchases, or cancel future hiring. A measured reduction in minutes becomes financial or staffing evidence only when that destination is observed. The time metric and the capacity-disposition ledger should remain linked without being combined into two independent dollar benefits.

The pattern of residual work matters. Automation may remove easy repetitive tasks while leaving difficult exceptions, judgment, relationship management, or accountability. Fewer total minutes can be concentrated in more demanding activity. Average touch time should therefore be accompanied by the exception mix, skill requirements, overtime, and workload measures. A process can become technically more efficient while the remaining work becomes harder to staff sustainably.

For post-labor economics, replicated declines in comparable human time across many workflows would strengthen the mechanism underlying broader output-employment separation. Increases in review, coordination, or external labor that absorb the apparent saving would weaken the net-compaction interpretation. Observations at the workflow level make both predictions more concrete.

Validated released capacity in the compact model is the positive part of $(h_0 - h_1)$ multiplied by V_1, where h_0 is baseline human work per valid unit, h_1 is post redesign human work per valid unit, and V_1 is actual valid output volume after implementation. If touch time is measured in minutes, convert the product to hours before using an hours ledger. The word valid carries most of the weight: failed quality, hidden repair, downstream exceptions and control breaches cannot be treated as productive accepted output. This arithmetic preserves the matched workload boundary; a negative difference indicates additional work and should remain visible separately. [5]

The process owner owns the workflow result. Quality owns validity. Technology owns event completeness. Finance owns cost per outcome. No individual employee should receive a productivity score from this layer; the unit of management is the workflow and production system.

Quality hidden work and comparison design

A weak validity rule can manufacture productivity. An organization can subdivide one outcome into several units, accept incomplete drafts, automatically close requests, or route difficult cases to an unmeasured team. A quality owner should define acceptance independently of the team claiming the time improvement.

Subsequent rework and repeat contact should be linked to the original case over a stated observation window.

NIST's AI RMF emphasizes demonstrated validity and reliability, evaluation under deployment-like conditions, documented limitations, and production monitoring. Applying these principles to the proposed metric means testing whether the accepted units actually satisfy their intended business function. A favorable average cannot compensate for severe defects outside the permitted quality boundary. [3]

Time capture can also distort the numerator. System activity logs can miss thinking, meetings, offline checks, and supplier effort. Self-reported savings can reflect perceived convenience rather than measured minutes. Representative time studies, observed case samples, and event logs can complement one another. Report their coverage and uncertainty instead of treating a software timer as an exhaustive account of human effort.

Compare similar demand, complexity, service obligations, risk tiers, and customer composition. A pilot restricted to easy cases should not establish the entire workflow's intensity. HM Treasury's evaluation guidance supports establishing a clear baseline and suitable comparison; randomized, staggered, or matched deployment can help distinguish the intervention from simultaneous process changes. [2]

Cohort timing matters because corrections can arrive after the initial completion. A monthly measure can temporarily appear efficient if its downstream work occurs next month. Mature case cohorts or an explicit lag adjustment can reduce this bias. Report current operational estimates separately from finalized cohort results.

A stronger claim would show a sustained decline in total included minutes, comparable accepted outcomes, high labor coverage, unchanged validity rules, and intact service quality. A weaker claim would depend on missing vendor time, altered case mix, self-reported convenience, or work shifted beyond the observed process.

The gaming patterns are predictable: automated systems can auto-close cases, generate more low-quality units, pause clocks, subdivide work to manufacture throughput, omit manual exception handling, and route difficult cases outside the measured workflow. Countermeasures are equally concrete: a quality-owned valid-unit definition, end-to-end rather than step time, P 90 alongside averages, independent sampling, full exception logging, and reconciliation between initiated, completed, accepted, and abandoned cases.

Case mix should be adjusted with variables defined before the result: complexity, risk, channel, product, and required service. Publish both the unadjusted intensity and a standardized comparison using a fixed mix. A changing portfolio of easy and difficult work can alter the average even when every individual case type uses the same time as before. Conversely, an aggregate average can conceal genuine improvements when the organization expands into harder work.

A reproducible work per outcome record

Use stable workflow-instance identifiers linked to people, roles, timestamps, touch duration, release versions, task complexity, risk tier, outcome, acceptance, defects, rework, and exceptions. Capture representative offline work and supplier time where observable. Preserve the allocation method for shared review, maintenance, and monitoring.

Calculate total included person-minutes divided by accepted valid outputs for matched cohorts, with component minutes shown separately. Plot direct work, review, correction, exception, and coordination contributions. Show accepted output, failed attempts, abandonment, and coverage beside the quotient so selection remains visible.

Compare before and after at similar mix, then retain a continuous series across ordinary operating cycles. Publish the validity-rule version and any historical restatement. Use sampling uncertainty when time is estimated. A recent deployment result remains supporting workflow evidence, while a twenty-year comparable series would be required for a secular interpretation.

Read the metric alongside straight-through completion, end-to-end throughput, cycle time, first-pass yield, exception burden, cost per valid outcome, and capacity realization. Together these measures can establish whether human work truly declined, useful output improved, and the released capacity reached a recorded economic destination.

These diagnostics require workflow-instance IDs, state transitions, timestamps, assigned roles, touch duration, intervention and model version, complexity, risk tier, output, acceptance, defect, rework, exception, and cost. Aggregate weekly and monthly, but preserve event detail for investigation.

Normalize by workflow type, complexity, customer or product mix, risk tier, and release version. Compare pre-intervention cases with untreated or phased cohorts when feasible. Activity outside the system needs representative time studies; it should not be assumed to equal zero.

Maintain a coverage table for direct employees, suppliers, offline activity, and shared work. An apparent decline with falling capture coverage deserves a provisional label. When the missing component is later measured, restate the comparable history or show a definition break rather than join the old narrow denominator to the new comprehensive numerator.

SOURCES AND REPRODUCTION NOTES

[1] Erik Brynjolfsson Danielle Li and Lindsey Raymond (2024). Generative AI at Work. Original authors revised paper 6 November 2024; subsequent QJE 2025 publication; staggered support-assistant rollout and resolutions per hour; verified retrieval date 4 October 2026

[2] HM Treasury and Evaluation Task Force (2026). Guidance on the Impact Evaluation of AI Interventions. Original evaluation guidance; baseline business as usual experimental and quasi experimental comparisons; verified retrieval date 4 October 2026; current HTML edition updated 15 May 2026

[3] National Institute of Standards and Technology (2023). Artificial Intelligence Risk Management Framework AI RMF 1.0. NIST AI100-1; MEASURE 2.3 to2.5 deployment context validity reliability monitoring and human oversight; verified retrieval date 4 October 2026

[4] U.S. Bureau of Labor Statistics (2025). Office of Productivity and Technology Calculation. Official output hours and labor-productivity accounting; conceptual comparison rather than the proposed workflow dataset; verified retrieval date 4 October 2026

[5] David Shapiro and Critical Path Consulting Group (2026). The jobs that never appear Measuring and capturing the enterprise AI productivity dividend. Unpublished supplied manuscript September 2026 edition Version 2.0; Chapters 13 and 14 and Appendix A capacity accounting and realized expense definitions; framework source rather than independent empirical evidence; consulted 4 October 2026

RELATED CHAPTERS 071 · 074 · 077 · 102 · 103 · 104 · 105 · 106 · 107 · 108 · 110 · 113

CHAPTER 102

Straight through completion

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Enterprise measurement specification with recent supporting evidence and no comparable twenty year national series

Completion without substantive human intervention tests the extent of end to end automation while requiring visible eligibility quality exceptions and all initiated cases.

Eligible completed cases and substantive human intervention

Straight-through completion measures eligible cases completed without substantive human intervention divided by eligible completed cases. Multiply by one hundred for a percentage. Eligibility is a versioned rule specifying the workflow, complexity, customer or product population, risk tier, and required controls for which autonomous completion is permitted. Completion must represent a valid business outcome under that rule.

Substantive intervention includes work necessary to produce or authorize the outcome: drafting or correcting required content, checking a decision, approving a transaction, resolving an exception, or repairing downstream failure. A machine completing one step while a person finishes the case does not contribute to the numerator under this end-to-end definition. Tool use or an AI-handled interaction is a different observation unless the whole outcome boundary is the interaction itself.

Monitoring and human ownership also need a clear policy. A periodic independent audit of a sample does not necessarily mean a person intervened in every case. A mandatory precompletion approval does. Publish whether routine review, sampled audit, customer effort, and subsequent repair enter the intervention classification. Shared monitoring time belongs in the human-work and cost metrics even when a particular case qualifies as straight through.

The completed-case denominator can conceal stalled or abandoned attempts. Retain its exact original definition, but also show all eligible initiated cases, completion yield, abandonment, backlog, and a whole-population rate. A system that completes only its easy attempts can have a high conditional rate while making little progress through the actual workload.

NIST's AI RMF describes human-AI configurations ranging from autonomous to manual and calls for explicit roles, validity, reliability, and production monitoring. Those principles support a workflow-specific autonomy boundary. They do not prescribe a universal desirable completion percentage or certify that a vendor's reported handling share meets this metric. [3]

A missing human-touch event should have an unknown classification until capture is validated. Absence of a log entry is weaker evidence than an observed process with complete records across the relevant systems. Classify confirmed straight-through cases, confirmed human-intervened cases, and cases with incomplete capture separately. Report the unclassified share and the systems or channels outside coverage, instead of silently granting them autonomous status.

Company handling claims and the absent national series

Klarna's official 2025 annual filing reports that its AI assistant handled 80 percent of customer-service chats during the year and that internal consumer-satisfaction measures did not decline. The filing attributes these observations to company chat logs and internal surveys. This is a useful concrete record of a large automated interaction share. [1]

It is not a verified observation of this chapter's stricter end-to-end numerator. A chat-handling share may include activity requiring follow-up work, authorization, customer effort, other channels, or later repair. The filing's handling and satisfaction claims should therefore retain their company-reported status and exact chat denominator. They cannot supply an independently audited total-human-work or whole-service completion rate without additional event and quality data.

A hypothetical example demonstrates the denominator issue. Of one thousand initiated cases, six hundred are eligible for autonomous processing. Five hundred of those eligible cases complete within the observation window; four hundred complete validly without substantive intervention. The original eligible-completed rate is eighty percent. The numerator covers two thirds of eligible initiated cases and forty percent of all initiated cases. These are all accurate descriptions of the assumed record and answer different questions.

If the organization reports only eighty percent, a reader may infer a much broader automation boundary than the observed forty percent of all work. If it removes the hardest cases from eligibility after the fact, even the conditional rate can improve without a production change. The eligibility policy and control totals therefore belong beside the headline.

No verified comparable twenty-year national series of this exact completion measure is available here. Straight-through processing can arise from conventional software and rules as well as new models. The proposed instrument is useful for testing contemporary workflow claims and could support a longer automation history if the same outcome and intervention definitions were preserved.

The twenty-year test would also require an older comparable automation record. Rules engines and conventional integration can complete standardized transactions without contemporary models. A future panel should identify the production method while preserving the same eligible case, intervention, and acceptance definitions. Its long-run contribution would concern increasing autonomous completion broadly, with AI treated as one possible mechanism inside that history.

Hypothetical measure	Calculation	Result
Eligible completed straight through rate	400 divided by 500	80 percent
Straight through among eligible initiated	400 divided by 600	66.7 percent
Straight through among all initiated	400 divided by 1000	40 percent

Assumed arithmetic illustrating denominator coverage. No company rate is converted into these stronger workflow measures.

End to end automation and the residual labor burden

The metric distinguishes a process that needs fewer human touches from a process in which an entire valid outcome can complete without case-specific human work. Both can improve productivity. Their operating requirements differ: assisted cases retain a direct labor dependency, while straight-through cases can potentially scale without proportional case labor inside the measured boundary.

The connection to post-labor is strongest when straight-through volume rises at stable quality and the total human work supporting the workload grows more slowly. A conditional rate alone cannot establish that outcome. More total demand, more complex exceptions, larger monitoring teams, or increased supplier work can offset the case-level saving. Human minutes per valid unit tests those residual inputs directly.

A hypothetical system completes ninety percent of cases automatically but requires an hour of expert effort on each remaining case. Another completes seventy percent automatically and needs five minutes for each exception. With equal volume and other inputs, the second may use less total human time. Straight-through share identifies the distribution of case paths, while exception duration determines how expensive the residual path becomes.

Eligibility should also reflect the work's economics and consequences. A low-risk standardized transaction may justify a wider autonomous boundary than a case requiring accountable judgment or mandatory approval. A lower completion rate in the latter setting can represent an appropriate production design. The framework should test whether the chosen boundary creates valid outcomes efficiently rather than treat the highest possible autonomy percentage as inherently superior.

New demand can offset labor saving. If automated delivery lowers prices or enables broader access, total transactions may expand sufficiently to require more human work in complementary activities. A larger straight-through share can then coexist with hiring. Conversely, stable volume with growing automation can reduce future staffing requirements. Demand, exception work, and capacity disposition determine which pattern is observed.

The implication is operational. Autonomy should be granted to a validated workflow and risk tier, never to “AI” in general. The company should measure straight-through completion, override rate, exception rate, defect and rework, expected loss, review time, drift, and the cost of monitoring. As evidence accumulates, the autonomy boundary can move.

A rate can improve through removing unnecessary handoffs even when substantive human judgment remains at one stage. That change can still produce substantial time savings and better service, yet the strict straight-through numerator remains unchanged. This is useful counterevidence to treating autonomy as the only route to labor leverage. Touch minutes and cycle time can capture valuable assisted redesign that the binary completion measure deliberately leaves outside its numerator.

Eligibility quality follow up and selective completion

Lock eligibility rules before evaluating performance and preserve their version over time. If the rule changes, show the rate under both the old and new boundary where feasible. Separate expansion into harder cases from improvements within the original eligible population. Without this bridge, an apparent deterioration can reflect wider useful coverage and an apparent improvement can reflect narrower selection.

Completion requires an acceptance rule and a maturity window. A case automatically marked closed can reopen, create a repeat contact, trigger a refund, or require work in another team. Link those events back to the original instance. Report provisional and matured completion separately so recent cases do not appear successful merely because their failure window has not yet elapsed.

Observe the full denominator. Reconcile initiated cases with accepted completion, human completion, pending work, abandonment, and rejected outcomes. Cases moved to a manual channel should remain classified rather than vanish from the eligible population. The conditional rate should be accompanied by absolute straight-through volume and by total demand.

The causal comparison also requires care. HM Treasury's evaluation guidance emphasizes a clearly defined baseline and comparison population. A phased rollout or appropriate untreated group can help distinguish system change from easier customer mix or declining demand. Monitoring can show a different path distribution; attribution to a particular intervention requires its own design. [2]

Quality checks should be independent of the completion flag. Sample accepted and rejected cases, assess severe defects and repeat work by risk tier, and document the limitations of generalization. NIST's measurement principles require demonstrated validity and reliability under deployment conditions and ongoing production monitoring. A large conditional completion share does not erase severe failures outside the acceptable boundary. [3]

Hidden human work can remain in vendor operations, manual recovery, data maintenance, monitoring, or customer self-service. Keep those time and cost contributions in companion measures. The original framework's end-to-end completion metric becomes persuasive when it is reconciled with those surrounding resources.

Straight-through automation should be accompanied by denominator coverage, exception volume, sampled quality, repeat work, and downstream defects. A team cannot improve the rate by excluding difficult cases or pushing rework into another function.

Fallback is part of the production design. If an automated system fails during a disruption, cases may require manual recovery and later reclassification. Track the original release, interruption, recovery effort, and accepted final outcome. A high ordinary-period rate with a large recovery burden differs from a resilient process producing the same useful volume. Human recovery hours remain in the total-work companion even when their timing falls outside the normal completion window.

A reproducible autonomy and coverage chart

Build an event record with case identifiers, initiation and completion times, eligibility-rule version, risk tier, complexity, model and release, all substantive human touches, acceptance, escalation, abandonment, repeat contact, repair, and later defects. Record which external channels and suppliers are covered.

Plot eligible-completed straight-through rate together with eligibility coverage, completion yield, absolute automatic completions, and the all-initiated rate. A flow table should reconcile the entire workload so pending and unsuccessful cases remain visible. Compare like risk and complexity groups before calculating the aggregate.

Show human minutes per valid unit and exception duration beside the rate. Add quality, first-pass yield, rework, customer outcomes, cost per valid outcome, and recovery performance. Keep periodic audit and platform-maintenance time in the surrounding work and cost record even when they do not count as case intervention.

Preserve definitions across releases and ordinary demand cycles. A recent company handling claim remains a short-history supporting observation; the chapter's exact metric remains a proposed standardized instrument until its complete record is verified. A longer comparable history could test whether autonomous useful output rises while total human requirements and staffing intensity fall, with the appropriate boundaries intact.

The enterprise outcomes above cannot tell management what to change next. The workflow ledger supplies the mechanism layer. Each measure must use a stable “valid unit” that satisfies quality, completeness, and risk requirements.

For comparable charts, separate improvements inside a fixed eligibility cohort from wider deployment into new cohorts. Show both paths and their quality outcomes. This lets a lower aggregate conditional rate be interpreted correctly when the autonomous system begins serving more difficult cases, while preventing easy-case selection from being credited as a technical advance.

SOURCES AND REPRODUCTION NOTES

[1] Klarna Group plc (2026). Annual Report on Form 20 F for the year ended December 31 2025. Official investor-hosted filing; customer-service chat share 80 percent in 2025 and internal consumer satisfaction; pages 86 and99; reported company observations; verified retrieval date 4 October 2026

[2] HM Treasury and Evaluation Task Force (2026). Guidance on the Impact Evaluation of AI Interventions. Original evaluation guidance; baseline business as usual experimental and quasi experimental comparisons; verified retrieval date 4 October 2026; current HTML edition updated 15 May 2026

[3] National Institute of Standards and Technology (2023). Artificial Intelligence Risk Management Framework AI RMF 1.0. NIST AI100-1; MEASURE 2.3 to2.5 deployment context validity reliability monitoring and human oversight; verified retrieval date 4 October 2026

RELATED CHAPTERS 077 · 101 · 103 · 104 · 106 · 107 · 108 · 110 · 111 · 112 · 114

CHAPTER 103

End to end workflow throughput

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN Production measurement methods published 2016 and selected firm studies published 2025 with updates available through October 2026

Valid workflow output per unit of total human input can reveal labor saving mechanisms, but local task acceleration and enterprise throughput require separate evidence.

Accepted output across the whole production boundary

End to end workflow throughput measures how many accepted valid outcomes a defined process delivers during a specified period. The workflow begins at a declared ready state and ends when the customer or responsible quality function accepts the outcome. Drafts, model responses and intermediate task completions do not automatically count as final output. A support workflow might end at a durable issue resolution; a development workflow might end at an accepted production change. The boundary must follow the economic outcome being claimed.

The Critical Path framework adds a labor normalized version: accepted valid units divided by the average total workforce FTE assigned during the same period. Its labor denominator includes employees and observable contractor capacity. State the time unit, such as valid cases per assigned FTE per month. That ratio differs from throughput per operating hour and from human touch minutes per case. Each answers a useful question, but dividing output by headcount does not directly measure the active minutes required to produce it.

An FTE requires a declared conversion convention. A person splitting time across processes contributes only the allocated fraction, and changing those allocations can move the ratio without a change in actual work. Contractor effort should use observed hours or an adequately documented capacity estimate, with missing coverage disclosed. The average assignment should reflect the whole reporting interval rather than only the final day's staffing. Supporting work such as review, coordination and exception handling belongs within the declared boundary when needed to deliver the outcome.

Validity is part of the numerator's definition. Use a versioned acceptance standard covering necessary quality and controls. A case that closes automatically but reopens with the same problem should not become two successful outcomes merely because the system logged two closures. Retain parent and child relationships, duplicate identifiers, rejection and reopening records. Allow a defined maturity interval for outcomes whose quality becomes observable later, and identify provisional counts until that interval has passed.

This metric supplies an enterprise mechanism for Post Labor economics: it asks whether a production system can deliver more useful work with less total human capacity. A rising ratio provides a relevant signature, while task, quality and labor coverage records determine its explanation. It is a supporting operational instrument rather than a twenty year national series demonstrating economywide labor decline.

Established methods and bounded empirical findings

Production measurement already recognizes that throughput, quality, availability and other performance measures depend on one another. NIST researchers' 2016 work develops a hierarchy for interpreting those relationships in manufacturing systems. It provides a methodological foundation for using related indicators together, rather than assuming one favorable KPI establishes improved system performance. Applying that principle to an AI assisted service requires an appropriate output definition and a map of the actual process. [1]

A particularly relevant firm study by Brynjolfsson, Li and Raymond examines a generative AI assistant used by customer support agents. The published research reports an average 15 percent increase in issues resolved per hour, with substantial differences across workers. Its outcome is close to a workflow productivity measure because it connects time to successful resolution. The result remains specific to the studied service operation; it does not establish that all enterprise processes or total company value increased by the same amount. [2]

Dillon and coauthors provide a different observation. Their field experiment covers 66 firms and examines an AI tool integrated into knowledge work applications. The current forthcoming article reports individual time savings without detected shifts in task quantity or composition. That result shows why a task time measure cannot automatically fill the missing throughput numerator. The original working paper appeared in 2025; the current version available at the cutoff should be used rather than mixing quantitative estimates from earlier versions. [3]

Official UK guidance on evaluating AI interventions emphasizes outcomes and a credible assessment of how an intervention produces them, with evaluation methods proportionate to the setting. This supports a clear distinction between observed workflow changes and causal attribution. A before and after throughput rise can be descriptively useful while changes in demand, staffing or case mix remain plausible explanations. An experiment or a well designed comparison can establish more within a specified population. [4]

No cited source supplies a comparable national twenty year series of accepted workflow units per total workforce FTE. Organizations choose different units and rarely publish complete contractor, quality and queue records. The evidence therefore consists of established measurement methods, bounded original studies and a proposed enterprise monitoring contract. The historical age of the methods cannot be substituted for the missing longitudinal economic data.

Sources [1] to [4]. Study publication dates are not claims of a continuous national observation series.

Evidence record	Date or version	What it establishes
NIST production KPI hierarchy	2016 publication	Dependencies among throughput quality and supporting measures
Customer support AI field study	2025 published article	15 percent average increase in resolved issues per hour in studied setting
Knowledge work AI field experiment	2025 working paper and current forthcoming article	Individual time savings do not automatically imply changed task output
UK AI impact evaluation guidance	Version available October 2026	Outcome and counterfactual design principles

Bottlenecks determine whether local speed becomes output

A workflow has several stages with their own capacity, variability and dependencies. Consider a hypothetical process where an automated preparation stage can supply ninety cases per day but reviewers can accept only forty. Increasing preparation to one hundred and twenty leaves final throughput constrained by review unless some other change occurs. It can instead increase work waiting for acceptance. The worker may be faster at a task while the organization delivers the same number of valid outcomes.

The intervention can improve throughput when it changes the limiting stage, removes a handoff or reduces exceptions that consume scarce capacity. Faster preparation can also help if downstream workers previously waited for complete inputs. A process map should identify which of these situations applies. Bottlenecks can shift as one constraint is relieved, so the relevant record includes stage queues, review capacity and acceptance rates over time rather than only the tool's generation speed.

Labor normalized throughput can rise through several distinct paths. The same workforce can deliver more cases; the same output can require fewer assigned FTE; or demand can grow faster than staffing. These paths have different staffing consequences. Higher utilization of existing capacity can also raise the assigned FTE ratio without reducing active minutes per case, so direct human work measures remain necessary. A temporary push through an accumulated backlog can raise completed output without establishing a sustainable production rate. Document whether the improvement survives after that stock is cleared.

For the Post Labor framework, the strongest mechanism combines rising valid output per total human input with direct evidence of lower human work per case, preserved quality and no hidden transfer of work to vendors or customers. That combination can support a credible account of avoided hiring when actual demand materializes. A ratio alone cannot show which jobs would have existed under the old process, because that counterfactual needs a preserved staffing plan or workload model.

Demand also mediates the employment outcome. A cheaper, faster service may attract additional customers, leaving staffing stable or growing while labor intensity falls. Alternatively, released capacity may become resilience, training or employee recovery. Throughput measures the production consequence of those choices, but it does not prescribe the disposition of capacity. Connecting the result to observed staffing, purchased work and financial records keeps its economic meaning clear.

Case selection accounting boundaries and quality drift

Case mix can dominate the ratio. Simple requests may require far less work than complex disputes, and an automation system may initially handle only the simplest cases. Report throughput by complexity, channel and risk tier, then use a fixed and documented normalization method if constructing an aggregate. Complexity weights should remain attached to a baseline version; changing them retrospectively can create an apparent gain. Show unweighted valid counts alongside normalized case equivalents.

Eligibility also needs its own record. A workflow can appear highly productive if difficult cases are routed elsewhere, abandoned or held outside the measurement system. The accepted numerator should accompany eligible arrivals, transfers, failures and open cases. A lower accepted share may be hidden by reporting output only from successful executions. Follow cases across handoffs and retain total customer journeys where a purported resolution generates a repeat contact.

The labor denominator can be gamed through allocation and outsourcing. Reassigning reviewers to a shared cost center, omitting managers or buying external verification raises apparent throughput per assigned employee FTE. A workforce bridge should identify those changes and the uncertainty in contractor coverage. Human work carried out by the customer is also economically relevant, even when it cannot be included in a payroll based FTE denominator. A process that shifts data entry onto customers may improve an internal ratio while increasing total social effort.

Quality standards can drift when volumes rise. If reviewers begin accepting weaker output, the numerator grows without the same useful service. Keep the acceptance standard versioned, use independent samples and examine severe defects, repeat work and customer results. An aggregate acceptance rate can miss rare but costly failures, so some limits need separate thresholds rather than conversion into an average quality score. These checks define what output counts as valid.

Causal attribution requires more than a clean ratio. Compare concurrent treated and appropriate control workflows, account for demand and staffing changes and preserve preperiod trajectories. A staggered rollout can be informative if rollout timing and spillovers are understood. Record release versions and other process changes. The UK evaluation guidance provides a basis for selecting a suitable design, while the operational record supplies the evidence needed to implement it. [4]

A reproducible throughput and capacity dashboard

Create separate charts for eligible arrivals, accepted valid output and open backlog. Show the whole workflow alongside important stage counts. A second panel should plot valid units per total workforce FTE and per operating hour, with their units clearly labeled. Add employee, contractor and missing coverage components of the labor denominator. Keep changes in assignment policy visible.

Each outcome needs a persistent case identifier, readiness and acceptance timestamps, complexity and risk tags, intervention version and quality status. Join those records to labor assignments and relevant contractor hours for the same period. Preserve rejected, abandoned and reopened cases rather than treating them as absent. Record the maturity interval for delayed failures and revise provisional accepted counts transparently.

For comparison, present fixed mix results and raw results together. Show first pass yield, rework, escalation and cycle time beside throughput. State the baseline window, evaluation design and degree of causal confidence. A pilot observed increase is a different evidence stage from a sustained result validated across ordinary demand cycles.

Read this metric with human work per valid unit, straight through completion, cycle time, full cost per outcome and capacity realization. The combined record can show whether local assistance became a scalable production change and whether the change altered hiring requirements. Its place in the superset is operational proof of a potential labor saving mechanism, with honest boundaries around firm specific evidence and the absence of a comparable national secular series.

SOURCES AND REPRODUCTION NOTES

[1] Ningxuan Kang Cong Zhao Jingshan Li and John A Horst NIST (2016). A Hierarchical Structure of Key Performance Indicators for Operation Improvement in Production Systems. Original production measurement research published 3 October 2016; dependency hierarchy not a national AI trend Verified retrieval 4 October 2026.

[2] Erik Brynjolfsson Danielle Li and Lindsey Raymond (2025). Generative AI at Work. Author publication page linking original paper; published QJE DOI 10.1093/qje/qjae044; updated 15 percent resolved issues per hour result Verified retrieval 4 October 2026.

[3] Eleanor W Dillon Sonia Jaffe Nicole Immorlica and Christopher T Stanton (2025 working paper current forthcoming version). Shifting Work Patterns with Generative AI. Original article forthcoming at cutoff; 66 firms six month experiment; current abstract distinguishes individual time savings and task outcomes Verified retrieval 4 October 2026.

[4] HM Treasury and Evaluation Task Force (2026). Guidance on the Impact Evaluation of AI Interventions. Official outcome evaluation and counterfactual guidance; version available at cutoff Verified retrieval 4 October 2026.

RELATED CHAPTERS 074 · 077 · 101 · 102 · 104 · 105 · 106 · 108 · 110

CHAPTER 104

Cost per valid outcome

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Established cost estimation methods 2009 to 2020 and technology cost specifications through June 2026 with no national valid outcome cost series

Full cost per accepted outcome tests economic substitution only when labor machine support quality and risk boundaries remain consistent.

The full cost numerator and the accepted outcome denominator

Cost per valid outcome divides the cost of a defined workflow by the accepted valid outcomes it delivers during a corresponding period or cohort. The Critical Path definition includes human labor, vendors, AI and cloud resources, allocated support and expected error cost. It is broader than inference price, wage cost per task or the invoice for an automation platform. Those narrower measures can diagnose a component, but a substitution decision requires the costs incurred to complete the entire economic work.

The denominator must represent a stable outcome and acceptance standard. A generated draft, an opened support ticket and an accepted resolution are different units. If the alternative processes deliver different quality, speed, coverage or risk, their unit costs do not describe equivalent service. Define what qualifies as valid, when delayed failure can revoke that classification and which difficult or abandoned cases remain in the measured population. Expenditure on failed attempts remains a cost even though those attempts do not become valid outputs.

The human component includes relevant employees and purchased human work, with a clear treatment of benefits, payroll costs, supervision and shared services. A workflow that removes internal staff but buys vendor review has changed the location of labor rather than necessarily eliminated it. Include remaining integration, verification, escalation and maintenance work. Unlogged activity requires bounded sampling or an explicit missing coverage estimate instead of an assumption that its cost is zero.

The machine component includes the resources actually consumed and the commitments needed to make the service available. Model calls, retrieval, storage, infrastructure, monitoring and software licenses can all matter. Shared costs need an allocation rule that corresponds to resource use or a documented capacity convention. Currency, billing period and amortization treatment must align with the output window. FOCUS supports a consistent technology billing record, while the business outcome definition still has to come from the workflow. [2]

Expected error cost is a modeled supplement for residual failure, with assumptions and uncertainty shown separately from observed spending. It must not duplicate losses already booked or rework already included in labor. Some material risks are operating limits rather than costs that can be averaged away. This proposed enterprise metric therefore combines a comparable output contract with a complete and auditable cost boundary.

Methodological foundations and what empirical studies do not supply

GAO's Cost Estimating and Assessment Guide, updated in 2020 from the 2009 guide, sets out practices including a technical baseline, scope, work breakdown, assumptions, data collection, risk and sensitivity analysis and updating estimates with actual cost. Those practices provide a strong foundation for constructing a full workflow cost. They do not supply a universal AI unit cost or prescribe the business definition of a valid outcome. The enterprise must map the general methods to its own process and decision. [1]

The FOCUS 1.4 specification was ratified in June 2026 and standardizes technology cost and usage information. Its consistent billing fields can support allocation and reconciliation across providers. It is a measurement infrastructure improvement, rather than evidence that the total cost of every automated service declined. A normalized bill still needs to be joined to outcomes, labor and support records before the complete ratio can be calculated. [2]

NIST's AI Risk Management Framework provides a basis for evaluating relevant system risks and contextual requirements. It helps define the limits under which an apparently cheap outcome remains acceptable. It does not imply that all harms can be expressed reliably as one expected dollar figure. Official UK AI evaluation guidance supplies complementary methods for assessing whether an intervention changes its intended outcomes and for selecting an appropriate counterfactual. [3][4]

Original firm evidence illustrates both promise and scope limits. The customer support study by Brynjolfsson, Li and Raymond finds more issues resolved per hour with AI assistance. That outcome may lower the human time component of cost, but it is not a complete accounting of model expense, integration, support and residual risk. Translating a labor productivity result into full cost requires those additional observations and a defined financial treatment of released capacity. [5]

This metric is consequently classified as proposed rather than secular evidence. Cost accounting and evaluation methods have long histories, but there is no comparable national twenty year series of full cost per accepted AI enabled outcome. The proposed instrument allows an organization to generate credible evidence about a particular workflow. Its relevance to Post Labor economics comes from testing whether machines can economically substitute for human work under stable outcome requirements, rather than from an invented historical chart.

Measurement foundation	Verified publication or version	Contribution
GAO cost estimation guide	2009 original and 2020 update	Baseline complete scope assumptions and sensitivity
FOCUS cost specification	Version 1.4 June 2026	Consistent technology cost and usage records
NIST AI risk framework	2023	Contextual risk and acceptability boundaries
UK AI impact evaluation guidance	Version available October 2026	Outcome and counterfactual assessment

Sources [1] to [4]. These are methods and specifications, not observations of a national cost trend.

Economic substitution requires a quality adjusted comparison

A low machine price can change a production decision only if the entire workflow becomes economically attractive. A task that costs little to generate may still require expensive review, correction or integration. Conversely, a costly model can be worthwhile when it reduces difficult exceptions or enables a service previously unavailable. The full ratio captures these interactions more effectively than a token price or an isolated estimate of employee time saved.

Consider a wholly hypothetical baseline that spends $120,000 to deliver 10,000 valid outcomes, giving a unit cost of $12. A redesigned process spends $100,000 and records 12,000 nominal completions, but only 8,000 meet the same acceptance standard. Its nominal cost per completion is about $8.33, while cost per valid outcome is $12.50. The lower total expenditure and higher raw completion count have not established cheaper equivalent production. All values here illustrate the denominator logic; they are not observed company or study results.

A different hypothetical process might preserve 10,000 valid outcomes at $100,000 full cost, lowering the comparable ratio to $10. The organization would still need to explain where the $20,000 difference came from. Lower vendor spending, reduced overtime, cheaper inputs and lower required human effort have different implications for labor. A model based allocation of salaried time can reveal released capacity even when payroll expense remains fixed, but it cannot automatically become cash savings.

Fixed and variable costs affect scale. Building an integration and maintaining a platform can create substantial fixed costs; inference and case specific review can vary with volume. A pilot's average cost may be high because little output spreads the fixed burden, while a large rollout can face rising exception or infrastructure costs. Compare alternative volume scenarios using observed or defensible inputs. The lowest pilot unit cost does not necessarily identify the most economical operating design at full scale.

The Post Labor connection becomes strongest when a sustained decline in full comparable cost is accompanied by lower human work per unit and a feasible plan for absorbing demand with less staffing than the old process required. A price reduction alone cannot reveal the labor channel. The metric tests the economic viability of substitution and helps distinguish a real production change from a redistribution of cost across accounts or people.

Allocations time horizons and residual risk

A workflow allocation should reconcile with the organization's cost records. Shared infrastructure and support can be assigned by measured usage, capacity or a declared rule, but the rule must remain visible and stable. Assigning all platform cost to another business unit can make one process look artificially cheap. Compare results under plausible allocation alternatives where the choice materially changes the decision. GAO's emphasis on documented assumptions and sensitivity analysis is directly useful here. [1]

Operating and lifecycle perspectives require separate views. A run cost comparison examines continuing delivery. A lifecycle comparison adds development, transition, training, migration and eventual exit or replacement. State the horizon and treatment of capitalized expenditure; do not count an initial investment and its amortization twice in the same economic total. A short payback period based on excluding ongoing

support can be misleading, while including every historical sunk cost can obscure the economics of a current choice.

Expected error losses require evidence about frequency, severity and exposure. Rare events may be poorly observed in a small pilot, and a change in detection can alter measured rates without changing underlying risk. Show a range of possible losses and separate actual incidents from modeled residual exposure. Some harms or legal constraints remain unacceptable even when an estimated average unit cost is favorable. The NIST risk framework supports attention to context, affected people and the limits of a single numerical summary. [3]

Case mix and timing create further risks. A cheap process may exclude difficult cases or complete easy ones first, leaving costly work in backlog. Costs can be incurred before acceptance, so dividing this month's spending by this month's completions may misalign cohorts during rapid growth. Use either a consistent operating period with work in progress adjustments or a cohort cost model, and explain the choice. Reopened outcomes should carry their repair costs and revised validity status.

Causal evaluation should compare equivalent demand, service and quality. A before and after decline can come from cheaper cloud prices, a different workforce mix, lower input complexity or a demand contraction. An appropriate control or experiment can help identify the intervention's contribution. Preserve those distinctions when reporting an AI related saving; the cost ratio itself describes economics, while the evaluation design establishes why it changed. [4]

For procurement, an optional purchased cost per accepted outcome companion divides the matched supplier charges by accepted valid supplier outcomes. This operationalization follows the decision map label. It is a component comparison and must disclose internal oversight, integration, correction and risk costs outside the invoice; the complete make or buy comparison still uses the full cost boundary. [6]

A cost bridge from resource records to accepted output

Build a cost waterfall separating human work, vendors, model and cloud use, allocated support, transition cost and modeled error exposure. Present observed spending separately from imputed capacity value and expected losses. Reconcile totals to financial records and show the valid output denominator beside the ratio. Include cost coverage and uncertainty, so unmeasured support is visible.

Join resource records and outcomes through persistent workflow and case identifiers, time periods, release versions and allocation versions. Use consistent billing currency and document exchange rate treatment. FOCUS compatible records can support technology cost normalization, but acceptance, human effort and incident records still require other systems. Retain the raw inputs needed to reconstruct every bridge item. [2]

Chart operating cost per valid outcome alongside a lifecycle scenario, human minutes, throughput and quality. Show fixed mix and observed mix results. For each claimed saving, identify whether it is an actual expense reduction, future cost avoidance or released capacity awaiting disposition. Avoid adding those descriptions of the same improvement into one inflated benefit total.

Read this instrument with full AI cost per valid outcome, human work per unit, rework, customer outcomes and capacity realization. The narrower AI cost metric can guide model selection; the complete workflow ratio

tests the business alternative. Its contribution to Post Labor economics is evidence about economic substitution under valid outcome constraints, with no implication that a comparable national two decade decline has already been observed.

SOURCES AND REPRODUCTION NOTES

[1] United States Government Accountability Office (2020). Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Program Costs. GAO 20 195G released 12 March 2020; scope baseline lifecycle assumptions risk sensitivity and actual cost updates Verified retrieval 4 October 2026.

[2] FinOps Open Cost and Usage Specification Project (2026). FOCUS Specification 1.4. Ratified 4 June 2026; normalized technology cost and usage schema; does not define a valid business outcome Verified retrieval 4 October 2026.

[3] National Institute of Standards and Technology (2023). Artificial Intelligence Risk Management Framework AI RMF 1.0. NIST AI 100 1 framework and primary document; contextual risk assessment and measurement limits Verified retrieval 4 October 2026.

[4] HM Treasury and Evaluation Task Force (2026). Guidance on the Impact Evaluation of AI Interventions. Official outcome and counterfactual guidance; version available at cutoff Verified retrieval 4 October 2026.

[5] Erik Brynjolfsson Danielle Li and Lindsey Raymond (2025). Generative AI at Work. Original author publication page; QJE DOI 10.1093/qje/qjae044; labor productivity result does not by itself provide full cost accounting Verified retrieval 4 October 2026.

[6] David Shapiro and Critical Path Consulting Group (2026). The jobs that never appear Measuring and capturing the enterprise AI productivity dividend. Unpublished supplied manuscript September 2026 edition Version 2.0; Appendix A and chapter 16 decision map; framework source rather than independent empirical evidence; consulted 4 October 2026

RELATED CHAPTERS 075 · 077 · 101 · 103 · 107 · 109 · 110 · 112

CHAPTER 105

Cycle time and waiting time

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN Queueing methods published 1961 and manufacturing flow measurement 2015 with selected AI work evidence available through October 2026

Elapsed workflow time shows whether local automation survives queues and handoffs, while active human time and calendar waiting must be measured separately.

Ready to acceptance elapsed time and its components

End to end cycle time is the elapsed interval between a case becoming ready for the defined workflow and acceptance of its valid outcome. The Critical Path framework specifies reporting both the median and the ninetieth percentile. The median describes the typical completed case; the upper percentile highlights slower cases that an average can obscure. The clock boundary is an economic choice: it must include the stages needed to deliver the outcome whose improvement is being claimed.

Ready requires a stable rule. A case might be ready when required information is available, when a customer requests service or when an upstream approval completes. Moving the start later can shorten the measured interval without making the customer's experience faster. Keep the original request timestamp alongside readiness so preworkflow delay remains observable. Acceptance similarly requires a defined standard, rather than whichever technical event happens to be easiest to log.

Elapsed time, active processing time and human effort differ. A case can wait several days while consuming little labor, or involve several people working simultaneously for an hour. Summed human touch minutes can exceed calendar elapsed minutes when parallel work occurs. An automated operation can consume machine processing time without human activity. Separate active work, queues, external dependencies and planned calendar pauses using state definitions that avoid overlapping elapsed intervals.

Queue time is the period in which work is ready for a next step but awaiting available capacity or a decision. The Critical Path queue share divides queued minutes by end to end elapsed minutes. State whether it is a ratio of summed times across cases or an average of case level shares; the two give different weights to long cases. Distinguish internal waiting from a customer supplying information or a legally required interval rather than treating every delay as removable waste.

For Post Labor economics, time measures test whether task acceleration changes the productive system. A large reduction in human effort can occur with little change in elapsed service time when approvals or external dependencies dominate. Conversely, a faster handoff can improve service without reducing much labor. Measuring both dimensions preserves the difference between lower labor intensity and a better customer experience.

The historical methods and their proper scope

Queueing analysis supplies a long established relationship among flow, time and work in process. John Little's original 1961 proof relates mean units in a system to the arrival rate and mean time spent there under specified conditions. In a stable and consistently defined flow, the familiar expression is L = lambda times W. The result is a relationship among averages, rather than proof that increasing speed at any one task will reduce the entire workflow's duration. Its assumptions and boundary remain essential. [1]

Kingman's 1961 research addresses a single server queue in heavy traffic. It supplies a classical foundation for studying waiting when utilization is high and arrival and service behavior matter. A practical workflow can have multiple servers, priorities, parallel stages and dependencies, so applying a simple model requires checking its assumptions. The old publication date demonstrates the history of the method; it does not turn a modern enterprise timing measure into an observed sixty five year economic trend. [2]

NIST's 2015 technical note reviews inventory and flow time in United States manufacturing and develops a method for tracking manufactured product flow, with applications to automotive and aircraft production. It shows that elapsed production time and interindustry relationships can be studied using economic records. Its manufacturing boundary differs from an individual software or customer service workflow. One should not attach its estimates to a new service process as though they were interchangeable observations. [3]

Current AI evidence reinforces the need for scope discipline. Dillon and coauthors' field experiment records individual time savings from a knowledge work tool without detected changes in task quantity or composition in the current version. It does not provide a universal ready to acceptance cycle time effect. The distinction is useful: time released from one activity is a measured intermediate outcome, while the next coordination or delivery consequence needs its own record. [4]

These sources establish a methodological foundation and bounded contemporary observations. They do not supply a national twenty year series of enterprise workflow cycle times, queue shares and active human minutes under stable outcome definitions. The metric is supporting operational evidence. Its historical chapter therefore documents the age of the methods and the limits of their application, rather than claiming a secular national deterioration or improvement that has not been measured.

Evidence foundation	Publication or current version	Relevant boundary
Little queueing proof	1961	Mean system inventory arrival rate and time under stated assumptions
Kingman heavy traffic research	1961	Single server queue with specified arrival and service conditions
NIST manufacturing flow study	2015	Manufacturing inventory flow and interindustry links
Knowledge work AI experiment	2025 working paper current forthcoming article	Individual time use distinct from delivered workflow output

Sources [1] to [4]. Method history and study versions are separated from observation histories.

Why faster work can leave delivery unchanged

Consider a hypothetical workflow that takes sixty elapsed minutes: fifteen in active processing, thirty five in internal queues and ten waiting for an external response. A five minute drafting step is part of the active processing. Halving that step saves two and a half minutes, reducing the full interval to fifty seven and a half minutes if every other component remains fixed. The local fifty percent improvement therefore yields about a 4.2 percent reduction in total elapsed time. These are illustrative values, not empirical estimates.

The other components may change after automation. Faster preparation can send more cases into a review queue, increasing waiting unless review capacity or routing changes. Better input quality can instead reduce clarification requests and exceptions, shortening both work and delay. An intervention might also remove a redundant approval, yielding a large calendar improvement with limited change in human touch. A component chart reveals which of these mechanisms occurred.

Capacity and variability interact. A system with spare capacity can absorb uneven arrivals more easily than one whose required service continually approaches available capacity. Differences in case complexity can create bursts of long work, and batching or approval schedules can produce predictable queues. The appropriate response may involve scheduling, routing, limiting simultaneous work or changing decision rights rather than accelerating the automated task again. The queueing literature provides methods for examining those conditions, with the process assumptions made explicit. [1][2]

Work in process provides another diagnostic. In a stable hypothetical system delivering twenty cases per day with an average of one hundred cases inside the same boundary, Little's relationship implies a mean five day system time. The inventory measure must include the cases represented in the flow and timing denominator. If backlog is continually accumulating, a short window ratio cannot be treated as a stable long run mean. Reducing inventory while preserving delivery can improve timeliness, but indiscriminately rejecting cases can also reduce it without providing better service. [1] If cases can reject or abandon, the total arrival and exit population used for the queueing identity must include those paths. Accepted valid throughput alone cannot substitute for total exit flow while inventory includes unsuccessful cases.

For the Post Labor framework, the key connection is conversion. Lower active human effort can release capacity, while lower elapsed time can improve service and demand. Those changes may support avoided hiring or expanded output, but neither follows automatically from the other. The timing record tests where the production system still requires scarce human judgment and where organizational waiting absorbs an otherwise promising automation gain.

Incomplete cases clock rules and the slow tail

Completed case statistics can create selection bias during a rollout. If the new process finishes easy cases quickly while difficult ones remain open, the median among completions can fall sharply. The unfinished workload may be worsening at the same time. Report the age distribution of open cases, abandonment and acceptance rates alongside completed durations. A cohort view that follows all arrivals through a sufficient observation window is often more informative than a completion only monthly view.

Right censoring arises when observation ends before a case completes. Its eventual duration is unknown, rather than zero or the current age. A careful analysis can report unresolved shares and minimum ages or use

an appropriate time to event method with assumptions stated. The analyst should not silently drop those cases and present the remaining distribution as the experience of everyone entering the workflow. This is particularly important for P90 measures when slow cases are still accumulating.

Calendar rules need consistency. A business hours clock can be useful for operational staffing, while a continuous clock describes elapsed customer experience. Holidays, weekends and time zones should be handled through declared calendars, with both perspectives retained where relevant. Pausing a clock during a handoff can hide exactly the organizational waiting the metric is intended to diagnose. Legitimate externally imposed waits can be tagged without deleting them from the full elapsed record.

Parallel stages complicate decomposition. Adding every stage's elapsed duration can exceed the total case duration, and adding overlapping queues can inflate queue share. Use an event map to construct nonoverlapping states for the elapsed clock, while measuring human effort separately as resource time. Identify the critical dependency path where appropriate. A duration reduction on a parallel branch may have no effect on completion if another branch remains slower.

A causal claim needs comparable cohorts and a design addressing simultaneous changes in demand, staffing and complexity. Preserve the acceptance standard and readiness definition across releases. Report the distribution rather than only the mean, since an average can improve while the slow tail worsens. Faster invalid closure or an increase in abandonment would weaken the improvement claim. The strongest result combines shorter valid cycle times, preserved access and quality, and lower total human effort under a stable boundary.

A timeline and distribution based monitoring record

For each case, retain request, ready, stage start and finish, queue entry and exit, acceptance, reopening and abandonment timestamps. Store a consistent time basis and the applicable local calendar. Preserve workflow and release versions, risk tier and complexity. Tag missing events so an unobserved queue is not assigned zero duration.

Plot median, P90 and selected further percentiles for accepted outcomes, alongside open case ages and acceptance rates. Use separate panels for elapsed time and human touch minutes. A nonoverlapping state decomposition can show active processing, internal queues and external waits. State whether the queue share aggregates minutes or averages case percentages, and preserve both if their difference helps explain a change.

Compare arrival cohorts with sufficient follow up and flag censored cases. Show stage throughput and work in process to locate moving bottlenecks. Apply Little's relationship only to consistent boundaries and an appropriate stable flow window; a growing backlog requires direct analysis of arrivals, completions and capacity. Any simplified queue model should publish its arrival, service and staffing assumptions. [1][2]

Read this metric with end to end throughput, human work per valid unit, straight through completion, first pass yield and capacity realization. Its distinctive role is to expose the interval between faster execution and delivered value. That operational evidence can support a labor saving mechanism, while retaining the absence of a comparable national twenty year timing series and the possibility that organizational redesign improves service without reducing employment.

SOURCES AND REPRODUCTION NOTES

[1] John D C Little (1961). A Proof for the Queuing Formula: L = λW. Original Operations Research 9 3 pages 383 to 387 DOI 10.1287/opre.9.3.383; MIT hosted original paper; finite stationary means and consistent system boundary Verified retrieval 4 October 2026.

[2] J F C Kingman (1961). The single server queue in heavy traffic. Original October 1961 volume 57 4 pages 902 to 904; online digitization 2008 is not original publication date; DOI 10.1017/S0305004100036094 Verified retrieval 4 October 2026.

[3] Douglas Thomas and Anand M Kandaswamy NIST (2015). Inventory and Flow Time in the US Manufacturing Industry. NIST Technical Note 1890 published 14 December 2015 DOI 10.6028/NIST. TN.1890; manufacturing method rather than universal service timing series Verified retrieval 4 October 2026.

[4] Eleanor W Dillon Sonia Jaffe Nicole Immorlica and Christopher T Stanton (2025 working paper current forthcoming version). Shifting Work Patterns with Generative AI. Original forthcoming article at cutoff; six month field experiment; individual time use does not measure universal end to end cycle effects Verified retrieval 4 October 2026.

RELATED CHAPTERS 101 · 102 · 103 · 104 · 106 · 108 · 110 · 114

CHAPTER 106

First pass yield

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN Established process quality methods; selected workplace studies from 2020 to 2023, published through 2026; no comparable national longitudinal series

First pass yield tests whether apparent automation speed produces accepted work without repair, but supplies workflow evidence rather than a twenty year macroeconomic trend.

Acceptance without correction

First pass yield is the fraction of submitted outputs accepted without correction or resubmission. The supplied Critical Path report specifies that numerator and denominator explicitly. Multiply the fraction by 100 to express a percentage. An output is counted once at its first submission, even if it later goes through several rounds of review. A repaired output may become usable eventually, but it does not retrospectively become a first pass success. The metric identifies how much of apparent production reaches the agreed acceptance gate cleanly. [1]

The unit needs an operational definition. It might be a completed insurance assessment, reconciled invoice, customer issue resolution, tested software change, or reviewed document. A sentence, model token, chat message, or code suggestion is usually a component of that unit. Counting components as finished outcomes can produce a very high yield while the substantive job still requires extensive integration. The denominator should therefore be outputs submitted to the same meaningful acceptance gate, with version and scope recorded.

Define correction before collecting data. Factual repair, missing evidence, failed tests, substantive revision and regulatory nonconformance generally belong in the correction ledger. A customer's changed request or an optional stylistic preference can be recorded separately. Ambiguous distinctions need a documented adjudication rule applied to both the baseline and intervention periods. Otherwise, a team can improve the reported rate by renaming yesterday's defects as today's preferences. Record both the strict contractual acceptance result and any broader assessment of usefulness.

The report's submitted output denominator differs from a yield measured against every unit started. Work abandoned before submission is absent from its headline formula. Preserve that formula, then show the share of initiated cases reaching submission, abandonment and backlog alongside it. Final accepted output divided by all cases started is another useful measure with another denominator. Neither should silently replace first pass yield. [1]

NIST's proportion control methods provide a statistical starting point for classifying units as conforming or nonconforming. They require a stable inspection rule and a defined number inspected. Their mathematical methods do not establish that every service outcome has an objectively binary definition of quality. An acceptance committee can produce a precise proportion from inconsistent judgments. Agreement between reviewers, independent outcome checks and the identity of the gate are therefore part of this metric's measurement quality. [2]

What the empirical record shows

The verified sources support the importance of quality measurement, rather than a national trend in first pass yield. NIST's engineering handbook treats proportions of nonconforming units as process control observations. This is a longstanding method that can be applied to a factory or service workflow. The age of the method does not provide twenty years of comparable observations for contemporary knowledge work. There is no national first pass yield series verified for this reference as of 4 October 2026. [2]

An original randomized consulting study examined 758 professionals using GPT 4 on tasks designed in 2023. The article published in 2026 found better task performance within the tested capability frontier and worse correctness on a particular task beyond it. Quality scores and correctness are distinct outcomes; neither is automatically the report's accepted without correction rate. The study supplies a reason to inspect task boundaries, without supplying a first pass yield time series. [3]

The 2025 published customer support study by Brynjolfsson, Li and Raymond followed a staggered assistant deployment around 2020 and 2021. It measured successful resolutions per hour and resolution share in work already conducted by human agents. The final article reports productivity improvement and heterogeneous quality effects. These observations support checking valid outcomes alongside speed. They do not observe autonomous cases accepted without repair, nor identify national changes in labor demand. [4]

The source table keeps methods and studies separate. A firm's own first pass yield record can be much longer than the recent studies, especially in manufacturing or established transaction processing. Its value depends on continuity in product specifications, case eligibility, inspection intensity and the acceptance gate. A long record with several undocumented definition changes is weaker evidence than a shorter, well documented experiment. Comparing different firms' percentages also requires their submitted outputs to represent comparable work.

For a secular post labor interpretation, the missing empirical bridge is repeated observation of comparable workflows over at least two decades, accompanied by total human effort and output value. A historical rise in acceptance would become more relevant if fewer human hours were required to sustain it, case complexity did not fall, and the gains persisted through changes in demand. A quality improvement alone remains an improvement in quality. It can coexist with rising employment, additional review roles or higher service standards. The report should retain that distinction when presenting a recent AI experiment beside older automation evidence.

Sources [2] to [4]. Study outcomes are adjacent quality measures, not interchangeable first pass yield observations.

Record	Observation or publication scope	What it measures
NIST engineering handbook	Established statistical method	Proportion of inspected units nonconforming
Consulting experiment	2023 task setting; 2026 article	Task quality and correctness
Customer support deployment	Around 2020 and 2021; 2025 article	Resolutions per hour and resolution share
National first pass yield series	Not verified through 4 October 2026	No comparable national estimate supplied

The connection to labor compression

First pass yield makes an automation claim more economically meaningful by testing its usable output boundary. A system that produces twice as many drafts but sends many more back for repair may have increased gross activity without reducing labor per accepted result. The quality gate prevents a headline throughput statistic from treating every machine generated item as value created. It is especially useful when the output count can expand almost costlessly while verification remains expensive.

Consider a hypothetical process submitting 1,000 cases. At 90 percent first pass yield, 900 pass initially and 100 require another action. If an intervention raises submissions to 1,500 while yield falls to 80 percent, first pass accepted outputs rise to 1,200 but cases requiring another action rise to 300. This is simultaneously more clean output and more repair demand. Whether labor intensity improved depends on preparation, review and repair time. The percentages alone cannot decide whether staffing requirements fell.

A simple workload illustration makes the complement clear. Suppose every submitted case requires six human preparation minutes and two review minutes, and each corrected case requires another twenty minutes. For the initial hypothetical process, labor totals 10,000 minutes: 8,000 for preparation and review plus 2,000 for repair. For the expanded process, unchanged preparation and review requirements produce 18,000 minutes. Automation must save enough of the first two categories, or improve the repair burden, for a genuine reduction in human work per valid outcome. These values are illustrative assumptions, not estimates from a study.

The post labor relevance appears when independently accepted work expands with less total human input, including labor purchased from vendors. Such evidence identifies a production mechanism that could compress demand for particular tasks. The ensuing economic destination remains open. Capacity can absorb demand, improve service, reduce overtime, support new products or avoid future hiring. A first pass yield improvement does not establish which destination occurred. It must be linked to actual hours, costs and capacity disposition. [1]

Quality can also raise the value of labor rather than substitute for it. A professional supported by better tools may deliver a more demanding product that previously was uneconomic. The human contribution can shift toward judgment, explanation and accountability while ordinary errors decline. The relevant comparison preserves product value and service expectations, rather than assuming that every reduction in correction creates a removable position. This is why first pass yield belongs among the framework's supporting workflow instruments, alongside broader measures of labor intensity and household distribution.

Acceptance standards and hidden failures

The strongest threat is a moving acceptance standard. Faster automatic approval can make yield improve when inspection has weakened. More exacting review can lower yield while customer outcomes improve. Record reviewer instructions, sampling rates, evidence requirements and policy versions. A change in any of them should appear as a measurement break or a separately estimated effect. NIST's AI framework calls for documented evaluation and oversight processes, including independent review where appropriate. That guidance supports the measurement design; it does not certify a particular acceptance rate. [5]

Sample rejected and accepted outputs independently of the delivery team. Sampling only rejected work studies reasons for correction but cannot estimate hidden defects in accepted work. Sampling only easy cases inflates the apparent quality of the whole process. A probability sample of all submitted outputs supports a population estimate; extra sampling of consequential or rare categories helps investigation. Keep sampling weights available when reconstructing the overall rate. Treat missing inspection records as missing, rather than as an automatic pass.

Separate first pass acceptance from downstream validity. A document may meet its immediate checklist yet contain a factual error discovered later. Software can pass available tests and still fail in production. A claim can be accepted internally while a customer experiences a consequential mistake. Link downstream complaints, returns, reopened cases and incident losses back to the original submission cohort. An initially recorded pass may remain a first pass acceptance event, while its later defect status changes the assessment of whether the gate was adequate.

Severity also matters. A hundred minor formatting corrections and one severe safety error cannot be combined into a simple statement that the process became better because fewer outputs failed. Publish severe defect exposure separately and establish thresholds before deployment. A high average yield should never compensate statistically for crossing a material harm threshold. A rejected high risk case sent to an expert may be evidence of effective control rather than poor workflow design.

For causal comparison, assign similar work to the intervention and baseline processes, preferably randomly when practical. Otherwise, track intake complexity, customer segment, risk tier, reviewer and concurrent process changes. Include all assigned cases, even those never submitted, in a complementary completion analysis. Investigate whether users chose the easiest tasks for automation. Stable yield together with lower human effort, unchanged inspection and mature downstream outcomes strengthens a labor compression interpretation. Improvement that disappears under these checks should reduce confidence in the claimed productivity mechanism.

A reproducible monitoring record

Maintain one row per workflow instance with a permanent identifier, intake cohort, output category, risk tier, intervention assignment, model and process versions, first submission timestamp, first decision, correction flag and final disposition. Store acceptance criteria separately with effective dates. Keep correction events linked to the first instance rather than creating a new output identifier for every resubmission. The event record should support both the first pass formula and the reconciliation of initiated, submitted, abandoned and finally accepted work. [1]

For each mature cohort, divide the count accepted on first submission without correction by all outputs first submitted. Pool counts across teams to obtain the organization rate; an unweighted average of small and large team percentages answers another question. State whether pending decisions are excluded, included as unaccepted or deferred until a fixed observation window closes. Consistency matters more than choosing the most flattering timing convention.

Chart monthly yield with submitted counts and uncertainty intervals, marking deployment dates and acceptance rule changes. A separate panel should show human minutes per valid output, and another should show severe downstream defects. NIST proportion charts can flag process changes when their sampling

assumptions and baseline stability are appropriate. Repeated outputs from the same client or batch may be correlated, so simple independent item intervals can overstate precision. [2]

Keep an intake mix panel or a fixed mix comparison to distinguish easier submissions from better execution. Preserve the raw count table, query, inclusion rules, sampling weights and data extraction date. Restate older points only when a documented reconstruction is possible. Connect this record to rework, exception burden, cost per valid outcome, customer results and capacity realization. Together they can test whether work became less labor intensive while remaining useful. They still require broader longitudinal evidence to connect that enterprise mechanism to a secular macroeconomic claim.

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro, Critical Path Consulting Group (2026). The Jobs That Never Appear: Measuring and Capturing the Enterprise AI Productivity Dividend. Unpublished supplied report, September 2026 edition, Version 2.0; Appendix A2 workflow diagnostics and Appendix A3 guardrails; source trail, not independent empirical evidence; verified retrieval 4 October 2026

[2] NIST and SEMATECH (Undated online handbook). 6.3.3.2. Proportions Control Charts. Engineering Statistics Handbook; binomial fraction nonconforming, inspected sample sizes and control limits; method, not national observations; verified retrieval 4 October 2026

[3] Fabrizio Dell'Acqua and coauthors (2026). Navigating the Jagged Technological Frontier: Field Experimental Evidence of the Effects of Artificial Intelligence on Knowledge Worker Productivity and Quality. Organization Science 37(2), 403–423; original randomized study, 758 consultants, GPT 4 setting in June 2023; quality and correctness, not first pass yield; verified retrieval 4 October 2026

[4] Erik Brynjolfsson, Danielle Li and Lindsey Raymond (2025). Generative AI at Work. Quarterly Journal of Economics 140(2), 889–942; published 4 February 2025; final sample 5172 agents; staggered rollout around 2020 and 2021; resolutions per hour and resolution share, not an autonomous first pass yield series; verified retrieval 4 October 2026

[5] Elham Tabassi, National Institute of Standards and Technology (2023). Artificial Intelligence Risk Management Framework (AI RMF 1.0). NIST AI 100-1, January 2023; MAP 3.5, MEASURE function and Appendix C; methods and governance, not an observed productivity series; verified retrieval 4 October 2026

RELATED CHAPTERS 101 · 102 · 103 · 104 · 105 · 107 · 108 · 110 · 111 · 112

CHAPTER 107

Rework and defect rates

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN Established process quality methods; selected software task observations February to June 2025, with methodological update February 2026; no comparable national longitudinal series

Rework and defect measures reveal repair labor and output harm that can offset automation gains; no verified national twenty year trend supports a uniform conclusion.

Repair frequency and error exposure

The Critical Path report defines rework rate as outputs requiring correction divided by completed outputs. The numerator counts affected outputs, not every correction event. Multiply by 100 for a percentage. A completed case corrected three times contributes one affected output to the rate but three repair events to the event ledger. This distinction prevents repeated failures on one output from being mistaken for failures on three different outputs. Report repair minutes separately because frequency alone does not describe the workload. [1]

A defect is a specified failure of the output or its requirements. A defective output can contain several defects. NIST's count chart methods distinguish these concepts explicitly. The proportion of defective units and the number of defects per unit can move differently. Five erroneous fields on one invoice are one affected invoice and five defects, if fields are the predefined inspection opportunities. Define the unit and the inspection opportunity before comparisons; a larger document naturally offers more opportunities for error. [2]

The supplied report also specifies a severe defect rate: severity 1 or 2 defects divided by exposed valid outputs, multiplied by 1,000. Its severe classification must be translated into explicit operational consequences for the workflow. Freeze the exposure count at release so that an output later found defective cannot disappear from the denominator. Explain that these were outputs accepted as valid at exposure, with defects discovered subsequently. Also publish severe events per all exposed outputs when that denominator differs. Neither a label nor a severity number is comparable across firms without a shared definition. [1]

Correction can occur before completion or after exposure. A draft repaired before submission imposes labor but may never appear in the completed output rework ledger. Record that internal repair separately. Customer requested changes, maintenance necessitated by new requirements and adaptation to new information should have distinct reason codes. They can consume time without proving that the initial work was defective. The same boundary should govern both the old and redesigned workflow.

Useful companion units include human repair minutes per completed output, repair cost per accepted outcome, defects per specified opportunity, severe defects per 1,000 exposures and days until discovery. Count all human participants, including reviewers and external suppliers, within the declared process boundary. An honest dashboard preserves these separate quantities instead of compressing them into a quality score that allows a large amount of minor improvement to conceal a consequential failure.

The customer visible error rate is a separate guardrail: errors reaching customers divided by customer facing outputs, multiplied by 1,000. Its exposure denominator differs from corrected or completed internal work. Record error severity and reporting delay, and do not infer a safer process merely from fewer recorded complaints. This preserves the explicit Appendix A3 instrument alongside repair frequency. [1]

Observed studies and unavailable history

These metrics have a long methodological history in statistical process control, but the available national record does not supply comparable rework rates across the economy over twenty years. Manufacturing inspections, administrative error measures and software defects each use different units, acceptance rules and detection systems. Pooling them into a single national series would require explicit weighting and comparability work that has not been verified here. The absence of that series is a measurement limit rather than evidence that repair has become either more or less important. [2]

METR's original randomized study observed 16 experienced open source developers completing 246 tasks with early 2025 AI tools. It found longer completion times when AI was allowed. Its appendix examined post review repair and did not find statistically significant evidence of a difference in mean post review implementation time; initial pull request quality appeared broadly similar. This is a bounded productivity result with quality checks, rather than proof of a nationwide increase in defective software or repair labor. [3]

The later METR methodological update, published 24 February 2026, warns that its follow up data provide an unreliable signal of the current productivity effect. Developer and task selection changed, and time measurement became harder with concurrent agents. The update does not erase the earlier experiment's observations. It does prevent presenting that earlier point as the current general effect, or treating the new raw estimates as a settled reversal. [4]

NIST provides a separate type of evidence: methods for counting nonconformities and documenting evaluation of human and machine systems. Neither is a panel of actual enterprise repair rates. The supplied Critical Path report contributes proposed measurement contracts and workflow ledger fields, with fictional dashboard specimens explicitly identified as illustrations. Its worked percentages should not be copied into the empirical table as company observations. [1, 2, 5]

The appropriate history section in a firm chapter is its own audited baseline and intervention record. Publish the start and end observation dates, then the release date of the analysis. Show both affected output counts and repair minutes, with changes in inspection and the time allowed for defect discovery. A workflow observed for six months can offer strong evidence about that implementation. It cannot satisfy the user's two decade secular criterion simply because the quality control method existed for decades. The defensible status is supporting evidence, with results allowed to confirm or challenge a particular labor saving claim.

Sources [1] to [4]. Studies and methods are separate records; no spliced national quality trend is constructed.

Source record	Verified scope	Interpretation boundary
NIST count control methods	Defects versus defective units	Method; no national rate
METR original experiment	February to June 2025 tools; 16 developers, 246 tasks	Selected software tasks; bounded labor result

Source record	Verified scope	Interpretation boundary
METR methodological update	24 February 2026 publication	Follow up selection and time measurement concerns
Critical Path report	September 2026 Version 2.0	Proposed ledger; fictional specimens excluded

Hidden work in the automation dividend

Rework is economically important because it uses resources after a process appears to have produced its output. A machine can shorten initial drafting while leaving a professional to correct omissions, reconcile contradictions and verify evidence. A workflow that logs only initial handling time will miss this labor. The failure may also create another queue, specialist review, repeated customer contact or a supplier charge. The apparent gain can disappear when the full production boundary is restored.

Consider hypothetical production of 1,200 completed cases a month. Before a change, initial human work takes ten minutes per case; 60 cases need repair averaging twenty minutes. Total initial and repair labor is 13,200 minutes. After a change, initial work takes six minutes, while 120 cases require thirty minutes of repair. Total labor is 10,800 minutes. The rework rate doubles from 5 to 10 percent, yet the recorded production labor falls. Whether the intervention is worthwhile depends additionally on review, operating cost, output validity and consequences. These arithmetic values illustrate a possibility, not an observed company's results.

The reverse is equally possible. Fewer corrected outputs can coexist with higher repair labor if the remaining failures are difficult. More repair can also represent better detection that prevents downstream losses. Rate, minutes and harm therefore need separate interpretation. The purpose of the metric is to make the trade visible. A preset quality floor can still prohibit a harmful change even when its average labor arithmetic is favorable. Changes in the failure tail cannot be resolved by a favorable mean alone.

For post labor analysis, the net quantity of interest is total human input per valid outcome, including error prevention and remediation. Declining repair burden can help production scale without proportional growth in human work. Rising repair burden can explain why task automation has yet to produce a lower labor requirement. Either observation is informative about the mechanism. It does not establish whether firms will reduce employment, expand production, change wages or transfer gains to customers.

Trace labor categories once. A specialist's exception minutes may also be logged as rework, so adding both subtotals without checking event identifiers double counts the same effort. Allocate one time interval to a primary labor category, preserving multiple reason tags for analysis. Attach supplier invoices and customer compensation to the underlying incident without pretending that spending itself measures human hours. Financial loss and labor use are different economic quantities, and both can matter to the retained automation dividend. [1]

Detection and severity can change the result

Detection intensity is a central source of bias. When a firm improves tests or begins independent auditing, the observed defect rate may rise even if underlying quality improves. When it removes review, errors may decline in the ledger while actual customer harm rises. Record the probability and method of inspection,

follow up duration and coverage of every output class. Separate reported incidents from independently estimated prevalence. An absence of logged incidents is weak evidence where reporting channels or detection systems are incomplete.

Use exposure cohorts for delayed defects. Compare outputs released in the same period after equivalent time to mature, rather than dividing this month's discovered failures by this month's deliveries. A system can accumulate defects before they become visible through complaints, recalls, failed tests or other consequences. A separate incident discovery chart remains useful operationally, but it answers a different question from the eventual defect experience of an output cohort.

Severity should reflect consequences and plausible exposure, with explicit thresholds for safety, financial loss, privacy, compliance and service disruption. Apply the classification consistently to human and automated work. A changed severity policy should create an annotated break, not a silent improvement. Near misses can reveal ineffective controls before material loss occurs; they are additional evidence rather than interchangeable realized defects. NIST's AI framework emphasizes documenting evaluation, limitations and human oversight within the deployment context. [5]

Rare severe events need careful statistical interpretation. Zero observed events in a small sample does not prove a zero failure probability. Confidence depends on exposure count and sampling design. Repeated outputs generated by the same faulty rule can fail together; the independent event assumption then breaks down. Publish batch identifiers and investigate common causes. Severity weighted summaries can help budgeting, but keep the actual event counts and largest consequences visible so average losses do not hide a catastrophic tail.

A credible intervention comparison balances case complexity and product requirements. It also records changes in deadlines, reviewer staffing, customer expectations, workload and external supplier coverage. Random assignment offers a stronger causal design when feasible. For observational comparisons, maintain a comparison group and inspect differences in pre intervention trends. If quality improves only after removing complex cases or pushing repair to another department, the claimed process boundary has changed. Such a change can be operationally useful, but it does not demonstrate that the total work became less labor intensive.

The explicit Appendix A3 severe defect rate counts severity 1 or 2 defects divided by exposed valid outputs and multiplies by 1,000. Keep the severity policy and exposure maturity window fixed. This exposure rate is distinct from an inspection sample defect fraction; when only a sample is reviewed, report its selection and coverage. [1]

Charting and reproducing the repair ledger

Record each output identifier, first completion, release or exposure date, inspection status, defect category, severity, correction reason, responsible process version and discovery date. Link every repair event to the original output, with start and finish times, active human minutes, role and supplier involvement. Preserve final disposition, including cancellation and abandonment. Sample informal fixes through bounded time studies where event logs miss them, and publish the sampled coverage rather than treating unobserved labor as zero. [1]

For each mature completion cohort, count affected outputs once and divide by all completed outputs to reproduce the report's rework rate. Sum repair minutes separately. Distinguish repairs made before first submission, after review and after customer exposure. For defect charts, publish both defective output share and defects per stated unit of exposure. NIST's count methods distinguish charts for defect counts from those normalized for differing inspection units; selecting the chart requires specifying the underlying opportunity and assumptions. [2]

Use four coordinated panels: rework percentage, human repair minutes per valid output, severe defects per 1,000 exposed outputs, and elapsed time to detection. Label the denominators and include output volumes. Add deployment, inspection and policy changes. A loss panel can show realized cost separately from estimated prospective exposure. The data should allow readers to inspect the underlying counts rather than trusting a smoothed line alone.

Reproduce each point from a saved query, data extract date, severity dictionary and maturity rule. Retain missing values and sampling weights. Investigate changes by case type and process release before merging them into organization averages. Connect the findings to first pass yield, human work, escalation, customer outcomes, full operating costs and incident losses. A sustained net reduction in labor with stable or better mature quality strengthens the enterprise mechanism. A favorable initial task time that reverses after repair weakens it, and the monitoring record should preserve that conclusion.

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro, Critical Path Consulting Group (2026). The Jobs That Never Appear: Measuring and Capturing the Enterprise AI Productivity Dividend. Unpublished supplied report, September 2026 edition, Version 2.0; Appendix A2 workflow diagnostics and Appendix A3 guardrails; source trail, not independent empirical evidence; verified retrieval 4 October 2026

[2] NIST and SEMATECH (Undated online handbook). 6.3.3.1. Counts Control Charts. Engineering Statistics Handbook; defects versus defective units, inspection units, counts and normalized defect rates; method, not longitudinal enterprise observations; verified retrieval 4 October 2026

[3] Joel Becker, Nate Rush, Beth Barnes and David Rein (2025). Measuring the Impact of Early-2025 AI on Experienced Open-Source Developer Productivity. Original randomized task study, tools observed February to June 2025; 16 developers, 246 tasks; Appendix C2.6 assesses post review time and qualitative pull request quality; point in time result; verified retrieval 4 October 2026

[4] Joel Becker, Nate Rush, Tom Cunningham, David Rein and Khalid Mahamud (2026). We are Changing our Developer Productivity Experiment Design. Published 24 February 2026; later study began August 2025; authors flag developer/task selection, compliance and concurrent agent timing, so raw follow up is not a reliable current effect estimate; verified retrieval 4 October 2026

[5] Elham Tabassi, National Institute of Standards and Technology (2023). Artificial Intelligence Risk Management Framework (AI RMF 1.0). NIST AI 100-1, January 2023; MAP 3.5, MEASURE function and Appendix C; methods and governance, not an observed productivity series; verified retrieval 4 October 2026

RELATED CHAPTERS 101 · 102 · 104 · 106 · 108 · 109 · 110 · 111 · 112 · 114

CHAPTER 108

Human escalation and exception handling

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN Selective classification methods published 2010; customer support deployment around 2020 and 2021, article 2025; enterprise framework 2026; no comparable national longitudinal series

Escalation frequency and exception labor show where automation still needs human judgment, but a lower frequency is beneficial only when appropriate routing and output quality remain adequate.

Routing to judgment and residual work

The supplied Critical Path report defines human escalation rate as eligible cases transferred to human judgment divided by eligible cases. Express the result as a percentage. Count distinct cases rather than each transfer; a case handed to several experts still contributes one escalated case to this headline rate. Preserve transfer counts separately because repeated handoffs consume labor and can indicate poor routing. The numerator needs evidence that a handoff happened, rather than an unsupported assumption that every flagged case received expert attention. [1]

Eligibility is part of the measurement contract. It should identify the classes of work offered to the automated or assisted process, with risk, complexity and exclusions stated before deployment. Publish eligible cases divided by total intake alongside the escalation rate. The process can appear increasingly autonomous if complex cases are excluded from eligibility, even when the fraction of total demand handled automatically shrinks. A case that fails midway should retain its initial assignment rather than being removed retrospectively.

The report's companion exception labor burden is human minutes spent on exceptions divided by total valid outputs. Its unit is minutes per valid output, rather than a percentage. Include diagnosis, expert decisions, communication, overrides, remediation and coordination when they fall within the declared exception boundary. A valid output denominator of zero makes the burden undefined. Report hours and incomplete cases separately during an outage or failed release. [1]

Escalation can mean different things across systems. A customer's request to speak to a supervisor is a request event. A queue transfer is a routing event. The expert's actual judgment is an intervention event. Universal legally required human approval is routine review, while escalation is an additional or exceptional move beyond the planned path. These categories should not be merged silently. In a copilot workflow already staffed by humans, escalation to a senior specialist says little about whether the first human could be removed.

Exceptions also arise from missing inputs, unusual customer needs, outages, policy disputes or detected errors. Some are preventable; others are an appropriate consequence of the service offered. Reason codes should separate them. The metric becomes useful when the record links intake, routing, human actions, completion and subsequent outcomes. It describes the boundary between automated execution and residual

human work. It cannot by itself distinguish a capable system from one that has suppressed access to assistance.

Evidence from studies and methods

The original customer support study published in 2025 supplies a useful measurement distinction. It measured the share of chats in which customers requested a manager and found requests declined after AI assistance. The authors explicitly lacked actual escalation data. Human agents continued conducting the conversations. That observation supports improved customer confidence in that setting; it is not the rate of autonomous cases transferred to human judgment. Copying the result into an automation handoff series would change both numerator and production model. [2]

Selective classification offers an older analytical foundation. El-Yaniv and Wiener formalized a classifier's ability to abstain, trading coverage against error risk on accepted classifications. Their 2010 paper analyzes theoretical learning settings, rather than enterprise staffing or exception minutes. It shows why rejection can be part of a well functioning prediction system. The existence of the method does not establish an observed twenty year decline in escalation, especially where a rejected case still requires costly human resolution. [3]

NIST's 2023 AI Risk Management Framework treats human oversight and the configuration of human and machine responsibilities as matters to define, document and assess. It supports measuring whether a handoff is appropriate to the context. The supplied 2026 Critical Path report translates similar operational concerns into escalation and exception burden formulas. These are methods and management specifications, rather than observations of a national labor market. [1, 4]

There is no comparable national longitudinal escalation or exception labor series verified for this reference through 4 October 2026. Organizations' definitions vary with service channels, risk rules, model capabilities and the scope of eligible demand. A percentage from one chatbot provider and a percentage from an industrial production line cannot be appended into a historical curve. Industry specific records may support a more precise history when the workflow and institutional rules remain comparable.

The useful empirical record therefore begins with a stable firm's own baseline, then measures intervention cohorts under consistent eligibility and observed outcomes. The table separates empirical deployment evidence from theory and oversight methods. Additional evidence could strengthen the mechanism: repeated deployment records covering total intake, actual human transfers, active handling minutes, severe errors and full staffing boundaries. A twenty year panel of such records would support a secular analysis; recent studies remain supporting evidence. They are still valuable because they test whether a particular automation claim leaves the difficult work visible.

Record	Verified scope	What it establishes
Customer support study	Rollout around 2020 and 2021; article 2025	Customer requests for a manager, not actual transfers
Selective classification research	2010 theoretical analysis	Error versus coverage relationship with abstention
NIST AI framework	2023 methodological guidance	Document and evaluate human oversight

Record	Verified scope	What it establishes
National escalation history	Not verified through 4 October 2026	No comparable national rate or labor burden supplied

Sources [2] to [4]. Publication dates do not turn these records into a comparable longitudinal national dataset.

When fewer exceptions mean less labor

Escalation and exception handling make the residual human production requirement visible. Automation often handles familiar cases while concentrating ambiguity, emotional demands and consequential decisions in a smaller specialist group. The overall proportion needing intervention can fall while the remaining work becomes harder. This can support labor compression at the routine layer and rising demand for expert judgment at the same time. Counting workers without their changing tasks would miss the mechanism.

A hypothetical calculation illustrates the issue. Suppose 10,000 cases all reach valid outcomes, 8 percent require escalation, and escalated cases take thirty active human minutes. Exception work is 24,000 minutes, or 2.4 minutes per valid output. A redesigned process with a 4 percent escalation rate and ninety minutes per escalated case requires 36,000 minutes, or 3.6 minutes per valid output. The rate halves while residual labor rises. These assumed values are illustrative and exclude other labor, which must be added separately to estimate total production effort.

The workforce skill mix matters as well. A minute supplied by a scarce licensed expert can have a different cost and capacity constraint from a minute supplied by a general service agent. Report minutes by role and the fully loaded cost, while retaining the aggregate physical time measure. Specialist utilization and queue length can become binding even when total exception hours look small. Faster routine throughput can feed a bottleneck that reduces end to end service performance.

Improved escalation can also create value without reducing labor. Earlier identification of a risky case may increase interventions while preventing a serious mistake. Better access to human help may improve trust, accessibility or customer retention. Some cases need human authority because the institution has chosen accountability or discretion as part of its service. Those benefits should be evaluated against their requirements rather than graded by an assumption that the lowest possible rate is always optimal.

For post labor research, the stronger signal is a durable reduction in total human work per valid output at a comparable risk and demand mix, with an appropriate residual intervention path. The change may create avoided hiring or permit a larger service operation with the same workforce. It may instead support broader demand, new expert roles or better service. Track the destination of released capacity and the ownership of the resulting gains separately. Escalation metrics provide evidence about production boundaries; they do not alone reveal household income distribution or aggregate employment consequences. [1]

Suppressed handoffs and selected cases

A lower escalation rate can result from denying access to a human, raising the threshold for help or closing difficult cases prematurely. It can also follow a genuine improvement in the process. Distinguish these possibilities with sampled review of cases that were escalated and cases that were not. Investigators should judge whether the assigned path was appropriate, whether the outcome was valid, and whether the

customer could reach assistance. Examine abandonment, repeat contacts and delayed complaints, which may reveal failures excluded from the completion denominator.

The policy boundary is a choice. Changing a confidence threshold alters which cases a system accepts and which it defers. Evaluating that change requires the error experience of automatically accepted cases, the burden and performance of the human route, and the share of total demand covered. A fixed threshold is not necessarily a fixed risk rule when the model, input distribution or calibration changes. Revalidate the routing policy after meaningful releases and preserve the earlier policy for comparison.

An appropriate escalation sample needs a reference judgment independent of the original route. Domain experts can review a probability sample with documented criteria and disagreement handling. For consequential categories, use additional targeted review without pretending that the enriched sample has the natural intake distribution. Estimate both unnecessary escalations and missed necessary escalations. A transfer that arrives after a deadline or to an overloaded team may satisfy the event definition yet fail the service requirement.

NIST's framework emphasizes defined human roles, knowledge limits and documented oversight. These features require more than a human listed as nominally available. Reviewers need usable information, authority, time and an effective means to interrupt or correct execution. Human intervention can introduce its own mistakes, delays and biases. Evaluate the whole decision process rather than treating a signature as proof that a risky output became safe. [4]

Selection risks deserve explicit reporting. Automation users may choose simple cases, management may redirect unusually hard customers, or exclusions may expand during a pilot. Compare initial assigned cohorts and publish intake mix before any routing decision. Include the cost of work sent to another team or supplier. A credible labor saving estimate reconciles all cases and preserves quality; an impressive percentage confined to a shrinking easy subset supplies narrower evidence. The appropriate conclusion should remain proportional to the observed coverage and the consequence of failures.

Monitoring the actual exception path

Give every intake case an identifier and record eligibility, initial assignment, risk tier, request events, queue transfers, judgment interventions, overrides and final outcome. Store policy and model versions, transfer reasons, active human minutes by role, queue waiting and completion timestamps. Link repeat contacts and delayed defects to the original case where possible. Logs should distinguish a requested handoff, an attempted handoff and an actual expert intervention. [1]

Reproduce escalation rate from distinct eligible cases with actual transfers to judgment divided by all eligible cases. Publish total intake, eligible count and excluded categories next to it. Reproduce exception burden by summing human exception minutes over the declared boundary and dividing by valid outputs. Flag missing time records and estimate unlogged work with a documented sample. Do not convert vendor charges into assumed expert hours without evidence, and avoid counting the same remediation minutes twice under rework and escalation.

Chart escalation percentage, eligibility coverage and exception minutes per valid outcome in separate panels. Add specialist queue times, severity outcomes and the fraction of reviewed routing decisions deemed

appropriate. A version specific error versus automated coverage plot can show the tradeoff between accepting more cases and observed error exposure. Use a representative evaluation set and identify the human fallback cost separately; the plot should never imply that deferral itself resolves the case. [3]

Save queries, risk definitions, sample weights, reconciliation counts and extraction dates. Compare mature cohorts with a stable mix, and annotate routing rule or staffing changes. Link results to straight through completion, human work, rework, cycle time, full cost, workforce workload and resilience. A sustained improvement across these measures can demonstrate that the human production boundary moved. The longitudinal macro claim still requires evidence about diffusion, labor demand and the distribution of economic gains beyond the pilot.

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro, Critical Path Consulting Group (2026). The Jobs That Never Appear: Measuring and Capturing the Enterprise AI Productivity Dividend. Unpublished supplied report, September 2026 edition, Version 2.0; Appendix A2 workflow diagnostics and Appendix A3 guardrails; source trail, not independent empirical evidence; verified retrieval 4 October 2026

[2] Erik Brynjolfsson, Danielle Li and Lindsey Raymond (2025). Generative AI at Work. Quarterly Journal of Economics 140(2), 889–942; published 4 February 2025; Section VII B and Figure X measure customer requests to speak to manager, explicitly not actual escalations; assisted human support, rollout around 2020 and 2021; verified retrieval 4 October 2026

[3] Ran El-Yaniv and Yair Wiener (2010). On the Foundations of Noise-free Selective Classification. Journal of Machine Learning Research 11(53), 1605–1641; original theory of selective classification, risk and coverage; no workplace labor observations; verified retrieval 4 October 2026

[4] Elham Tabassi, National Institute of Standards and Technology (2023). Artificial Intelligence Risk Management Framework (AI RMF 1.0). NIST AI 100-1, January 2023; MAP 3.5, MEASURE and Appendix C distinguish human and automated responsibilities; guidance, not national escalation statistics; verified retrieval 4 October 2026

RELATED CHAPTERS 101 · 102 · 104 · 105 · 106 · 107 · 109 · 110 · 111 · 112 · 113 · 114

CHAPTER 109

Full AI cost per valid outcome

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Workflow research in 2025 and measurement framework in 2026

A proposed enterprise measure compares human and machine alternatives using complete workflow costs and accepted outcomes; it is a diagnostic for current deployments rather than a secular national series.

Cost boundary and valid outcome denominator

Full AI cost per valid outcome asks what an AI enabled workflow actually costs to deliver a usable result. The Critical Path manuscript defines fully loaded cost as human labor plus vendors, AI or model and cloud costs, allocated support, and expected error cost, divided by valid outcomes. This chapter preserves that definition while distinguishing operating costs, implementation costs, and risk adjustments. Its unit is currency per accepted business outcome in a specified workflow and period. It is a management instrument proposed in the 2026 framework, with no comparable national series extending twenty years. [1]

A valid outcome is an accepted resolution, paid and correctly matched invoice, compliant completed claim, usable code change, or another explicitly defined business result. It cannot be an arbitrary model response or token. Define the population, quality requirements, risk tier, service commitment, and acceptance test before comparing alternatives. Costs of rejected attempts remain in the numerator. Multiple calls, retries, intermediate drafts, and duplicate outputs cannot each become additional valid outcomes simply because they are observable in an AI platform.

Human work includes preparation, prompting, review, correction, exception handling, supervision, and work performed outside the main application. Vendor costs include contractors or outsourced functions supplying the same outcome. Machine costs include model calls, hosting, retrieval, data processing, and relevant software. Allocated support covers monitoring, evaluation, security, platform operations, and other shared services according to a disclosed rule. The boundary must include activities shifted to a different team when automation is introduced. Otherwise a workflow can appear cheap while its enterprise cost increases. [1]

Two cost views should be reported separately. The recurring operating view measures the system after deployment. A lifecycle view additionally allocates integration, training, transition, and other implementation spending over a stated horizon. Avoid charging the same build expenditure both when incurred and again through its amortized allocation in the same view. Report the accounting treatment and analytical horizon so a reader can compare a mature workflow with a newly installed one fairly. The original framework’s narrower AI operating cost per valid unit excludes build and transition unless explicitly paired with lifecycle economics. [1]

Expected error cost is a decision adjustment requiring its own assumptions about frequency and severity. Show it separately from recognized expense and actual incident losses. Counting both the expected exposure and the full realized loss for the same event would duplicate the risk burden. A serious risk that cannot be priced credibly can remain a constraint on adoption rather than being assigned an invented dollar amount.

NIST's risk framework provides a basis for documenting measurement, uncertainty, and ongoing evaluation; it does not prescribe this cost formula. [3]

Evidence checkpoints and illustrative cost arithmetic

The available evidence concerns recent workflows, not a secular history of full AI cost per outcome. An experiment with sixteen experienced open source developers and 246 tasks found that access to early 2025 AI tools increased task completion time by nineteen percent. Participants nevertheless perceived faster work. The result is specific to experienced developers working in familiar mature repositories and the tools tested. It illustrates why perceived time savings cannot replace measured end to end labor requirements in a cost comparison. [4]

A separate field experiment with 758 consultants found better performance on tasks within the tested model's capabilities and lower correctness on a task outside that frontier. Its relevance here is the changing mix of speed, quality, and error risk across tasks. It does not supply an enterprise cost estimate, an aggregate employment effect, or a result for every later model. Quality acceptance and task eligibility must therefore travel with each workflow's cost observation. [5]

The following arithmetic is entirely hypothetical. A human workflow costs 60,000 dollars during a period and delivers 900 valid outcomes. Its cost is 66.67 dollars per valid outcome. An assisted alternative costs 55,000 dollars after including the listed labor, vendors, machine usage, support, build allocation, and expected loss, and delivers 1,000 valid outcomes. Its decision adjusted cost is 55 dollars. The improvement is about 17.5 percent. These numbers demonstrate the calculation; they are not observations from either study or a forecast of typical savings.

The assisted model bill alone is two dollars per valid outcome in that example. Treating it as the price of the entire automated service would ignore most of the resources required to make the result usable. Conversely, counting every retained employee's entire salary against one small workflow would overallocate labor. Measurement needs the appropriate share of actual effort and a separately disclosed rule for idle or released capacity. The cost comparison should state which expenses would actually change if management selected a different production method.

Repeated observations can become a useful enterprise longitudinal record if outcome definitions and allocations remain stable or their revisions are documented. Preserve old and new model versions, workload mix, review requirements, and cost views. A falling ratio caused by easier cases, a looser acceptance test, or omitted monitoring does not show improved economics. A stable outcome with lower complete cost across repeated periods is stronger evidence. Aggregate historical claims would require representative cross enterprise records and consistent coverage that are currently absent from this proposed measure.

Hypothetical period record	Human workflow dollars	Assisted workflow dollars
Human labor	50,000	30,000
Vendors	1,000	3,000
Model and cloud	0	2,000
Allocated support	7,000	8,000

Hypothetical period record	Human workflow dollars	Assisted workflow dollars
Allocated build and transition	0	7,000
Expected error adjustment	2,000	5,000
Total decision adjusted cost	60,000	55,000
Valid outcomes	900	1,000
Dollars per valid outcome	66.67	55.00

Illustrative arithmetic only. Cost categories adapt the Critical Path framework; no firm or national observations are implied. [1]

Economic mechanism and interpretation

The metric tests whether a technical capability can become an economically competitive production method. More capable software may handle individual steps quickly, yet require expensive human verification, data preparation, integration, and exception resolution. If those complements exceed the labor displaced, complete cost can increase. Conversely, a modest model paired with a well designed process can reduce the resources required for an accepted result. The relevant economic object is the whole production arrangement, with consistent output quality, rather than the model's isolated benchmark score.

For post labor research, a sustained decline in full cost alongside falling human work per valid unit documents a possible substitution channel. It can show that an employer has a cheaper way to meet additional demand without proportionate hiring. This is supporting mechanism evidence, because the firm's decisions about prices, expansion, staffing, and redeployment remain separate outcomes. A cheap workflow that serves rapidly increasing demand may employ more people overall. A firm may also preserve staffing and redirect work toward service, reliability, or new products.

Separate average cost from the cost of expanding production. A system with large fixed setup expenditure and low incremental machine expense can look expensive during a small pilot and economical at greater volume. That is a possible scale effect, not a reason to assume unlimited demand. Compare feasible volume scenarios with the actual capacity of review teams, infrastructure, and downstream operations. Include contractual minimums and shared resource constraints where they matter. Record the volume at which one alternative becomes cheaper under the stated assumptions, without presenting that modeled crossover as an observed result.

The measure also connects model selection to operating design. Routing straightforward cases to a lower cost system and difficult cases to experienced humans can improve complete cost even when the human escalation rate rises. A more capable model can be cheaper overall if it eliminates enough correction and review. A lower inference price can have little business effect when the main cost is waiting for approvals or repairing incomplete inputs. Compare costs by complexity and risk stratum so changes in routing do not masquerade as uniform productivity improvement.

This chapter adds a cost coverage audit to the general cost per valid outcome measure. It focuses on the AI components, implementation burden, risk adjustment, and shared expense that headline automation claims can omit. The ratio should be considered with first pass yield, rework, escalation, elapsed time, and realized capacity. Together they can establish whether machine participation changes the workflow economically.

They should not be added as separate financial benefits: a lower unit cost, released hours, and a margin improvement can describe successive parts of the same underlying change. [1]

Allocation risk and comparisons that can mislead

Shared expenses create a genuine choice rather than a single perfect allocation. A central platform may serve many workflows, and support effort may vary with risk more than with tokens. Document an allocation based on a relevant driver, preserve the unallocated balance, and test whether the ranking of alternatives changes under plausible choices. FOCUS Specification 1.4 offers standardized records for billed costs, invoice reconciliation, attribution, and calculated split allocations. It can support a traceable machine cost ledger. It cannot determine whether the resulting business outcome is valid or whether a specific workflow deserves the expense. [2]

Cost coverage should accompany every published ratio. State the fraction of model bills mapped to workflows, the coverage of human time measurement, and the support categories included. An unmapped platform bill should remain visible at enterprise level rather than disappear from all unit calculations. Manual review performed informally through chat or spreadsheets still consumes resources. Sampling and time studies may be necessary where application logs capture only the machine’s activity. Explain uncertainty rather than treating incomplete instrumentation as evidence of zero human effort.

Comparisons also need a credible counterfactual. Before and after observations can reflect a changed customer population, new policy, general process improvement, or different demand. Randomized or staggered deployment may help isolate the intervention when practicable. If a model upgrade arrives alongside simpler forms and revised approval rules, identify the combined intervention honestly. Attribution to one model is weaker than evidence that the overall operating system improved. The baseline can remain economically useful even when the precise causal decomposition is uncertain.

Expected loss is especially sensitive to rare events. A short pilot with no severe incidents cannot establish negligible tail risk. Report incident severity, controls, sampling limits, and the decision rule used for uncertain exposures. A vendor indemnity or a human checkpoint may redistribute risk without removing operational consequences. NIST emphasizes measuring relevant risks with documented assumptions and limitations throughout the system lifecycle. Its guidance supports that discipline, while the monetary adjustment remains an enterprise analytical choice. [3]

Finally, labor cost released analytically may remain on payroll. A workflow’s reduction in allocated human effort can be real without a matching cash saving. Show the resource cost view, avoidable expense view, and actual financial result separately. Unpaid overtime, delayed work, or deteriorating service cannot be accepted as hidden sources of apparent savings. A lower full cost is compelling when complete records reconcile, outcome standards remain stable, and independent quality checks support the denominator. It weakens when advantages disappear after including support, transition, harder cases, or necessary review.

Ledger design and ongoing reproduction

Create a workflow outcome ledger with unique case identifiers, eligibility, complexity, risk tier, treatment status, model and application version, acceptance events, defects, retries, and human effort. Join it to a resource ledger covering machine charges, vendor work, allocated support, and implementation cost. Record

the allocation version and cost view on every calculation. Reconcile underlying machine charges to invoices and the relevant financial records rather than reconstructing expense from an assumed public token price. FOCUS can help standardize that cost evidence. [2]

For each period, sum covered costs first and divide by the matching valid outcomes. An unweighted average of daily unit costs can misstate the result when volume varies. Publish counts and cost totals with the ratio so reviewers can distinguish a true numerator reduction from denominator growth. Report complexity strata and a standardized mix comparison when the case population changes. Keep failed attempts and necessary corrections inside the complete cost boundary.

Plot observed cost per valid outcome for each production alternative over the available enterprise history, alongside quality and human work per valid unit. Mark deployment and allocation changes. Show operating and lifecycle views as separately labeled lines or panels; expose expected loss as an additional adjustment. A sensitivity table can vary volume, build allocation horizon, support allocation, and error assumptions. It should identify modeled scenarios clearly rather than manufacture a historical trend.

Finance should validate cost coverage and reconciliation, operations should validate usable outcomes and effort, and the relevant risk owner should validate acceptance constraints. Link the resulting record to rework, exception handling, customer service, incidents, and capacity realization. The conclusion should state whether one method delivered comparable valid output at lower complete cost during the measured period. National secular interpretation requires evidence beyond this proposed enterprise instrument; current workflow findings justify measuring the mechanism carefully, with each result kept within its observed scope.

Preserve the narrower Appendix A2 AI operating cost per valid unit companion: direct model, cloud and data cost plus allocated monitoring and support cost, divided by valid outputs. It excludes build and transition cost unless joined to lifecycle economics. A governance cost per valid outcome companion can similarly divide declared governance expenditure by valid outputs; that operational formula is inferred from the decision map label. Neither component should be added to a total that already includes the same cost. [1]

SOURCES AND REPRODUCTION NOTES

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[4] Joel Becker Nate Rush Elizabeth Barnes and David Rein (2025). Measuring the Impact of Early-2025 AI on Experienced Open-Source Developer Productivity. Original randomized study of 16 developers and 246 tasks; AI allowed tasks took 19 percent longer; specific early 2025 tools and cohort; verified retrieval 4 October 2026

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RELATED CHAPTERS 080 · 094 · 100 · 101 · 102 · 103 · 104 · 105 · 106 · 107 · 108 · 110 · 111 · 112 · 113 · 114

CHAPTER 110

Capacity realization and redeployment

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Recent workflow studies in 2025 and enterprise measurement framework in 2026

A proposed capacity ledger separates validated reductions in required human work from evidenced destinations, hiring avoidance, and actual expense reductions, without treating each as an independent financial benefit.

Released hours and evidenced destinations

Capacity realization and redeployment measure what happens after a workflow requires less human effort. The Critical Path manuscript defines gross released capacity as the positive difference between counterfactual human hours and actual human hours, after quality and service requirements are satisfied. Its realization rate divides capacity with an evidenced destination by validated gross released capacity. The basic unit is human hours per workflow and period; the ratio is reported as a percentage. It is a proposed enterprise instrument, with no consistent national longitudinal series meeting the twenty year criterion. [1]

The counterfactual describes the old production system at actual post intervention demand, complexity, case mix, service obligations, and quality. It should use parameters established before broad rollout. Subtracting current staffing from an aspirational hiring plan does not establish released capacity. Lower demand could have eliminated those hires without automation. Likewise, reported minutes saved on individual tasks do not establish the workflow result if verification, exception handling, or coordination consumes the same time elsewhere. The measurement boundary must include that human work. [1]

Every released hour receives one primary disposition. Possible destinations include absorbing observed demand growth, reducing backlog or improving service, performing named new work, avoiding a supported vacancy or backfill, reducing overtime or purchased labor, and producing incremental commercial output. Deliberate reinvestment in quality or resilience can also qualify when the associated work is defined and evidenced. Capacity without an observable destination remains unclaimed. Planned assignment should be distinguished from an implemented destination; announcing redeployment is weaker evidence than showing the receiving workload and delivered result. [1]

A full time equivalent is a translation of work hours, not proof that a particular person became redundant. Divide released hours by a stated productive hours standard for the same period to obtain an FTE equivalent. Partly saved hours may be spread across many roles and cannot automatically be consolidated into a removable position. Keep the original hours alongside the converted figure, particularly when comparing teams with different schedules, service coverage, leave, or training requirements.

Realization is broader than cash reduction. More output from the existing team, a cancelled future hire, and a lower current contractor invoice are different economic outcomes. The first is an operational gain, the second an evidenced future expense avoided, and the third a reduction in observed spending. Report each separately. For existing labor or vendor expense, the manuscript requires a corresponding event such as

removed paid hours or lower external work expense, with transition costs included. Redeployment can create value without lowering payroll, and the ledger must preserve that distinction. [1]

Recent evidence and illustrative conversion

Recent workflow research establishes reasons to look for released capacity, but does not supply a national realization rate. A 2025 study of 5,172 customer support agents found fifteen percent more issues resolved per hour on average after access to an AI assistant, with substantial differences across worker groups. The unit of observation concerned assisted work at a particular firm. The study did not establish an economy wide change in staffing, wages, or labor demand. Its relevance is a measured improvement in production per human hour that could support a later capacity disposition analysis. [3]

A randomized experiment reported in the November 2025 version of Shifting Work Patterns with Generative AI covered 66 firms and 7,137 workers. It found individual time savings but no detected change in task quantity or composition from individual AI access. This is particularly relevant to realization: a worker can spend less time on an activity without the organization visibly changing its overall work allocation. The observation supports keeping personal convenience, reduced work outside regular hours, and an implemented enterprise destination distinct. [5]

The table below is a hypothetical monthly ledger. A validated workflow releases 1,000 human hours. Four hundred support additional completed demand at the required service level, two hundred go to named receiving work, and one hundred correspond to reduced paid overtime. The remaining three hundred have no evidenced disposition. Realization is therefore seven hundred divided by one thousand, or seventy percent. The rate says where the validated capacity went; it does not turn all seven hundred hours into a cash return.

Only the overtime line has an existing paid expense reduction in this example. If the avoided overtime costs an approved forty five dollars per hour, the gross reduction is 4,500 dollars before relevant transition costs. That arithmetic is also hypothetical. The demand absorption and redeployment lines require their own output evidence and value analysis. Multiplying every realized hour by the same wage and adding the resulting amount to measured extra margin would count the same production change repeatedly.

There is no honest twenty year chart to draw for this specific instrument. An enterprise can begin a longitudinal ledger now and retain comparable observations through successive deployments. Historical staffing and workflow records may help build a baseline where their coverage is adequate, but they cannot manufacture a standardized national realization series. Keep the measurement framework’s publication date separate from observation periods in any firm adopting it. The recent studies establish limited mechanisms and boundaries; the hypothetical ledger illustrates a method for testing economic conversion in a particular organization.

Hypothetical monthly disposition	Released hours	Evidence required
Observed demand absorbed	400	Additional accepted output with stable service
Named redeployment	200	Receiving workload and delivered work

Hypothetical monthly disposition	Released hours	Evidence required
Paid overtime removed	100	Paid hours record and approved cost
Unclaimed	300	No evidenced destination
Total validated gross capacity	1,000	Counterfactual minus actual human hours
Realized share	70 percent	700 evidenced hours divided by 1,000

Illustrative ledger only, adapting Critical Path capacity disposition rules. Categories are mutually exclusive; no enterprise or national observations are implied. [1]

From workflow productivity to the labor market

The instrument addresses a missing link between productivity and employment outcomes. A workflow can require fewer hours per accepted result while the firm keeps its workforce unchanged. The productivity dividend may become more output, reduced delay, additional control work, or less strain on employees. It may also become fewer future hires or reduced external labor spending. A capacity ledger makes those choices visible rather than assuming that every time saving immediately removes a job. Its post labor contribution is evidence about how production requirements change and how employers respond. [1]

Avoided hiring is especially relevant to gradual labor market compression. A growing firm can remain a successful employer while generating fewer new positions than its prior production relationship would have required. This effect may be difficult to see in layoff statistics. To document it, compare actual completed workload and required human effort with a credible old process requirement, then connect the difference to approved and implemented staffing decisions. Future job avoidance remains a counterfactual claim, so the model and uncertainty must remain visible alongside actual employee counts.

Demand absorption can have a different implication. Lower unit effort may permit expansion that would otherwise have been unprofitable or capacity constrained. If the firm serves more customers or produces a new offering, additional work can arise elsewhere. A high realization rate concentrated in growth is therefore compatible with rising employment. A high rate concentrated in cancelled vacancies or reduced labor purchases suggests a different hiring response. The disposition composition contains more information about labor demand than the headline percentage by itself.

Redeployment introduces skill and organization requirements. A person released from repetitive processing may need training, different tools, a receiving manager, and a suitable workload before contributing to another function. The productivity J curve research explains how complementary intangible investment can be needed to realize a general purpose technology’s gains. That conceptual mechanism supports observing implementation and organizational adjustment, rather than assuming instant economic capture. It does not prove that a specific redeployment succeeded or provide a universal timetable for doing so. [4]

A broader research program would aggregate firms’ verified dispositions with coverage of industry, firm size, work type, and the population affected. It would then compare employment creation, earnings, purchased labor, prices, output, and market entry. Until such representative records exist, enterprise capacity evidence should remain supporting evidence. It can make the mechanism concrete and falsifiable, while the national secular series establish whether labor intensity, job quality, compensation, or distribution has changed over decades. Concentrated successful pilots cannot determine those aggregate outcomes on their own.

Counterfactual credibility and failed redeployment

The denominator can be inflated by a weak baseline. Managers may overstate historical effort, include activities already scheduled for removal, or apply an obsolete staffing ratio to a different case mix. Estimate the old workflow relation before deployment and retain the input records. In evaluation, an untreated comparison can help distinguish the intervention from other changes. HM Treasury and the Evaluation Task Force's 2026 guidance emphasizes baselines and describes approaches including randomized or staggered rollout and several quasi experimental comparisons. Select a design suited to the intervention, then label weaker contribution evidence honestly. [2]

The numerator can be inflated by assignment without realization. A worker's name on a new team is insufficient if the receiving work never occurs. Evidence should identify the role, workload, start date, hours applied, delivered outcome, and continued placement over an appropriate review horizon. Record failed or reversed redeployments. A vacancy marked cancelled during a general hiring freeze also needs an explanation connecting the cancellation to the measured production change. Intent and implementation are different stages in the evidence record. [1]

Hidden work can erase a claimed capacity release. Additional review, senior employee escalations, unpaid overtime, contractor effort, deferred maintenance, and growing backlog all belong in the reconciliation. Quality and service requirements are prerequisites to validation, not optional scores that a financial benefit can offset. An operating team can reduce time per nominal completion by leaving the difficult cases unfinished. Measure accepted outcomes, abandonment, backlog age, and unresolved risk so that capacity is not credited for obligations merely shifted into the future.

Overlapping initiatives require a shared boundary. Two automations affecting the same case cannot each claim the entire counterfactual hour reduction. Give each benefit an overlap group or allocate the combined effect once at the workflow level. At aggregation, sum distinct evidenced hours and distinct gross hours before dividing. Averaging realization percentages across a small pilot and a large process would give each equal weight and can distort the enterprise result. A ratio above one hundred percent is a prompt to check periods, units, overlap, and numerator eligibility.

Fragmentation and bottlenecks also matter. Several saved minutes across many employees may improve work experience without creating a usable block of capacity. A faster upstream task can merely move the queue downstream. Record these outcomes as measured time or service changes while withholding a claim of removable paid hours. Evidence strengthens when sustained workflow records support the denominator and operational or workforce events support each destination. It weakens when reported capacity disappears after quality, exception effort, implementation costs, or failed receiving work are included.

Disposition ledger and longitudinal chart design

Build the ledger at workflow or initiative week, reconcile monthly, and retain volume, mix, complexity, quality, service, actual human effort, and the counterfactual parameters. Each capacity record needs an owner, period, destination, evidence stage, implementation event, overlap identifier, and link to receiving output or workforce records. Keep estimated gross release, owner validated assignment, finance validated expense effects, and sustained observations as distinguishable states. The original framework places operations, HR, and finance in different validation roles. [1]

Use a stacked hours chart to show observed demand absorption, service or backlog improvement, redeployment, hiring avoidance, existing labor expense reduction, other evidenced destinations, and unclaimed capacity. A separate line can report the realization rate with its gross hours denominator. Chart actual workforce, purchased labor, output, and workload companions beside it. Financial outcomes belong in a separately reconciled panel with cash reductions, avoided future expense, and additional margin kept distinct.

For redeployment, monitor whether the receiving work continues and whether the worker has the necessary skills and sustainable workload. The review horizon should suit the task rather than become a universal standard. Capture reversed assignments and staff outcomes. For hiring avoidance, retain approved demand assumptions and position records, and revisit the counterfactual when actual demand differs. Revisions should produce a visible updated estimate rather than silently rewrite the original benefit claim.

Connect this record to human work per valid unit, end to end throughput, full AI cost, customer outcomes, workforce health, and operational resilience. A credible statement reports the hours released, the destinations evidenced, the resulting costs or output, and the observation period. It describes the firm's conversion of productivity into operating decisions. It remains a proposed supporting instrument for post labor mechanisms until broader, consistently defined longitudinal evidence establishes its aggregate relevance.

An affected role companion divides evidenced realized capacity hours by the declared number of affected roles for the same period. It reports hours per role and makes fragmentation visible; it is an operationalization of the decision map label, not the realization percentage. State whether the denominator counts positions, people or role categories, and retain gross, realized and unclaimed hours separately. [1]

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro and Critical Path Consulting Group (2026). The jobs that never appear: Measuring and capturing the enterprise AI productivity dividend. User provided manuscript September 2026 edition Version 2.0; Chapter 11.6 and metric registry Capacity Realization Rate, capacity destinations and benefit ledger; framework source rather than independent empirical proof; verified retrieval 4 October 2026

[2] HM Treasury and Evaluation Task Force (2026). Guidance on the Impact Evaluation of AI Interventions (HTML). Updated 15 May 2026; baselines, counterfactual design and evaluation methods for evolving AI interventions; verified retrieval 4 October 2026

[3] Erik Brynjolfsson Danielle Li and Lindsey Raymond (2025). Generative AI at Work. Quarterly Journal of Economics 140 issue 2 May 2025 pages 889 to 942; published 4 February 2025; 5,172 agents and 15 percent average resolutions per hour gain; no aggregate employment estimate; verified retrieval 4 October 2026

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RELATED CHAPTERS 073 · 074 · 075 · 076 · 077 · 080 · 100 · 101 · 103 · 104 · 105 · 108 · 109 · 111 · 112 · 113 · 114

CHAPTER 111

Customer retention and service outcomes

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN Enterprise cohort measurement proposed; separate customer support rollout mainly fall 2020 and winter 2021 published 2025 and satisfaction measurement history beginning 1994

Customer retention and service outcomes test whether lower human effort preserves the customer value that makes an enterprise productivity gain economically meaningful.

Customer value and the measurement boundary

Customer retention measures the share of a defined starting customer cohort that remains in a specified commercial relationship after a fixed observation horizon. The numerator counts retained customers from that starting cohort; the denominator contains customers eligible to remain, using rules declared before the intervention. A retention delta subtracts the matched comparison cohort's retention from the automation exposed cohort's retention. Percentage points express this difference clearly. The boundary must specify the product, account or household unit, renewal opportunity, cancellation rule and exposure definition. Customer satisfaction, complaint frequency and successful service resolution are companions because retention alone can miss harm that has not yet produced an exit.

For subscriptions, customer retention and revenue retention answer different questions. Gross customer retention follows account survival. Gross revenue retention follows the starting cohort's revenue after losses and contraction, excluding expansion. Net revenue retention also includes expansion from surviving accounts and can therefore increase while many smaller customers leave. A price increase can raise revenue retention without improving service. These are proposed operational definitions that require reconciliation to the firm's own contracts and billing records. A consistent cohort avoids counting newly acquired customers as evidence that existing customers were retained. Acquisition success and retention quality should remain separately visible.

Service outcomes require a valid customer result. Examples include restoring access, correcting an account, completing a delivery or answering a question accurately enough that no repeat contact is required within the declared follow up window. A closed ticket is an administrative event and needs a separate outcome validation rule. Repeat contact rate divides eligible customers or cases returning for the same unresolved issue by the corresponding completed cases. Complaint rate divides complaints by exposed customers or transactions and should distinguish severity and substantiation. Customer effort can also include time spent navigating menus, supplying evidence and correcting errors, even when paid employee time falls.

The American Customer Satisfaction Index uses survey information to distinguish perceived quality, perceived value, expectations, satisfaction, complaints and loyalty. Its loyalty measure includes stated repurchase likelihood and price tolerance; it is not an administrative count of observed renewal. This distinction matters when comparing an enterprise retention record with an external survey benchmark. Neither a sentiment score nor an intention to repurchase can replace actual cohort follow up. Each contributes different information about the customer relationship and should retain its own units and observation window. [1]

Available evidence and the limits of its history

The most relevant original workflow study is Brynjolfsson, Li and Raymond's Generative AI at Work, published in 2025. It studies 5,172 customer support agents and a staggered rollout occurring mainly in fall 2020 and winter 2021. AI assistance increased issues resolved per hour by 15 percent on average. Customers' language became more positive and requests for a supervisor declined. The agents continued to conduct the conversations. The study establishes a specific productivity and service mechanism within one firm; it does not estimate customer renewal, customer lifetime value or economywide employment effects. Worker retention in this research must not be relabeled customer retention. [2]

External customer satisfaction measurement has a much longer history. ACSI first published its U.S. index in October 1994 and continues to publish a rolling national score. That history clears the twenty year duration threshold for a satisfaction instrument, but it does not establish a twenty year automation treatment effect. A broad cross industry index combines changing products, prices, expectations and economic conditions. Treating every national fluctuation as evidence of rising automation or labor compression would require an attribution model that the index alone does not supply. This chapter does not claim a verified secular deterioration in national customer retention. [3]

The Consumer Financial Protection Bureau provides a public complaint database with product, issue and company information. The Bureau explicitly cautions that the database is not a statistical sample of consumer experience and that low complaint counts do not demonstrate absence of harm. Company size and market share affect the interpretation of volume. Publication eligibility and changes in product categories also influence comparisons. These records can identify service problems worth investigating, but the public count needs exposure information before it becomes a complaint rate. They do not provide a standardized national record of automation exposed customer cohorts. [4]

The usable empirical record therefore has several distinct layers. A long established survey system provides context about perceived service quality. A modern firm study shows that assistance can improve measured support productivity and selected customer interactions. Administrative complaints reveal reported problems with important coverage limits. The enterprise must supply the missing exposure, renewal and service outcome linkage. Maintaining that separation prevents a recent operational result from acquiring an invented secular history. It also leaves room for improvement: a firm with archived billing, case and deployment records may build a credible multiyear panel even when no national panel exists.

Publication dates must remain separate from customer observation dates. A study appearing in 2025 can analyze a much earlier rollout, and a current complaint download can include older submissions that were revised later. For enterprise work, freeze the extraction date and retain the original event date, exposure date and outcome horizon. This makes apparent changes in customer results auditable when case systems, products or reporting policies change.

Evidence record	Observed or methodological period	What it can establish
Customer support original study	Rollout mainly fall 2020 and winter 2021; publication 2025	Specific support productivity and customer interaction effects
ACSI measurement system	First U.S. publication October 1994; ongoing methodology	Long history of satisfaction measurement, without automation attribution

Evidence record	Observed or methodological period	What it can establish
CFPB public complaint database	Current methods verified October 2026	Reported complaint patterns with coverage and denominator limits
Enterprise matched retention cohorts	Organization specific horizon to be declared	Customer survival difference under an explicit comparison design

Sources [1] to [4]. Records measure different outcomes and must not be combined into a single longitudinal series.

How customer outcomes validate labor leverage

The economic connection to post labor is through the value of output. Lower human work per completed transaction supports an inference about labor intensity only when the transaction continues to satisfy the customer's underlying need. If an automated contact ends quickly because the customer cannot reach help, nominal contacts per employee can rise while useful service falls. If customers must repeat the process, the organization may also move labor onto customers or another department. A retention and service record checks whether the claimed efficiency survives these wider boundaries. The result strengthens an enterprise production argument without independently establishing a national labor market trend.

Consider a clearly hypothetical subscription business. Two comparable starting cohorts each contain one thousand customers. After the declared renewal horizon, nine hundred of the exposed cohort and nine hundred ten of the comparison cohort remain. Retention is therefore ninety percent and ninety one percent, with an exposed cohort delta of minus one percentage point. This calculation alone does not identify causation: the customers may differ in price, tenure or product needs. It does show why a large service labor saving requires an outcome comparison. Management must investigate whether the difference is economically and statistically meaningful before treating the intervention as preserving customer value.

A useful outcome can also improve without raising retention. Customers may receive answers sooner, avoid repeat contacts and experience fewer billing errors, while annual contracts delay any change in account survival. The service benefit is real if measured against a credible counterfactual and linked to an actual improvement. It should retain its own value category rather than being converted automatically into fictional revenue. Where commercial valuation is appropriate, use incremental contribution margin after service and acquisition costs. Avoid multiplying every retained account by unrestricted lifetime revenue while ignoring the costs and uncertainty required to serve it.

Labor leverage can arise through several mechanisms. Assistance can help inexperienced staff retrieve accurate information. Routing can send difficult cases to qualified people earlier. Automated status updates can remove unnecessary contacts. Process redesign can fix the underlying cause of repeated customer demand. These mechanisms have different signatures: resolved cases per hour, customer effort, repeat contacts and complaint severity need not move together. A mechanism based on prevention may reduce the number of tickets even as output quality improves. Counting fewer service interactions as reduced productive output would then miss the gain. The denominator should represent the customer need or delivered service where feasible.

Customer outcomes also influence the durability of avoided hiring. A firm may absorb higher demand with the same workforce while preserving response time and renewal rates. That is stronger evidence of scalable capacity than a short pilot measured only on easy contacts. Conversely, if the firm spends the apparent

savings on refunds, additional outreach, customer reacquisition or outsourced escalation, the net labor and financial dividend is smaller. These costs belong in the same economic perimeter as the original gain. The guardrail prevents management from taking credit for a staffing change before its downstream consequences are observable.

Comparison design and sources of misleading success

Exposure selection is the first identification problem. Automation often handles simple questions while people handle unusual or high consequence cases. Comparing all automated cases with all human cases then compares difficulty as much as operating method. Define eligibility in advance and retain the whole eligible population, including transfers, failures and customers who abandon the process. Match or randomize on preintervention characteristics when practical. Product, tenure, acquisition channel, geography, language, account size and prior service history can matter. A concurrent control helps separate common demand or pricing changes from the intervention, while a pretrend check tests whether the cohorts were already diverging.

Retention requires enough follow up. A newly exposed customer who has not yet reached a renewal opportunity is not evidence of successful renewal. Report the number of customers still under observation and use a consistent maturity rule. Different contract durations create different exposure to churn. If customers leave through business closure, product discontinuation or a merger, record the reason where known and explain its treatment. These events may remain relevant to commercial retention while weakening an attribution to service quality. Reclassifying them only after the results become unfavorable would break comparability and allow the organization to select its preferred answer.

Customer silence can be misleading. A complaint channel that becomes harder to access may lower recorded complaints. A chatbot may invite positive ratings after successful contacts while failed or abandoned contacts receive no survey. A change in response rate can alter the observed satisfaction average even when underlying experience is unchanged. Independent sampling of all eligible customers helps detect this selection. The CFPB’s warning about interpreting complaint counts illustrates the broader denominator problem; enterprise reporting should pair complaints with exposed customers, severity, unresolved cases and reporting access rather than declaring success from declining volume alone. [4]

Prices and competitive conditions can preserve retention despite poor service. A customer may stay because migration is expensive, the product is essential or competitors are unavailable. Conversely, customers may leave because a competitor lowers its price even when service improves. Pair retention with perceived value, price changes, product mix and actual switching costs. This is particularly important when automation changes the service promise, such as replacing access to a person with an automated interface. Maintaining account survival does not establish that the same quality adjusted service was delivered. The interpretation must reflect what customers purchased and what they received.

A noninferiority rule can make the decision concrete: define beforehand the largest acceptable loss in retention or service quality and show the uncertainty around the estimated delta. Absence of a statistically significant decline does not prove equivalence, especially in a small cohort. A material complaint or severe customer harm can also require a hold even when the average rate looks favorable. Financial gains and guardrail outcomes should remain separate decision inputs. Scaling becomes more credible when multiple

renewal cohorts mature, the results hold across difficult cases, and independent review confirms that lower human effort did not conceal reduced access or deferred remediation.

The explicit customer visible error guardrail divides errors reaching customers by customer facing outputs and multiplies by 1,000. Appendix A3 also defines AI related complaints divided by exposed customers or transactions, multiplied by 1,000, and retention delta between AI exposed and matched control cohorts. These are different exposure boundaries and outcomes. Preserve each horizon and severity definition rather than combining satisfaction, complaints and retention into a single unvalidated success score. [5] Attribution rules distinguish reported AI associations from demonstrated causes.

Monitoring and reproduction of the customer record

Build a cohort chart with months since first eligible exposure on the horizontal axis and the share of the starting cohort retained on the vertical axis. Show the comparison cohort with the same maturity rule. A second panel can show retention deltas with uncertainty intervals at declared review horizons. Label account counts, product and renewal definition. Use separate panels for customer satisfaction, complaints per exposed transaction, repeat contacts and resolution success. Keep their units visible; averaging percentages, survey scores and minutes into one customer quality number hides the mechanism and the operating limit.

The reproducible extract should preserve pseudonymous customer and case identifiers, eligibility, assignment, exposure version, customer tenure, contract dates, price changes, case complexity, outcome validation and follow up status. Retain transfers and abandoned sessions. Reconcile the starting cohort to billing or customer records, and reconcile complaint counts to the complaint system. Freeze the data and definition versions at each review. A later correction should restate earlier results explicitly rather than silently replacing the apparent baseline. Survey response rates and missing administrative outcomes should appear alongside the measured effects.

Use frequent service signals to diagnose a rollout, then mature retention cohorts to assess durability. A customer result can block scale or require human review even when throughput improves. Review with human work per valid unit, end to end throughput, cycle time, first pass yield, rework and cost per valid outcome. The customer chapter supplies the external validation that those production measures need. Its contribution to the post labor framework is conditional: an organization demonstrates more useful customer service per unit of total human work when the production gain and customer outcomes hold together. The available public evidence does not turn that conditional enterprise test into an observed twenty year national retention trend.

SOURCES AND REPRODUCTION NOTES

[1] American Customer Satisfaction Index (Current methods retrieved 2026). The Science of Customer Satisfaction. Official index methodology; distinguishes satisfaction, complaints and stated loyalty from observed retention; verified 4 October 2026.

[2] Erik Brynjolfsson, Danielle Li and Lindsey Raymond (2025). Generative AI at Work. Quarterly Journal of Economics 140(2), 889–942; published 4 February 2025; 5,172 agents, rollout mainly fall 2020 and winter 2021; customer interaction outcomes and employee rather than customer retention; verified 4 October 2026.

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[5] David Shapiro and Critical Path Consulting Group (2026). The jobs that never appear Measuring and capturing the enterprise AI productivity dividend. Unpublished supplied manuscript September 2026 edition Version 2.0; Appendix A and chapter 16 decision map; framework source rather than independent empirical evidence; consulted 4 October 2026

RELATED CHAPTERS 074 · 077 · 101 · 103 · 104 · 105 · 106 · 107 · 108 · 110 · 112 · 114

CHAPTER 112

Compliance security and incident losses

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN Risk methods published 2024 and 2025 with a separate IC3 calendar 2025 checkpoint; enterprise exposure and loss series proposed

Exposure adjusted incident frequency, severity and loss establish whether apparent automation savings survive compliance and security failures that can otherwise remain outside the productivity account.

Incident frequency severity and loss boundaries

This entry joins related operating safeguards while preserving their distinct units. An incident rate counts qualifying incidents divided by the exposed population of decisions, outputs or transactions, multiplied by the declared reporting scale. A material incident requires a stable classification rule covering the type of failure, severity, affected parties and confirmation status. A security incident, an inaccurate recommendation and a compliance breach can overlap, but they should not become three separate losses for the same economic event. Retain a unique incident identifier and multiple descriptive tags. An affected output count measures the extent of exposure; it is different from the number of initiating incidents.

Expected loss is the sum of scenario probabilities multiplied by corresponding impacts over an explicit horizon. Realized loss records actual costs arising from events, with a reconciliation between booked amounts, remediation estimates and cash payments. Keep gross losses, insurance recoveries and recovered funds separately visible. Include incremental investigation, restoration, compensation and correction costs when they fall within the declared perimeter. Do not include an unsupported estimate of reputational damage as if it were an accounting expense. Where lost future business is modeled, state the counterfactual and uncertainty separately from directly observed costs. Expected loss and realized loss answer different questions and should never be added indiscriminately.

Compliance involves the obligations applicable to the workflow and jurisdiction, while security concerns such properties as authorized access, confidentiality, integrity and availability. A technically accurate output can still violate an obligation, and a compliant process can still suffer an outage. The NIST Generative Artificial Intelligence Profile supplies a cross sectoral risk management reference, including information security, privacy, provenance and incident processes. It is a framework for organizing risk work; it does not provide a universal legal compliance certificate or an empirical national incident rate. The enterprise must translate the relevant risks into observable controls and outcomes for its actual use case. [1]

Time to detect, contain and recover are separate intervals. Detection runs from estimated event onset to recognition; containment ends when harmful propagation is controlled; recovery ends at the defined restoration of acceptable operation. Unknown onset should be reported as uncertain rather than assigned the detection timestamp. NIST’s 2025 incident response guidance connects preparation, detection, response and recovery to wider cybersecurity risk management. These intervals belong beside frequency and loss because a control can reduce harm without preventing every initiating event. Median recovery time alone can conceal the few severe events that account for most business impact. [2]

Verified methods and public observations

Available official methods have recent publication dates that should not be mistaken for incident observation histories. NIST published its generative AI risk profile in July 2024. Its recommended practices cover governance, evaluation, documentation and incident handling across a range of generative AI risks. The NIST Cybersecurity Framework 2.0, issued in February 2024, organizes cybersecurity risk outcomes for organizations. Neither document estimates the amount of labor displaced, the frequency of automation failures or a secular change in enterprise compliance. They provide a vocabulary and management structure for an exposure based record that organizations must build themselves. [1][3]

NIST Special Publication 800 61 Revision 3 was published in April 2025 and superseded the 2012 revision. It emphasizes integrating incident response throughout cybersecurity risk management. A revised standard can reflect changed practices or accumulated experience without proving that observed incident frequency has increased or decreased. The analytical contribution here is a more complete measurement boundary: prevention, detection, containment and recovery all consume resources and affect the valid economic result. Those resources should accompany a claim that automation reduced total human effort or increased profit. [2]

A separate public observation comes from the FBI's 2025 Internet Crime Report. Its AI related descriptor applies when reported information contains a reference to artificial intelligence. The report records 22,364 complaints with that descriptor and roughly 893 million dollars in adjusted losses for calendar 2025. These are complaint based figures, not a representative estimate of all enterprise AI incidents. They include criminal use of AI and cannot be interpreted as losses caused by firms deploying productivity tools. The source warns that classifications and losses can change with investigation and that duplicate complaints are possible. [4]

The distinction between these records is substantive. A cybercrime complaint is an external report about alleged wrongdoing. An enterprise incident register can also capture accidental disclosure, incorrect execution, missing review and failures that never reach a law enforcement reporting channel. A risk framework prescribes ways to govern these possibilities without measuring their realized national prevalence. Combining the three records into a single line would mix reporting behavior, technology changes and management guidance. The sources verified here do not supply a comparable twenty year panel linking enterprise automation exposure, incident severity and full economic losses.

This chapter therefore remains an enterprise safeguard rather than evidence of secular national deterioration. A firm may possess much older operational loss records, but joining them to new workflow deployments requires stable classification and a consistent perimeter. Earlier events involving conventional software may be relevant comparators when the activity and consequence match. They should not be retrospectively labeled generative AI incidents. Where classification changes, retain the original labels, document the mapping and display any break in the series.

Verified record	Date or observation window	Interpretive boundary
NIST generative AI risk profile	July 2024 publication	Risk management methods, no national incident estimate
NIST Cybersecurity Framework 2.0	February 2024 publication	Organizational risk outcome framework

Verified record	Date or observation window	Interpretive boundary
NIST incident response Revision 3	April 2025 publication	Detection response and recovery methods
FBI AI related complaint descriptor	Calendar 2025; report available by October 2026	Reported reference to AI, without deployment exposure denominator

Sources [1] to [4]. Method publication dates and complaint observation dates describe different records.

Economic meaning of controls and hidden costs

An automation dividend requires a valid output produced at an acceptable full cost. A system that accelerates approvals while authorizing prohibited transactions may increase nominal throughput, then consume the gain through remediation and restrictions. A model that generates useful material while exposing confidential information can create a loss unrelated to the average quality of its answers. These failures affect the economic interpretation of labor leverage because the process has changed both production and risk. The loss record helps identify whether reduced routine effort was purchased by transferring work and harm to investigation teams, customers, counterparties or future periods.

In a clearly hypothetical example, an organization saves two hundred thousand dollars of annual operating expense and adds fifty thousand dollars of review and monitoring cost. A scenario analysis estimates an additional twenty thousand dollars of annual expected loss under the redesigned process. Within that simplified economic model, the expected net gain is one hundred thirty thousand dollars. The example is arithmetic, not a measured enterprise result. It also does not determine permission to operate: a prohibited action or intolerable safety outcome cannot become acceptable merely because average expected profit is positive. Legal obligations and operating limits require separate treatment.

The value of control work becomes clearer when exposure changes. An error probability can decline per transaction while the number of transactions expands enough that absolute expected losses rise. Conversely, a higher recorded incident count can follow better detection, with earlier containment reducing severity. Frequency, exposure, time to detect and loss should therefore appear together. A firm that scales automation without preserving the exposure denominator can mistake a volume effect for a control failure, or a detection improvement for deterioration. The relevant interpretation depends on which part of the event process changed and how the consequences were limited.

Human work can move upstream or downstream rather than disappear. Automation may reduce routine case handling while increasing audit sampling, adversarial testing, access administration and incident response. It may also remove repetitive checking while allowing experienced reviewers to focus on consequential exceptions. Total human work per valid outcome should include these activities within a consistent allocation rule. Do not count the same reviewer time again as both a direct process cost and a separate loss. Expected incident costs can inform cost per valid outcome, while actual events later support a reconciliation of the forecast with experience.

The connection to post labor is conditional on this full production system. A credible demonstration shows lower total human effort for the same useful output, while residual risk remains inside the declared operating limits. That mechanism can support an enterprise example of labor becoming less necessary per unit of production. Rising incident costs would weaken that specific claim if they absorb the savings or require

substantial replacement labor. Stable or improving controls would strengthen it. The national distribution of wages, transfers and ownership remains a separate question; an incident record alone cannot establish the historical macroeconomic thesis.

Rare events attribution and assurance limits

Rare events make average rates unstable. A pilot with no observed severe incident may have too little exposure to rule out a meaningful failure probability. Calculate uncertainty intervals using a method appropriate to the event process and the comparison design. Real failures can be correlated, clustered or delayed, making a simple independent event model inadequate. Report exposure and observation length alongside zero counts and retain scenario tests for consequences that the pilot cannot reasonably encounter often.

Attribution should distinguish the initiating cause, contributing controls and route of harm. An attacker may exploit an existing weakness through an automated interface; a failure may involve both a model recommendation and a person's approval. Labeling every event after deployment as caused by AI overstates attribution. Labeling every event involving a human review as purely human understates the system's contribution. Preserve causal findings with confidence and investigation status, and compare the redesigned workflow with credible alternatives. A manual baseline has its own errors and delays. The relevant question is the change in total risk and cost under the chosen operating model.

Loss estimates are sensitive to tails and correlation. Multiplying the average cost of a small observed incident by a large transaction count can miss a rare systemwide failure. A shared credential, update or data source may expose many cases at once. Scenario analysis should show what happens under a broad incident, not merely extrapolate independent small failures. Some harms are difficult to monetize, including denial of an essential service or disclosure of sensitive information. Preserve them as outcome and severity records even when the financial estimate is incomplete. A blank dollar value must not become a zero harm assumption.

Control coverage is an important companion but remains an intermediate measure. Having a review rule or training record does not establish that the control worked in the affected case. Low override rates can reflect good recommendations, poor reviewer detection or automatic approval. High override rates can signal a weak model or a healthy challenge process. Independent sampling of approved and rejected outputs, reason codes and subsequent outcomes help distinguish these possibilities. NIST's risk frameworks provide a basis for organizing these activities, while the actual effectiveness claim needs observed evidence in the enterprise's deployment. [1][3]

The strongest record reconciles incident logs, finance, legal and operational review without allowing the financial owner to erase uncomfortable events. Keep unresolved material incidents visible and give any waiver an owner, scope and expiry. An improvement claim is stronger when reporting access is stable, detection coverage improves, severe outcomes decline relative to comparable exposure and remediation effort is included. It is weaker when a new taxonomy excludes old failures, outsourced incidents disappear from the perimeter, or delayed losses fall outside a short evaluation window. These are specific measurement failures that can distort an otherwise favorable productivity calculation.

The incident dashboard and reproducible loss record

Use separate panels for material incidents per exposed decision, severity distribution, gross and net realized losses, expected loss scenarios, and detection containment and recovery times. Show event counts and exposure beneath every rate. A timeline should mark releases, control changes, classification revisions and major incidents. Display unresolved material events individually. A severity breakdown makes a stable average interpretable when minor events improve but rare severe events worsen. Avoid a composite in which more revenue offsets a breach and makes the risk indicator appear green.

The underlying record needs a unique event identifier, occurrence and detection timestamps, affected workflow and version, exposure estimate, severity, confirmation status, causal assessment, corrective actions and financial entries. Track remediated costs and forecast amounts separately, then update the reconciliation as claims mature. Record insurance and recovered funds against the event without suppressing gross harm. Preserve incident definition versions and extraction dates. Scenario estimates should contain assumptions, horizon, dependencies and sensitivity ranges so that another reviewer can reproduce the expected loss calculation and see which assumptions dominate it.

Review this safeguard with cost per valid outcome, human escalation, first pass yield, rework, customer outcomes and operational resilience. Financial recognition can remain provisional while significant losses are unresolved or exposure remains too short to assess the critical risk. The metric contributes to the framework by making apparent labor savings accountable for their downstream consequences. It supports a claim of durable useful output per unit of total work when losses, control effort and residual risk are properly included. Current public methods and complaint data provide a foundation for that enterprise measurement; they do not establish a comparable national secular incident trend caused by automation.

Two additional Appendix A3 controls preserve the validity boundary. Override rate is substantive human overrides divided by AI recommendations reviewed; a low rate can reflect either better advice or rubber stamping. Guardrail breach status uses the labels within tolerance, warning, breach, waived and unresolved, and must never be netted against financial value. A separately declared governance cost per valid outcome is a useful operational cost companion, inferred from the decision map label; it does not measure control effectiveness by itself. [5] For the explicit risk incident rate, divide material AI related incidents by exposed decisions or outputs and multiply by 1,000; retain classification and exposure counts. [5]

SOURCES AND REPRODUCTION NOTES

[1] National Institute of Standards and Technology (2024). Artificial Intelligence Risk Management Framework: Generative Artificial Intelligence Profile. NIST AI 600-1, July 2024; governance, information security and incident monitoring/actions; a methods source rather than national prevalence data; verified 4 October 2026.

[2] Alexander Nelson, Sanjay Rekhi, Murugiah Souppaya and Karen Scarfone (2025). Incident Response Recommendations and Considerations for Cybersecurity Risk Management: A CSF 2.0 Community Profile. NIST SP 800-61 Revision 3, April 2025, superseding 2012 revision; integration of preparation, detection, response and recovery; verified 4 October 2026.

[3] National Institute of Standards and Technology (2024). The NIST Cybersecurity Framework (CSF) 2.0. NIST CSWP 29, published 26 February 2024; organizational cybersecurity outcomes and risk management, not a statistical incident series; verified 4 October 2026.

[4] Federal Bureau of Investigation Internet Crime Complaint Center (2026 publication of 2025 observations). 2025 Internet Crime Report. Calendar 2025 report, AI descriptor and observations page39; 22,364 complaints and 893,346,472 dollars adjusted losses; descriptor means reported reference to AI, not verified productivity deployment attribution; Appendix C classification and duplicate caveats; verified 4 October 2026.

[5] David Shapiro and Critical Path Consulting Group (2026). The jobs that never appear Measuring and capturing the enterprise AI productivity dividend. Unpublished supplied manuscript September 2026 edition Version 2.0; Appendix A and chapter 16 decision map; framework source rather than independent empirical evidence; consulted 4 October 2026

RELATED CHAPTERS 074 · 075 · 104 · 106 · 107 · 108 · 109 · 111 · 113 · 114

CHAPTER 113

Workforce health and workload

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN Proposed enterprise guardrail with 2019 to 2021 workflow evidence and 2000 to 2016 health research

Workload and employee outcomes test whether enterprise labor savings reflect sustainable reduced effort rather than hidden overtime or intensified work.

Enterprise safeguard and measured exposures

Workforce health and workload is a group of enterprise guardrail measures that tests whether a claimed productivity gain is sustainable for the people doing the remaining work. The original Critical Path report includes overtime, workload, absence, burnout or engagement pulses, regrettable attrition, internal mobility, redeployment success, critical skill concentration, span of control and management load. These outcomes accompany production and financial results. They should retain individual thresholds rather than disappear into a composite in which higher profit can offset a serious workforce failure. [1]

The most direct hours measure is the overtime delta: overtime hours per FTE after an intervention minus the matched baseline or comparison value. Keep the FTE convention fixed and state whether overtime means payroll overtime, all additional hours beyond the planned schedule, or both. A salaried employee's unrecorded evening work can increase the real human input without appearing in payroll overtime. Measure that exposure separately using credible time records or representative surveys. Contractor and supplier hours belong within the labor boundary when the workflow depends on them; otherwise work can simply migrate outside the employee measure. [1]

A critical voluntary exit rate divides qualifying voluntary exits by the eligible critical workforce exposure over a specified period. The original report's regrettable attrition delta compares that rate in the affected cohort with a baseline or control. The eligibility rule must exist before outcomes are known, so managers cannot reclassify departed workers as unimportant. Report the count, the denominator and the observation horizon. Redeployment persistence separately measures workers still performing the named target work after the review horizon divided by workers redeployed. It verifies continued assignment, while the target work's output establishes its value. [1]

Health and workload require more than hours. The NIOSH WellBQ provides a structured instrument covering work experience, organizational policies and culture, physical environment and safety, health, and life outside work. Its items include work overload, fatigue, autonomy, job security and engagement. Use the instrument's definitions and coding rather than calling a custom satisfaction question a validated burnout scale. The revised June 2026 instrument retains the original 2021 measurement framework. [2]

This chapter has supporting evidence status because the methods and related empirical studies justify the safeguard. It does not report a comparable national twenty year series of AI related overload or claim that all workplace health has deteriorated. Its contribution is to validate the enterprise mechanism behind an apparent reduction in labor required per accepted outcome.

Observed studies and the limited historical record

The relevant empirical record contains evidence that technology can improve work experience as well as evidence that excessive hours create health risks. These are different sources and observation windows. Neither can supply a complete national trend for the enterprise safeguard. An instrument's publication date establishes when a measure became available, not when an observed worsening began. An organization can build its own longitudinal record, but that record must be presented with its cohort, intervention and exposure boundaries visible.

The author manuscript of Generative AI at Work analyzes a staggered rollout to 5,172 customer support agents using field records from September 2019 to June 2021. It reports a roughly 15 percent increase in resolved issues per hour, improved customer treatment of agents, fewer requests for managerial intervention and lower attrition concentrated among newer workers. The authors limit the interpretation to medium term effects within one firm. Those results demonstrate that a productivity gain can accompany better employee experience; they do not estimate economy wide employment or a twenty year health trend. [4]

The WHO and ILO joint analysis published in 2021 models long hours exposure and related disease burden for 2000, 2010 and 2016. It examines at least 55 weekly hours relative to standard 35 to 40 hour exposure and estimates approximately 745,000 attributable deaths from ischemic heart disease and stroke globally in 2016. This is a modeled population burden with uncertainty, not a count of health events directly assigned to an enterprise. Its sixteen year span falls below the reference's secular threshold. It supports attention to hours exposure without proving that automation produced that exposure. [5]

NIOSH's current fatigue guidance, updated in July 2026, identifies extended work hours, nonstandard schedules, stress and demanding physical or mental tasks as potential contributors. It describes consequences for attention, judgment and safety and points to organizational prevention strategies. This guidance supplies a mechanism for monitoring fatigue alongside production outcomes. It does not state that a particular firm must experience those outcomes after adopting technology, and it does not provide a new historical trend estimate. [3]

The original September 2026 Critical Path report is a proposed operating framework. Its overtime and attrition deltas define observable comparisons, while the quality of a particular result depends on actual company records. No enterprise health result has been supplied here. The reference therefore distinguishes a verified measurement method, a short workflow study, a population health model and a future company monitoring program. Preserving those categories prevents an operational safeguard from being presented as existing secular evidence of worsening work. [1]

Evidence record	Observed or publication window	What it establishes
Customer support workflow study	September 2019 to June 2021 data	Within firm productivity and employee experience results
WHO ILO long hours analysis	2000 2010 2016 observations	Modeled exposure related health burden
NIOSH WellBQ	2021 original instrument revised June 2026	Structured worker well being measurement

Evidence record	Observed or publication window	What it establishes
Critical Path enterprise guardrail	September 2026 proposed framework	Overtime attrition and redeployment comparison rules

Primary workflow research [4], population health analysis [5], government instrument [2] and user supplied enterprise measurement framework [1]

Distinguishing released capacity from intensified work

A firm can report more output per employee after reducing staffing even when the technology removes little human effort. Remaining workers may take additional shifts, work unpaid hours, skip recovery time or defer activities that protect future performance. The employee count falls while total effective labor and hidden costs do not fall proportionately. Workforce health and workload help distinguish these mechanisms. The correct interpretation depends on the complete production boundary and the state of the remaining work, not the arithmetic improvement in a headcount ratio alone.

Consider a hypothetical team delivering one thousand valid outcomes each week. Ten people each work forty hours, for four hundred human hours. After a change, eight people deliver the same accepted output but each works fifty hours. Output per employee rises by twenty five percent, while total human hours remain four hundred. This example is original illustrative arithmetic, not a company observation. It shows that a higher output per person ratio need not demonstrate less labor per unit. A concurrent increase in fatigue or attrition would identify further costs omitted from that simple ratio.

A second hypothetical outcome is genuinely different. Suppose the eight workers each retain a forty hour schedule and continue producing the same valid output with stable quality and manageable exceptions. Total human hours fall to three hundred twenty. Labor input per valid outcome declines, creating potential capacity or a staffing adjustment that the company can explain. Whether the gain becomes growth, shorter hours, better pay, redeployment or lower spending is a management and distribution question. The guardrail checks the human sustainability of the change; the financial and capacity metrics identify what management did with it.

Intensity can change even when hours remain stable. A tool might remove routine activity but leave workers continuously handling difficult exceptions or emotionally demanding cases. More complex work can make an unchanged schedule more exhausting. Conversely, better guidance and easier access to information can reduce stress while raising throughput, as the workflow study illustrates. Measure task mix, interruption, autonomy, recovery opportunities and managerial support alongside weekly hours. A single average time measure cannot determine which experience workers are having. [4]

The post labor connection is diagnostic. A successful intervention demonstrates lower human input for comparable valid outcomes while maintaining acceptable employee outcomes. A failed safeguard can show that an apparent automation gain depends on shifting costs to workers or concentrating scarce expertise in an unsustainable way. Both results are useful evidence about how production is changing. Neither by itself determines the economy wide number of good jobs, which requires the macro and distribution records elsewhere in the reference.

Attribution denominators and employee voice

Demand and staffing shocks can change hours independently of a technical intervention. Compare exposed workflows with a credible control or use phased adoption when feasible. Match volume, complexity, seasonality, service requirements and staffing availability. A higher overtime rate during an unusual demand surge does not identify a technology effect. A lower rate after cancellations or slower throughput does not establish an improvement. Pair the workforce comparison with valid delivery, backlog, rework and customer outcomes so that the denominator cannot be improved by suppressing demand.

Selection can make an average look healthier after vulnerable workers leave. A repeated cross section of remaining staff can show lower fatigue even though those who exited had the worst experience. Preserve cohort counts, document new hires and exits, and report how the observed composition changed. Attrition may also rise because workers gain more attractive outside opportunities; it may fall because outside opportunities deteriorate. Exit rates therefore require context about voluntary versus involuntary departure, stated reasons, tenure and relevant labor market conditions. They are informative signals rather than direct diagnoses of burnout.

Absence and engagement need comparable definitions. Divide absence hours by scheduled exposure hours under a stable rule, and distinguish illness related absence from approved leave categories when the data support that distinction. Interpret engagement changes with response rates and question wording visible. A low reported overload score can reflect a genuine improvement, fear of disclosure or selective nonresponse. Repeated use of a stable instrument and a clear separation from individual performance evaluation improves the record's credibility. NIOSH's instrument includes explicit privacy and interpretation guidance. [2]

NIOSH recommends administering the WellBQ as a whole for its integrated assessment and protecting participant anonymity. An organization seeking only selected topics can use other appropriate instruments rather than claiming that a shortened custom pulse is the full questionnaire. Keep identifiable health responses outside ordinary management reporting, use sufficiently large reporting groups and disclose the purpose of collection. This is part of measurement validity: employees must be able to answer candidly without the measurement becoming another source of workplace pressure. [2]

Thresholds should reflect the work and baseline rather than an invented universal safe score. A material deterioration in hours exposure, health indicators or critical capability can trigger redesign, additional capacity or restricted rollout even when financial results improve. The original framework treats guardrails as operating limits. Explain the breach, the affected cohort and the action taken; do not average a severe workforce problem away by combining it with several positive financial indicators. [1]

Monitoring and evidence needed for a real result

Establish a representative preintervention baseline and retain the workforce plan, expected workload and staffing assumptions. Record weekly paid hours, additional unrecorded hours where measured, valid output, complexity, backlog, exception handling and contractor support. Define the FTE and overtime conventions once. Display the exposed cohort and its comparison alongside calendar events and adoption dates. A chart of overtime delta should show the underlying hours and exposure counts as well as the difference. [1]

Use a separate worker experience panel with stable survey items, response rates and sufficient group sizes. Preserve the instrument version and scoring rules. Plot critical voluntary exits with the eligible workforce denominator and review horizon. Track redeployment persistence together with actual target work output, proficiency and employee experience. Movement on an organizational chart does not establish that released capacity found useful work. [1][2]

The operational review should connect changes in hours and workload to changes in human work per valid unit, cost per valid outcome, capacity realization and quality. If output per employee rises while total labor hours or supplier effort rise proportionately, investigate the apparent gain. If hours fall and quality is stable, examine whether harder exception work, management overload or critical skill concentration creates a different constraint. The measurements should explain the mechanism and the next operating decision.

A genuine reported result requires actual observations, a stated baseline or comparison, a defined cohort, stable measurement rules and a sustained review period appropriate to the workflow. Report a short implementation study as short, and an internal multiyear record as internal. No current source here supplies a national twenty year deterioration series for this guardrail. Its role in the complete reference is to keep enterprise automation claims economically meaningful and to show whether the people performing the remaining work share in a sustainable improvement.

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro Critical Path Consulting Group (2026). The jobs that never appear Measuring and capturing the enterprise AI productivity dividend. User supplied manuscript September 2026 version 2.0 chapter 11 workforce and organizational health and appendix overtime attrition and redeployment definitions; provenance is original enterprise scope rather than independent macro evidence; verified retrieval date 4 October 2026

[2] National Institute for Occupational Safety and Health (2026). NIOSH Worker Well Being Questionnaire WellBQ. Publication 2021 110 revised June 2026; five domains items coding and privacy instructions; instrument original April 2021; verified retrieval date 4 October 2026

[3] National Institute for Occupational Safety and Health (2026). Fatigue and Work. Updated 14 July 2026; extended hours demanding work fatigue and organizational prevention guidance; verified retrieval date 4 October 2026

[4] Erik Brynjolfsson Danielle Li and Lindsey Raymond (2024). Generative AI at Work. Author manuscript revised 6 November 2024; customer support field data September 2019 to June 2021; one firm workflow outcomes not aggregate employment; verified retrieval date 4 October 2026

[5] Frank Pega and colleagues WHO ILO Joint Estimates (2021). Global regional and national burdens of ischemic heart disease and stroke attributable to exposure to long working hours for 194 countries 2000 to 2016 A systematic analysis from the WHO ILO Joint Estimates of the Work related Burden of Disease and Injury. Environment International 154 106595; modeled exposure and attributable burden observations 2000 2010 and 2016; sixteen years below secular threshold; verified retrieval date 4 October 2026

RELATED CHAPTERS 101 · 103 · 106 · 108 · 110 · 111 · 112 · 114

CHAPTER 114

Operational resilience and vendor concentration

EVIDENCE STATUS **Supporting evidence** · OBSERVATION SPAN Continuity methods published 2010 and bank resilience principles published 2021 and 2025; separate July 2024 incident checkpoint; enterprise series proposed

Critical dependency shares and demonstrated recovery test whether labor leverage survives disruptions and supplier dependence rather than relying on a production system that works only under normal conditions.

Critical dependencies and measurable recovery

Operational resilience is the ability to maintain or restore the critical service required by the organization under disruption. Its measurement starts with the service and the maximum tolerable interruption, then maps the people, technology, data, facilities and suppliers needed to deliver it. Vendor concentration measures the share of a defined critical capability or expenditure supplied by the largest provider or providers. The denominator must identify the relevant capability or spend perimeter. An enterprise's model API expenditure share, cloud infrastructure share and fraction of critical workflows dependent on a supplier are separate measures. A single spend statistic cannot represent all three.

The Critical Path guardrail pairs concentration with fallback recovery success. A useful reporting rule counts successful material recovery tests divided by scheduled material tests, using a frozen test population and a declared pass standard. Record tests not executed as such; removing them from the denominator hides the gap between the schedule and demonstrated capability. Success requires that the critical service meet the agreed restoration, data integrity, output quality and capacity conditions. A backup that can start but cannot serve the required workload is incomplete recovery. A substituted model that responds but produces unacceptable outcomes also fails the service test.

Recovery time objective, or RTO, is the allowed restoration interval for the relevant system resource. Recovery point objective, or RPO, identifies the point in time to which data must be recovered and therefore the tolerated data loss interval. Actual elapsed restoration and actual data loss must accompany the objectives. NIST's contingency planning guide distinguishes these concepts and ties recovery planning to business impact analysis. The business service may require additional time after technical restoration to validate results and clear a backlog. That wider interval should remain visible when the organization measures whether customer service truly recovered. [1]

A concentration register needs the contractual provider and material indirect dependencies, such as hosting, identity, payments or common data sources. Two nominal suppliers may share an underlying failure source. The Basel Committee's 2025 third party risk principles explicitly address direct and indirect dependencies and concentration at the bank and system levels. They are banking guidance, which this chapter uses as a methods reference rather than a universal legal requirement for every firm. The operational extension is

straightforward: map the critical capability and demonstrate the alternative path before treating supplier diversification as evidence of resilience. [2]

Standards history and observed incident evidence

The historical record available here consists mainly of methods and selected incidents. NIST's revised contingency planning guide was published in 2010, with updates through November of that year. It supplies definitions, business impact analysis and planning procedures; the date does not measure how often firms successfully recovered. Its publication is sixteen years before the October 2026 cutoff and therefore cannot itself supply the requested twenty year observed trend. The history of continuity planning is older, but an older practice or predecessor document does not create a consistent statistical series of recovery outcomes. [1]

The Basel Committee published Principles for operational resilience in March 2021. These principles focus on delivery of critical operations through disruption and include mapping dependencies, business continuity testing and third party dependency management. The Committee's final Principles for the sound management of third party risk followed in December 2025. A more developed standard can signal that the issue deserves systematic attention, but it cannot establish a measured secular rise in vendor concentration or deterioration in operational resilience. The chapter retains the dates as methods history and uses the documents to structure an enterprise record. [2][3]

A concrete first party incident observation comes from Microsoft's July 2024 discussion of the CrowdStrike update outage. Microsoft estimated that 8.5 million Windows devices were affected, representing less than one percent of all Windows machines, while emphasizing the broad impact on enterprises running critical services. This is an event specific vendor estimate, not a complete estimate of economic losses or a random sample of outages. The example illustrates why a small share of total devices can have a large critical service footprint. It does not demonstrate a twenty year worsening trend or an effect caused by AI deployment. [4]

Comparable enterprise observations would need provider dependency shares, the critical service population, actual disruptions, tested alternatives and recovery outcomes over time. Public market share data can supply context about supplier markets, while contracts and architecture records establish which services a particular firm actually depends on. These populations differ. A vendor with a small national share can be indispensable to one business, and a dominant vendor can support an enterprise that has a well tested substitute. Concentration is therefore an exposure measure whose economic significance depends on criticality and substitutability.

No standardized national longitudinal series of automation specific fallback success is verified in these sources. Treat the entry as a supporting instrument for enterprise productivity claims. If a firm has years of consistent incident and continuity records, preserve that actual span without extending it backward from a standard's publication date. Record the addition of new workflows, dependency discoveries and changes in test difficulty. These events can shift the measured series without changing the reliability of a stable underlying service. A defensible chart separates those coverage changes from a genuine change in operational performance.

Primary record	Verified date or event	Use in this chapter
NIST contingency guide Revision 1	2010 publication and updates	Recovery definitions and planning methods
Basel operational resilience principles	March 2021 publication	Critical operations and disruption tolerance
Basel third party risk principles	December 2025 final publication	Indirect dependency and concentration framework
Microsoft CrowdStrike incident account	July 2024 event and estimate	One observed critical dependency disruption

Sources [1] to [4]. The timeline contains methodological publications and one incident, not an interpolated national resilience trend.

Resilience in the economics of automation

Labor leverage changes the production system's dependence structure. A workflow may replace many separate manual steps with a common platform, model or orchestration service. During normal operation this can reduce human work per valid outcome and allow more output without proportional hiring. It can also make more output dependent on one failure source. The economic question is whether the lower labor requirement remains viable after the cost of redundancy, fallback, recovery and disruption is included. Resilience supplies that boundary. It prevents a firm from treating a production design that performs well only in uninterrupted conditions as a fully realized durable dividend.

The same automation can improve resilience. A reproducible automated process may be easier to restore than a process dependent on one person's undocumented knowledge. Monitoring can detect problems earlier, routing can isolate a failed component, and retained digital records can support reconstruction. Centralization may also make a control update consistent across the organization. These possibilities are reasons to measure actual service performance rather than infer fragility from automation or concentration alone. A supplier dependency can be acceptable when the service is robust, a credible alternative exists and its full cost fits the operating economics.

Consider a clearly hypothetical operation receiving one hundred valid requests per hour. A six hour outage produces a backlog of six hundred requests if demand continues and none is served. When service resumes at two hundred requests per hour while new demand remains one hundred, the net clearance rate is one hundred requests per hour, so another six hours are required to clear that backlog. Technical restoration after six hours therefore does not mean the service consequence ends after six hours. The example shows why recovery records need workload, residual capacity and backlog as well as system availability. It is arithmetic, not an observed enterprise outage.

Manual fallback also has a production denominator. If a substantially smaller workforce can only process a fraction of normal demand, the fallback may be suitable for essential cases but insufficient for every case. That may be a deliberate economic choice when service prioritization and maximum interruption are explicit. The retained people, training, drills and reserve capacity belong in the cost account. A cost saving that assumes those resources disappear while the recovery plan depends on them is internally inconsistent. Conversely, a tested partial fallback can provide meaningful resilience without recreating the entire former workforce.

Vendor dependence affects capture of the productivity dividend as well as uptime. A provider can change price, discontinue an interface or alter capabilities, raising the cost of the production system. Proprietary context, evaluation assets and data formats can make switching expensive even when invoices look small. Exit testing identifies the human effort and elapsed time needed to substitute. That economic friction connects this guardrail to full AI cost and purchased work expenditure. It does not prove that supplier dependence has increased everywhere or that all gains flow to capital owners, but it exposes a concrete channel that could change who captures an enterprise gain.

Testing independence substitutability and difficult cases

Supplier counts can exaggerate diversification. Different vendors may use the same hosting region, identity provider, upstream model or network component. Geographic labels can also conceal a shared administrative control plane or common update mechanism. Start from the critical service and trace failure paths, then examine whether the alternatives remain usable under the same disruption. The Basel third party principles make indirect dependency and supply chain concentration explicit. For an enterprise, the useful test is functional independence under a declared scenario rather than the number of names in procurement records. [2]

Concentration calculations require a stable weighting rule. Spend shares are reproducible from invoices but can miss a low cost component without which the service stops. Workflow shares can give equal weight to trivial and essential activities. Revenue at risk and criticality weights can be informative but introduce modeling assumptions. Report the simple source measures before an adjusted index. If using a sum of squared supplier shares, state the units and perimeter and explain that it is a descriptive concentration measure; it does not by itself estimate failure probability, supplier power or expected loss. Local employer concentration elsewhere in the glossary concerns a different economic market.

Recovery tests can be selected to produce success. A planned drill with ample staff, advance notice, reduced demand and a working primary service may fail to resemble the condition it is meant to address. Include realistic access restrictions, missing dependencies and workload in material scenarios. Define success before execution, preserve unsuccessful and canceled tests, and record the elapsed time to a valid service result. A passing tabletop discussion establishes familiarity with a plan; it is weaker evidence than an exercised technical failover with verified data and acceptable outputs. Both may be useful if their evidence levels remain clear.

Portability must include meaning as well as files. Exporting data does not prove that another provider can reproduce the same valid outcomes, permissions and audit trail. A substitute model may handle routine cases while failing on rare exceptions. A restored database may contain records but omit the recent transactions needed for reconciliation. Test a fixed outcome evaluation set, difficult case routing and the restoration of essential context. Compare service capacity, quality, latency and operating cost under fallback with the declared minimum. Document capabilities that remain unavailable so that partial restoration does not acquire the label of full recovery.

The strongest interpretation comes from repeated material tests, actual incident experience and a consistent service perimeter. A rising concentration share accompanied by faster proven switching and better fallback can leave residual risk lower. A falling spend share accompanied by lost manual knowledge or shared infrastructure can leave risk higher. Monthly uptime can also look excellent before a rare, severe outage, so

normal performance should accompany stressed performance rather than replace it. Retain unresolved weaknesses and explicit risk acceptance with a named owner and review date. Productivity gains become more durable when the service can withstand the disruption scenarios that matter to the business.

A reproducible dependency and recovery dashboard

Use a matrix with critical services in rows and providers or material indirect dependencies in columns. Show the dependence, tested alternative and maximum tolerable interruption for each service. A companion time series can plot the largest provider's spend share and critical capability share separately. Recovery results need their own panel showing scheduled tests, execution, pass status, actual restoration time, data loss and minimum service capacity. Mark definition and architecture changes. This arrangement keeps a broad concentration statistic connected to the particular service whose failure would matter.

The source record should include versioned architecture maps, contracts and exit provisions, supplier registers, invoices, service criticality decisions, test schedules and execution logs. Retain the scenario, workload, staffing, dependencies removed, timestamps and quality checks for every material drill. Actual incidents require restoration and backlog histories with customer consequences and incremental costs. Reconcile tested alternatives to the production configuration after each material release. A backup that worked before a large migration provides limited assurance unless the dependencies, data and procedures remain valid in the new configuration.

Review this chapter with human work per valid unit, full cost per valid outcome, capacity realization, incident losses, customer outcomes and workforce health. Reserve staffing, redundant technology and portability work can reduce the apparent financial gain while making it more credible. A failed material recovery test may justify limiting scale until the critical service has a workable alternative. The contribution to the post labor argument is a durability test of an enterprise production mechanism: less human effort can support more useful output when the operating system remains viable under disruption. Standards and individual incidents support that test, while leaving the claimed twenty year macro history to separately observed economic series.

SOURCES AND REPRODUCTION NOTES

[1] Marianne Swanson, Pauline Bowen, Amy Wohl Phillips, Dean Gallup and David Lynes (2010). Contingency Planning Guide for Federal Information Systems. NIST SP 800-34 Revision 1, including updates through 11 November 2010; business impact analysis and RTO/RPO definitions pages 16–17; federal information system methods, not enterprise recovery observations; verified 4 October 2026.

[2] Basel Committee on Banking Supervision (2025). Principles for the sound management of third-party risk. Final publication 10 December 2025; concentration definitions and indirect supplier dependencies, bank and systemic levels, testing and exit; banking methods applied here as an analytical reference; verified 4 October 2026.

[3] Basel Committee on Banking Supervision (2021). Principles for operational resilience. Published 31 March 2021; critical operations, tolerance for disruption, mapping, testing and third party dependencies; not a time series of outcomes; verified 4 October 2026.

[4] David Weston, Microsoft (2024). Helping our customers through the CrowdStrike outage. 20 July 2024 first party incident account; estimated 8.5 million Windows devices affected, less than one percent of Windows machines; event estimate not complete economic loss or AI causality evidence; verified 4 October 2026.

RELATED CHAPTERS 074 · 075 · 077 · 080 · 091 · 101 · 103 · 104 · 108 · 109 · 110 · 111 · 112 · 113

CHAPTER 115

Revenue per employee alpha

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Proposed enterprise specification in September 2026 with a separately dated fiscal 2025 disclosure illustration and no official comparable twenty year company alpha series

RPE Alpha compares company and matched benchmark real revenue per employee growth, identifying relative commercial performance while leaving automation attribution to separate evidence.

Relative growth in commercial output per employee

Revenue per employee alpha, or RPE Alpha, is company real RPE growth minus matched peer or sector real RPE growth. This is the exact specification in Appendix A1 of the supplied Critical Path report. When growth rates are percentages, their difference is measured in percentage points. A company growing real RPE by 6 percent against a benchmark growing by 4 percent has an illustrative alpha of 2 percentage points. These assumed values are not company observations. Alpha here is a relative operating measure, rather than a financial return adjusted for investment risk. [1]

The underlying company ratio should retain the report's boundary: trailing twelve month constant price, constant currency, organic external revenue divided by average employee full time equivalents. Calculate growth over matching periods, with the same adjustments for the benchmark. Revenue excludes internal transfers within the consolidated perimeter. Organic comparisons remove the effect of acquired and divested activities consistently from both revenue and workforce. Average FTE should represent the period's employed capacity rather than a convenient closing headcount. [1]

Constant currency removes translation effects from exchange rate movements. Constant price addresses changes in selling prices. One adjustment does not accomplish the other. Organic growth addresses the business perimeter and likewise does not guarantee a fixed product mix or output quality. A firm's adjusted revenue series therefore needs a documented bridge from reported sales. A general consumer price deflator can give a rough purchasing power comparison, but it may inadequately represent prices of the company's actual products and services.

The reference ratio measures commercial revenue supported per payroll employee. Gross revenue, sectoral output and value added have different accounting boundaries. BLS distinguishes those output concepts and measures aggregate labor productivity against hours worked. An official productivity index is consequently not an interchangeable peer RPE series. It can provide contextual evidence when its scope and limitations are explicit. Comparisons should keep revenue per employee and value added per human hour separately labeled. [2]

Choose the growth convention before evaluating performance. Ordinary percentage changes, annualized growth over several years and changes in logarithms are different quantities. Subtract like from like and retain the original formula when presenting the headline. The ratio is undefined with zero employee FTE, and its ordinary growth rate cannot be calculated from a zero baseline RPE. Acquisitions, exits or major

reorganizations can also leave a formally calculable but economically incomparable observation. Report those boundaries rather than manufacturing a smooth alpha history.

Public observations do not yet supply alpha

RPE Alpha is a proposed management specification in the September 2026 report. No official comparable twenty year company alpha history has been verified for this reference through 4 October 2026. Public companies may disclose revenue and employees over much longer periods, but an analyst must still construct prices, currency adjustments, organic scope, average workforce and a matched benchmark. The longevity of financial statements does not make those missing transformations observed data. [1]

Microsoft's fiscal 2025 annual report illustrates the available inputs and their limits. It reports revenue of $281.724 billion for the year ended 30 June 2025 and approximately 228,000 full time employees at that date. The employee number is a closing stock, not the average FTE required by the proposed measure. The report also distinguishes business segments and product categories. These disclosures provide useful evidence for reconciliation; they do not publish a matched real organic RPE Alpha. This is a dated disclosure illustration, not an assertion that fiscal 2025 is the latest available company period. [3]

Dividing annual revenue by that closing headcount would produce a nominal employee proxy. Label it as such if used. It would not establish constant price output, eliminate exchange rate effects, remove acquisition contributions or measure purchased human work. No alpha can be inferred until the comparator has been specified and made comparable. A single company's ratio is insufficient even when its financial numerator is audited.

The methodological sources answer other questions. BLS explains productivity output and labor boundaries. HM Treasury's AI evaluation guidance, updated in May 2026, explains the need to define the intervention, baseline and comparison. Neither supplies a ready made company RPE Alpha dataset. The source table separates disclosed facts from proposed calculations so a reader can see where judgment enters. [2, 4]

A defensible empirical chapter would present the company and peer input records for every matched period, followed by the calculated rates and difference. Older periods should remain visibly older. A missing deflator or undocumented workforce boundary should be treated as a limitation, not filled with an assumed value. For a secular argument, comparable observations across at least two decades would be needed, with changes in the peer group and business perimeter documented. Until that record exists, this entry belongs in the measurement program. It adds a distinct relative performance question to revenue per employee without claiming an established national trend.

Record	Dated observation or method	Boundary
Critical Path Appendix A1	September 2026 proposed specification	Company real RPE growth less matched benchmark growth
Microsoft annual report	Fiscal 2025 revenue $281.724 billion; 30 June 2025 full time employees about 228,000	Reported revenue and closing workforce; no comparable alpha supplied
BLS productivity handbook	Concepts page modified September 2020	Output and hours definitions; methodological context

Record	Dated observation or method	Boundary
HM Treasury guidance	Updated 15 May 2026	Impact evaluation and counterfactual design; no company alpha series

Sources [1] to [4]. Disclosures and methods are distinct from an observed RPE Alpha calculation.

The contribution to the post labor framework

The benchmark subtraction asks whether an enterprise is improving beyond its operating environment. If industry demand, selling conditions and ordinary productivity improve for everyone, a company's rising real RPE may reflect participation in that broader change. A matched benchmark makes that context visible. Positive alpha can identify a firm whose commercial output is scaling faster relative to its employee base than the selected comparison group. It is a useful lead for investigating work redesign and capital deployment.

The distinction matters for a post labor argument about labor compression. A firm that serves more demand with proportionately less employee growth may have changed its production system. Relative outperformance can help distinguish an unusual company trajectory from a common sector trajectory. The evidence becomes more persuasive when human work per valid unit also falls, total purchased labor is included, and output quality remains adequate. Revenue measures then have an observed workflow mechanism rather than only an appealing ratio. [1]

Alpha cannot measure the economy's overall movement away from labor. If every matched firm improves real RPE at the same rate, alpha is zero even while the sector becomes substantially less labor intensive. Conversely, a positive alpha can occur in a declining industry when a company deteriorates more slowly than its peers. Publish absolute company and benchmark growth beside their difference. A relative statistic must not erase their common direction or the size of the underlying output change.

Consider another hypothetical comparison. Company real RPE falls by 2 percent while the benchmark falls by 5 percent. Alpha is positive 3 percentage points, although the company's output per employee proxy declined. If both instead rise by 8 percent, alpha is zero despite an increase in both ratios. These arithmetic examples show why the proposed metric supplements the level and growth of revenue per employee rather than replacing them.

The income distribution question remains separate. Commercial outperformance can accrue to owners, workers, suppliers or customers. A company can improve its ratio by increasing product value, shifting its business mix or using more purchased services. It can maintain a small payroll while relying on substantial external human work. Total work cost share, value added per total workforce equivalent, operating profit and capacity disposition describe the destination and boundary of the gain. Household labor share and ownership income address its wider distribution. RPE Alpha helps identify where to investigate these relationships; it does not itself establish displacement, avoided hiring or a transfer of prosperity away from workers.

Matching peers and testing attribution

Construct peers before inspecting the intervention result. Relevant dimensions include products, customer markets, geography, company size, capital intensity, growth stage and vertical integration. An industry label can group manufacturers, resellers and service operators whose revenues count very different amounts of

purchased work. A global firm compared with domestic employment and domestic sector output also changes geography. Document why each comparator is relevant and which mismatches remain.

Specify how the benchmark is aggregated. A median peer growth rate, a weighted mean of individual growth rates and growth in pooled peer revenue divided by pooled FTE can yield different values. Choose a headline rule, disclose the weights and publish alternatives where they affect the conclusion. Fixed baseline weights can reduce mechanical changes in peer influence as relative firm size changes. A contemporaneous sector index can be informative, but its output and employment boundaries must match the claim rather than borrow authority from an official label.

Selection and survival can distort the result. Excluding failed or acquired companies leaves a different comparison group from the one that existed at baseline. Choosing only weak peers after observing company performance manufactures outperformance. Replacing peers as the company changes its business may improve current relevance while breaking historical comparability. Preserve the original cohort and show any revised cohort separately. Keep acquisition and divestiture adjustments symmetrical between the target firm and peers.

A positive alpha is relative performance, with no automatic causal attribution to AI or other automation. Product demand, marketing, market power, investment, outsourcing, management and prior capabilities can produce it. A peer company may itself adopt the same technology, reducing the observed difference even when both benefit. Common exposure does not supply an untreated counterfactual. HM Treasury's guidance requires defining business as usual and using an appropriate evaluation design for the intervention and context. [4]

Stronger identification might use a planned staged rollout, randomized workflow assignment or a credible quasi experimental comparison. Pre intervention trajectories, concurrent changes and spillovers require inspection. Separate the statistical effect estimated by that design from the descriptive alpha. Workflow evidence should establish lower human input with valid output, while financial reconciliation should show how it reached revenue and margins. An alpha that changes sign with plausible peer choices or price adjustments warrants a limited interpretation. A durable result across defensible specifications strengthens evidence of relative performance, while causal claims still depend on the identification design.

Reproducing and monitoring the comparison

Save company and peer records for each matched period: reported external revenue, price adjustment, currency adjustment, acquisition and divestiture bridge, average employee FTE, geography and business perimeter. Retain the source filing, observation dates and extraction date. Average workforce estimates inferred from closing stocks should be marked as approximations. Publish purchased labor coverage separately and avoid presenting a payroll ratio as a total human work ratio. [1]

Calculate each adjusted RPE, its growth under the chosen convention, and the benchmark growth under the stated weighting rule. Subtract benchmark growth from company growth. Keep an audit table containing all inputs and the final percentage point difference. Do not subtract a calendar year sector rate from a different fiscal year company rate without a documented matched reconstruction. Use the same price concept for both or label the comparison as approximate.

Chart company and benchmark RPE indexes on a common base, with a separate panel for alpha. Show revenue and employee growth components so the reader can distinguish output expansion from workforce contraction. Mark intervention dates, scope changes and peer revisions. Add companion panels for total work costs, value added, valid workflow output, defects and customer outcomes when those records exist.

Review rolling annual comparisons alongside several year windows to reduce sensitivity to hiring lags and exceptional demand. Retain negative results and benchmark sensitivity ranges. Extend the historical record only with comparable observations; missing price, perimeter or workforce evidence should remain visible. Connect this proposed instrument to company revenue per employee, workforce elasticity, total workforce value added, operating profit, human work per valid unit and full cost per valid outcome. The combined record can test relative scalability and its mechanism while keeping the separate secular macroeconomic and causal questions open.

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro, Critical Path Consulting Group (2026). The Jobs That Never Appear: Measuring and Capturing the Enterprise AI Productivity Dividend. Unpublished supplied report, September 2026 edition, Version 2.0; Appendix A1 RPE Alpha and Real Organic Revenue per Employee FTE; exact proposed formulas and boundaries, not independent observed evidence; verified retrieval 4 October 2026

[2] U.S. Bureau of Labor Statistics (2020). Handbook of Methods Productivity Measures: Business Sector and Major Subsectors Concepts. Page last modified 23 September 2020; output, value added, sectoral output and labor hours boundaries; current official method consulted, not an RPE Alpha series; verified retrieval 4 October 2026

[3] Microsoft Corporation (2025). Microsoft 2025 Annual Report. Fiscal year ended 30 June 2025; income statements revenue and Human Capital Resources closing full time employee count; dated disclosure illustration, no claimed current alpha or average FTE; verified retrieval 4 October 2026

[4] HM Treasury and Evaluation Task Force (2026). Guidance on the Impact Evaluation of AI Interventions (HTML). Updated 15 May 2026; business as usual baseline, comparison groups and experimental or quasi experimental evaluation of evolving interventions; methods, not measured company alpha; verified retrieval 4 October 2026

RELATED CHAPTERS 072 · 073 · 074 · 075 · 076 · 101 · 104 · 109 · 110

CHAPTER 116

Value per work dollar

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN September 2026 framework with June 2026 compensation context

A proposed ratio of real GVA to complete work expenditure tests enterprise labor cost dependence, with production boundaries, compensation prices, and human hours needed to distinguish automation from lower pay.

Definition and complete work cost

Value per work dollar measures real gross value added divided by total work cost. The exact formula appears in Appendix A1 of the Critical Path September 2026 manuscript. It asks how much real production value a defined business supports for each dollar spent on employee, contingent, and work like outsourced activity. This is a proposed enterprise outcome measure. No official firm wide series with a consistent twenty year history has been identified. Its relevance to post labor economics is a test of structural dependence on paid human work, subject to explicit production and price boundaries. [1]

Gross value added starts from output less intermediate inputs. BEA uses this concept to measure an industry's contribution to GDP and provides separate price and quantity measures. At enterprise level, output requires a consistent treatment of external sales, inventory change, and other production activity. Purchased materials, energy, and services are intermediate inputs under the standard boundary. Real GVA removes relevant price effects; simply substituting revenue in the formula would preserve pass through spending and change the meaning of the metric. [2]

Total work cost includes fully loaded employee compensation: wages, salaries, bonuses, commissions, employer taxes, benefits, overtime, and recognized stock compensation under the disclosed enterprise policy. Add contingent labor, temporary workers, and relevant contractors. Include work like outsourced functions such as business process services, recurring agencies, consultancies, and managed services that replace or augment internal activity. Pure software, cloud, and data expense belongs in its own technology category. Mixed services require a defensible allocation or a visible opaque work like category rather than an unsupported guess about vendor staffing. [1]

The denominator is expenditure, not hours or employees. It can change because fewer hours are required, compensation changes, supplier prices move, or work shifts among differently priced groups. A higher ratio therefore establishes more real GVA per recorded work dollar under its boundary; it cannot alone establish higher output per human hour. Pair it with human work, workforce composition, actual compensation, quality, and the cost of technology supplying the alternative production method.

The original formula mixes a real numerator with a nominal cost denominator. Its unit is reference period currency of GVA per current period currency of work expenditure. Printing "dollars per dollar" without that distinction conceals an important price effect. Report the reference year, currency conversion, organic business perimeter, period, and retained or adjusted GVA method. A constant price work cost companion is

necessary for interpreting changes over time. The original ratio should remain visible rather than being silently redefined into that companion.

Retained and adjusted production boundaries

A retained GVA numerator subtracts all purchased intermediate inputs, including purchased business services. It measures value remaining within the legal entity. This can be paired with total work cost, but the label must make clear that purchased work is deducted in determining retained value while also appearing as expenditure in the denominator. That treatment answers a retained value yield question. It does not represent the output of the entire client and supplier production system, and outsourcing can change the ratio even when the underlying work is unchanged. [1] [2]

An adjusted numerator can describe a defined controlled workforce boundary. For controlled contractors whose labor is included in the production system, exclude their identifiable labor component from the intermediate input deduction. Keep nonlabor vendor inputs, vendor margin, and work outside the defined boundary deducted. The associated work cost remains in the denominator once. This is a novel enterprise adaptation in the manuscript, rather than a standard national accounting measure. Reliable contract scope and labor composition are prerequisites; adding back every supplier invoice would inflate the numerator with unrelated purchases. [1]

The common error is an undisclosed mixture of boundaries. A report may call its numerator extended workforce value while subtracting the labor component of the same controlled work that it counts as an input. That depresses the adjusted production yield and obscures sourcing comparisons. The retained calculation itself remains valid for its stated question. Avoid describing every appearance of purchased services in both parts of a retained ratio as an arithmetic error; the problem is treating that retained result as though it measured a different production perimeter.

Cost duplication is a separate issue. An agency worker must not appear once through employee payroll and again through the entire accounts payable invoice if those records cover the same expense. Reconcile contingent labor systems, payroll, procurement, and invoices. Document transfers between segments and shared service allocations so each expense enters the enterprise total once. Work costs can legitimately include a complete work like invoice when its composition is opaque, but uncertainty should remain visible and the adjusted GVA labor addback should not be invented.

Real measurement requires another reconciliation. BEA’s industry methods deflate output and intermediate inputs with appropriate price measures. Independently published chained dollar components are generally nonadditive, so subtracting their displayed levels is not a reliable shortcut to a real GVA series. An enterprise can use a documented constant price construction or a suitable quantity index and reference value. Preserve the retained and adjusted definitions before applying the price method, and show the nominal accounting bridge alongside the real estimate. [2] [5]

Illustrative changes and structural interpretation

The following scenarios are hypothetical and use an unchanged production boundary. In the baseline, ten million reference year dollars of GVA are supported by five million current dollars of total work cost and one hundred thousand human hours. Value per work dollar is two. If the firm produces twelve million real GVA

with the same work spending, the ratio becomes 2.4. This is a higher economic yield, although the source could be automation, capital investment, better products, process changes, or a different mix of production.

Two other scenarios generate the same ratio of 2.5. One preserves output and the price of work while reducing required hours by twenty percent. The other preserves output and hours while cutting work expenditure by twenty percent through lower pay or cheaper suppliers. The first is consistent with reduced human input per unit; the second changes the price paid for the work. Without human hours and compensation evidence, the ratio cannot distinguish those mechanisms. All scenario values are illustrative and are not observed enterprise results.

For post labor analysis, a sustained rise is most informative when real GVA grows faster than complete work spending, human input per valid result falls, and technology and support costs are recorded. This combination can indicate that a business needs less human work to support a given production value. Management may use the resulting capacity to expand output, improve service, redirect workers, or avoid future hiring. Value per work dollar describes the economic yield; capacity records identify what the organization did with the changed work requirement.

The metric also reaches beyond payroll headcount. A business that replaces employees with external human work should still record the purchased work expenditure. That improves the evidence boundary, particularly when vendor hours cannot be observed. It does not solve every sourcing comparison. Retained value can fall because more production is located at a supplier, and supplier prices incorporate its capital, margins, and bargaining position. A transparent retained versus adjusted bridge is therefore central to assessing whether the organization improved production or merely moved its boundary.

The interpretation should preserve distribution. A business can become less dependent on expensive labor by paying workers less, while remaining equally dependent on their physical work. That outcome is relevant to bargaining power and earnings, but it is not evidence of automation. Lower work cost accompanied by worse health, quality, or customer outcomes can also reflect shifted burdens. A credible production interpretation requires stable accepted outcomes and sustainable work alongside the ratio. An increase should be investigated rather than automatically counted as a favorable post labor observation.

Hypothetical scenario	Real GVA millions	Work cost millions	Human hours thousands	Value per work dollar
Baseline	10	5	100	2.00
More real value	12	5	100	2.40
Fewer required hours at same hourly cost	10	4	80	2.50
Lower pay with unchanged hours	10	4	100	2.50
Work price inflation only	10	5.5	100	1.82

Illustrative arithmetic only. GVA is at one reference price basis, work cost is nominal, and production boundaries are held fixed. No historical observations are implied. [1]

Compensation prices and constant price companions

Complete compensation is materially different from wages alone. In June 2026, BLS reported average private industry employer compensation of 46.89 dollars per hour, comprising 32.82 dollars of wages and salaries and 14.07 dollars of benefits. Benefits were thirty percent of the measured total. The release appeared on 9 September 2026. These are bounded national compensation observations that support cost coverage; they do not measure an enterprise's full work cost or establish a value per work dollar trend. [3]

If real GVA and work quantities are unchanged while compensation prices rise, the original ratio falls. In the hypothetical price scenario, five million dollars of cost becomes 5.5 million and the ratio declines from two to approximately 1.82. Such a decline can reflect rising pay rather than worsening production. Conversely, falling real pay can improve the ratio without changing the technology. Distinguish compensation per comparable worker hour from changes in seniority, location, skills, benefit coverage, or the mix of employees and suppliers.

Construct a companion by dividing real GVA by work cost expressed at a consistent reference price basis. A production work cost index should reflect the employee and external work mix actually included. BLS's Employment Cost Index measures employer labor cost change while controlling shifts across occupation and industry categories; it can inform the employee compensation portion. It does not cover every outsourced function or reproduce a particular firm's price changes. Supplier contracts, appropriate service price measures, and disclosed mix adjustments are needed for the external component. [4]

Deflating all work cost by a consumer price index answers a different purchasing power question and may fail to isolate the price of the inputs the enterprise buys. Nor does using the same output deflator for every work expense prove physical productivity. Explain the selected index, weights, limitations, and revision policy. Publish the nominal work expenditure alongside the constant price companion so actual budget dependence and production quantity interpretation remain distinguishable.

Technology prices and other intermediates also matter. Lower prices for materials, purchased services, or machine capability can improve economic outcomes, while real GVA construction and sourcing boundaries determine which effects appear in this ratio. Acquisition, currency, capitalization, and allocation changes can create additional breaks. Keep a bridge separating production quantities, output and input prices, compensation, work mix, and business perimeter. The strongest evidence is durable within a comparable boundary; a one period improvement driven by lower wages or incomplete cost coverage supports a different explanation.

Ledger reproduction and longitudinal monitoring

Build a segment period ledger linking nominal output and intermediates to retained GVA, then reconcile any controlled labor addback to adjusted GVA. Record the real measurement method and reference year. Separately reconcile employee compensation, contingent cost, and work like suppliers to financial records. Give each vendor line a composition flag and disclose the classified share. Keep pure technology costs, opaque services, intercompany transfers, and duplicate invoice controls visible. The manuscript's numerator and work cost boundary should be printed beside the calculated ratio. [1]

For a quarter or trailing twelve months, sum the matching GVA and work cost amounts before dividing. Do not average monthly ratios without cost weights. If the work cost denominator is extremely small, show the underlying totals and suppress misleading comparisons. Retain actual human hours, output quality, worker compensation, and technology expense as companions. A firm with negative or unusually volatile GVA needs explicit explanation rather than a favorable ranking based on an unstable ratio.

Plot the original real GVA per nominal work dollar and the constant price work cost companion in separate labeled panels. Show their numerator and denominator growth rates, the retained or adjusted method, and sourcing changes. Mark acquisitions and accounting breaks. A nominal GVA per nominal work dollar panel can provide a budget distribution perspective, but it is another stated companion rather than the original metric. Chained dollar measures should follow the documented construction and avoid unsupported component arithmetic. [5]

Link the result to real value added per workforce FTE, total work cost share, operating profit per FTE, purchased labor and AI expenditure, full AI cost, and workforce health. The conclusion should identify the observed period and explain how much of the change comes from quantities, prices, and production boundaries. This proposed ratio can help test enterprise labor cost dependence. It becomes secular evidence only through consistently defined long records, and wage suppression cannot be relabeled as automated production.

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro and Critical Path Consulting Group (2026). The jobs that never appear: Measuring and capturing the enterprise AI productivity dividend. User provided unpublished manuscript, September 2026 Version 2.0, Appendix A1 Value per Work Dollar, Chapter 11.2 GVA boundaries and Chapter 11.3 Total Work Cost; source of proposed framework, not independent empirical proof; verified retrieval 4 October 2026

[2] U.S. Bureau of Economic Analysis (2026). Guide to the Interactive GDP-by-Industry Accounts Tables. Gross output, intermediate inputs, value added, price and quantity indexes and real industry value added methods; official concepts do not endorse novel firm adjusted boundary; verified retrieval 4 October 2026

[3] U.S. Bureau of Labor Statistics (2026). Employer Costs for Employee Compensation June 2026. Released 9 September 2026; private industry compensation 46.89, wages 32.82, benefits 14.07 dollars per hour; benefits 30.0 percent; bounded compensation context rather than full enterprise ratio; verified retrieval 4 October 2026

[4] U.S. Bureau of Labor Statistics (2026). Handbook of Methods Employment Cost Index Concepts. Employer hourly compensation cost index controls employment shifts among occupation and industry categories; scope exclusions and employee compensation definitions; verified retrieval 4 October 2026

[5] U.S. Bureau of Economic Analysis (2023). Concepts and Methods of the U.S. National Income and Product Accounts Chapter 4 Estimating Methods. Updated December 2023; chain quantity and price measurement and nonadditivity of chained dollar components, especially pages 4-20 to 4-21; verified retrieval 4 October 2026

RELATED CHAPTERS 074 · 075 · 076 · 080 · 109 · 113

CHAPTER 117

Operating profit per work dollar

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Enterprise measurement specification from September 2026 with accounting context and no verified twenty year national series

Operating income relative to total employee and purchased work cost tests economic capture across the payroll boundary while remaining sensitive to compensation prices product mix and investment.

The reported profit and total work denominator

Operating profit per work dollar is reported operating income divided by total work cost. This is the exact ratio named in AppendixA 1 of David Shapiro's user-supplied Critical Path September 2026 version 2.0 manuscript. It is intended to evaluate economic capture when external-work FTE cannot be observed credibly. The numerator and denominator use the same accounting period, organizational perimeter, currency, and recognition policy. [1]

Total work cost includes fully loaded employee cost, contingent labor, and work-like outsourced services. Employee cost includes wages, salary, bonuses, commissions, employer taxes, benefits, overtime, and recognized stock compensation under a disclosed policy. Contingent work includes temporary staff and individual contractors. Work-like purchases include consulting, agencies, outsourced functions, and managed services that substitute for or augment internal work.

BLS's employer-compensation methods provide an official foundation for including wages and benefits together. Employer Costs for Employee Compensation measures wages, salaries, and benefits per employee hour worked, with categories such as paid leave, supplemental pay, insurance, retirement, and legally required benefits. The proposed enterprise denominator extends beyond that employee survey boundary to purchased work; the official series does not measure the full custom ratio. [2]

A vendor's outcome price can contain technology, capital, overhead, and margin alongside people. Count an opaque work-like invoice under the declared purchasing boundary while reporting that its exact human compensation component is unknown. The resulting denominator is an economic work-cost bundle, not a measured number of human hours. Do not turn supplier expenditure into equivalent workers using an arbitrary wage.

The quotient is currency of operating income per currency of included work cost, so it is dimensionless when both amounts use the same currency. A value of 0.25 means twenty-five cents of reported operating income per dollar of included work expenditure during the period. It does not mean each work dollar causally generated that profit or that labor receives the remaining seventy-five cents. Other revenue and operating inputs also shape the result.

This is a profit-to-cost intensity measure rather than a return on invested capital. Work costs are generally expenses contributing to the operating result, while invested capital is an asset or financing base with a different timing and risk interpretation. A comparison of businesses should therefore retain capital intensity,

cash flow, and investment requirements alongside the quotient. A business with expensive equipment can earn high profit per work dollar while requiring substantial resources outside its work denominator.

Accounting context and the absence of a secular series

No verified comparable twenty-year national enterprise series of this exact ratio is established in the research. It remains a proposed measurement instrument. Its component concepts have longer accounting histories, but a complete denominator requires supplier categories that public disclosures often do not distinguish consistently. A plausible formula and an available payroll number do not together create an observed total-work series.

The original manuscript identifies the ratio separately from operating profit per total-workforce FTE. Its cost denominator supplies a practical alternative where invoices are known but external human time is opaque. This is the definition source, supplied by the user as an unpublished September 2026 version 2.0 report, rather than a claim that an external statistical agency already publishes the measure. [1]

Accenture's fiscal 2025 filing illustrates the disclosure boundary. It separately presents payroll and a nonpayroll category that includes subcontractors, facilities, technology, and travel, alongside reported operating income. The entire nonpayroll line cannot be classified as human work. Its table supplies primary accounting context but does not independently reveal the proposed complete denominator. [3]

A hypothetical business reports operating income of 20 and fully loaded employee cost of 40, contingent cost of 10, and work-like outsourced cost of 30. Total work cost is 80 and the ratio is 0.25. If an analyst used employee cost alone, the quotient would be 0.50. Both arithmetic calculations are possible, but only the first implements the declared total-work boundary. These are assumed amounts, not observations of an actual company.

A historical panel would require the same classification across payroll, contingent invoices, mixed services, and outsourced functions, plus a consistent reported-income bridge. Acquisitions, reorganizations, currency movements, and restated expense categories would need to be identified. A shorter internal series can support concrete sourcing decisions while retaining its proposed or supporting status under the user's twenty-year secular rule.

Loss-making activity should remain in the record. A developing product can have negative operating income and substantial work cost before it reaches a viable market. Its negative ratio can reflect deliberate investment, weak demand, or poor economics; subsequent results and a consistent cost bridge determine which interpretation fits. Dropping such businesses from a panel selects successful survivors and can make observed historical capture appear stronger than the complete commercial experience.

Hypothetical component	Amount in common currency units
Reported operating income	20
Fully loaded employee cost	40
Contingent work cost	10
Work-like outsourced cost	30
Total work cost	80

Hypothetical component	Amount in common currency units
Operating income per work dollar	0.25

Illustrative assumed arithmetic. A payroll-only denominator would describe a narrower measure.

Economic capture and the relationship to other ratios

The ratio tests whether the enterprise retains operating income after the expenses recognized in producing it, relative to its expenditure on human and work-like resources. Revenue per employee can improve while technology, suppliers, support, and transition costs absorb the apparent gain. Profit per work dollar brings the recognized operating result and a broader purchasing boundary into one economic comparison.

Its relationship to work cost share is exact when the component boundaries agree. Let P be operating income, W total work cost, and R revenue. Operating profit per work dollar is P/W, which equals operating margin P/R divided by work cost share W/R. A higher ratio can therefore arise from stronger operating profitability, a lower work share, or both. The decomposition makes the source of movement visible rather than treating it as independent confirmation from three ratios using the same inputs.

Operating profit per FTE uses a quantity of human labor, while this ratio uses its price and quantity together. Higher compensation can reduce profit per work dollar even when human hours per valid outcome improve. Lower wages can increase it without any reduction in hours. Profit per work dollar and profit per workforce equivalent therefore answer complementary questions about economic cost and labor intensity.

The broader denominator resists a simple outsourcing reclassification. In a hypothetical business, employee cost falls from 40 to 20 while purchased work rises from 20 to 40. Total work cost remains 60. If operating income stays 20, the ratio remains one third even though a payroll-only comparison changes sharply. Genuine supplier efficiency, altered contract scope, or lower wage geography could subsequently change costs, but the payroll transfer alone does not erase the work expenditure.

For post-labor economics, a durable increase alongside expanding real output, stable outcomes, and declining human minutes per valid unit would support economic capture of a less labor-intensive production system. An increase caused mainly by lower pay or favorable prices would support a different distributional account. The metric is useful because it makes those competing interpretations testable through its components.

The formula also exposes an important accounting dependency. Where W is fully included in current operating expense and C represents other recognized operating costs, P equals revenue minus W minus C. Dividing by W yields revenue per work dollar minus one minus other cost per work dollar. The proposed ratio summarizes this relationship; it does not isolate labor's marginal product or independently estimate how much profit automation caused. A deployment comparison and workflow evidence supply that additional inference.

AI cost recognition wages investment and safeguards

Keep reported operating income as the anchor. Recurring model, cloud, software, data, review, support, and integration costs should reconcile to the expenses recognized in that numerator. Transition and restructuring

costs require a reported-to-adjusted bridge, including recognition timing and the basis for any normalized companion. The exact ratio should remain visible even when management also shows an adjusted measure.

Capitalized development can shift expenditure away from current operating expense and into later depreciation or amortization. A current profit-per-work-dollar gain can therefore precede a substantial investment burden. Show current resource use, capital expenditure, depreciation, and the accounting bridge. Count a resource once under the chosen denominator policy; distinguish total work expenditure from the subset recognized in operating income when timing differs.

Segment allocations also matter. A benefiting business can appear unusually profitable if shared technology and support costs sit centrally. IFRS 8 establishes the context for operating-segment disclosures. The custom ratio additionally needs a documented allocation driver and a reconciliation of segment costs and profit to the consolidated origin. Allocation policy is part of the analytical method, not an automatic feature of the formula. [4]

Wage suppression can improve both sides of the ratio. In a hypothetical fixed-revenue business, reducing work cost by 10 raises reported profit by 10 if other costs remain constant. The quotient can rise substantially without any technical change. Offshoring, seniority mix, supplier margins, pricing power, and shifts toward more profitable products can have related effects. Decompose compensation rates, hours, purchases, prices, and mix before attributing the movement to automation.

Underinvestment can also produce temporary gains. Deferring training, maintenance, support, review, or capability development can reduce current cost while weakening future delivery. Pair the ratio with accepted quality, complaints, retention, incidents, overtime, turnover, skill concentration, recovery performance, and supplier resilience. A favorable average should not override severe failures in those outcomes. The safeguards identify whether the economic capture is durable and whether workers or customers absorb hidden costs.

Transition costs can appear in both the numerator bridge and the work-cost classification when they include human severance or redeployment. That is consistent with a profit-to-work-cost ratio because income is calculated after expenses and then compared with one expense bundle. It would become an error to deduct the same transition charge again from already reported income. Show its accounting origin and its denominator classification, preserving the exact reported ratio and any expressly labeled alternative.

A reproducible profit per work dollar record

Finance should reconcile reported operating income and any adjusted companion at each close. HR should validate fully loaded employee cost; procurement should classify contingent and work-like invoices, identify mixed contracts, and report opaque coverage. Maintain effective-dated vendor and expense categories so outsourcing and acquisitions do not silently alter the denominator.

Calculate monthly and trailing-twelve-month ratios on a stable perimeter. Plot operating income and total work cost separately, with employee, contingent, and outsourced components. Show the operating-margin and work-share decomposition, the reported-to-adjusted bridge, and allocation versions. Negative operating income should remain visible rather than be excluded from the comparison.

Use nominal income and cost in the same currency for the core accounting ratio. Add constant-currency, price, wage, and product-mix bridges where material. A research history must preserve at least twenty comparable years before supporting a secular claim. A recent internal improvement can still guide sourcing and capital allocation without that label.

Read the ratio with profit per FTE, work cost share, purchased labor relative to AI spending, AI-enabled incremental margin, full cost per valid outcome, and workforce health. Together they can distinguish reduced human requirements, altered prices, moved supplier costs, and genuine operating capture. Customer and resilience outcomes determine whether the gain survives ordinary service demands and disruptions.

Record denominator completeness beside every value. A known employee bill plus an incomplete vendor taxonomy should be published as a subtotal proxy, with omitted spend identified. If supplier coverage improves, restate prior periods where evidence supports it or mark a definition break. Preserving missing categories is more informative than assigning every invoice a precise human-work label without support.

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro Critical Path Consulting Group (2026). The jobs that never appear Measuring and capturing the enterprise AI productivity dividend. User supplied unpublished manuscript September 2026 edition Version2.0; AppendixA1 Operating Profit per Work Dollar and Total Work Cost Share; local source verified rather than a public URL; verified retrieval date 4 October 2026

[2] U.S. Bureau of Labor Statistics (2017). Handbook of Methods National Compensation Measures Calculation. Employer Costs for Employee Compensation definition wages salaries and benefits; last modified 15 December 2017; verified retrieval date 4 October 2026

[3] Accenture plc (2025). Annual Report on Form 10 K for the year ended August 31 2025. Geographic market cost and operating income table and note2 on nonpayroll including subcontractors; primary disclosure context; verified retrieval date 4 October 2026

[4] IFRS Foundation (2026). IFRS 8 Operating Segments. Original operating segment disclosure overview; methodological context rather than a dataset of the proposed ratio; verified retrieval date 4 October 2026

RELATED CHAPTERS 075 · 076 · 080 · 100 · 104 · 109 · 113

CHAPTER 118

Realized labor expense reduction

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Original enterprise framework September 2026 with established cost measurement methods published 2009 to 2020 and no comparable national savings series

Observed reductions in paid labor and purchased work identify one financial destination of released capacity, while avoided future hiring and unchanged salary expense remain separate.

Definition and observed expense boundary

Realized labor expense reduction records the labor spending that a bounded intervention actually removes during a stated period. The Critical Path Appendix A1 definition combines removed paid hours multiplied by an approved cost per hour, adds the observed reduction in external work expense, and subtracts transition cost. Employee and supplier components must cover distinct work. The result is a currency amount; it has no inherent denominator. A companion percentage may divide it by comparable baseline work expense, with the period and baseline clearly identified. This is a proposed management measure from the September 2026 manuscript, rather than an established national statistical series. [1]

Removed paid hours require a change in the employer's payment obligation. Ending overtime, reducing paid shifts, or removing a funded position can qualify once expense changes are evidenced. Completing a salaried employee's assigned work more quickly while keeping compensation unchanged releases capacity but does not reduce payroll expense. A calculation of forty saved working hours multiplied by an average wage cannot establish forty fewer paid hours. Paid time, productive time, and workflow touch time use different boundaries and must remain distinguishable in the source records.

The approved hourly rate should contain the costs actually avoided by the relevant staffing change. Wages, employer taxes, and benefits have different adjustment schedules and contractual commitments. A benefit cost allocated across hours may remain unchanged when a few overtime hours disappear. BLS defines total compensation broadly and expresses its employer cost measure per hour worked; that population average is useful context, but it is not automatically an enterprise's marginal savings rate. The rate applied to removed paid hours must reconcile with the expense change it claims to measure. [3]

External work reductions need procurement, invoice, and accounting evidence, including residual commitments, replacement providers, and the relevant service scope. A terminated agency invoice cannot be counted again as employee hours removed. Transition costs include attributable severance, contract exit charges, retraining, and temporary parallel operations, with the allocation policy disclosed. The original measure is net of these transition costs. Full technology operating expense belongs in the wider intervention profitability bridge; it should not disappear because this chapter focuses on the labor component. [1][2]

Cash and recognized expense may change in different months. Accrued severance, prepaid vendor contracts, and payment lags make that distinction material. Label the view and reconcile it to payroll, accounts payable, and the general ledger.

Historical provenance and evidence stages

The distinct entry comes from Appendix A1 of the user's unpublished Critical Path report, September 2026 edition Version 2.0. Its purpose is to prevent operational capacity estimates from being presented as already realized financial value. The manuscript supplies a definition and measurement architecture, not an independent sample showing widespread expense reductions. Its fictional worked examples are teaching devices. They provide no national estimate and should never appear as observed firm results in a longitudinal chart. [1]

The surrounding methods have a longer history. GAO's cost assessment guide was originally published in 2009 and updated on 12 March 2020. It emphasizes a defined scope, technical baseline, assumptions, data collection, risk analysis, documentation, and updates using actual costs. These disciplines support an expense bridge even though the guide was developed principally for program cost estimation. The existence of a mature costing method does not create a twenty year empirical history for the new AI benefit measure. [2]

A useful evidence progression begins with a representative workload baseline, continues through observed changes in human work, and then reaches paid labor disposition and financial reconciliation. These stages answer different questions. A workflow experiment can estimate required human minutes. A staffing record can show that a shift or supplier commitment ended. A financial record can show the amount and timing of expense removed. Joining all three strengthens a claim that automation changed labor demand and delivered a recognized saving.

Historical spending is an observation, but expected spending without the intervention is estimated. A company can report a smaller payroll than last year with certainty about the recorded numbers while remaining uncertain about attribution. It may also spend more than last year and still have a credible positive effect relative to a higher no intervention workload requirement. In that case the absolute change and the estimated intervention effect must be displayed separately. Future vacancies never filled remain hiring cost avoidance, rather than reductions in existing paid work. [1]

Evaluation guidance updated in May 2026 recommends a defined baseline, proportionate causal methods, and attention to interventions that evolve during evaluation. For this measure, release dates, staffing decisions, demand conditions, and replacement work must be dated together. Revalidation after normal operating cycles determines whether an initial reduction persists or is reversed by subsequent hiring, overtime, or supplier expansion. [4]

Date or stage	What is established	What is not established
2009 and March 2020	GAO cost estimation and assessment methods	A national AI labor savings history
September 2026	Critical Path proposed expense reduction definition	Independent evidence of broad adoption
Financially reconciled firm period	Observed expense change in the stated perimeter	Economy wide net employment effect

Method provenance and evidence boundaries; sources 1 and 2. These rows are not a numerical time series.

Labor demand and financial capture mechanisms

This measure connects production changes to one economically concrete result: a firm purchases less paid human work. If valid output, case complexity, service commitments, and quality remain comparable, a durable reduction in paid hours is evidence that the firm can produce the covered output with a smaller compensated labor input. Where workflow records identify automated tasks and reduced residual human work, the mechanism is more persuasive than an expense total alone. Financial reconciliation establishes that management converted at least part of released capacity into lower spending.

The connection to Post Labor Economics is bounded but useful. It can document a local reduction in the labor requirement that conventional output or adoption statistics miss. Employees may leave through attrition, overtime may disappear, or purchased work may contract. Each changes labor demand differently. Removing overtime primarily changes intensive margin demand; cancelling an occupied supplier assignment changes purchased labor demand; eliminating a paid position changes employment demand. Record which channel produced the financial amount before relating it to the wider labor market.

Consider explicitly hypothetical monthly arithmetic. A workflow intervention removes 1,000 previously paid overtime hours at a verified avoidable rate of $40 per hour. A separate agency contract becomes $15,000 cheaper, and attributable transition expense is $10,000. The proposed measure is $45,000 for that month. A further 500 minutes saved by retained salaried staff do not add payroll savings when salaries remain unchanged. Three planned hires cancelled for next quarter also remain outside this realized existing expense total. These exclusions preserve the original definition's economic meaning. [1]

A positive labor expense result can coexist with a negative total investment return. New licenses, inference, integration, monitoring, and incident handling may cost more than the amount saved. Conversely, an intervention can have valuable output or service benefits while labor expense reduction is zero. Each result deserves its own terminal classification. Summing time value, avoided FTE value, observed wage expense reductions, and the resulting profit improvement would count the same economic effect repeatedly.

Acemoglu and Restrepo's task framework provides the broader analytical connection: task displacement can reduce labor demand, while productivity expansion and new tasks work through different channels. A firm's expense reduction observes only part of that adjustment. Demand growth at the firm, expanded hiring by its technology suppliers, competitor responses, and new activities can offset local reductions. Its currency saving is not an estimate of national jobs lost, and lower payment rates cannot substitute for evidence of fewer required human hours. [5]

Rival explanations and hidden replacement costs

Falling work expense has several explanations that do not establish automation driven labor substitution. A demand downturn can shrink both output and staffing. An unusually expensive project may finish. Seasonal overtime can return to normal. Wage cuts, benefit reductions, or relocation can lower the cost of unchanged human work. An acquisition or divestiture can change the reporting perimeter. Each explanation leaves a different signature in hours, output, worker compensation, supplier invoices, and case complexity. The expense bridge should expose these components rather than attributing the entire residual to AI.

Outsourcing is a particularly important rival. Payroll reductions accompanied by higher agency, consultancy, managed service, or offshore work expense may change the employer of record without reducing total human input. Some suppliers bill for a mixture of human and technological work, so their invoice reductions cannot reveal human hours without additional information. Include the purchased work perimeter and publish the unobserved portion. If contractor labor cannot be measured, financial coverage and operational coverage should receive separate confidence assessments.

The counterfactual requires proportionate evidence. A locked baseline staffing model should use actual volume, complexity, and required quality. An untreated workflow, staggered rollout, or randomized access can improve attribution when feasible. Staffing decisions may occur well after deployment, so a short experiment on task speed seldom identifies the paid expense effect directly. Concurrent hiring freezes, organizational redesign, and supplier renegotiation need separate dates and explanatory variables. State whether the reported number is a descriptive historical change or a causal estimate against a no intervention baseline. [4]

Hidden work can reverse apparent savings. Supervisors may perform more checking, remaining staff may work unpaid extra hours, customers may absorb completion tasks, and errors may return as future rework. A smaller payroll that produces a rising backlog or weaker service quality does not establish a stable production improvement. The labor expense figure can remain financially correct while the broader interpretation fails. Quality thresholds, overtime, employee workload, supplier cost, and subsequent defect outcomes are therefore necessary companions.

Transition cost requires symmetric treatment. Count the attributable costs of reaching the new staffing arrangement, including unsuccessful implementation spending where it belongs in the initiative perimeter. Do not retain only successful projects when aggregating a portfolio. GAO's cost scope and uncertainty disciplines help distinguish actual charges from forecasts and prevent optimistic estimates from substituting for reconciliation. A first period with negative net savings may be plausible; persistence and recovery should be observed rather than assumed. [2]

Reproduction and longitudinal monitoring

Construct the record at initiative, workflow, labor category, and accounting period level. Preserve worker or position identifiers with effective dates, paid hours, compensation components, vacancy status, supplier contract lines, replacement purchases, transition charges, and the approved rate version. Link each expense component to its source record and an overlap group. Finance should reconcile the totals, while the process owner certifies the output and quality boundary. Protect personal data through aggregation and controlled access; detailed identifiers need not appear in the public dashboard.

Reproduction should start from a frozen extract and documented baseline. Sum only evidenced removed paid hours at their corresponding avoidable rates, add the distinct external work reduction, and subtract assigned transition charges. Compare the modeled employee amount with observed payroll expense and explain material differences. A changed wage rate, benefit timing, currency, or legal entity boundary requires a separate bridge. Publish both the recognized expense view and the cash view if their timing differs materially.

A waterfall chart can show employee expense reduction, external work reduction, transition costs, and the net amount. Adjacent monthly lines should display valid output, paid hours, external work expense, and the unadjusted total work budget. Keep actual periods separate from forecasts and annualized run rates. Cost avoidance from unfilled future hires belongs on a distinct panel with its counterfactual uncertainty. Avoided FTE and redeployment are operational companions, not additional currency benefits to be summed.

Link chapter 77 for avoided hiring, chapter 110 for capacity disposition, chapter 75 for total human work cost share, and chapter 104 for cost per valid outcome. Together these entries distinguish changes in required work, paid labor, spending, and total production cost. For macro research, a representative multi industry panel with stable definitions would be more informative than selected success stories. Until such data exist, this measure supplies auditable mechanism evidence within measured firms and periods, without meeting the twenty year national secular trend criterion. [1][4]

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro and Critical Path Consulting Group (2026). The jobs that never appear: Measuring and capturing the enterprise AI productivity dividend. User provided unpublished manuscript September 2026 edition Version 2.0; Appendix A1 original measure definitions; framework source rather than independent empirical proof Verified retrieval 4 October 2026.

[2] United States Government Accountability Office (2020). Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Program Costs. GAO 20 195G published and released 12 March 2020; original guide 2009; cost scope assumptions sensitivity and updates using actual costs Verified retrieval 4 October 2026.

[3] United States Bureau of Labor Statistics (Current methods retrieved 2026). National Compensation Measures: Concepts. Official total compensation and cost per hour worked definitions; national survey costs are not firm specific marginal avoidable expense rates Verified retrieval 4 October 2026.

[4] HM Treasury and Evaluation Task Force (2026). Guidance on the Impact Evaluation of AI Interventions (HTML). Updated 15 May 2026; official baseline counterfactual and evolving intervention evaluation methods Verified retrieval 4 October 2026.

[5] Daron Acemoglu and Pascual Restrepo (2019). Automation and New Tasks: How Technology Displaces and Reinstates Labor. Journal of Economic Perspectives 33 issue 2 Spring 2019 pages 3 to 30; DOI 10.1257/jep.33.2.3; task framework distinguishes displacement productivity and new tasks Verified retrieval 4 October 2026.

RELATED CHAPTERS 077 · 110 · 075 · 104

CHAPTER 119

AI enabled contribution margin

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Original enterprise definition September 2026 with accounting interpretation updated December 2022 and cost and evaluation methods available through October 2026

Incremental commercial margin tests whether attributed AI gross margin survives the added costs of selling servicing and supporting the offering, without equating captured profit with reduced labor demand.

Definition and gross margin bridge

AI enabled contribution margin is the proposed currency amount remaining after an offering's AI enabled incremental gross margin is reduced by its incremental sales, service, and support costs. The exact relationship comes from Appendix A1 of the user's unpublished Critical Path manuscript, September 2026 Version 2.0. It measures an attributed incremental economic result, rather than all revenue associated with a product containing AI. Neither subscriptions sold nor model usage provide the required counterfactual. The measure has no inherent denominator; a margin percentage needs a separately defined revenue denominator. [1]

The upstream incremental gross margin combines the revenue difference between the actual AI offering and a no AI counterfactual, subtracts the difference in direct costs, and deducts cannibalized gross margin. Chapter 100 explains that upstream measure. This chapter preserves a separate downstream step: the additional commercial and service resources needed to win, retain, and support that business. Count only their increment relative to the same counterfactual and accounting period. If a service cost is already included in direct cost, do not subtract it again. [1]

Sales costs may include incremental selling effort, commissions, marketing, presales demonstrations, and customer onboarding where the declared boundary assigns them. Service and support may include human assistance, escalation, account management, training, and exception handling. Define these classifications before measurement because enterprises locate similar activities in different accounts. The distinction between an observed new expense and an allocated share of existing personnel time must remain visible. Released capacity used for sales can consume a real scarce resource even when the payroll total does not rise.

A positive contribution amount is not automatically net operating profit, cash flow, or distributable income. Shared platform investment, corporate overhead, taxes, financing, working capital, and capital expenditure may lie outside this defined subtotal. Publish a bridge to the fuller economic view. Existing fixed resources can matter for long term scale even when they have little short term incremental expense. The decision to include an allocation should follow the purpose and capacity constraint, with an alternative view where the allocation is uncertain.

SEC staff guidance warns that misleading labels, inconsistent adjustments, and excluded recurring operating expenses can distort non GAAP measures. It specifically distinguishes contribution margin from labels such as

net revenue. This proposed internal subtotal needs its own clear definition and reconciliation; its title does not confer a standard accounting meaning or cross company comparability. [2]

Provenance and available historical evidence

The standalone definition is a September 2026 enterprise instrument, not a decades long national statistic. The Critical Path manuscript identifies contribution margin as a companion to incremental gross margin and warns that shared commercial allocations can be arbitrary. The source is a user supplied unpublished framework. Its proposals and fictional illustrations explain the architecture but do not establish that companies throughout the economy have achieved positive AI contribution margins. No comparable national longitudinal series for this exact measure was verified by the 4 October 2026 cutoff. [1]

Older accounting guidance provides measurement discipline. The SEC's interpretation page, last updated on 13 December 2022, discusses normal recurring expense exclusions, changes between periods, recognition principles, labeling, and comparability. These issues predate the proposed AI subtotal. They show why an apparently profitable product can look different after definitions and excluded expenses are examined. They do not identify an automation contribution margin trend, and this chapter uses them for transparent measurement rather than interpreting disclosure rules as empirical findings. [2]

Technology cost data became easier to normalize through standards such as FOCUS. Version 1.4 was ratified in June 2026 and provides a shared specification for cost and usage records, including reconciliation and allocation information. Such records can help assign model, cloud, and platform costs to an offering. They leave revenue attribution, employee effort, commercial allocations, cannibalization, and valid customer outcomes unresolved. A well structured billing dataset is one component of the evidence package, not proof that the product earns incremental margin. [4]

Historical comparison should follow offering cohorts and stable definitions. Record pilot launch, commercial rollout, pricing changes, support redesign, and model releases. Initial acquisition spending can precede recognized revenue; renewals can follow months of servicing. A short launch window may therefore understate durable contribution or exaggerate it by omitting subsequent support and churn. Report observed period results first. Lifetime value projections require retention, cost, and discount assumptions and belong in a separate forecast view.

The useful longitudinal question is whether a stated offering's attributed contribution persists across ordinary customer and release cycles. A firm can reconstruct that sequence from its own records, but aggregation requires common boundaries and representative sampling. Twenty years of general software margins cannot be relabeled as twenty years of this AI enabled measure. For the wider Post Labor reference, the entry supplies a test of commercial realization and economic capture, with a proposed status that preserves its actual evidentiary history.

Primary methods and framework chronology, sources 1, 2 and 4; no empirical margin observations are implied.

Source checkpoint	Measurement contribution	Remaining gap
December 2022	SEC interpretation of non GAAP presentation	No AI causal margin estimate

Source checkpoint	Measurement contribution	Remaining gap
June 2026	FOCUS 1.4 technology cost specification	Commercial and labor costs need additional records
September 2026	Critical Path proposed contribution formula	No verified comparable national time series

Economic capture and net labor demand

The measure answers whether an innovation's apparent gross benefit survives the work of bringing it to customers. AI may reduce direct production effort while increasing explanation, training, assurance, troubleshooting, and customer support. Alternatively, it may automate both production and servicing and permit profitable expansion with modest additional human input. The contribution bridge distinguishes these cases. A gross margin improvement accompanied by a larger commercial burden can leave little economic gain for reinvestment or distribution.

Consider explicitly hypothetical quarterly amounts. An offering generates $200,000 of attributed incremental gross margin after direct cost and cannibalization. It requires $60,000 of incremental sales expense and $90,000 of incremental service and support expense. Its proposed contribution margin is $50,000. If the service workload instead costs $160,000, the same gross result leaves a negative $20,000 contribution. These examples are arithmetic demonstrations, not company observations. An uncertain shared allocation should be shown as a range beside the result rather than disguised as an exact causal amount. [1]

For Post Labor Economics, positive contribution can demonstrate that a low human production intensity is financially scalable. Yet the labor implication depends on both labor per accepted outcome and the resulting volume. A product can have fewer human minutes per customer and employ more people overall as sales expand. It can also earn more contribution through higher prices or reduced wage costs without lowering the required human work. Record the volume, paid hours, supplier work, and commercial staffing alongside margin before interpreting the result as evidence of labor compression.

Acemoglu and Restrepo's task framework separates displacement from productivity expansion and the creation of new tasks. Commercial support is one place where new or expanded human tasks may appear. The proposed contribution measure can test whether those tasks absorb part of the financial dividend, but it cannot identify their economy wide balance. A profitable AI product may induce hiring elsewhere, replace a competitor's labor intensive service, or stimulate complementary demand. These responses require wider evidence. [5]

Economic capture also has a distributional dimension. Contribution accruing to a firm does not establish how much reaches employees, owners, suppliers, or customers. Some gains fund wages and new hiring; others finance capital investment or distributions. Lower prices can transfer part of the production benefit to customers while reducing measured margin. The financial subtotal therefore complements factor shares and wage evidence rather than replacing them. Its strongest contribution is to show whether a stated mechanism creates retained commercial value after visible human and technological burdens.

Counterfactuals allocations and competing causes

The no AI counterfactual should represent what the firm and its customers would plausibly have done, rather than assuming all revenue from an AI labeled product is newly created. Customers may have bought an older product, used a manual service, or delayed purchase. Discounts may move buyers across product lines. The incremental gross margin upstream must deduct displaced margin consistently before the contribution calculation begins. Recheck the counterfactual when the offering changes from an optional feature into a bundle that customers cannot separate.

Demand growth, an improved sales campaign, pricing power, acquisition, exchange rates, or product mix can raise the subtotal independently of technical labor substitution. Randomized offers, staggered rollout, and matched customer cohorts may improve attribution where feasible. Differences in eligibility, sales targeting, and adoption can create selection bias. Evaluating the combined offering may be appropriate when workflow redesign and AI arrive together, but the resulting effect should be labeled as the package effect. UK evaluation guidance supports explicit baselines, experimental or proportionate alternative methods, and attention to evolving interventions. [3]

Shared commercial allocations require two views when they materially affect the decision. An incremental expense view identifies costs that actually change because the offering exists. A capacity consumption view assigns constrained staff and shared service resources even if their current payroll is fixed. Publish the allocation driver, capacity denominator, time horizon, and residual costs. Revenue based allocation can assign little support expense to a discounted but difficult customer group; transaction counts can ignore complexity. Tested workload drivers and sensitivity analysis make that choice reviewable.

Allocation cannot manufacture an enterprise saving. Moving a support charge from the AI product to a legacy unit raises one subtotal while leaving total cost unchanged. Reconcile allocations across products to the original commercial cost pool, disclose unallocated balances, and keep the policy consistent across periods. Technology usage data can support parts of the bridge, but vendor invoice allocations do not settle the human sales and service burden. FOCUS supplies a record structure rather than an economic counterfactual. [4]

Short term underinvestment can mimic a durable gain. Reduced support coverage may suppress current cost while complaints, cancellation, refunds, and future remediation accumulate. Aggressive selling can produce revenue that fails to renew. Delayed direct costs or changed capitalization can alter timing. Maintain customer retention, service quality, risk, and full investment costs as companions. A financially positive subtotal with deteriorating outcomes needs revalidation before it is treated as evidence of sustainable production change.

Reproducible monitoring and chart design

Build the measurement at offering, customer cohort, intervention version, and accounting period level. Join recognized revenue, direct cost, cannibalization adjustments, commercial activity, support contacts, allocated resources, and model or platform expense. Preserve eligibility and treatment records, pricing and contract terms, refunds, renewal outcomes, and the no AI comparator. Each component needs an owner, source extract, calculation version, and uncertainty note. Model usage establishes exposure and cost; it does not establish incremental customer willingness to pay.

Reproduce the upstream incremental gross margin first, including its counterfactual and cannibalization adjustment. Then subtract incremental sales, service, and support costs exactly once. Confirm that direct cost classifications and commercial allocations are mutually consistent. Reconcile reported expense totals and revenue to accounting control totals while keeping the causal estimate distinct from those observed financial numbers. Publish sensitivity to the counterfactual and material allocation drivers. An exact ledger amount can be combined with an uncertain attribution estimate; the resulting contribution is still uncertain. [1][2][3]

Use a waterfall from incremental revenue through direct cost and cannibalization to incremental gross margin, then through commercial and service costs to contribution. A cohort chart can show recognized contribution by months since acquisition, with observed periods separated from forecasts. Companion panels should show accepted customer outcomes, retention, complaints, human hours, and technology cost per outcome. Label currency, accounting period, organic business perimeter, allocation policy, and whether shared fixed costs remain outside the displayed subtotal.

Chapter 100 supplies the gross margin bridge; chapter 104 tests total cost per valid outcome; chapter 109 details full AI cost; chapter 111 supplies customer safeguards; and chapter 76 connects enterprise profit to total workforce input. These links prevent the contribution subtotal from being counted again as an independent savings benefit or treated as national employment evidence. A representative panel sustained across comparable periods would strengthen the larger narrative. For now, its purpose is a bounded test of whether an attributed commercial innovation captures economic value after the work needed to sell and sustain it.

A contribution margin per accepted outcome companion divides the matched contribution margin by accepted valid outcomes over the same period. This operationalization of the decision map label separates economic yield per delivered result from total incremental margin. Disclose the counterfactual, outcome quality and the commercial cost allocation used in both versions. [1]

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro and Critical Path Consulting Group (2026). The jobs that never appear: Measuring and capturing the enterprise AI productivity dividend. User provided unpublished manuscript September 2026 edition Version 2.0; Appendix A1 original measure definitions; framework source rather than independent empirical proof Verified retrieval 4 October 2026.

[2] United States Securities and Exchange Commission Division of Corporation Finance (2022 current interpretations). Non-GAAP Financial Measures. Last updated 13 December 2022; Questions 100.01 through 100.06 cover recurring expense exclusion comparability recognition principles and contribution margin labeling Verified retrieval 4 October 2026.

[3] HM Treasury and Evaluation Task Force (2026). Guidance on the Impact Evaluation of AI Interventions (HTML). Updated 15 May 2026; official counterfactual and staged evolving AI intervention evaluation guidance Verified retrieval 4 October 2026.

[4] FinOps Open Cost and Usage Specification Project (2026). FOCUS Specification 1.4. Ratified 4 June 2026; normalized technology cost and usage records support invoice reconciliation and allocation lineage but do not define commercial margin Verified retrieval 4 October 2026.

[5] Daron Acemoglu and Pascual Restrepo (2019). Automation and New Tasks: How Technology Displaces and Reinstates Labor. Journal of Economic Perspectives 33 issue 2 Spring 2019 pages 3 to 30; DOI 10.1257/jep.33.2.3; task model links displacement productivity expansion and new tasks Verified retrieval 4 October 2026.

RELATED CHAPTERS 100 · 104 · 109 · 111 · 076

CHAPTER 120

Decision latency

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Enterprise event timestamps proposed; separate workflow context from a September 2023 to October 2024 field experiment and December 2018 risk methods

Decision latency identifies the elapsed wait after a decision becomes ready, testing whether organizational bottlenecks absorb task level productivity gains while preserving necessary risk review.

The ready event and the decision clock

Decision latency is the decision timestamp minus the decision ready timestamp, reported as the median and ninetieth percentile, or P90, for a defined population of decisions. This is the formula in the supplied Critical Path report. The unit is elapsed time, such as calendar hours or business days, rather than labor minutes. The population should identify the decision type, risk tier, workflow and authorized decision owner. The ready event means that the predeclared information and required prerequisites are available for the decision to proceed. A submitted request is not necessarily ready; an undocumented claim that the reviewer is ready is not enough either. [1]

A defensible readiness rule can name the documents, validation, recommendation, options and required consultation that must be complete. The rule needs to fit the decision rather than demand perfect information indefinitely. Preserve an initial submission timestamp and the readiness timestamp separately so that a redesign cannot improve latency simply by moving waiting upstream. If the case becomes unready because new material information arrives, retain the event and reason, and declare how the clock treats it. Keep total elapsed time visible alongside any time that the process officially pauses. Otherwise a new pause category can create an apparent gain without shortening the customer’s wait.

The decision event also needs a stable meaning. It might be a recorded approval, rejection or documented choice that permits the next action. Implementation and customer delivery can occur later and belong in separate cycle time measures. A refusal can be a valid decision when the workflow requires a choice, but a timeout or automatic closure does not automatically qualify. Cases awaiting decisions at the extraction date remain important. Report their age and count rather than presenting only the quick cases that already finished. The median describes the center of completed decision waits; P90 describes their upper tail and can conceal an even longer unresolved tail.

Elapsed waiting and active review should remain distinct. A manager can spend a few minutes on a choice that waits several days in an approval queue. Another choice can consume substantial expert work while being completed promptly. Latency diagnoses the first kind of constraint and does not directly measure the second. Compare it with manager touch minutes, human work per valid unit, decision quality, exceptions and total workflow cycle time. Shortening the clock establishes a time result. A labor saving requires evidence that less total human effort was used for the same valid result.

Observed task evidence and legitimate control gates

The proposed instrument has no verified comparable twenty year national series in the sources reviewed here. Decision events are often recorded inside firms, with readiness definitions that differ by process. A national occupational employment series cannot be converted into elapsed approval time. The report's formula supplies a management measurement contract, not an observation of secular deterioration. Long organizational histories may be usable when the decision population and event definitions remain comparable; any actual historical span must be documented from those records. Publication of a new workflow measure does not establish that firms have been consistently recording it for decades.

Bounded empirical context comes from Dillon, Jaffe, Immorlica and Stanton's field experiment across 66 firms and 7,137 knowledge workers, conducted between September 2023 and October 2024. In the later half of the six month experiment, users of the integrated AI tool spent about two fewer hours per week on email. The researchers did not detect changes in the quantity or composition of tasks. Their telemetry did not measure work content or performance evaluation. This is evidence of selected task time savings, with a clear boundary: it does not estimate elapsed decision latency or show that faster information handling removed organizational approval bottlenecks. [2]

Necessary control work can place a legitimate lower bound on speed. NIST's Risk Management Framework, published in December 2018, organizes security and privacy activities including control assessment and authorization. It assigns accountability for decisions about systems and inherited controls. That framework does not prescribe a universal minimum approval delay. Its relevance is that some decisions require evidence, qualified assessment and responsible acceptance of risk. A shorter clock cannot demonstrate better productivity if the organization simply omits these prerequisites or grants permission before the evidence is adequate. The chapter uses this as a methods reference, with obligations determined by the actual workflow. [3]

Queueing theory offers a separate analytical relationship. Little's original 1961 paper relates the average number of units in a consistently defined system to their arrival rate and average time in that system under the stated conditions. This relationship can help reconcile a decision queue with elapsed waiting, but it does not convert a snapshot into a forecast or estimate labor savings. Its publication date is the age of a mathematical result, not the start of an observed enterprise latency trend. The same boundary must define queued decisions, arrivals and waiting for any application to be meaningful. [4]

Record	Actual period	Contribution
Critical Path decision latency definition	Supplied September 2026 report	Proposed ready to decision formula and median/P90
Integrated AI field experiment	September 2023 to October 2024	Selected task time savings, no decision latency estimate
NIST risk framework	December 2018 publication	Assessment and authorization methods
Little queueing relationship	1961 publication	Consistency relationship among averages, no observed trend

Sources [1] to [4]. Methods and short studies provide context rather than a national longitudinal decision latency series.

Organizational compression and the moving bottleneck

Decision latency can reveal why a faster task fails to change enterprise performance. Automation may prepare analysis, summarize a request or check routine information promptly while the completed packet still waits for the same decision owner. The task gain changes readiness; the organizational gain requires a change in what happens after readiness. A shorter observed interval can follow clearer decision rights, removal of redundant approval, better routing or sufficient reviewer capacity. These mechanisms should be named and tested separately. Their economic meaning is more concrete than a general claim that artificial intelligence made the organization faster.

Organizational labor compression is present when the enterprise accomplishes the same valid decision work with less human preparation, coordination and review, or handles more comparable decisions with the same total work. Latency can accompany that change without proving it. A queue can shrink because an extra reviewer was hired; latency improves while labor intensity may remain unchanged or rise. A smaller approval chain can reduce waiting but transfer effort to the remaining accountable manager. A fully automated routine decision can reduce both waiting and work, while difficult cases continue to require substantial judgment. Measure each mechanism inside a stable risk and complexity scope.

Consider a clearly hypothetical decision that takes four business days after readiness, including thirty minutes of active review. A routing change reduces the elapsed interval to one business day while the active review remains thirty minutes. The waiting gain is three business days, but the direct review labor saving is zero. The firm may still benefit through earlier delivery, less idle work in progress or more timely customer action. These benefits need their own observations and valuation. Counting the removed waiting days as eight hours of paid labor per day would misstate the production change and the economic destination of the gain.

The opposite combination is also possible. Automation can cut preparation and review minutes while decision latency remains fixed because the decision occurs at a weekly committee. That evidence supports a task effort change but leaves the elapsed bottleneck intact. Management can then decide whether the committee frequency, authority or risk process should change. A weekly decision schedule may be economically appropriate if cases are scarce or require coordinated review. The measure becomes useful when it reveals which constraint remains and what tradeoff a proposed redesign changes. It should not force every process toward immediate decisions regardless of consequence.

The connection to post labor remains a mechanism test within a production system. Lower human work per useful decision can demonstrate labor leverage, while shorter approval waiting can permit that capacity to reach customers and output. Neither result independently proves fewer good jobs economywide. A durable pattern across comparable workflows would strengthen enterprise evidence that information processing and organizational coordination require less labor. A growing exception burden, degraded decision quality or lost managerial accountability would weaken the interpretation even if the median clock improves.

Readiness gaming selection and privacy limits

Readiness is the most vulnerable definition. A team can declare a case ready only when the approver is about to act, producing low latency while concealing earlier delay. Another team can mark every incoming request ready and make necessary information gathering look like managerial inaction. Use objective prerequisites and record submission to readiness separately. Independently sample packets around the readiness event.

Keep the definition version and reasons for exceptions. A stable clock is more informative than a narrow target that encourages people to move timestamps rather than change the process.

The comparison population must include comparable decision types and complexity. Replacing routine approvals with automated decisions changes the remaining human queue toward harder cases. Its median may rise despite genuine overall improvement. Report routine, exceptional and high consequence decisions separately, plus the eligible total population. Cases redirected outside the measured department must remain traceable. Compare risk tiers, approval paths, workload and staffing. A concurrent comparison or phased rollout can help distinguish a process effect from seasonality or a temporary demand decline. Preserve unresolved cases so that lengthy delays do not vanish from the completed case sample.

Some waiting deliberately protects the result. A decision may depend on a cooling period, consultation, a scheduled market event or new evidence whose arrival the organization cannot control. Record the reason and responsible dependency. Show total time and any separately classified required wait; do not silently erase it. The proposed goal is timely valid judgment within the operating constraints. Removing a necessary safeguard can increase downstream reversals, losses or customer harm. Pair the distribution of latency with decision quality, overrides, incidents and the cost of correction before recognizing a financial or staffing dividend.

Monitoring should preserve a useful event record without turning it into an individual surveillance score. The necessary fields usually concern workflow events, role and case characteristics rather than continuous screen observation or message content. Aggregate reporting can identify an approval bottleneck without ranking named employees on incomparable cases. Restrict access to sensitive decision material and preserve only the data needed for the stated analysis. A low latency target that discourages escalation or rewards superficial approval can distort behavior. Review whether the measure changed the work or merely induced rushed decisions and selective logging.

Latency charts and reproducible decision records

Plot monthly median and P90 ready to decision time for each declared decision family and risk tier. Add the count of completed decisions and the count and age of unresolved decisions. A companion chart should separate submission to readiness, readiness to decision and decision to valid implementation. These intervals reveal whether a gain moved waiting elsewhere. Use the same calendar or business time convention throughout, and mark holidays, definition changes, reviewer staffing and workflow releases.

The reproducible record needs a pseudonymous case identifier, submission and readiness events, prerequisite version, risk tier, complexity indicators, approval path, decision timestamp, outcome and later reversal or incident status. Retain pauses, reassignment, reopened decisions and excluded cases with reasons. Audit timestamp ordering and missing events against source systems. Preserve the extraction date and the maturity window used for follow up. The calculation should return the declared latency for each eligible decision and then aggregate the distribution, rather than subtracting average timestamps that belong to different populations.

Review the results with cycle time, backlog days, manager coordination load, throughput, escalation, customer outcomes and risk incidents. An intervention can merit expansion when useful decisions occur sooner, total human effort falls or capacity serves more demand, and operating limits hold. A wait reduction

can also be valuable while leaving staffing unchanged, provided its benefit is identified honestly. This proposed measure makes the conversion from task capability to organizational performance testable. The available short field study and established methods inform that test without supplying an invented twenty year national latency trend.

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro, Critical Path Consulting Group (2026). The Jobs That Never Appear: Measuring and Capturing the Enterprise AI Productivity Dividend. Unpublished supplied manuscript, September 2026 report, version 2, Appendix A2 workflow diagnostics; original metric definition rather than independent evidence of a secular macroeconomic trend.

[2] Eleanor Wiske Dillon, Sonia Jaffe, Nicole Immorlica and Christopher T Stanton (2025). Shifting Work Patterns with Generative AI. Original field experiment, version 4 submitted 13 November 2025; PDF dated 17 November 2025.66 firms, 7,137 workers; experimentation September 2023–October 2024; telemetry time and activity, no decision latency or output quality measurement; verified 4 October 2026.

[3] Joint Task Force, National Institute of Standards and Technology (2018). Risk Management Framework for Information Systems and Organizations: A System Life Cycle Approach for Security and Privacy. NIST SP 800-37 Revision 2, final 20 December 2018; assessment, authorization and accountability methods, not elapsed decision observations; verified 4 October 2026.

[4] John D C Little (1961). A Proof for the Queuing Formula: L = λW. Original Operations Research 9(3)383–387, university hosted copy; definitions and consistency relationship under stated conditions; publication age is not a longitudinal dataset; verified 4 October 2026.

RELATED CHAPTERS 074 · 077 · 101 · 103 · 104 · 105 · 106 · 107 · 108 · 110 · 111 · 112 · 113 · 114 · 121 · 122

CHAPTER 121

Manager coordination load

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Enterprise touch time sampling proposed; separate September 2023 to October 2024 field experiment and ATUS 2003 to 2025 measurement context

Manager touch minutes per valid output test whether task automation reduces organizational coordination effort or transfers that effort into managerial review routing and exception work.

Touch minutes and a valid output denominator

Manager coordination load is manager touch minutes divided by valid outputs, the formula in the supplied Critical Path report. The numerator measures active managerial effort assigned to the declared workflow, such as routing, handoffs, clarification, approval, exception handling and coordination across teams. The denominator counts accepted valid outputs from the same scope and period. Units are manager minutes per valid outcome. Define which managerial roles and purchased supervisory work are included. Report total minutes and output volume beside the ratio so that a lower rate can be distinguished from lower workload, a changed managerial perimeter or a change in which outputs qualify. [1]

Touch time means active effort, not the elapsed duration of a case or approval wait. A manager may spend ten minutes deciding a case that has waited several days; those ten minutes enter this numerator while the days belong in decision latency. Define the treatment of meetings, messages, interruptions and concurrent activity. For a meeting involving several managers, the labor input is the sum of their relevant person minutes, not merely the meeting’s duration. Allocate shared time across workflows using a transparent rule. Keep unallocated time visible rather than placing it wherever the ratio appears most favorable.

The valid output must represent the process result. A reviewed draft, answered message or status update may be an intermediate event rather than the final outcome. Coordination that supports several completed cases should be allocated consistently, with reasonable treatment of work in progress and later rework. Changes in complexity can change the amount of managerial effort needed per case. Report the original case count and, where useful, a separate complexity adjusted rate using weights fixed before the comparison. A new weighting scheme should not silently replace the historical denominator and create an apparent improvement.

Coaching, mentoring, staffing, strategy and capability development need explicit boundaries. Some may support the workflow broadly while others are distinct managerial outcomes. Excluding them is acceptable for a narrowly named coordination metric if their time and results appear elsewhere. The enterprise labor account must still include economically relevant managerial work. A reduction in coordination minutes that eliminates mentoring or weakens succession can produce a future capability cost. This measure therefore belongs beside manager health, handoffs, decision quality, escalation and workforce outcomes. It measures a particular organizational burden rather than declaring that every managerial minute is unnecessary.

Primary evidence without an invented secular series

Dillon, Jaffe, Immorlica and Stanton's original field experiment covers 66 firms and 7,137 knowledge workers, with experimentation between September 2023 and October 2024. Its updated working paper reports selected email time savings but no detected shifts in task quantity or composition. Average meeting time did not change significantly. The data observe digital time and activities rather than work content or performance. The study does not estimate manager minutes per valid output. It provides bounded evidence that reducing individual information handling time can coexist with limited change in activities that require organizational coordination. [2]

Bloom, Garicano, Sadun and Van Reenen's original firm study, published in 2014, distinguishes information technology from communication technology. In their evidence, better information access is associated with greater autonomy, while easier communication can move decisions upward in the hierarchy. The study covers firms in the United States and seven European countries and examines autonomy and spans of control. These organizational results do not supply a time series of manager coordination minutes. They are useful context for a mechanism in which technology can either remove the need for escalation or make escalation to managers easier and more frequent. [3]

The American Time Use Survey offers a genuine national measurement history from 2003 through 2025. Its broad time use records can describe work, location and other activities, but they do not provide this enterprise metric's matched valid output denominator. A national estimate of working time for managers cannot be divided by unrelated company output to create a coordination load series. The survey's duration exceeds twenty years while the proposed workflow ratio lacks that verified history. Keep the two statements distinct. No comparable national secular trend in manager touch minutes per valid output is claimed here. [4]

Measurement itself has a risk boundary. NIST's January 2020 Privacy Framework treats privacy risk as part of enterprise risk management and supports consideration of consequences for individuals. It is a voluntary methods reference, not permission for unlimited employee observation. A manager time study can often use declared sampling, broad categories and aggregated results without reading message content or recording continuous screens. The historical evidence therefore supplies organizational hypotheses, short experiment results, national time use context and a privacy framework. The enterprise must still produce the specific numerator, denominator and comparison needed to evaluate its coordination change. [5]

Sources [2] to [5]. These records support measurement design while retaining their distinct populations and outcomes.

Evidence	Actual span or publication	Boundary
Integrated AI field experiment	September 2023–October 2024; working paper 2025	Digital work patterns, not manager minutes per valid outcome
Information and communication firm study	Published2014	Autonomy and hierarchy evidence, no coordination time series
American Time Use Survey	2003–2025 records	Broad national time use without enterprise valid outputs
NIST Privacy Framework version 1.0	January 2020 publication	Privacy risk methods, not authorization of surveillance

Coordination as a limit on labor compression

The coordination ratio tests a specific failure of aggregation. Automation can accelerate drafting, analysis or routine case handling, creating more material that managers must integrate and approve. If managerial capacity stays fixed, the organization may develop an approval queue, more interruptions or weaker oversight. Direct production workers can appear more productive while total human work remains unchanged or rises. Measuring manager effort inside the production perimeter shows whether the task gain reduced total labor intensity or relocated work to another role. Decision latency shows a related elapsed consequence, while touch minutes show the active labor required.

Consider a clearly hypothetical team producing one hundred valid outcomes per week. Managers spend six hundred minutes coordinating those outcomes, giving six minutes per outcome. After redesign, the team produces one hundred fifty valid outcomes with the same six hundred coordination minutes, giving four minutes per outcome. Coordination intensity falls by one third while absolute managerial effort stays unchanged. This supports a capacity scaling interpretation; it does not demonstrate that a manager’s job disappeared or that payroll cost fell. If the additional outcomes are unaccepted drafts, the valid output condition fails and the arithmetic no longer supports the claimed gain.

Technology can lower coordination demand by making status visible, routing cases correctly, standardizing prerequisites and providing information that workers need to decide locally. It can also raise demand by generating more candidate outputs, introducing new exceptions or making it easy to seek approval for every small choice. These pathways explain why the count of AI uses or generated messages is insufficient. The firm should name which coordination tasks changed and test whether their frequency or duration moved. A reduced approval count can be meaningful when authority is transferred with adequate information and accountability; it can be harmful when review is simply bypassed.

A smaller managerial layer can reduce overhead while increasing load on the managers who remain. Report per output effort, total effort and effort per manager together with span of control and the complexity of reports. Declining minutes per output can coexist with longer managerial workweeks when output expands faster than labor. That result may show production leverage and an unsustainable staffing design at the same time. The post labor connection is the reduced managerial work required for comparable useful production. Claims about displaced roles or improved worker welfare require their own evidence. The coordination ratio helps distinguish those questions rather than forcing them into one favorable number.

Sampling coverage privacy and interpretive limits

Time sampling should capture ordinary work, peak periods, difficult cases and interruptions. Short recall surveys can miss fragmented coordination, while continuous activity tracking can overstate precision and intrude on privacy. A structured diary or intermittent random prompt can record broad task category, workflow and approximate duration with less detail than message capture. Explain the sampling window, response rate and missing coverage. Do not extrapolate a convenient quiet week to the entire year without checking workload and seasonality. Participation in measurement can itself change behavior, so compare source patterns and discuss the plausible direction of that effect.

Digital activity is a proxy requiring validation. An open meeting window does not prove that every minute was relevant coordination; a brief message can depend on substantial preparation outside the observed

application. Managers may coordinate in conversation, travel or a separate platform. Preserve the gap between observed app time and estimated active effort. Sample interviews or case reviews can test whether categories fit actual work without recording private content. The NIST privacy framework supports assessing the risks of the data process itself; the enterprise should limit collection, access and retention to the stated measurement purpose. [5]

Changes in case mix and denominator maturity can distort comparisons. A rollout may remove easy cases and leave managers with a smaller number of harder exceptions. The exception workflow's ratio can increase while the eligible end to end process uses less managerial labor overall. Report both populations and use preintervention complexity characteristics where possible. Preserve time associated with rework and outputs accepted later. A ratio that drops because rejected cases were removed from the time account conceals effort. A ratio that rises during temporary training does not automatically describe the stable operating model.

Interpret gains with outcomes and workload. Lower touch time accompanied by more incidents, poorer decisions or lost mentoring weakens the economic claim. More coordination time can be a worthwhile investment when it avoids expensive errors or builds capability. An individual performance ranking is inappropriate when assignments differ in risk, complexity and responsibility. Use this instrument to diagnose the production system and evaluate a defined redesign. Stronger evidence includes repeated representative samples, a credible comparison, stable validity rules and independent reconciliation of effort and results. The absence of a verified national history keeps its classification proposed rather than secular evidence.

Reproducing the coordination account

Chart manager minutes per valid output alongside total coordination minutes, valid output count and managerial staffing. Break the numerator into routing, approval, exception handling and other declared categories. Show sample coverage and uncertainty where time is estimated. A companion panel can display decision latency, handoffs and escalation rates. Mark training, role changes, demand peaks and releases. Keep any complexity adjusted ratio separate from the original count based calculation.

The calculation record should contain pseudonymous sampled participants or roles, sampling period, task category, workflow, active duration, allocation rule, output validity and maturity. Reconcile estimated total minutes with the coverage and expansion weights actually used. Retain missing responses and unallocated work. Preserve the sampled source extract and definition version while controlling access to sensitive personnel information. A reader should be able to reconstruct numerator and denominator without needing a complete transcript of managerial conversations.

Review the ratio with human work per valid unit, total throughput, capacity realization, manager health, customer outcomes, risk incidents and resilience. A useful result identifies which coordination work became unnecessary, which became more effective and which moved elsewhere. Financial recognition follows the demonstrated destination of capacity rather than a salary conversion of every sampled minute. This proposed measure supplies a missing organizational layer in the labor leverage account. The short empirical studies motivate its use; the enterprise's own valid output and touch time record must establish the actual gain.

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro, Critical Path Consulting Group (2026). The Jobs That Never Appear: Measuring and Capturing the Enterprise AI Productivity Dividend. Unpublished supplied manuscript, September 2026 report, version 2, Appendix A2 workflow diagnostics; original metric definition rather than independent evidence of a secular macroeconomic trend.

[2] Eleanor Wiske Dillon, Sonia Jaffe, Nicole Immorlica and Christopher T Stanton (2025). Shifting Work Patterns with Generative AI. Original updated field experiment; version 4 submitted 13 November 2025; 66 firms 7,137 workers, experimentation September 2023–October 2024; digital time/activity rather than managerial valid output productivity; verified 4 October 2026.

[3] Nicholas Bloom, Luis Garicano, Raffaella Sadun and John Van Reenen (2014). The Distinct Effects of Information Technology and Communication Technology on Firm Organization. Original Management Science 60(12)2859–2885, Harvard author repository; autonomy and span of control evidence, not manager touch time series; verified 4 October 2026.

[4] U S Bureau of Labor Statistics (Current methods retrieved 2026). ATUS Overview. Official time use overview updated 25 June 2026; records 2003–2025; broad time use lacks a matched enterprise valid output denominator; verified 4 October 2026.

[5] National Institute of Standards and Technology (2020). NIST Privacy Framework: A Tool for Improving Privacy through Enterprise Risk Management, Version 1.0. 16 January 2020 voluntary framework; privacy risk consideration for measurement systems; version explicitly identified, no claim it is a new national outcome dataset; verified 4 October 2026.

RELATED CHAPTERS 074 · 075 · 101 · 103 · 104 · 105 · 106 · 107 · 108 · 110 · 111 · 112 · 113 · 114 · 120 · 122

CHAPTER 122

Backlog days

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Enterprise workload stock and daily valid throughput proposed; separate original queueing methods 1961 and customer support rollout mainly 2020–2021 published 2025

Backlog days express open eligible work in units of observed daily valid throughput, testing whether released capacity actually covers demand rather than allowing unresolved work to accumulate.

Eligible work and the days of throughput formula

Backlog days equal open eligible workload divided by average daily valid throughput, the formula in the supplied Critical Path report. The numerator is a stock measured at a declared point in time. The denominator is a flow rate measured over a declared recent window, using the same work unit and process boundary. The result expresses how many days of that observed valid throughput the open workload represents. It is an operational coverage ratio, not automatically the expected waiting time for a particular case or a forecast of when the queue will disappear. Those interpretations need additional conditions about arrivals, priorities, complexity and capacity. [1]

Open eligible work means work that falls inside the workflow's declared service population and has not reached the valid completion event. Eligibility should be determined by a stable rule, such as product, service, case type or contractual obligation. A blocked eligible case remains part of open workload unless the rule explicitly defines a different boundary. Preserve blocked and ready statuses so that work awaiting information, approval or a legitimate hold is visible. Prospective opportunities that have not entered the eligible service population belong in a separate pipeline. Excluding difficult cases after deployment can reduce backlog without demonstrating additional capacity.

Valid throughput counts accepted outcomes during the denominator window. Closing, canceling, transferring or duplicating a record does not automatically produce one valid outcome. Reopened work needs a declared rule that avoids counting the same unresolved customer need repeatedly as completed. Use consistent units: cases divided by valid cases per day, or predefined workload equivalents divided by valid equivalents per day. Specify business days or calendar days and preserve nonoperating days consistently. When throughput is zero, report the ratio as undefined with the stock visible; replacing it with zero would reverse its meaning.

The averaging window matters. A recent surge can raise throughput temporarily, while a holiday or outage can lower it. Choose a window that represents the intended monitoring question and show both the window and actual daily counts. Complexity weights can help compare a mixed queue, but preserve the raw counts and fix the weights before judging the intervention. A single backlog ratio can conceal old high priority work while many easy new cases are completed. Pair it with case age, priority, complexity, blocked work and the applicable service commitments.

Queueing methods and bounded operational evidence

Little's original 1961 paper establishes a relationship between the average number of units in a consistently defined queueing system, their arrival rate and their average time in that system under the stated conditions. This gives an analytical basis for linking work in progress, flow and elapsed time. The proposed backlog days formula instead uses a current open workload stock and a recent average valid completion rate. Those are not necessarily the long run averages required for a queueing interpretation. In a rapidly growing or shrinking queue, the ratio remains a descriptive workload coverage measure and should not be presented as an exact mean customer wait. [2]

Useful modern empirical context comes from Brynjolfsson, Li and Raymond's original customer support study, published in 2025. Across 5,172 agents, AI assistance raised issues resolved per hour by 15 percent on average during a rollout occurring mainly in fall 2020 and winter 2021. This is a measured workflow productivity result in one firm. It does not establish how a national backlog series changed, or how every organization would adjust staffing and demand. The distinction matters because higher resolution capacity can reduce a queue, accommodate more incoming work or permit a different workforce plan. The backlog record must identify which outcome actually occurred. [3]

GAO's December 2019 Assessing Data Reliability guide treats accuracy, completeness and applicability to the purpose as essential properties of evidence. For this proposed metric, the same principles apply to the stock and the flow. Missing open cases, duplicate records or a completion code that no longer means valid service can bias the ratio. Reconciliation to source records and examination of the measurement purpose are necessary before interpreting apparent improvement. The guide supplies a data assessment method; it does not measure enterprise automation backlogs or imply that their national level has deteriorated. [4]

The sources verified here therefore offer established queueing analysis, a short original production study and data reliability methods. They do not supply a comparable twenty year national panel of eligible workload divided by valid throughput. A firm may have a long operational history, but changes in products, case systems and service definitions can break comparability. Preserve actual historical windows rather than extending the record from the age of queueing theory. Backlog days remains a proposed enterprise instrument that tests demand coverage within the broader labor leverage account.

Record	Verified date or span	What remains unmeasured
Critical Path backlog days formula	Supplied September 2026 manuscript	Enterprise workload and valid completion observations
Little queueing result	1961 original publication	Current snapshot behavior and automation attribution
Original support productivity study	Rollout mainly 2020–2021; publication2025	Comparable national backlog and staffing response
GAO data reliability guide	16 December 2019 publication	Actual workflow stock and valid throughput history

Sources [1] to [4]. Publication chronology is not a reconstructed longitudinal backlog dataset.

Capacity absorption and the stock flow relationship

Backlog days help determine whether task savings reach demand. If a process requires less human effort per valid unit but open eligible work continues to accumulate, the organization may still lack sufficient end to end capacity. A downstream approval, review or delivery step can remain constrained. Alternatively, demand may be growing faster than productive capacity. The ratio and its underlying counts can separate these possibilities when incoming workload, valid completions, staffing and complexity are observed together. The economic result is the useful output delivered, rather than a nominal sum of minutes saved on tasks that leave the service queue unchanged.

Consider a clearly hypothetical queue containing five hundred eligible cases with average valid throughput of one hundred cases per business day. The ratio is five backlog days. If no new work arrives and comparable capacity holds, that stock corresponds to five days of processing. If eighty additional eligible cases arrive each day, net stock reduction is only twenty cases per day, so clearing the original stock under those simplified conditions takes twenty five business days. The ratio remains five days of throughput coverage; it is not the twenty five day net clearance forecast. The example shows why arrival flow must accompany interpretation.

The workload account can be reconciled through beginning open work, eligible arrivals, reopened work, valid completions, justified cancellations and transfers across the boundary. Maintain separate entries for every disposition. A large administrative cleanup can lower the stock without producing more customer outcomes, while fixing duplicate records can legitimately improve the accuracy of the account. A reduced arrival rate may reflect prevention of recurring problems, lost customers or suppressed access to the service. Each has a different economic meaning. Match the change to its mechanism before converting a lower backlog into evidence of automation capacity.

Organizational labor compression is more credible when the same total human work supports more comparable valid output and the service queue remains controlled as demand grows. Backlog days add that demand coverage test to human work per valid unit and end to end throughput. They can also reveal a hidden transfer of cost: lower staffing expense accompanied by older unserved work may defer rather than eliminate human effort. A deliberate low priority backlog can be efficient when its service consequences and option value are explicit. The ratio informs that choice and does not imply that every open case should be completed immediately.

Complexity required waiting and monitoring limitations

Case mix is a central limitation. A process can finish many simple cases while accumulating a smaller number of unusually demanding ones. Raw backlog days may improve even as the remaining labor requirement rises. Separate priority and complexity classes, retaining the same preintervention classification where possible. A fixed workload equivalent can make the stock and throughput more comparable, but the weights must be justified and tested. Do not use realized postintervention effort as the sole weight when the intervention itself changes effort. That would let the measurement absorb the very productivity effect it is meant to identify.

Required waiting should be visible rather than treated as inefficiency by default. A case may await external evidence, a customer action, qualified review or an appropriate risk hold. Separate actionable work from blocked eligible work and retain both within the declared coverage report. Show why work is blocked, who

can resolve the dependency and how old it is. A faster automated response does not create valid throughput if the underlying obligation remains incomplete. Service level targets and risk tiers should determine which aged cases need action, with severe unresolved consequences displayed separately from the average ratio.

Denominator changes can manufacture success. A very short throughput window during a one time clearance campaign produces an unusually favorable ratio. Counting cancellations as completions or counting intermediate drafts increases apparent flow. Removing transferred cases from one team without adding them to the receiving team erases workload from the enterprise view. Freeze the rules, retain original disposition events and reconcile organizational transfers. Compare demand, service access, abandonment and customer outcomes. A queue can shrink because people gave up; that result weakens a service productivity claim even when the stock arithmetic is correct.

Collect the operational events needed to verify work while avoiding unnecessary personnel or customer monitoring. A backlog account usually requires pseudonymous case identity, status, dates, scope and output validity, not continuous screen capture or unrestricted message content. Restrict access to sensitive descriptions and retain the data for the stated purpose. Daily reports can diagnose overload without ranking workers on incomparable cases. Source system completeness and validation matter more than a highly precise looking chart. Stronger evidence includes stable eligibility, independent validity checks, representative throughput windows and repeated performance through demand peaks rather than a single favorable pilot.

Backlog charts and reproduction instructions

Chart backlog days with open eligible workload, eligible arrivals and daily valid throughput in adjacent panels. Add an age distribution and service commitment breakdown for the open stock. Distinguish ready, blocked and deliberately deferred work. Mark changes in staffing, demand, eligibility, complexity weights and completion rules. Label the snapshot date, throughput averaging window and business or calendar day convention. Avoid a trend line that bridges an unverified system migration or a changed validity definition.

The reproducible extract should retain pseudonymous cases, arrival date, eligibility rule, priority, complexity, status transitions, blocked reasons, completion validation and reopened or transferred work. Reconcile the beginning and ending stocks through recorded movements. Compute valid throughput over the declared denominator window, then divide the current eligible stock using matching units. Preserve zero throughput periods, exclusions and missing statuses. A reviewer should be able to reproduce both components and see whether a favorable ratio comes from lower stock, higher valid flow or an administrative change.

Review this instrument with cycle time, decision latency, manager coordination load, first pass yield, rework, escalation, capacity realization, customer outcomes and workforce health. An intervention supports a capacity claim when demand is served with less total human work and the stock remains inside justified service limits. Rising backlog can prompt routing, staffing or bottleneck changes without automatically disproving the underlying task gain. The proposed ratio makes that conversion visible. Its mathematical and empirical context is useful, while its actual enterprise history must come from the organization’s own eligible and valid work records.

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro, Critical Path Consulting Group (2026). The Jobs That Never Appear: Measuring and Capturing the Enterprise AI Productivity Dividend. Unpublished supplied manuscript, September 2026 report, version 2, Appendix A2 workflow diagnostics; original metric definition rather than independent evidence of a secular macroeconomic trend.

[2] John D C Little (1961). A Proof for the Queuing Formula: L = λW. Original Operations Research 9(3)383–387, university hosted original copy; average work in system, arrival rate and elapsed time with consistent system boundaries; snapshot backlog/throughput ratio differs from long run relationship; verified 4 October 2026.

[3] Erik Brynjolfsson, Danielle Li and Lindsey Raymond (2025). Generative AI at Work. Original QJE 140(2)889–942; 5,172 agents; rollout mainly fall 2020/winter 2021; 15% average issues resolved per hour gain; no comparable national backlog trend inferred; verified 4 October 2026.

[4] U S Government Accountability Office (2019). Assessing Data Reliability (Supersedes GAO-09-680G). GAO-20-283G published and released 16 December 2019; accuracy, completeness and applicability to audit purpose; methods reference rather than a measured automation workload series; verified 4 October 2026.

RELATED CHAPTERS 074 · 077 · 101 · 103 · 104 · 105 · 106 · 107 · 108 · 110 · 111 · 112 · 113 · 114 · 120 · 121

CHAPTER 123

Time to sustained value

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Measurement framework proposed in 2026 with earlier schedule and statistical methods

Elapsed time from a funded decision to sustained evidenced value tests implementation and realization speed, while unfinished and retired initiatives must remain visible to avoid a success-only timing series.

Funding date and sustained evidence date

Time to sustained value measures the elapsed interval between the funded decision and achievement of a sustained evidence stage. The Critical Path manuscript gives the formula as the date that stage is achieved minus the funded-decision date. The unit is calendar days or months per initiative. Declare the clock convention before collecting observations. This is a proposed enterprise measure in the 2026 framework, with no verified national series meeting the twenty year secular criterion. Its contribution is to distinguish technical deployment from a durable operating result. [1]

The starting event should identify a real resource commitment, an accountable business owner and the initiative's defined production boundary. A purchasing signature, approved business case, initial budget release and start of implementation may fall on different days. Choose one event consistently and retain the other dates as milestones. If the clock starts only when a successful system enters production, the measure excludes the costly work of building and integrating it. Conversely, preliminary unfunded exploration should have a separate clock rather than being silently combined with committed implementation.

The ending event requires a preset evidence contract. Specify the result to sustain, its minimum magnitude, the observation horizon, acceptable uncertainty and relevant guardrails. A workflow might qualify after a declared period of comparable human work per accepted outcome, validated capacity disposition and a finance-reconciled economic effect. A service improvement can qualify under an explicitly nonfinancial objective, but it should retain that label. A favorable task benchmark, license adoption or a manager's forecast does not meet a financial realization condition simply because it arrives quickly. [1]

Sustained value is a state of the measured operating system. Evidence should cover remaining review, exceptions, supplier work and error correction, together with output validity and the actual destination of released capacity. Preserve the date the underlying criterion was met and the later date reviewers approved the evidence. Their difference measures verification delay. Do not backdate achievement to a brief favorable period when durability was established only after additional observations.

Changes to scope require versioned records. Expanding from one team to a business unit can create a second scaling clock linked to the original initiative. A project restart should preserve the original funded date, earlier spending and stop reason. Resetting the clock whenever implementation proves difficult produces an apparently faster portfolio by deleting the time that decision makers most need to understand.

Methods history and an illustrative timeline

The available source record supports measurement methods rather than an observed secular acceleration in value realization. GAO published its Schedule Assessment Guide on 22 December 2015. The guide links reliable schedules, approved plans, schedule risk and the cost consequences of delay. Its relevance is that elapsed time belongs alongside expenditure and operating milestones. The publication does not estimate how long enterprise automation takes to produce sustained value. Its date cannot serve as the first observation of such a series. [3]

HM Treasury and the Evaluation Task Force updated their AI impact evaluation guidance on 15 May 2026. The guidance calls for early baselines, clearly stated comparisons and evaluation throughout evolving deployment. An intervention can change while evidence is collected, requiring the analyst to retain what was evaluated at each stage. These principles help define a defensible achievement event, but the publication supplies no economywide time-to-value distribution. Its case studies are explicitly hypothetical and should remain separate from company observations. [2]

Consider a wholly hypothetical initiative funded on 1 January 2026. A technical milestone occurs on 1 March, live workflow operation begins on 1 April, and a capacity owner approves a disposition on 1 May. A predefined sustained-value condition is established by 30 September. Using ordinary date subtraction, the final interval is 272 days. Recording only the 90 days to initial live operation would answer a different question. Neither interval is an observed national or company result.

The example also shows why a set of milestone durations is more informative than one headline number. Technical readiness can arrive before operating acceptance, and operating acceptance can arrive before finance validates a continuing result. A clear delay after workflow deployment may reflect missing budget action, weak demand, uncertain attribution or a legitimate need to observe outcomes. The timing record can locate that problem without presuming its cause.

Time-to-event methods provide a further analytical foundation. NIST's statistical handbook explains that a fixed observation window can end before the event occurs, creating right-censored data. For this proposed application, the event is qualifying value rather than equipment failure. The statistical analogy does not establish an enterprise result; it explains why an unfinished initiative's observed age must be retained. A duration table restricted to completed successes otherwise hides the longest unresolved cases. [4]

Hypothetical event	Date	Days since funding
Funded decision	1 January 2026	0
Technical milestone	1 March 2026	59
Live workflow	1 April 2026	90
Capacity disposition approved	1 May 2026	120
Sustained condition achieved	30 September 2026	272

Illustrative dates and arithmetic only; no observed company or national time series

Implementation lags and labor compression

This metric identifies the interval over which a potential production improvement becomes an organizational result. An automated task can become faster immediately while staffing commitments, output targets, vendor contracts and service practices remain unchanged. Value realization depends on decisions around those complementary resources. A shorter technical development cycle does not guarantee that the firm can absorb more useful output with less total human work. The timing contract should therefore follow the causal chain from the workflow into a documented enterprise outcome.

The economic role of complementary investment helps explain those lags. Brynjolfsson, Rock and Syverson's 2021 Productivity J-Curve paper models how general purpose technologies require intangible organizational investment and how incomplete measurement can obscure the timing of productivity gains. This supports a reason to observe implementation and realization separately; it does not predict a fixed waiting period or demonstrate that every delayed project will eventually pay off. The paper's model is broader than contemporary generative AI. [5]

For a post labor interpretation, timing becomes useful when combined with the level and persistence of labor required per valid output. Repeated initiatives that achieve meaningful production gains, convert released work into explicit destinations and sustain those gains within an observable horizon reveal an implementation channel for labor compression. Their value can appear as demand absorbed without proportional hiring, lower existing paid work, new products or better service. Those destinations have different implications for job availability and worker income.

A faster qualifying event can also arise without any reduction in human work. Better demand forecasts, a price change or a product redesign could improve the selected financial result. Conversely, automation that saves labor can take longer to realize value because the firm invests the capacity in service quality or resilience. Time itself has no technological attribution. The analyst needs the mechanism, comparison and labor record to determine what the interval describes.

Implementation work is part of the production boundary. Data preparation, training, integration, supervision and process redesign use people and resources. A firm can employ more labor temporarily while creating a system that needs less recurring work later. Compare the implementation burden, recurring labor trajectory and achieved output separately. A long-run record should include unsuccessful implementations and renewed hiring as well as successful compression, because otherwise the observed duration becomes a selection rule that favors the thesis.

Selection risk and legitimate longer horizons

A success-only median is the central measurement risk. Suppose a hypothetical cohort contains ten funded initiatives. Four achieve qualifying value quickly, while six remain unresolved at the cutoff. The median of the four successes describes those successes alone. It cannot be called the cohort's median time to value. If fewer than half the cohort has achieved the event, an event-time median may not yet be estimable. Publish the achieved fraction and the unresolved ages so a short reported duration cannot conceal a low probability of realization.

Retirement is a separate observed outcome. A well-evidenced stop can be a good capital allocation decision, but it is not a qualifying value event under a criterion requiring sustained production benefits. Keep the retirement date and reason. For a time-to-value analysis, retirement prevents that initiative from reaching the event in its present form; treating it as ordinary incomplete follow up would obscure this competing outcome. Report value achievement, retirement and continued work separately before applying statistical models. [4]

Comparability also requires initiative type and scale. A bounded administrative workflow, a regulated decision system and a replacement of shared enterprise infrastructure have different dependencies and observation needs. Cohort comparisons should hold business scope, risk tier, benefit objective and required persistence reasonably constant. Longer measurement of rare severe incidents may be necessary even when common output measures improve rapidly. The metric should expose that requirement rather than reward a shorter, less meaningful evidence window.

Preset criteria reduce retrospective convenience. Changing the benefit threshold downward, shortening the persistence horizon or excluding difficult output types can manufacture earlier achievement. Such changes may be justified by new information, but both the original and revised rule should remain visible. Report whether the initiative would qualify under the original contract. A finance-approved milestone should retain the evidence available on its approval date and subsequent reversals.

Time should also be read with benefit magnitude and total cost. A small improvement achieved in a month can be less valuable than a durable material improvement achieved in a year. A project can produce an early gain followed by escalating support cost or customer harm. For decision purposes, retain the value trajectory after initial achievement, full cost and guardrail status. A shorter interval strengthens the implementation case only when the measured outcome remains credible and worth the resources committed.

An elapsed-time comparison can also lose information when review meetings occur only at fixed intervals. If value qualifies between monthly reviews, the precise event may be known only to lie within that interval. Preserve the bounds instead of assigning a convenient day without evidence. Where observed conditions are volatile, require the specified persistence interval to restart after a material failure and disclose the interruption. A current qualification rate and the dates of first and latest qualification together can distinguish durable operation from an early result that later disappeared.

Cohort charts and a reproducible event register

Build an initiative event register with a permanent identifier, funded-decision date, initial scope, business owner, technical and workflow milestones, capacity destination, sustained-value contract, achievement date, verification date and stop or redesign events. Retain the budget and cost perimeter, intervention versions, underlying output records and guardrail findings. A monthly frozen extract should show what was known at that time; later corrections should have an audit trail. [1, 3]

Plot cohorts by funding quarter, displaying the fractions that reach sustained value, retire and remain unresolved at successive elapsed months. A separate duration distribution can describe completed achievements, labeled accordingly. If using an event-time model, state the censoring and retirement treatment. Show sample size and observation cutoff. Compare like domains and risk tiers; do not connect a

recent cohort observed for three months directly with an older cohort observed for two years as though their opportunity to qualify were equal.

A milestone chart can show time spent in technical development, live workflow validation, capacity realization and financial confirmation. Preserve parallel activities rather than sum overlapping intervals into an inflated total. Pair timing with benefit magnitude, total human work per accepted outcome, hiring avoidance or actual expense reduction, complete AI cost and unresolved guardrails. Distinguish a planned timeline from actual dated events.

The resulting record supports action on deployment bottlenecks, missing operating decisions and unproductive capital commitments. It also gives the broader post labor inquiry a disciplined mechanism record. Only a sufficiently long, consistently defined panel could establish secular change in realization speed. The 2026 proposal supplies a way to begin or reconstruct that panel; it does not supply the missing twenty years of observations.

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro and Critical Path Consulting Group (2026). The jobs that never appear Measuring and capturing the enterprise AI productivity dividend. Unpublished supplied manuscript; September 2026 version 2.0; Appendix A2 and executive decision maps. Exact proposed KPI definition, without independent empirical longitudinal evidence or a public URL. Verified retrieval date 4 October 2026.

[2] HM Treasury and Evaluation Task Force (2026). Guidance on the Impact Evaluation of AI Interventions HTML. Updated 15 May 2026; sections 2.1 to 2.4 baseline counterfactual and evaluation of evolving deployments; hypothetical case studies are not observed enterprise results; verified retrieval date 4 October 2026

[3] U S Government Accountability Office (2015). GAO Schedule Assessment Guide Best Practices for Project Schedules. GAO16-89G published and publicly released 22 December 2015; approved baseline scheduling and schedule risk methods rather than observed enterprise AI durations; verified retrieval 4 October 2026

[4] National Institute of Standards and Technology (Undated handbook page). Engineering Statistics Handbook Section 8 1 3 1 Censoring. Original statistical methods page; right censoring interval observations and competing event distinctions; application to benefit achievement is explicitly proposed; verified retrieval 4 October 2026

[5] Erik Brynjolfsson Daniel Rock and Chad Syverson (2021). The Productivity J Curve How Intangibles Complement General Purpose Technologies. American Economic Journal Macroeconomics 13 issue 1 January 2021 pages 333 to 372; complementary intangible investment model rather than firm time-to-value dataset; verified retrieval 4 October 2026

RELATED CHAPTERS 057 · 077 · 101 · 109 · 110 · 124 · 125 · 126

CHAPTER 124

Initiative conversion and retirement rates

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Portfolio measurement proposal in 2026 with earlier technology readiness and iterative evaluation methods

An evidence-qualified scaling rate and a documented scale-or-retire decision rate measure different portfolio outcomes and require a fixed mature cohort rather than a count of surviving pilots.

Conversion and documented retirement denominators

Initiative conversion and retirement rates measure how a funded portfolio progresses into sustained use or an evidenced stop. The Critical Path manuscript explicitly defines its Scaled-or-Retired Ratio as initiatives scaled with sustained evidence plus initiatives retired with a documented decision, divided by mature initiatives due for decision. Multiply by 100 to express a percentage. A high result indicates that due decisions were resolved in the prescribed ways. It does not establish that many initiatives created production value. [1]

The executive decision map separately names Portfolio Conversion Rate without printing an exact formula. This chapter operationalizes that companion as initiatives scaled with sustained evidence divided by the same mature initiatives due for decision. It is an explicitly proposed convention, rather than a quoted original equation. Its numerator includes successful scaling and excludes retirement. Using the common denominator makes the distinction visible: the scale-or-retire ratio measures decision closure, while this conversion rate measures evidence-qualified progression into sustained scale. [1]

Also publish documented retirement divided by that denominator. When scaling and retirement are mutually exclusive states at the review date, the two component rates sum to the scale-or-retire ratio. Redesign, extended evaluation, suspension and overdue decisions remain separately visible. A redesign does not qualify as sustained scaling simply because it keeps the project funded. If the organization wants to count a formal redesign as a timely decision, it should name and define an additional decision-completion measure instead of silently changing the original ratio.

The denominator requires a maturity contract established before outcomes are known. An initiative becomes due when its declared evidence horizon or review gate arrives. Include overdue initiatives until an outcome is recorded. Do not define maturity by whether a manager happens to request a review; that lets difficult cases disappear from the denominator. A newly funded initiative whose agreed review date is still in the future can remain outside the due cohort, but the broader funded pipeline should disclose it.

One initiative needs a stable boundary, accountable owner, production objective and resource commitment. A license installation, model experiment or minor release is not automatically a separate enterprise initiative. Preserve identifiers when projects are renamed, merged or restarted. This prevents a portfolio from manufacturing a higher conversion rate through administrative splitting or from deleting unsuccessful work when it closes a budget code.

Readiness history and hypothetical portfolio states

There is no verified comparable national twenty year series of these enterprise portfolio rates. The current record consists of an original 2026 measurement proposal and earlier methods for technology assessment, iterative delivery and impact evaluation. Those methods support the design of an evidence gate. They do not establish an observed secular improvement in the fraction of automation initiatives reaching scale. The date of a methods publication must remain separate from the dates of any portfolio observations.

GAO released its Technology Readiness Assessment Guide on 7 January 2020 and reissued it with revisions on 11 February 2020. The guide evaluates technology maturity and the quality of evidence supporting readiness for integration. Technical readiness is useful within the proposed portfolio, but it is one gate rather than the full definition of sustained financial value. A mature component can fail to improve a live workflow, and a successful workflow can fail to produce a realized operating benefit. [3]

GAO's Agile Assessment Guide was published on 28 November 2023 and reissued with revisions on 15 December 2023. It describes incremental software development with continuing evaluation of functionality, quality and customer satisfaction. Its connection here is the need to observe useful increments and reassess commitments as evidence develops. It supplies no standardized conversion or retirement percentage for private enterprise automation portfolios. [4]

In a wholly hypothetical mature cohort of twenty initiatives, six reach sustained scale, eight are retired with documented decisions, four enter redesign and two remain overdue. The proposed scaling conversion rate is 30 percent. The documented retirement rate is 40 percent. The original scale-or-retire ratio is 70 percent. This portfolio resolves many due decisions while scaling fewer than one third of the cohort. Calling the 70 percent a deployment success rate would misdescribe its numerator.

The counts should accompany every percentage. If the six scaled initiatives subsequently lose their qualifying evidence, a current-state panel needs to show the reversals. A historical gate-passage panel can retain the original event and record the later failure separately. Decide which question the dashboard answers before comparing periods. The source documents offer methods; the table below contains illustrative arithmetic only.

Hypothetical mature cohort state	Initiatives	Share of 20 due
Sustained scale	6	30 percent
Documented retirement	8	40 percent
Redesign	4	20 percent
Overdue without resolution	2	10 percent
Scaled or retired	14	70 percent

Illustrative portfolio counts; component states are mutually exclusive and the final row is their stated sum

From experimentation to production leverage

Portfolio discipline matters because a technical possibility has to cross several organizational boundaries before it changes production. A system must work in its intended setting, deliver accepted outputs, reduce or

redirect total human effort, produce an evidenced operating destination and meet quality and risk limits. Evidence-qualified scaling means those conditions remain credible when the deployment reaches its declared scope. The conversion rate can reveal whether a collection of demonstrations becomes a working production system.

For the post labor framework, that is a mechanism test rather than a secular macro indicator. A portfolio that repeatedly scales lower-human-work workflows can contribute to output growth without proportional hiring. It can also shift work toward integration, oversight and harder exceptions. The scaling label alone says nothing about the net labor effect. Link every qualified scaled initiative to total human work per valid unit, output, external work, capacity disposition and the actual workforce or commercial result.

Retirement has a different economic role. Ending an initiative can preserve future capital and release people for better alternatives. A well-supported null result can therefore improve the allocation process without demonstrating successful automation. Keep sunk expense, recoverable assets, cancelled future commitments and remaining obligations separate. Stopping expenditure that would otherwise have occurred is a prospective decision; it is not a booked gain equal to the entire original forecast benefit.

The combined ratio deliberately credits evidenced stopping. That can discourage indefinite pilots and reduce pressure to convert weak evidence into a deployment claim. Yet its interpretation requires the components: a rising closure ratio driven entirely by retirement may indicate improved governance, poor opportunity selection, tighter capital or disappointing technology. A rising scaling component with stable safeguards provides a different signal. Neither can be inferred from the combined percentage alone.

HM Treasury's 2026 AI evaluation guidance supports using clear baselines and comparison groups while following evolving interventions. Those principles apply at the initiative level before the portfolio count is credible. NIST's 2023 AI Risk Management Framework adds ongoing measurement and management of deployment risks. This chapter uses those methods to qualify transitions, not as evidence that any particular proportion of initiatives is successful. An initiative that breaches a material operating limit should not receive unqualified scaling credit because its financial forecast is attractive. [2, 5]

Gaming selection and the meaning of a high rate

A high conversion rate can reflect strong opportunities, effective implementation or cautious selection. It can also arise because the denominator excludes early failures and difficult work. Publish the entire funding cohort alongside the mature due cohort: unfunded ideas, funded initiatives, initiatives entering live testing, due reviews, sustained scaling and documented stops. The scaling fraction among due initiatives and the scaling fraction among all funded initiatives answer different questions. Preserve both labels rather than compare their percentages interchangeably.

Gate dates can be manipulated. Repeatedly extending a review horizon keeps a weak project immature and outside the due denominator. Shortening the horizon for obvious winners has the opposite effect. Freeze the original date, disclose revised dates and reasons, and show an original-contract view. A legitimate extension may be necessary for rare outcomes or dependencies, but it should remain observable. Long observation requirements should be specified by risk and outcome type before the manager knows which option improves the dashboard.

Initiative splitting creates another distortion. Ten small deployments can produce ten successes while one shared platform carries most capital and labor risk. A count-weighted rate should retain its simple unit, with additional panels for committed cost, exposure and credible realized value. Do not quietly replace counts with management-assigned forecast values. Forecast weighting can become self-fulfilling when optimistic estimates determine which projects dominate the reported average. Audited expenditure weights also describe resource allocation, not benefit magnitude.

Retirement quality matters as much as the act of stopping. An initiative can be retired after a disciplined test, after a material harm, because its owner leaves, or because demand disappears. Record the reason, evidence stage, remaining costs and displaced commitments. A rapid stop before unnecessary spending can be constructive. A rapid stop after avoidable poor discovery can reveal a weak intake process. The original manuscript explicitly warns that rapid retirement can reflect inadequate discovery rather than good management. [1]

Cross-company comparisons require common units and eligibility rules. One firm may define an initiative as a business domain and another as each feature release. Their raw rates are not comparable. Within a firm, compare cohorts with similar scope, risk, budget and maturity horizons. Reversals, continuing support burdens and actual terminal value should remain visible after a project first qualifies. A portfolio metric strengthens the interpretation only when its gate evidence is credible and its underlying production record survives follow up.

Small denominators can make the rates jump even when the underlying process has barely changed. One additional scaling decision in a due cohort of five changes the reported fraction by twenty percentage points. Always display the underlying counts and use a rolling cohort view only when its eligibility rules remain stable. A rolling window can otherwise hide an unresolved old project as soon as it ages out. Keep an overdue register outside the headline window, reconciled to the same permanent initiative identifiers. This prevents a convenient reporting horizon from functioning as an undocumented retirement decision.

Portfolio charts and reproducible transition records

Maintain a versioned portfolio register with permanent identifiers, funded dates, owners, scope, budget, evidence contract, original and revised due dates, gate decisions, supporting data and current state. Each scale decision needs the declared deployment boundary, sustained evidence interval, actual operating destination and unresolved guardrails. Each retirement needs a documented rationale, closure date, remaining obligations and disposition of people and reusable assets. Preserve merged and restarted initiatives through linked histories. [1, 3]

Publish scaling conversion, documented retirement and the combined scale-or-retire ratio as separate series, with the numerator counts and due denominator. Add redesign, overdue and suspended shares so all cohort states reconcile. A cohort transition chart should show how initiatives move from funding to testing, review and later outcomes. Keep immature initiatives visible in a pipeline panel and compare elapsed horizons fairly. A quarter with many fresh projects should not look weak solely because it has not had time to reach its gate.

Pair the rates with time to sustained value, initiative cost, net realized value, full cost per valid outcome, human work per unit and actual capacity realization. The portfolio aggregation should count terminal value

once even when one workflow gain appears in several operational ratios. Use fixed review extracts and a correction log so a subsequent reversal cannot rewrite the earlier decision record without disclosure.

This proposed dashboard supports scaling, redesign and retirement decisions while retaining null and adverse results. Its eventual long-run value would be a consistent record of which automation opportunities survive technical, workflow, economic and safeguard tests. The current proposal does not provide that longitudinal record or demonstrate that fewer good jobs follow from a higher conversion percentage. That conclusion requires the linked labor, output and worker outcomes.

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro and Critical Path Consulting Group (2026). The jobs that never appear Measuring and capturing the enterprise AI productivity dividend. Unpublished supplied manuscript; September 2026 version 2.0; Appendix A2 and executive decision maps. Exact proposed KPI definition, without independent empirical longitudinal evidence or a public URL. Verified retrieval date 4 October 2026.

[2] HM Treasury and Evaluation Task Force (2026). Guidance on the Impact Evaluation of AI Interventions HTML. Updated 15 May 2026; sections 2.1 to 2.4 baseline counterfactual and evaluation of evolving deployments; hypothetical case studies are not observed enterprise results; verified retrieval date 4 October 2026

[3] U S Government Accountability Office (2020). Technology Readiness Assessment Guide Best Practices for Evaluating the Readiness of Technology for Use in Acquisition Programs and Projects. GAO20-48G published 7 January 2020 and reissued with revisions 11 February 2020; technology maturity and evidence quality methods, not enterprise scaling-rate observations; verified retrieval 4 October 2026

[4] U S Government Accountability Office (2023). GAO Agile Assessment Guide Best Practices for Adoption and Implementation. Published 28 November 2023 and reissued with revisions 15 December 2023; iterative software development evaluation and program control; no national conversion-rate dataset; verified retrieval 4 October 2026

[5] National Institute of Standards and Technology (2023). Artificial Intelligence Risk Management Framework AI RMF 1.0. NISTAI100-1 January 2023; MEASURE and MANAGE functions for deployment risk evaluation and response; methodological guardrails rather than observed portfolio outcomes; verified retrieval 4 October 2026

RELATED CHAPTERS 077 · 101 · 102 · 109 · 110 · 112 · 123 · 125 · 126

CHAPTER 125

Net realized AI value

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN Proposed enterprise valuation specification in September 2026 with appraisal accounting and evaluation methods; no official comparable twenty year realized AI value series

Net realized AI value connects verified capacity changes to distinct economic benefits after complete costs, while keeping cash profit avoided future spending and modeled risk reduction separately visible.

The benefit and cost equation

Chapter 14 of the supplied Critical Path report defines net realized AI value as realized labor or vendor savings, plus contribution margin from incremental valid output, plus monetized expected loss reduction, minus AI total cost of ownership, minus transition cost not already included. This is a proposed management measure, expressed in money over a stated period or valuation horizon. It is not a recognized accounting statement line. Its title does not turn every component into collected cash or booked profit. [1]

The equation requires a complete perimeter. Labor savings must reflect an evidenced change in spending or the separately identified avoidance of a credible future requirement. Incremental output must meet acceptance and quality requirements. Its contribution margin is the additional revenue less the relevant additional costs, with cannibalization and displaced activity considered. Expected loss reduction needs a documented comparison of risk with and without the intervention. Model subscriptions, infrastructure, data, integration, review, monitoring and support belong in total ownership cost when relevant.

The final transition term covers costs absent from the other terms. Training, migration, parallel operation, restructuring or temporary disruption should be included once within the declared boundary. If they already enter total ownership cost, deducting them again exaggerates cost. The same issue applies when contribution margin has already deducted a model expense also listed in AI TCO. Preserve the report's equation by using a reconciliation that excludes costs already deducted in another term. [1]

Choose the temporal convention explicitly. A month's realized change, an annual recurring run rate and discounted lifecycle value are different records. Do not combine a lifetime implementation cost with one month's benefit and present the result as a comparable annual return. Accrued expenses, cash payments and capital investment may occur on different dates. A transparent ledger can reconcile them while retaining the valuation horizon and price basis.

Self reported time savings do not become financial benefits by multiplying minutes by salary. Salaried capacity may support output, reduce overtime, avoid future hiring or improve employee recovery. The destination must be observed and classified. A saved hour with no evidenced destination stays in the capacity record. It may still be useful to employees, but it cannot be inserted as booked financial value. This distinction is central to the report's proposed measure and to evaluating whether automation changed the enterprise's actual labor requirement. [1]

Cash profit and modeled value remain separate

The strongest economic reading preserves distinct benefit classes. Collected cash and reduced cash payments describe liquidity. Booked revenue and expenses describe performance under the applicable accounting rules. Avoided future cost compares actual spending with a credible requirement that did not occur. Modeled expected loss reduction values a probabilistic change rather than a realized receipt. These quantities can all inform decisions, but their sum must not be labeled as current cash or reported profit. [1]

Accounting treatment can affect the timing. IAS 38, for example, distinguishes research expenditure from development expenditure meeting specified asset recognition criteria. That is an IFRS rule, not a universal classification for every organization's AI spending. The relevant finance function must reconcile its own applicable reporting basis. Capitalizing a qualifying cost changes when expense is recognized; it does not make the cash payment disappear. A management value calculation should disclose the reconciliation rather than imply that its formula replaces financial reporting requirements. [2]

Public appraisal methods likewise distinguish perspectives. The 2026 Green Book assesses social costs and benefits for public decisions, while this proposed metric normally concerns enterprise value. Its disciplines of a stated baseline, a consistent horizon and explicit risk and uncertainty are useful here. Its social valuation perspective and discounting conventions should not be silently imported into a company's profit calculation. A benefit to customers or society may be valuable without being revenue captured by the company. [3]

GAO's cost guide supplies methods for building documented cost estimates and updating them with actual information. HM Treasury's AI evaluation guidance supports defining the baseline and comparison for an intervention. These are primary methods, not an observed dataset of net realized AI value. No official comparable twenty year company series has been verified through 4 October 2026. A contemporary management specification cannot satisfy that secular criterion merely because general appraisal and accounting methods are older. [4, 5]

The table gives a practical classification rather than a national empirical history. For every claimed amount, record the basis, horizon, owner and evidence. A cancelled invoice and a hypothetical future hire require different documents. A reduction in expected loss requires assumptions and uncertainty ranges rather than a receipt. Keeping these records distinct lets the reader inspect what was realized, what was avoided and what remains modeled. The chapter therefore retains Proposed metric status.

Benefit class	Evidence to preserve	Interpretation
Cash change	Payments collections or invoice records	Cash in the stated period
Booked profit change	Revenue and expense reconciliation	Accounting performance under the reporting basis
Avoided future cost	Prior plan and matched actual workload	Counterfactual requirement not incurred
Expected loss reduction	Risk model exposure and uncertainty	Modeled probabilistic benefit
Potential saved time	Workflow time and capacity evidence	Capacity until an economic destination is demonstrated

Proposed classification based on [1], with accounting and appraisal boundaries in [2] to [5]; these are not interchangeable benefit observations.

Connecting production gains to their destination

The metric asks whether an apparent reduction in human effort became economic value after costs. This is a necessary bridge in post labor analysis. A workflow can need fewer minutes per outcome while the enterprise incurs enough new technology, integration and verification cost to offset the benefit. A firm can also keep payroll constant while using released capacity to serve more demand. Net realized value records the resulting destination rather than assuming every saved minute creates a removable job.

Consider a hypothetical annual calculation. Verified vendor savings are $200,000, and additional accepted output contributes $150,000 after its incremental operating costs. AI TCO not already deducted is $180,000, with another $40,000 of transition cost. The resulting financial benefit is $130,000 before any modeled loss reduction. If a separate risk model estimates a $50,000 reduction in annual expected loss, the wider management total is $180,000, with the modeled $50,000 explicitly separated. These are assumed illustration values, not company observations or booked accounting results.

Do not treat that illustration as a single cash figure. Vendor expense reduction may be accrued before the related payment changes. Additional contribution may include revenue not yet collected. The expected loss component may never appear as a cash receipt because the benefit concerns incidents avoided probabilistically. Publish the cash bridge and reporting bridge separately. Also show whether benefits recur after transition or depend on a temporary demand condition.

Expected loss depends on exposure, event probability and consequence. Automation can lower error probability while expanding transaction volume enough to increase total expected loss. It can reduce frequent small failures while worsening rare severe ones. Assess the full distribution and the relevant exposure, rather than assuming a lower observed incident count proves durable risk improvement. Guardrails for consequential harm remain constraints; a favorable aggregate value should not be allowed to compensate for breaching them.

Positive enterprise value can coexist with employment growth if output expands. It can coexist with job compression if savings come from a sustained reduction in human input at comparable demand. Negative value can reveal a process that is technically impressive but economically expensive. The framework should preserve all three possibilities. Distribution still requires separate evidence: owners may retain profits, workers may share gains, customers may receive lower prices, and suppliers may capture rents. This proposed metric identifies a private economic result and its classes; it does not by itself measure the social value or household distribution of the automation dividend.

Attribution and complete cost recognition

A before and after change is not necessarily an AI effect. Demand, prices, staffing policy, supplier renegotiation, outsourcing or a wider process redesign may change during deployment. The benefit ledger needs a predeclared mechanism and comparison. HM Treasury's guidance emphasizes defining business as usual and evaluating an evolving intervention with suitable experimental or quasi experimental methods. Its principles support a credible assessment, while the design must fit the actual workflow and context. [5]

For labor and vendor savings, preserve the original requirement at actual demand, complexity and service standards. A demand collapse can reduce spending without any improvement in automation. An unfilled

vacancy can lower cost while creating backlog. Work moved to another department or vendor remains inside a declared extended production boundary. Evidence of lower human work per valid outcome, stable quality and actual capacity disposition strengthens the claimed mechanism.

Incremental contribution needs an additionality test. New product revenue may cannibalize an existing offering; a faster sales process may pull revenue forward rather than create a lasting increase. Higher throughput may be unusable if customer demand is absent. Deduct the incremental delivery, support, refund and technology costs under the agreed convention. Preserve the gross revenue figure for reconciliation, but value the additional contribution once. A new revenue stream and its associated capacity should not both be monetized independently as the same economic benefit.

Cost recognition should span discovery, implementation, operation and exit. Include external invoices and relevant internal labor, even when spending is held centrally or charged to a different business unit. Use recorded costs where available and document estimates where necessary. GAO's guide supports a structured cost breakdown, assumptions, risk analysis and updates with actual information. A short pilot invoice is an incomplete estimate of scaled ownership cost. Capital, operating and cash views need reconciliation rather than selective exclusion. [4]

Assess the sensitivity of conclusions to adoption, utilization, incident probability, repair work, output margin and vendor prices. Preserve unsuccessful deployments, abandonment and cost overruns in the record. Distinguish the forecast from the live observed result and retain both vintages. A positive total driven predominantly by uncertain avoided losses should be presented differently from one supported by repeated expense reductions and accepted output. The Green Book's uncertainty and sensitivity disciplines are relevant methods, although enterprise valuation still uses its own stated perspective and applicable financial conventions. [3]

Portfolio Realized Value and reproduction

Portfolio Realized Value is the explicit aggregation companion named in the report's capital portfolio decision map. Build it from the reconciled initiative benefit and cost ledger, preserving each benefit class. Give each economic effect a unique identifier and overlap group. Two projects that improve the same workflow cannot each claim the full labor saving or incremental contribution. Consolidate the effect once, with the attribution method recorded. Portfolio rollup is not a separate independent demonstration of value. [1]

Include shared platforms, governance and infrastructure costs once. Allocate them transparently for project reviews, then eliminate duplicate allocations in the consolidated portfolio. Preserve common costs that remain unallocated rather than hiding them outside the total. Interproject dependencies can make benefits nonadditive: a data platform and workflow deployment may jointly enable an outcome that neither could produce alone. Report the joint package and its complete cost instead of inventing independent standalone returns.

For reproduction, retain initiative and workflow identifiers, intervention dates, baseline, actual volume and quality, benefit owner, evidence stage, value class, observation horizon and source transactions. Record whether each cost was already deducted from another component. Attach forecast versions, actual results, model assumptions and independent validation. Keep negative initiative results within the portfolio rather than displaying only successful projects.

Chart cash, booked financial effects, avoided future cost and modeled loss reduction separately, with a bridge to net value and costs. Add the forecast versus observed trajectory and sensitivity ranges. Match portfolio periods and price bases; use a stated discounting convention for lifecycle analysis. Connect this record to full AI cost, capacity realization, incident losses, contribution margin, benefit to cost ratios and capital return measures. The combined record can explain whether work became less labor intensive and where the gain went, while broader secular and distributional claims require additional evidence.

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro, Critical Path Consulting Group (2026). The Jobs That Never Appear: Measuring and Capturing the Enterprise AI Productivity Dividend. Unpublished supplied report, September 2026 edition, Version 2.0; Chapter 14 Capacity Has to Go Somewhere, net realized AI value equation and benefit class separation; Capital Portfolio decision map Portfolio Realized Value; supplied framework, not independent empirical proof; verified retrieval 4 October 2026

[2] IFRS Foundation (Current standard summary). IAS 38 Intangible Assets. Official standard summary distinguishes research expense and qualifying development asset recognition; IFRS accounting scope only, not a universal AI cost classification; verified retrieval 4 October 2026

[3] HM Treasury (2026). The Green Book (2026). Updated 5 February 2026; baseline, lifecycle costs and benefits, risk, uncertainty, sensitivity and programme dependencies; public social appraisal perspective explicitly distinguished from enterprise profit; verified retrieval 4 October 2026

[4] U.S. Government Accountability Office (2020). Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Program Costs. GAO-20-195G, published 12 March 2020; lifecycle cost estimate documentation, assumptions, risk and uncertainty, validation and updates using actual costs; methods, not an observed AI value series; verified retrieval 4 October 2026

[5] HM Treasury and Evaluation Task Force (2026). Guidance on the Impact Evaluation of AI Interventions (HTML). Updated 15 May 2026; baseline, business as usual, comparison groups and evaluation of evolving AI interventions; primary causal evaluation methods, not measured company value; verified retrieval 4 October 2026

RELATED CHAPTERS 109 · 110 · 112 · 118 · 119 · 126

CHAPTER 126

Financial benefit to total cost of ownership ratio

EVIDENCE STATUS **Proposed metric** · OBSERVATION SPAN September 2026 enterprise framework with current appraisal and established lifecycle cost methods

A proposed lifecycle benefit cost multiple tests evidenced enterprise financial capture after complete AI costs, with matched horizons, attribution, monetary recognition and binding outcome constraints.

Definition and distinct financial measures

Financial benefit to total cost of ownership ratio compares evidenced incremental financial benefits with the complete lifecycle cost of an AI intervention over a matched horizon. Write the proposed operational definition as financial benefits divided by lifecycle AI TCO. The Critical Path manuscript names Financial Benefit to TCO Ratio in its executive decision map as a primary KPI for releasing capital through evidence gates. This reference makes the formula and recognition rules explicit. It is a proposed enterprise measure, with no official national twenty year series for this specific instrument. [1]

The ratio is a benefit cost multiple. A value of 1.5 means one and a half currency units of included gross financial benefit per currency unit of included cost. It does not mean a net return of 150 percent. Under identical boundaries, net ROI is benefits minus costs, divided by costs; a benefit cost multiple of 1.5 corresponds to net ROI of fifty percent. Net present value is a currency amount obtained by subtracting discounted costs from discounted benefits. These measures answer related questions and should have separate labels.

Define the enterprise, initiative, baseline alternative, population, implementation date, lifecycle endpoint, currency, price basis, and evidence stage. Benefits must be incremental to a credible counterfactual and stated before deduction of costs counted in TCO. If a reported margin benefit already deducts project costs, restore those costs for the gross benefit numerator or use a separately explained net benefit calculation. Subtracting the same expenditure inside the benefit and again through the denominator produces an inconsistent ratio.

Financial benefits can include demonstrated expense reductions, supported future expense avoidance, or incremental contribution from additional commercial activity. These categories require separate evidence and timing. Customer demand associated with an AI feature is not automatically incremental revenue, and revenue is not automatically financial benefit after the ordinary costs of delivering it. Released hours alone are an operational measure until they support an evidenced financial event or a separately modeled future benefit. The capacity and financial stages are distinct in the original framework. [1]

A discounted version divides present value benefits by present value costs using the same valuation date and consistent assumptions. An undiscounted version should say so. HM Treasury’s 2026 Green Book similarly

distinguishes benefit cost ratios from net present social value, while its public appraisal concerns social effects rather than this enterprise financial scope. The analogy supports clear metric definitions; it does not make a company's AI ratio an official Treasury statistic or authorize importing a public sector discount rate without considering the firm's decision. [2]

Complete lifecycle cost and shared resources

TCO should cover design, data preparation, integration, implementation, testing, transition, training, recurring operation, monitoring, maintenance, necessary human review, support, and retirement or exit. Machine charges are only one component. Include relevant vendor and internal labor resources, security, controls, change management, and switching obligations. GAO's Cost Estimating and Assessment Guide defines lifecycle cost across development, operation, maintenance, and disposal, including costs from different funding sources. That comprehensive boundary provides a useful method for preventing inexpensive model calls from standing in for the full intervention. [3]

Separate costs already common to both alternatives from resources required by the intervention. A complete AI project boundary can include existing employees' time when they build, review, or support the system, even if payroll does not immediately change. In the financial analysis, show how those resource costs translate into cash expenditure, accounting expense, or opportunity cost. Unsupported notional cash savings should not be used to offset a real project cost. Keep a reconciliation of analytical resource cost to financial records so the decision maker understands the chosen numerator and denominator.

Shared infrastructure needs a reproducible allocation. A platform may support several workflows, and direct usage may not capture evaluation or risk support. Allocate according to documented drivers, preserve the original charge, and ensure initiative allocations sum to the platform total. Do not exclude centralized costs simply because a business unit receives the benefit. Conversely, do not charge a reusable asset in full to every initiative. Portfolio analysis should count the shared investment once and identify overlapping benefits. A project ranking should disclose whether it uses allocated average cost or avoidable incremental cost.

Transition costs can include running old and new systems together, training before full use, redundancy or contract termination, temporary review, and a disrupted service period. Capitalization changes the timing of accounting recognition, not whether a resource was required. A cash view records the investment when paid; an expense view may reflect depreciation or amortization. Avoid counting both the original build payment and its entire later amortization in the same lifecycle cost view. GAO recommends documented assumptions, scope, sensitivity, and updates with actual cost evidence. [3]

Full historical TCO includes incurred costs, while a continue or stop decision may depend on future avoidable costs and benefits. Publish those as separate analyses. Sunk spending should remain in the project's cumulative performance record even when it is irrelevant to the next incremental choice. Define exit and residual value treatment consistently. A ratio based on two years of benefits and one year of costs, or on lifetime benefits with omitted renewal and retirement obligations, cannot support an honest comparison.

Illustrative horizon and benefit cost arithmetic

There is no verified national history to report for this enterprise AI ratio. Appraisal and lifecycle costing methods have a longer history, but their existence does not supply observations of this specific KPI. The

available source trail identifies a 2026 management framework and current public appraisal guidance, together with established GAO cost methods. Forecasts should never be plotted as though they were completed financial outcomes.

The table is entirely hypothetical. A project starts with a 600,000 dollar implementation cost, then incurs 200,000 dollars at the end of each of two operating years. The final year includes the assumed exit obligation. Evidenced or forecast financial benefits, depending on the stated evidence stage, are 600,000 dollars in year one and 900,000 dollars in year two. Total benefits are 1.5 million dollars and total lifecycle cost is one million. The undiscounted benefit cost ratio is 1.5, net ROI is fifty percent, and net benefit is 500,000 dollars.

Timing changes the valuation. Using a hypothetical annual discount rate of ten percent, present value benefits are approximately 1,289,256 dollars and present value costs approximately 947,107 dollars. The discounted ratio is about 1.36 and NPV approximately 342,149 dollars. These calculations demonstrate why a large later benefit cannot be compared with an early investment as though both occurred today. The ten percent rate is an arithmetic assumption, not a recommended rate or an observed enterprise hurdle.

The example also distinguishes benefit cost scale from total value. A small initiative can have a higher ratio than a larger project with much greater NPV. Selecting only the highest multiple may fail to make the best use of an available budget or may overlook dependencies among initiatives. Report the investment amount, uncertainty, time profile, NPV, and strategic requirement alongside the ratio. A constrained portfolio may require explicit optimization rather than a simple league table of multiples.

Evidence maturity should accompany the numerator. A forecast can use estimated future hiring avoidance if its baseline and assumptions are clear. A realized ratio needs observed events and should not count the entire forecast as achieved. Expected incident loss avoided is another modeled category requiring probabilities and severity assumptions. Present a core ratio for recognized financial effects and an expanded scenario including modeled effects. The gap between them makes uncertainty visible, instead of allowing one precise looking number to hide unlike types of evidence.

Hypothetical date	Financial benefits dollars	Lifecycle AI cost dollars
Initial implementation	0	600,000
End of year 1	600,000	200,000
End of year 2 including exit	900,000	200,000
Undiscounted total	1,500,000	1,000,000
Present value at hypothetical 10 percent	1,289,256	947,107

Illustrative arithmetic only. Matched two year lifecycle from initial investment to end of year two; no enterprise or national observations are implied.

Attribution uncertainty and outcome constraints

A financial benefit needs a counterfactual, not merely a favorable post deployment result. Expense can fall because demand weakens, a contract expires, or another process changes. Additional revenue can reflect pricing, product mix, or sales activity unrelated to AI. HM Treasury and the Evaluation Task Force’s current AI evaluation guidance emphasizes early baselines, clear comparisons, and designs suited to evolving

interventions. Use experimental or suitable comparison evidence where feasible; identify weaker contribution claims and combined interventions honestly. A before and after financial bridge alone does not establish AI causality. [4]

Cash, booked profit, and modeled expected loss are different records. A reduced contractor payment is a cash and expense event under the relevant timing. Avoiding a future hire is a supported counterfactual expenditure avoided, rather than a payroll reduction already visible. Capitalized development can delay reported expense while requiring cash immediately. Better controls may reduce modeled exposure without a recognized gain in the accounts. Keep these lines separate and explain which enter each ratio rather than adding them indiscriminately under the word savings.

Benefits can also overlap. Released hours, their wage equivalent, avoided FTE, and additional gross margin can describe one capacity pathway. Claim it once in the financial numerator while retaining the operating mechanism as supporting evidence. If a system enables additional sales, include incremental contribution after nonproject delivery costs and connect it to the relevant outcomes. When a claimed benefit is already net of AI review or platform expense, reconcile that subtraction before applying the TCO denominator. Costs and benefits should share an overlap identifier across the portfolio.

Uncertainty belongs on both sides. Adoption can be slower, review burdens larger, volume lower, or useful model life shorter than anticipated. Estimate scenarios and test the assumptions that change the decision. An appealing point ratio can reverse when a shared platform, transition period, or replacement cycle is included. GAO’s guidance supports risk and sensitivity analysis as part of a credible cost estimate and updating estimates with actuals. Do not substitute an arbitrary contingency percentage for an explained uncertainty model. [3]

The original framework requires safety and quality gates to remain binding even when a forecast looks financially attractive. Customer outcomes, workforce sustainability, compliance, security, and resilience therefore remain decision constraints. A higher ratio cannot compensate for an unacceptable incident or degraded valid output by assigning a convenient price to the breach. The Green Book likewise asks decision makers to consider unmonetisable effects and uncertainty alongside summary metrics. Its public social perspective is broader than this firm financial ratio, and distributional effects should remain visible rather than being inferred from private returns. [1] [2]

Evidence ledger and longitudinal reproduction

Maintain an initiative ledger with the baseline alternative, lifecycle, valuation date, currency, price basis, discount assumption, benefit owner, cost owner, evidence stage, and source records. Use a cost breakdown covering implementation, operation, support, transition, and exit, with shared allocations tied to origin charges. Tag financial benefits by cash reduction, future expense avoidance, incremental contribution, or modeled risk change. Preserve analytical resource cost, accounting expense, and cash reconciliations. Documentation and actual cost updates are central to GAO’s estimating method. [3]

Calculate the ratio from summed matching benefits and costs, or from their present values for the discounted version. Keep net ROI and NPV in separate fields. A tiny or incomplete denominator makes a large multiple unreliable; show the underlying totals and coverage. Portfolio totals should remove duplicated benefits and count common investments once. Averaging project ratios can distort the result when

investment sizes differ. Record unsuccessful and stopped projects so the portfolio does not contain only survivors.

Plot cumulative realized financial benefit and cumulative complete cost across the observed lifecycle, with the realized ratio shown only for the matching period. Forecast remaining values belong in visibly separate scenarios. Compare approved forecasts with current estimates and actual outcomes to reveal optimism and cost escalation. A mature enterprise record can show how financial capture varies by workflow, cost structure, and evidence stage without inventing a national secular trend.

Connect this measure to AI enabled gross margin, full AI cost per valid outcome, the relevant workflow and governance instruments, and capacity disposition. Its post labor relevance is whether reduced human work can produce an evidenced financial return after the whole complementary stack is paid for. A successful private return alone does not establish national labor displacement, broad prosperity, or a decades long trend. The ratio supplies a test of economic capture at the enterprise and lifecycle boundary stated in the record.

SOURCES AND REPRODUCTION NOTES

[1] David Shapiro and Critical Path Consulting Group (2026). The jobs that never appear: Measuring and capturing the enterprise AI productivity dividend. User provided unpublished manuscript September 2026 Version 2.0; executive decision map Capital Portfolio names Financial Benefit-to-TCO Ratio and binding safety and quality gates; operational formula and recognition boundaries made explicit in this reference; verified retrieval 4 October 2026

[2] HM Treasury and Government Finance Function (2026). The Green Book (2026). Updated 5 February 2026; present value benefit cost ratio and net present social value, uncertainty and unmonetisable effects; public social appraisal differs from enterprise financial ratio; verified retrieval 4 October 2026

[3] U.S. Government Accountability Office (2020). Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Program Costs. GAO-20-195G published 12 March 2020; lifecycle scope, cost breakdown, assumptions, risk and sensitivity, actual updates and avoiding omitted or duplicated costs; verified retrieval 4 October 2026

[4] HM Treasury and Evaluation Task Force (2026). Guidance on the Impact Evaluation of AI Interventions (HTML). Updated 15 May 2026; baseline, counterfactual and attribution designs for changing AI interventions; verified retrieval 4 October 2026

RELATED CHAPTERS 100 · 109 · 118 · 119 · 125

CHAPTER 127

Teen labor force participation

EVIDENCE STATUS Mixed evidence · OBSERVATION SPAN Annual history 1948–2025; observed 2005–2025 comparison; September 2026 monthly context

Teen attachment declined across decades, while schooling and recent rebounds prevent equating that decline with continuously worsening job exclusion.

Definition and distinction from youth disconnection

Teen labor force participation is the percentage of civilian noninstitutional people ages 16 through 19 who are employed or unemployed under Current Population Survey rules. Calculate one hundred times the teen labor force divided by the teen population. An unemployed teenager who actively seeks work remains in the numerator; a student who neither works nor meets the unemployment definition generally does not. This is a population attachment rate. [1]

The age boundary makes this measure distinct from youth not in employment, education or training. A full time student without a job can lower participation while remaining outside the NEET population. A teenager searching unsuccessfully while attending school can raise participation without improving access to employment. Show employment to population and unemployment alongside participation when asking whether entry opportunities have weakened. Keep their denominators visible: participation and employment use the population, whereas unemployment uses the labor force. The same change in work opportunities can move them differently.

The narrow interval also separates teenage attachment from the aggregate consequences of population aging. Retirees do not enter this denominator. Nevertheless, the proportions aged 16 or 17 and aged 18 or 19 can change, as can school enrollment within those ages. A comparison should therefore preserve the four individual ages or two narrower bands where the sample permits. An aggregate decline can reflect fewer students combining employment with education, weaker opportunities after leaving school, or both. Those are different transitions with different welfare implications.

Participation does not weight hours, earnings, benefits or the usefulness of a job. A short summer assignment and a substantial year round position both count as attachment. The metric belongs in the Post Labor framework because early access to paid work may reveal which groups can obtain experience and labor income. Its contribution is diagnostic: the secular history establishes a changed relationship between teenage life and paid employment, while an exclusion interpretation requires evidence about willingness to work, schooling and the quality of available starts. More attachment can represent improved opportunity or greater financial pressure to work. Less attachment can represent investment in education or unwanted difficulty finding a foothold.

Long decline, partial recovery and the current endpoint

The BLS historical review identifies a participation peak of 57.9 percent in 1979. The rate was 52.0 percent in 2000, fell to 34.1 percent in 2011, and stood at 34.3 percent in 2015. The comparison spans several decades and technological regimes. It provides a genuine secular decline in teenage attachment before contemporary generative AI, rather than a pandemic-only result. The steep movement after 2000 is visible against an earlier gradual reduction, so a smooth straight line would misrepresent its timing. [2]

The current BLS projections table reports observed teenage rates of 43.7 percent in 2005, 34.3 percent in 2015 and 36.2 percent in 2025. The twenty year endpoint difference is a decline of 7.5 percentage points. The last decade instead shows an increase of 1.9 points. These opposing comparisons matter: a substantially lower contemporary level than earlier decades can coexist with a meaningful rebound. The 2035 value in that table is projected and supplies no additional observed trend. [3]

The annual CPS table places the 2025 teen population at 17.842 million and the labor force at 6.456 million, producing the published 36.2 percent participation rate. Employment to population was 31.1 percent and unemployment 14.0 percent. The annual estimate excludes October because the federal shutdown prevented data collection; BLS warns that its eleven month average is not strictly comparable with ordinary annual averages. Treat it as the latest verified annual checkpoint with a visible comparability qualification, rather than silently reconstructing the missing month. [4]

The current monthly layer gives a different time unit. In September 2026, seasonally adjusted teen participation was 37.0 percent, employment to population 31.7 percent and unemployment 14.5 percent. The unadjusted participation rate was 35.6 percent. These observations were released on 2 October. They update monitoring without becoming a 2026 calendar year average. Comparing an unadjusted school-year month with a historic summer peak would create an especially misleading decline. [5]

Read the history as a lower attachment baseline with recoveries, not evidence that each generation or every expansion worsened. Neither publication date nor a more recent single month extends the research into a continuous annual causal series. A secular chart should retain the rise toward the late 1970s peak, the later decline and the partial rebound. That trajectory distinguishes an enduring change in work patterns from an assertion that the economy is currently eliminating teenage participation at an accelerating rate. Its causes require separate investigation. Keep those observation windows explicit.

Schooling and the alternatives to a demand collapse explanation

Education is a central competing interpretation. The BLS review emphasizes the pull of school, including enrollment and time spent on educational activities, as an important reason for the historical participation decline. It also discusses competition for jobs rather than presenting schooling as the only explanation. [2] More time outside paid employment can be an investment in later capabilities. Whether that investment succeeds depends on what students learn, the resources financing it and the opportunities available afterward. A lower teenage work rate cannot settle that assessment.

A recent enrollment supplement illustrates the importance of the school boundary. In October 2024, recent high school graduates enrolled in college had participation of 41.2 percent, compared with 66.4 percent among graduates not enrolled. These are people ages 16 to 24, so they do not reproduce the teen-only

annual measure. They are a one-October cross section rather than an identified effect of college enrollment. [6] Nevertheless, the difference shows why employment opportunities and educational status must be observed jointly before interpreting nonparticipation.

Selection complicates the comparison. Students who enroll can differ from those who do not in family resources, previous achievement, location and health. Enrollment itself can respond to poor job opportunities, while household income can permit a student to devote more time to education. Calling every school-related absence voluntary would overlook these constraints. Calling every absence hidden unemployment would erase valuable education. The relevant research question is what alternative the person could realistically obtain, whether additional work was desired, and what educational and earnings path followed.

A useful accounting decomposition holds school and age weights constant. Calculate participation separately within enrollment and age groups, then combine the rates using one fixed population distribution. Compare that standardized rate with the observed aggregate. The exercise distinguishes changes in who is in school from changes in participation among similarly classified students or nonstudents. It remains descriptive. A within-group decline can still result from care, health, regulations or changing preferences, and a fixed-weight residual should not receive an automation label merely because a composition effect was removed.

Family circumstances can make the same observed rate change mean different things. A financially secure student may stop a low-value assignment and gain study time. Another may need paid work but abandon search when schedules conflict with classes or transport is unavailable. A third may take excessive hours because the household has lost income. Pair attachment with desired work, actual paid hours, school completion and household resources. These outcomes reveal whether a changing work pattern improves preparation or reduces access to income. They also keep the assessment connected to people rather than treating any maximum participation level as a welfare objective.

How early work access can reveal compression

Teenage work often provides an initial opportunity to demonstrate reliability, learn routines and establish references. If employers require prior experience for jobs that once trained entrants, the route into paid employment can narrow even when established adults remain employed. Test it using application outcomes, experience requirements, training provision and the destinations of comparable applicants. A change in requirements is meaningful only when it affects realistic opportunities for the population seeking entry.

Automation could affect that route by reducing demand for simple tasks, increasing the productivity of incumbent staff or allowing a firm to serve growth with fewer additional workers. It could also simplify tasks enough to make them accessible to inexperienced workers, or create new complementary activities. The predicted direction therefore depends on the production setting. A reduction in vacancies for entrants is more informative when output or service volume expands, required human hours fall, and the change remains after ordinary demand conditions recover. The national teen rate supplies an outcome to investigate, not the production evidence itself.

Competition can also reflect institutions and composition. Adults seeking additional income, migrants or students with more education may compete for overlapping positions. Their presence does not automatically establish that the total number of good jobs has fallen. Follow hiring probabilities and acceptable offers

within comparable local markets. If inexperienced applicants face persistent rejection while experienced incumbents retain employment, the distribution of access may worsen without a large change in aggregate employment.

The quality of an early job matters beyond whether it is obtained. Training, supervision, predictable schedules and progression can turn modest initial pay into a useful career start. A job with volatile hours and little skill development can provide current income while offering a weaker path. School activities, apprenticeships and other learning can sometimes substitute for paid work experience. An assessment should compare the capabilities and later outcomes generated by these routes. It should not assume that all historical teenage jobs supplied valuable training or that every newer educational route is a compensation for exclusion.

A stronger Post Labor interpretation would join several observations: lower within-group participation among teenagers wanting work, fewer accessible paid starts, weaker transition earnings and growing output with reduced entrant labor requirements. A weaker interpretation would follow from improved employment access, greater educational attainment with favorable subsequent outcomes, or successful paid learning pathways despite a lower aggregate rate. Both possibilities remain testable. The framework concerns whether human effort can obtain prosperity; it should distinguish a delayed but successful entry from prolonged inability to secure a rewarding place, and retain the recent attachment rebound as relevant evidence.

Chart design, subgroup tests and update rules

Build the principal chart from annual CPS teenage participation beginning with the verified historical record. Mark the late 1970s high and show the complete subsequent path. Keep the 2025 missing-October qualification in the caption and preserve source vintages. Provide a separate recent monthly panel with seasonally adjusted estimates and an uncertainty-aware average. Annual and monthly rates should not be joined as though they were the same observation. A change in survey population controls belongs in the reproduction notes.

A summer panel answers a different question. The BLS review reports July participation of 71.8 percent in 1978 and 43.2 percent in 2016. These unadjusted July comparisons describe access and attachment during summer, when school schedules differ. [2] Keep them separate from annual averages and compare the same calendar month. Record whether summer schooling, term dates or training changed. A fixed-month series improves seasonal comparability without automatically controlling the underlying changes in education or the duration of available work.

Add narrower ages and educational status. In the 2025 annual table, participation was 24.8 percent at ages 16 to 17 and 49.1 percent at ages 18 to 19. [4] Their large level difference makes shifting age weights consequential. Pair these rates with employment to population, unemployment and the share outside participation that wants work wherever samples permit. Report subgroup uncertainty and avoid very small local cells. A school-enrollment decomposition should state whether it uses a monthly basic survey question or the annual supplement; those sources have different timing and content.

Follow transitions as well as stocks. Repeated observations can distinguish a student temporarily leaving summer work, a graduate moving promptly into employment and an unsuccessful searcher ceasing to seek

work. Record hours, earnings, enrollment and the duration of nonemployment in a common cohort where feasible. A national decline in participation does not reveal these flows by itself. For causal research, predefine the affected occupation or technology exposure, comparison group and outcome window. Check the sequence of schooling, opportunity shocks and withdrawal, including destinations that disappear from the employed sample.

Update the annual history after each official release and review the monthly layer without redefining the secular assessment after every fluctuation. Retain mixed evidence status: the multidecade decline is clear, but education offers a substantial alternative explanation, the latest annual history includes a rebound, and participation does not measure job quality. Strengthening evidence should come from deteriorating access among comparable willing workers and poor later outcomes. Improving starts, earnings or educational transitions should count in the opposite direction. This measurement discipline allows teenage attachment to reveal a neglected margin of labor access while preserving its distinct meaning beside NEET and college graduate underemployment.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (2026). Concepts and Definitions—Current Population Survey. Official CPS employment, unemployment, participation and civilian population definitions; preserve denominator and paid work boundaries. Verified for version two 4 October 2026.

[2] Teri L. Morisi, Bureau of Labor Statistics (2017). Teen labor force participation before and after the Great Recession and beyond. Original BLS historical review, annual ages 16–19 through 2015, separate summer history and schooling explanations. Forecasts excluded. Verified for version two 4 October 2026.

[3] Bureau of Labor Statistics (2026). Table 3.3 Civilian labor force participation rates by age, sex, race, and ethnicity. Official observed participation checkpoints 2005, 2015 and 2025; 2035 column is projected and kept separate. Verified for version two 4 October 2026.

[4] Bureau of Labor Statistics (2026). Employment status of the civilian noninstitutional population by age, sex, and race—Annual Table 3. Annual 2025 CPS age table; eleven month average omits October and is not strictly comparable. Updated 20 February 2026. Verified for version two 4 October 2026.

[5] Bureau of Labor Statistics (2026). Table A 1 Employment status of the civilian population by sex and age—September 2026. Official September 2026 household age table, released 2 October; seasonally adjusted monthly teen participation, employment and unemployment. Verified for version two 4 October 2026.

[6] Bureau of Labor Statistics (2025 release, 2024 observations). College Enrollment and Work Activity of Recent High School and College Graduates—2024. October 2024 enrollment supplement, ages 16–24; single month and school status comparisons differ from teen annual history. Verified for version two 4 October 2026.

CHAPTER 128

Great Reversal in cognitive task demand

EVIDENCE STATUS **Bounded historical supporting evidence; contemporary continuation mixed** · OBSERVATION SPAN United States historical analysis 1979–2011; wage-premium evidence through 2022; separate recent-graduate checkpoint 2026 Q2

A historical reversal in cognitive-task demand offers a mechanism for downward occupational competition, but its continuation must be tested against later employment and wage gains.

Definition a demand reversal and occupational cascade

The Great Reversal is a historical research construct concerning the demand for cognitive work. It asks whether the earlier expansion of managerial, professional, and technical opportunities changed direction around the turn of the century while the supply of educated workers continued to grow. Beaudry, Green, and Sand identify such a turning point in their historical analysis and propose a cascade in which highly educated workers compete further down the occupational ladder. It is a claim about a changing allocation of skills across tasks, rather than a synonym for graduate unemployment. [1]

Three objects belong in the definition. Educational supply describes how many people possess particular qualifications. Occupational allocation describes where those people work. Task demand describes the work employers want performed at relevant wages. A larger graduate population with an unchanged number of professional jobs can change the first two without proving that demand for all cognitive activities has fallen. The framework therefore requires evidence connecting employment patterns with relative wages and the tasks embodied in occupations.

The mechanism is distinct from ordinary polarization. Polarization can involve expanding professional opportunities while routine middle occupations contract. A cognitive-demand reversal would put pressure on the upper route as well. The same graduate can remain employed, retain a wage advantage over a noncollege worker, and nevertheless lose access to the career previously associated with the degree. The consequential outcome is a narrower ladder, including the effect of competition on workers entering its lower rungs.

The label should retain its historical boundary. A research paper covering several decades can identify a reversal within that interval without demonstrating a twenty-year decline after the turning point. This entry qualifies as a long historical comparison and a proposed mechanism for compression. It does not independently satisfy a strict requirement for twenty continuously declining post-2000 years. Treat the original claim, later corroborating evidence, and current monitoring as separate parts of the record.

Operationally, levels of cognitive employment, its population share, and workers' allocation should be reported separately. Their joint movement helps distinguish fewer positions, slower growth than educated supply, and changes in who obtains existing positions.

Evidence historical findings and later wage checks

The author-hosted January 2013 paper uses CPS outgoing-rotation observations from 1979 through 2011, with adults aged 18–64 and positive potential work experience. Its turning-point evidence therefore includes both the preceding expansion and the post-2000 period, including major recessions. The final journal publication appeared in 2016. Neither date makes the historical observations current. A chart based on that version should end in 2011 and identify its sample rather than extend a fitted decline through 2026. [1]

Valletta provides a related but distinct check using monthly CPS wages over 1979–2015. He finds progressively slower growth in higher-education wage gaps, including little change during 2010–2015, and evidence consistent with both polarization and skill downgrading. These results concern relative compensation among employed wage and salary workers. They do not directly measure the number of cognitive tasks available or establish that every graduate's real earnings fell. [2]

A later Federal Reserve Bank of San Francisco update supplies consequential counterevidence to a simple continuous decline. Its controlled college premium was about 68% in 2000, reached roughly 79% in the mid-2010s, and stood near 75% in 2022. The recent narrowing primarily reflected faster wage growth among high-school graduates. The education grouping includes bachelor's and graduate degrees, so it should not be silently substituted for a bachelor's-only premium. [3]

Read these observations as different tests. A relative wage premium combines movements in the numerator and denominator; employment shares combine demand, supply, and selection. Occupational downgrading may accompany a rising premium if noncollege alternatives weaken more. A falling premium may accompany stronger noncollege prospects. Plotting the component real wages beside the premium reveals whether a smaller gap represents graduate deterioration, convergence through improvements below, or both.

The useful historical inference is consequently narrower than a universal law. Several labor-market patterns changed near 2000, and the cognitive-demand account offers a coherent way to investigate their relationship. Later outcomes should determine whether the mechanism remained dominant. A new observation that contradicts the expected pattern cannot be converted into support merely by calling it temporary concealment. The test becomes stronger when it specifies in advance which occupations, educational groups, and expansion peaks should show reduced opportunity.

For a long-run display, use separate panels for cognitive occupation shares, graduates' allocation across occupations, and adjusted wage premiums. Annotate economic contractions and classification changes. Show observed endpoints without interpolation beyond the data. This arrangement allows the original turning-point hypothesis to remain visible while exposing later periods in which demand recovered or other workers improved. It also prevents a contemporary weak cohort from being mistaken for a completed secular reconstruction.

Post labor interpretation investment, maintenance, and access

Beaudry, Green, and Sand propose a model in which skilled workers build organizational capital during installation and later maintain it. Cognitive-task demand falls from the installation peak as the technology matures, while remaining above its pre-technology level. This extension of skill-biased technical change can reproduce their historical patterns, but the authors acknowledge alternative explanations. [1]

A hypothetical firm makes the distinction concrete. During installation it recruits specialists to digitize records, redesign customer processes, and train employees. Once the system operates, fewer specialists maintain it and routine transactions use less employee time. The firm can produce more output with a smaller ongoing workforce even though implementation once generated jobs. This illustration describes a possible lifecycle; it supplies no estimate of how many national jobs followed that path.

The post-labor connection is the durability of the compensating opportunities. Workers displaced from routine tasks need accessible new tasks that last, not simply a temporary installation surge. If a new productive system generates a large stock of capability with relatively little recurring paid work, growth can deliver fewer enduring opportunities per increment of output. Income can still be distributed through remaining professional employment, ownership, prices, or transfers, with different consequences for households that chiefly rely on wages.

The cascade adds a distributional channel. Suppose an organization hires experienced graduates for roles previously open to noncollege entrants. Employment in those roles need not disappear. Yet noncollege workers' access can contract, while graduates accept less progression than expected. Compression then occurs through competition, screening, and match quality. The evidence needed is joint: who enters the occupation, what those workers earn, which candidates lose access, and whether their alternatives improve elsewhere.

This account does not require declaring existing service jobs pointless. A person working below a qualification can provide valuable output and receive a paycheck while facing a poorer opportunity set. The loss concerns the relationship between skills, scarce positions, and the distribution of productive gains. Measuring task content and progression is therefore more informative than judging a job's social value from its title. Qualification mismatch is an outcome to explain, not a verdict that the work has no economic use.

The mechanism also implies meaningful possible reversals. Demand for new services, new technologies requiring continued human expertise, or an expansion in public and private investment can create durable cognitive work. Evidence of sustained broad wage gains and improved entry across educational groups would weaken the claim that cognitive-demand compression dominates the current economy. Post-labor analysis should examine whether these compensating channels are large and accessible enough, rather than assume that every new opportunity is too small to matter.

Alternatives supply, cycles, and changing composition

Growing educational attainment is an essential competing explanation for the observed assignment of workers. If graduates increase faster than jobs commonly classified as requiring degrees, the graduate share in other occupations can rise even with expanding cognitive employment. This may still create intense competition, but the causal description is a supply-demand imbalance rather than a demonstrated fall in absolute cognitive demand. Compare levels, shares, and wages together before choosing between those statements.

Business-cycle timing can further alter the result. Young entrants are especially exposed to reduced hiring, and financial or technology contractions can interrupt particular career routes. A comparison beginning near an investment boom and ending after a severe recession may overstate persistence. Testing across several expansion peaks, with the same occupation categories and age groups, is stronger than assigning every post-

boom decline to the maturity of automation. Recovery can change the evidence even if the original downturn had structural elements.

Occupational measures also aggregate very different activities. A manager may perform routine compliance, judgment, coordination, and analytical tasks in the same week. New tools can remove one component while expanding another. An unchanged occupational count can conceal a major task shift, and a changed title can conceal stable work. A credible update should use consistent occupation crosswalks and supplement broad categories with task evidence rather than treat an official label as a complete production description.

Relative wages require similar discipline. The FRBSF update shows why a smaller college premium can be a favorable outcome for workers without degrees. Such convergence may strengthen their bargaining position and access to income, directly complicating a general compression narrative. It should appear as counterevidence in the relevant dimension. A framework that counts rising inequality and falling inequality alike as proof of labor deterioration would cease to discriminate among explanations. [3]

The New York Fed's graduate-underemployment series offers a contemporary outcome check, but it measures degree requirements associated with occupations, not direct cognitive demand. Its second-quarter 2026 reading was 42%, alongside 5.6% unemployment for recent graduates aged 22–27. Those numbers can motivate investigation of access and match quality; they cannot extend the original Great Reversal estimates or identify their cause. Persistent early-career mismatch, later progression, and differences by major all remain relevant. [4]

The appropriate status is therefore bounded historical supporting evidence with a mixed contemporary continuation. The original mechanism is economically plausible, and its occupational cascade is pertinent to the framework. Alternative explanations and later improvements limit the attribution. That classification preserves the contribution without making a twenty-first-century trend longer, smoother, or more causally settled than the verified record permits. It also leaves room for the historical demand regime to change again.

Monitoring a falsifiable opportunity dashboard

Begin with a reproducible historical file containing the original population filters, wage treatment, occupation groupings, and survey weights. Preserve the author version used. A current extension should document every change needed to bridge occupation and educational classifications, and should identify whether imputed earnings, top coding, or hours definitions differ. An updated series is an analyst reconstruction unless it reproduces a published extension; its chart should not borrow the original paper's authority for unverified new estimates.

The primary panel should show both the level and working-age population share of cognitive employment. A second should show the share of each educational group working in cognitive, routine, and manual categories. A third should show real hourly wages by education and occupation, together with adjusted premiums. Separating these panels prevents a supply-driven change in graduate allocation from being mistaken for a fall in total professional employment. Counts, percentages, and regression coefficients need their own axes.

For access, follow entrants into occupations and their subsequent progression. Record age, experience, major or qualification, employer hiring requirements, compensation, and time to reach a stable match where the data permit. A good test asks whether earlier cohorts with comparable qualifications obtained better opportunities under similarly strong aggregate conditions. It also examines whether workers without degrees regain access when graduates move upward. These linked outcomes address the cascade more directly than aggregate graduate employment alone.

For the investment-maintenance mechanism, use sector or firm evidence on implementation staffing and ongoing staffing after installation. Compare enduring labor demand with the investment cycle, output, and the emergence of new paid tasks. Avoid adding temporary implementation jobs to permanent jobs without showing their duration. Evidence that continuing innovation repeatedly renews skilled employment would qualify the maturation account. Evidence that a growing capability stock requires progressively less recurring paid work would strengthen it in the measured setting.

Predefine findings that would weaken the current interpretation: rising cognitive employment per working-age person, broad improvements in graduate occupational matches, faster real wages for noncollege workers, and restored access to middle-paid career routes. These improvements can coexist with automation. Their significance depends on scale and persistence, but they should be counted as improvements in their measured dimensions. Likewise, a deteriorating subgroup does not establish deterioration everywhere, and a strong aggregate does not erase a well-measured subgroup loss.

Read this entry alongside graduate underemployment, early-career hiring, task reinstatement, and the location of new work. The distinctive contribution is a proposed change in the demand regime and its downward transmission across educational groups. Its historical evidence, later wage checks, and monitoring design should remain visibly separate. The research can illuminate how labor loses some former role in distributing opportunity while leaving the future empirical question open: which technologies and institutions create the next durable ladder, and who can climb it?

SOURCES AND REPRODUCTION NOTES

[1] Paul Beaudry, David A. Green, and Ben Sand (2013 working paper; final journal publication 2016). The Great Reversal in the Demand for Skill and Cognitive Tasks. Author-hosted January 2013 analysis uses 1979–2011 observations; mature-stage demand falls from its installation peak but remains above the pre-technology level. Verified for version two 4 October 2026.

[2] Robert G. Valletta (2016). Recent Flattening in the Higher Education Wage Premium: Polarization, Skill Downgrading, or Both?. Working Paper 2016-17, version 17 August 2016; monthly CPS observations through 2015, with distinct bachelor's and postgraduate premiums. Verified for version two 4 October 2026.

[3] Leila Bengali, Marcus Sander, Robert G. Valletta, and Cindy Zhao (2023). Falling College Wage Premiums by Race and Ethnicity. Controlled premiums through 2022; recent narrowing chiefly reflects faster high-school wage growth, and the college grouping includes postgraduate degrees. Verified for version two 4 October 2026.

[4] Federal Reserve Bank of New York (2026). The Labor Market for Recent College Graduates. Dashboard checkpoint for 2026 Q2; recent graduates are aged 22–27, and underemployment uses occupational degree requirements rather than direct task demand. Verified for version two 4 October 2026.

CHAPTER 129

Private Sector Job Quality Index

EVIDENCE STATUS Supporting evidence for historical job composition; latest release timing qualified · OBSERVATION SPAN United States private payroll history from 1990; August 2026 labeled release dated 2 October 2026

A relative weekly-pay index reveals how payroll growth can coexist with a less favorable job mix, while leaving benefits, living costs, preferences, and individual wages to complementary measures.

Definition a weekly pay composition ratio

The U.S. Private Sector Job Quality Index, or JQI, measures the composition of private production and nonsupervisory payroll positions by weekly cash earnings. In the basic calculation, industry groups are classified above or below their employment-weighted average weekly pay, and the number of above-benchmark positions is divided by the number below, multiplied by 100. Large categories near the benchmark receive further occupational adjustments. The original white paper is the methodological reference; this is a privately constructed index using official inputs, rather than an official BLS adequacy standard. [1]

The scale requires careful translation. A hypothetical reading of 80 means 80 classified higher-pay positions for every 100 classified lower-pay positions. If these categories exhaust the covered positions, the higher-pay share is 80 divided by 180, or about 44.4%. The reading does not mean that 80% of jobs meet a good-job threshold, that wages fell 20%, or that 20% of workers are unemployed. Report the ratio and its implied composition on separately labeled scales.

Weekly pay joins the wage rate with available paid hours. A position paying a reasonable hourly rate can still generate limited weekly income if hours are short. Conversely, a high weekly amount can depend on long hours. The measure is useful for the income delivered by a payroll position, while requiring separate information about whether its hours are desired, predictable, or compatible with caring responsibilities. More hours can improve purchasing power and worsen another dimension of welfare.

CES, the principal input, counts jobs rather than unique workers; its earnings measure concerns cash payroll compensation and its hours concern paid time. Employer benefits are outside that earnings concept. A person with two jobs can enter twice, and self-employment lies outside the relevant payroll coverage. The JQI's classification also primarily describes industry averages, rather than a direct survey of each individual's pay. These boundaries determine the claims the ratio can support. [2]

Its separate contribution is therefore job composition. Keep it beside measures of adequate wages, benefits, household resources, and population employment. Their disagreement can reveal which dimension changed. Coverage and classification must remain stable before movements in the ratio are interpreted as economic changes.

Evidence long history, revisions, and reference dates

The November 2019 white paper reports a JQI of 94.9 in 1990 and 79.0 in July 2019. It also attributes 63% of net production and nonsupervisory job formation since January 1990 to below-benchmark categories. The word net matters: this is the distribution of the change in employment stocks, not the share of all gross hires or all jobs ever created. Both the population and the historical window should accompany that statistic. [1]

The latest release located before the 4 October 2026 cutoff is dated 2 October, headed August 2026, and reports 84.97. It states that delayed data require caution, but also refers to July employment data and an April weekly-pay level within the same release. The published number can be recorded with its literal label and release date; those conflicting reference periods prevent presenting it as an unambiguous September observation. Its headline is a three-month moving average. [3]

These checkpoints support a historical change in composition while allowing subsequent recoveries. The current published ratio is above the older July 2019 reading, and the long chart includes cyclical movement rather than a smooth decline. Do not turn a lower early-versus-late comparison into a claim that the index worsened every year. Nor should a rebound be excluded because it complicates the framework. Its duration and size should enter the same assessment as the preceding deterioration.

The original paper's text and figures also require faithful vintage handling. Its unspecified 1990 reading and its January 1990 percentage shares should not be forced into a single arithmetically reconciled endpoint without consulting the underlying series. Archive the published checkpoints as stated, retain their month labels, and identify any unresolved discrepancy. A chart assembled from current revised data may differ from the original chart; it should say which vintage it uses.

A net-flow statistic can become unstable when total net growth is small. For example, suppose lower-pay categories gain 100 positions while higher-pay categories lose 50. The lower category contributes 200% of the total net gain of 50, without any impossible count. Negative contributions are equally possible. This hypothetical arithmetic explains why net shares are not ordinary probabilities of a newly hired person getting a particular kind of job. Show both category changes and the total.

The long series is valuable because it predates generative AI and covers several technological and business-cycle regimes. Its interpretation remains a relative job-mix finding. Employment growth, recession, changing industry weights, and movements in the threshold can all affect the ratio. A historical chart should preserve those components wherever the underlying data allow, rather than use a single line to imply that one named technology caused the entire change.

Post labor interpretation payroll quantity and income capacity

The post-labor relevance is a change in relative composition: an economy can maintain or expand employment while a smaller share of covered positions belongs to relatively higher-weekly-pay categories. That result does not establish a decline in a fixed real-income standard or in the absolute count of higher-pay positions. Job creation alone supplies an incomplete account of the mix. The JQI identifies that distributional dimension; complementary real-earnings measures determine whether purchasing capacity also weakened.

A hypothetical economy adds many hospitality positions while losing fewer high-weekly-pay manufacturing positions. Its net employment grows, yet the mix of covered jobs can shift downward by the index's

classification. Households previously supported by one steady position might seek multiple jobs or another earner. That household response is an inference requiring separate evidence, not an outcome directly measured by the JQI. The ratio describes positions; it does not observe rent payments, family budgets, or the reasons workers choose hours.

The index is particularly useful beside labor productivity and labor compensation. If output per paid hour rises while the mix of weekly-paying opportunities weakens, investigate where the gains accrue: existing employees, owners, customers through prices, or new investment. The sequence is compatible with labor-saving reorganization, but it does not identify that cause. The distributional account becomes stronger when output and task evidence show why the economy can expand without reproducing the former opportunity mix.

Its contribution is also different from a labor-share measure. Labor share concerns the proportion of value added paid as compensation, whereas the JQI concerns the distribution of positions across relative weekly-pay categories. A large wage bill concentrated in a smaller set of highly paid jobs can coexist with many below-benchmark positions. Conversely, a more equal job mix can coexist with a smaller aggregate labor share. Keeping the measures separate helps distinguish total labor income from broad access to that income.

The weekly-hours component can expose an adjustment margin missed by a wage-rate focus. An employer may hold hourly rates steady while offering fewer paid hours, or shift staffing toward part-time positions. In such a setting, the purchasing capacity of a job can weaken without a nominal wage cut. Whether this represents unwanted underutilization requires surveys of desired hours and scheduling conditions. Shorter work can also be chosen and valuable, so the interpretation must preserve that possibility.

The index cannot establish that lower-paying work lacks economic value. Care, food service, retail, and other services can meet substantial needs while delivering limited pay. Their growth may reflect demand, demographics, or institutional pricing rather than artificial job creation. Post-labor analysis here concerns how valuable production becomes a source of household income. It gains explanatory force when the job mix is connected to compensation, ownership, access, and the institutions that distribute productive gains.

Alternatives relative thresholds and coverage limits

A moving mean is not a fixed purchasing-power floor. If every covered job’s real weekly pay doubles without a change in relative ranking, the classification and ratio can remain similar while living standards improve. If the pay of a small highly paid group rises sharply, the mean can increase and reclassify other positions despite unchanged pay there. These hypothetical cases show why the JQI should accompany real weekly earnings and an explicit adequacy measure.

Industry averages create an additional ecological boundary. Employees in the same industry can have different wages, schedules, and benefits. Classifying the industry does not prove that each individual position lies on the same side of the economy-wide mean. The flip-category adjustment reduces a particular source of instability but does not transform the entire index into person-level wage microdata. Analyses of within-industry dispersion or individual low pay should use appropriate worker or payroll records.

The occupational adjustments also use an input with its own methodology. OEWS is an establishment survey combining multiple semiannual panels, with changes in classifications and estimation over time. Its wage

measures are not a direct observation of each worker's actual weekly paid hours. Preserve the input vintage and documented conversion when reproducing JQI adjustments; do not infer consumer time or individual hours from annual-wage conversions. [4]

Coverage excludes important alternatives to payroll work. A shift into self-employment can change covered payroll composition without describing the quality of the new arrangements. The same is true of shifts involving government employment or other excluded populations. Compare coverage counts over time and use separate series for those arrangements. A narrower covered universe cannot automatically support a statement about the welfare of all employed Americans or the entire working-age population.

Hours preferences and benefits can change the welfare interpretation. A lower-weekly-pay job with chosen shorter hours, strong health coverage, and predictable scheduling can be attractive to some workers. A higher-weekly-pay job with hazardous conditions or excessive hours may be less attractive. These comparisons do not invalidate weekly income as a measure; they identify the additional evidence necessary to classify a job as good across several dimensions. CEPR-style benefit coverage and hours-preference measures supply complementary tests.

Several rival causes can produce an unfavorable composition shift: demographic demand for services, trade, regional relocation, outsourcing, weak aggregate demand, or institutional changes in compensation. Automation can interact with these mechanisms. A persuasive causal assessment should compare task exposure, sector output, wages, and counterfactual employment, rather than assign the long national ratio to one force by inspection. Likewise, favorable wage convergence and a sustained improved mix should weaken the relevant compression claim rather than be treated as irrelevant exceptions.

Monitoring ratio, components, and a broader quality check

The main chart should show the published JQI on its original ratio scale, with a clearly identified data vintage and smoothing rule. Include historical expansion peaks and recessions, and mark the latest number with the literal August 2026 label and 2 October release date. A source note should disclose the release's inconsistent reference periods. Avoid combining its headline with a separate instant net-flow reading as though both describe the same population and month. [3]

Below it, show covered higher- and lower-pay position counts and the employment-weighted weekly-pay threshold in real dollars. These components reveal whether a ratio change reflects growth below, contraction above, or reclassification. A separate panel can display the two categories' hourly earnings and paid weekly hours. Where an analyst reconstructs those components, publish the formula, seasonal-adjustment treatment, occupational splits, and sector crosswalk, and retain the raw official inputs.

For net growth, present the change in each category alongside the net total. Use a signed contribution chart when categories move in opposite directions. Do not cap a computed net share at 100% simply because it resembles a probability. If the denominator is close to zero, emphasize counts and a longer comparison window. A three-month smooth may improve readability, but it does not remove the arithmetic problem created by a tiny net denominator.

A complementary worker panel should assess real hourly pay, annual earnings, benefits, desired hours, schedule stability, and the share of the working-age population holding positions that meet an explicit

adequacy threshold. Household measures can then assess multiple earners, transfers, and resources after tax. This sequence traces the connection from payroll composition to lived income capacity without making the ratio answer questions its source data do not contain.

A rigorous update archives each release before revisions replace it. It checks benchmark revisions, sector reclassifications, and changes in the occupational adjustment, and distinguishes a revised history from a real-time reading available to observers at the time. Internal date discrepancies should remain flagged until resolved by the producer or reproduced from verified inputs. The goal is a usable longitudinal measure, not a false precision obtained by guessing which date the producer intended.

Read the JQI alongside good-job coverage, weekly and annual earnings, employment-population ratios, and labor share. The distinctive evidence is that the mix of covered payroll jobs can change while total job counts rise. Its strongest post-labor contribution is historical composition, bounded by a relative benchmark and limited coverage. A sustained improvement in real weekly earnings, benefits, desired hours, and accessible higher-pay employment would qualify that interpretation, even if the ratio remained below 100.

SOURCES AND REPRODUCTION NOTES

[1] Daniel Alpert, Jeffrey Ferry, Robert C. Hockett, and Amir Khaleghi (2019). The U.S. Private Sector Job Quality Index: White Paper. November 2019 methods paper; 63% refers to net covered job formation, and the ratio uses a relative weekly-pay benchmark. Verified for version two 4 October 2026.

[2] Bureau of Labor Statistics (2025 methods page, accessed 4 October 2026). Current Employment Statistics: Concepts. Official CES concepts: payroll positions rather than unique people, paid hours, and cash earnings that exclude employer benefit costs. Verified for version two 4 October 2026.

[3] U.S. Private Sector Job Quality Index research team (2026). U.S. Private Sector Job Quality Index, August 2026 labeled release. August-labeled release dated 2 October 2026; reports 84.97, but internal July and April references leave its precise reference period ambiguous. Verified for version two 4 October 2026.

[4] Bureau of Labor Statistics (Methods page accessed 4 October 2026). Occupational Employment and Wage Statistics: Frequently Asked Questions. Official occupational-survey methods and time-series cautions; establishment employment and wage estimates do not directly measure unpaid consumer task time. Verified for version two 4 October 2026.

CHAPTER 130

Middle income population and income shares

EVIDENCE STATUS **Mixed evidence: long-run middle-tier contraction, upper-tier expansion, and real income gains** ·
OBSERVATION SPAN United States CPS ASEC population observations 1971–2023; household income reference years 1970–2022

A smaller median-based middle-income tier indicates less concentrated access to a shared income range, but its contraction includes upward expansion and does not independently identify weaker labor demand.

Definition population coverage within a moving income band

Middle-income coverage measures the share of people living in households within a specified income range around the national median. Pew's historical definition places the tier between two-thirds and twice the median after adjusting household income for size. This differs from a middle quintile, which contains a fixed share of the ranked population by construction. The tier can expand or contract as the distribution changes, making its population coverage a distinct longitudinal outcome. [1]

The unit matters. A share of Americans living in middle-income households is a person-based percentage; it is not automatically the share of households in that tier. Larger households represent more people. A separate income-share measure reports the portion of aggregate household income received by the classified tier. Those two percentages have different numerators and purposes. The first concerns how broadly the income range encompasses residents; the second concerns the concentration of reported resources across tiers.

The threshold also moves. If the national median rises, the dollar boundaries rise with it. A household's real resources can improve while its relative position remains unchanged or falls. Conversely, a recession can change the median and tier membership even when a household has lost purchasing power. The measure answers a question about relative inclusion in the current distribution. A fixed real-income standard, consumption measure, or essential-cost budget answers a different question.

Pew adjusts for household size using its square root and presents comparable dollar amounts on a three-person scale. The historical CPS series does not adjust local living costs; the separate ACS demographic analysis does. Mixing their observations would combine different geographic adjustments and income-reporting clocks. The historical share is a national relative-income measure, not a declaration that the same income buys the same standard of living in every locality. [1]

Use middle income as a statistical label. It does not fully define class identity, economic security, occupational status, wealth, or the ability to withstand an emergency. Those dimensions require companion evidence. The same person can change tiers because income changes, household composition changes, or the national median moves. A membership change therefore requires explanation rather than a predetermined welfare interpretation.

Evidence fewer in the middle, with gains above and below

Pew's 2024 analysis reports that 61% of Americans lived in middle-income households in 1971 and 51% in 2023. The lower-tier share rose from 27% to 30%, while the upper share rose from 11% to 19%; rounded percentages need not sum exactly to 100. This is a five-decade change in distributional shape. The larger expansion occurred above the middle, so the result cannot be described as most of the missing middle falling into poverty. [2]

The income reference years are 1970 and 2022, rather than the survey years. Across that interval, the middle tier's reported aggregate income share fell from 62% to 43%, while the upper tier's rose from 29% to 48% and the lower tier's fell from 10% to 8%. Middle-tier real median income rose from approximately $66,400 to $106,100 on the report's three-person, 2023-dollar scale. Median gains were positive in every tier. [2]

These observations support relative contraction and unequal growth, while preserving absolute progress. Income shares can decline when a group's resources rise more slowly than the total. They also change when the tier contains fewer households. Separating membership and income levels is necessary to understand the outcome. It would be misleading to describe the middle income-share decline as the same-sized group losing a fixed percentage of its real income.

The analysis uses repeated cross sections, not a panel following the same households over fifty years. Changes in the upper and lower shares therefore describe the distribution at different dates. They do not establish how many particular people moved upward or downward, how long they stayed there, or whether the same families inherited their position. Individual mobility, lifetime earnings, and intergenerational opportunity are distinct instruments requiring linked or longitudinal evidence.

Publication and observation dates should remain visible. The 2024 release provides a completed historical comparison through the 2023 survey and prior-year income. A newer national median-income release cannot update its tier shares without applying the same household-size adjustment, weighting, and boundaries to the new microdata. Record a contemporary median as context when useful, but do not attach it to the old tier-share line or imply the original analysis reached 2026.

The broad endpoint comparison is informative without asserting smooth yearly deterioration. Expansion peaks, recessions, demographic shifts, and statistical redesigns may alter the path between endpoints. A well-documented chart should use the published observations or a verified reconstruction and identify their vintage. Where only selected years are available, show checkpoints rather than inventing an annual series. Retaining upward progress and intermediate reversals makes the indicator useful for evaluating competing accounts of economic change.

Post labor interpretation breadth of the income bargain

The post-labor connection concerns the breadth of economic inclusion formerly associated with ordinary employment. A relatively concentrated income distribution can allow many households to participate in a broadly shared standard, while a wider distribution can place more households far below or above its center. Middle-tier coverage offers an outcome measure of that breadth. It does not tell us which form of income created the position, but it can reveal whether the common range encompasses fewer residents.

One possible mechanism is a shrinking supply of positions that allow people with varied backgrounds to sustain middle-range household income. Loss of stable hours, employer premiums, benefits, or accessible career ladders can affect that capacity. A household may remain employed while another earner, overtime, transfers, or a second job becomes necessary. These are hypotheses requiring source and work-pattern evidence. The tier percentage alone records household resources, rather than the work effort needed to obtain them.

Another possibility is faster income growth at the top while the middle improves more slowly. That can reduce the center's relative economic influence without erasing its material gains. If top growth arises from ownership, the outcome would support an account in which capital claims distribute a growing part of prosperity. If it arises from highly compensated labor, it would instead show unequal access within labor. The published tiers contain both possibilities, so an income-source decomposition is indispensable.

Money income also incorporates regularly received government cash benefits. Census's alternative-income definitions identify Social Security, unemployment compensation, and specified means-tested programs among cash transfers. Consequently, middle-tier coverage may already reflect institutional support for people whose wages alone would place them lower. A useful post-labor test compares observed household resources with consistently defined earnings and transfer components. It should not call the published measure pre-transfer simply because some benefits are excluded. [3]

This connection is particularly valuable alongside transfer dependence. A stable middle-tier share could coexist with less reliance on labor if public cash support or ownership receipts increasingly maintain household resources. A falling share could occur despite increased support if market incomes diverge faster. Both patterns require separating the source of income from its distribution. The income band describes who occupies a relative position; source shares describe how that position is financed.

Upward expansion remains substantive counterevidence to a universal exclusion claim. More people in the upper tier can represent higher wages, successful business activity, or other real gains. Post-labor economics should ask who gains, which claims secure those gains, and how widely those routes are accessible. It cannot treat entry above the middle as deterioration simply because the center becomes smaller. The measured contribution is a thinner middle and more unequal growth, with both progress and vulnerability inside that result.

Alternatives household composition, resources, and classification

Household structure changes the relationship between an individual job and income-tier membership. Two earners can pool wages, while separation, retirement, or a change in household size can alter adjusted income without any new automation. Partners' earnings may be increasingly correlated, further changing the distribution of household resources. To evaluate labor compression, examine comparable household types and individual labor outcomes alongside the national tier, rather than assigning every compositional change to labor demand.

Aging matters for similar reasons. Retirees can receive pensions and Social Security while owning substantial wealth; young adults can have low current earnings during education or early career entry. Cross-sectional lower-income status does not determine their lifetime prospects. Cohort and age-standardized comparisons

can identify whether the national trend persists among otherwise comparable populations. Such adjustments are additional analytical series, not corrections that should silently replace the published all-person measure.

Census money income excludes capital gains and noncash benefits and is measured before personal taxes and specified deductions. It therefore differs from comprehensive disposable resources, consumption, and wealth. A household receiving substantial health benefits may appear lower in cash income than under a broader resource definition. A household with rising asset values may gain wealth without a corresponding money-income increase. The source also warns that reported income can be undercounted. [4]

Median-based bands are sensitive to the definition of income and the household equivalence scale. Changing either can change who is classified. A tier's income share is consequently not independent of the bands that define it. Robustness checks can vary reasonable boundaries or compare fixed real thresholds, but the original two-thirds-to-double series should remain clearly identified. Otherwise, an apparent historical change may arise partly from switching instruments rather than from economic change.

Geography supplies another rival interpretation. A national middle-range cash income can support different living standards in places with different housing and service costs. People can relocate, changing both wages and expenses. The historical national series cannot resolve whether affordability worsened in a particular locality. Use a separately labeled regional-price-adjusted series or essential-cost comparison when making that claim, and document that its geography and availability differ from the long national record.

Finally, a smaller middle is compatible with several causal stories: skill and wage dispersion, ownership returns, demographics, trade, technology, taxes, or transfers. The outcome strengthens a post-labor distributional account when it aligns with declining broad access to labor-derived income. It weakens that interpretation when comparable working households enjoy stronger real earnings and more accessible advancement, or when the change is mainly upward improvement. Evidence should distinguish those cases rather than assign the same theoretical meaning to all contraction.

Monitoring relative inclusion and its income sources

The first chart should show lower, middle, and upper population shares at each verified date. Label its denominator as people living in households and distinguish survey years from the prior-year income reference. The second should show reported tier income shares and a third real median income within each tier. These displays answer membership, concentration, and absolute-progress questions separately. A household-share reconstruction should have its own label and weighting rather than borrow the published person-based percentage.

A reproduction file should preserve the CPS ASEC vintage, the definition of household income, household-size adjustment, national median construction, income-band boundaries, and survey weights. Keep household-level income aggregation separate from person-level population tabulation. Confirm the published aggregation convention before reproducing the income-share panel. Apply appropriate sampling uncertainty and identify major questionnaire or processing changes. The Pew methodology explicitly notes CPS revisions and different uncertainty procedures for older years. [1]

For a labor-focused extension, produce age-standardized and household-type panels, then report wages and salary income, self-employment income, cash transfers, and asset receipts separately. These decompositions

should use compatible definitions and avoid classifying all business income as pure capital income. A counterfactual excluding transfers is a diagnostic calculation, not a behavioral estimate of what households would earn without the programs. Publish its assumptions and retain the observed classification beside it.

A fixed real-income benchmark provides a useful parallel measure of material progress. Holding a purchasing-power band constant answers how many households attain a historical income standard, while the moving median band answers relative inclusion. Neither alone establishes affordability of current essentials. A cost-based budget can add housing, food, transport, and care, with locality and household type specified. Report the different questions openly rather than collapse all three measures into a single middle-class statistic.

Longitudinal follow-up should ask whether households enter, remain in, or leave the tier, and how much effort or risk accompanies their income. Years in a stable range, exposure to earnings losses, multiple-job holding, and cumulative real income can distinguish a secure position from a fragile annual snapshot. These proposed complements require panel evidence. They should not be inferred from the endpoint change in national population shares or counted as already observed trends without independent documentation.

Read this measure with household income growth, good-job coverage, intergenerational mobility, ownership concentration, and transfer dependence. Its distinctive contribution is the changing coverage of a median-based income range over five decades. The result is mixed for the broader narrative: the middle contracted and its relative income share fell, while the upper tier expanded and real incomes increased. The post-labor interpretation depends on identifying whether labor-derived opportunity became less broadly available within that changing distribution.

SOURCES AND REPRODUCTION NOTES

[1] Rakesh Kochhar, Pew Research Center (2024). Methodology: The State of the American Middle Class. Defines median-based tiers, household-size adjustments, survey-year versus income-year timing, and separate regional-price treatment for the ACS demographic analysis. Verified for version two 4 October 2026.

[2] Rakesh Kochhar, Pew Research Center (2024). The State of the American Middle Class. Published 31 May 2024; population observations 1971–2023 correspond to income years 1970–2022, with both upward expansion and real gains. Verified for version two 4 October 2026.

[3] U.S. Census Bureau (Undated methods page, accessed 4 October 2026). Alternative Measures of Income Definitions. Official definitions identify government cash transfers within income; excluding noncash benefits does not make a money-income series pre-transfer. Verified for version two 4 October 2026.

[4] U.S. Census Bureau (Undated methods page, accessed 4 October 2026). About Income. Official money-income definition excludes capital gains and noncash benefits; it differs from wealth, consumption, and comprehensive after-tax resources. Verified for version two 4 October 2026.

CHAPTER 131

Shadow work and unpaid consumer service labor

EVIDENCE STATUS **Proposed metric; no verified national secular growth series** · OBSERVATION SPAN Measurement program proposed; ATUS infrastructure from 2003; separate observed teller example 1997–2007

Commercial services can move tasks onto unpaid consumers, but measuring that transfer requires identifying the former paid task, the customer's added time, service quality, and net labor effects.

Definition transferred commercial tasks outside payroll

Shadow work, for this entry, means unpaid consumer activity required to complete a commercial service when a comparable activity was previously performed by paid staff. It is a proposed measure of a boundary shift between payroll work and customer effort. The definition is narrower than all household production and different from unpaid overtime by employees. Cooking, caregiving, and ordinary shopping are not automatically included; a qualifying activity needs a specified service task and a defensible formerly paid comparison.

Consider a hypothetical checkout process. In the earlier arrangement, an employee identifies and records the customer's purchases. In the newer arrangement, the customer performs some recording while an employee supervises exceptions. The transferred component is the customer's incremental work associated with the changed service model. It is not the entire shopping trip, and it is not automatically equal to the employee time removed. Software, redesigned equipment, and supervision can change the required task time on both sides.

Three boundaries belong in every observation: the valid outcome delivered, the task formerly included in the service, and the incremental consumer time or burden. Compare quality and scope as well as duration. A cheaper service with extra customer effort may be a chosen tradeoff, while a compulsory process can impose a burden without a corresponding benefit. The metric records those changes rather than determining their welfare value from the presence of self-service alone.

Useful units include minutes per completed transaction, the share of transactions requiring customer task completion, aggregate unpaid hours, and a money valuation under stated assumptions. These units are not interchangeable. A short task used frequently can create considerable total time, while a rare difficult task can impose substantial burden on a subgroup. Record incidence, duration, completion, and errors separately. Equivalent paid hours are an analytical comparison, not proof that the same number of payroll hours or jobs disappeared.

This chapter supplies a measurement design and bounded examples. No verified national series currently assembled here establishes that qualifying shadow work rose for twenty years. The available longitudinal infrastructure makes that hypothesis researchable; it does not make it an observed secular result.

Evidence usable infrastructure and limits of examples

The American Time Use Survey provides a primary measurement resource beginning in 2003. Its September 2026 User's Guide documents previous-day diaries, activity coding, weights, and population estimates. ATUS mainly records primary activities and does not routinely capture simultaneous activities apart from specified childcare information. More importantly, it does not identify whether an activity used to be supplied by a paid commercial employee. Broad time-use categories therefore cannot be relabeled shadow work without additional evidence. [1]

A longitudinal study could use household management, purchasing, and service-related time as candidate areas, then identify qualifying transfers through task-specific questions or linked process evidence. An increase in a broad category would still require decomposition. More purchases, more complex products, demographic change, or administrative obligations can increase time without any employee-to-consumer transfer. A flat category can likewise conceal transferred tasks if digital processes simultaneously save travel or waiting time elsewhere.

Occupational employment evidence can identify the payroll side, but it cannot supply the missing consumer numerator. BLS's OEWS survey estimates employment and wages at establishments. Its multi-panel estimation and classification changes require caution in long-run comparisons; it does not measure unpaid customer tasks. A declining occupation count can reflect consolidation, automated execution, another paid occupation, or reduced demand rather than transferred consumer labor. [2]

Banking illustrates why a technological example is not a trend estimate. BLS reports that teller employment increased 11.6% from 1997 to 2007 even as ATMs were widespread. Its 2018 discussion separates that observed history from projections and describes mobile banking and video-teller mechanisms. This is counterevidence to a simple claim that consumer-operated equipment necessarily reduced aggregate teller employment. An old projection for 2026 cannot be substituted for an observed contemporary outcome. [3]

A case study must therefore document both sides of the task change. Archival service descriptions can show whether staff previously completed the action; process observation or diaries can show what customers now do. Transaction records can identify service volume and errors. Staffing and financial records can show whether payroll expense changed. Each source answers a different question, and none alone establishes that the total economy experienced an increasing burden across several decades.

The current evidence status is proposed, not established growth. Self-service arrangements make the construct plausible and particular transfers can be measured in specified settings. The unresolved question is whether their aggregate incremental time has grown, fallen, or changed composition. Retaining this open result is essential: a glossary can contain a valuable research instrument without counting it as another verified line of national deterioration. Its contribution is to identify what the familiar examples fail to measure.

Post labor interpretation labor boundaries and economic capture

The proposed post-labor connection is that the customer can become an unpaid input into production. A business can lower its paid task requirement while still delivering a completed service because consumers supply some necessary actions. Paid labor's role then contracts within that workflow, even though human

effort remains. This is a boundary shift, not elimination of work in the broad sense. It can help explain why productivity measured against paid hours differs from users' experience.

In a hypothetical service, output per employee hour rises after customers enter their own information. Part of the gain may come from genuine automation, part from removing redundant steps, and part from shifting input work to users. An assessment needs to separate those contributions. If customer time rises but employee time falls, measured payroll productivity can improve while the gain in total human-time efficiency is smaller. If both fall, the redesign can deliver genuine time savings as well as reduced labor demand.

The economic capture question concerns the resulting surplus. Savings may reduce prices, increase firm margins, finance more service volume, or support remaining employees' pay. Consumers may receive convenience, longer access, and faster completion in exchange for their effort. These possible benefits belong in the analysis. A paid-hours reduction supports a task-substitution account in the observed setting, but the welfare outcome depends on prices, time, quality, and the alternatives offered to users.

The net labor-demand implication also requires a wider boundary. A company may reduce frontline work while increasing technical support, equipment maintenance, exception handling, or software work elsewhere. Lower cost can expand demand, partially or fully offsetting the hours saved per transaction. Payroll contraction at one location is not a national employment estimate. Follow output volume and relevant upstream and support labor before describing how much paid work the new process ultimately requires.

The relation to transfer dependence is indirect. If task shifts reduce access to adequately compensated positions, households may rely more on other income sources. But a consumer task transfer does not itself establish household income loss, and unpaid consumers may be employed elsewhere. The proposed instrument contributes evidence about a production boundary; separate job-quality, earnings, and resource measures establish whether that boundary shift weakened labor's distributive capacity.

This construct is also distinct from the assertion that some paid jobs have no economic purpose. The displaced service task can be plainly useful; consumers must complete it for the outcome to occur. The question is who supplies it, who is paid, and who receives the benefits of redesign. That makes shadow work relevant to post-labor economics without requiring a claim that the economy manufactures pointless employment or that all self-service represents a harmful transfer.

Alternatives convenience, true automation, and measurement error

A task can disappear rather than move. An automated payment can eliminate manual reconciliation while requiring only a brief authorization from a customer who previously had to provide equivalent consent. Counting the entire process as unpaid transferred labor would overstate the shift. Define the customer action relative to the earlier service and identify which employee action it replaces. An observation of fewer paid staff is insufficient if the underlying work is now executed by a system.

Consumer effort can also decrease. A digital transaction might require a few extra active minutes while avoiding travel and a long queue. Active work, waiting, and travel should be reported separately, with total elapsed and opportunity time available as additional measures. Their welfare values can differ; time spent

waiting while doing another activity is not equivalent to uninterrupted required attention. ATUS's limited simultaneous-activity collection makes it necessary to explain what a diary-based estimate captures. [1]

Self-service can reflect preferences and price differences. A customer may choose a lower-cost option, more privacy, flexible hours, or direct control. If a full-service alternative remains available, recording its price and uptake helps distinguish an elective tradeoff from a universal requirement. Choice does not automatically remove distributional concerns: users with limited money, time, literacy, language access, or disability accommodations may face different practical alternatives. Measure those constraints rather than assume a representative user.

Some activities are newly necessary because products or institutions become more complex. Security checks, account recovery, dispute handling, or compliance may burden consumers without being a simple transfer from a formerly paid task. Such activities can matter greatly, but their mechanism should be labeled separately. Otherwise the metric combines technological displacement, service deterioration, and entirely new administrative work, making its trend difficult to interpret.

Quality is another boundary. A fast process that fails or requires later correction does not have the same output as a correctly completed service. Include retries, errors, abandonment, and unresolved cases, and avoid recording abandoned transactions as successful efficiency gains. Where a consumer performs additional troubleshooting, distinguish necessary service completion from optional learning or customization. A common valid-outcome definition is essential to compare time per transaction before and after a redesign.

These alternatives make a rising national burden an empirical question. Transactions can proliferate while minutes per transaction fall; increased task incidence can be offset by avoided travel; paid employment can rise with expanding service volume. Conversely, apparently faster digital completion can conceal repeated support efforts or exclusion. The post-labor interpretation becomes more credible when a specific former paid task, incremental consumer burden, and persistent paid-hour reduction are jointly documented under comparable output and quality.

Monitoring a transferred task account with explicit counterfactuals

Build a task register before an index. For each service, record the former paid action, the new consumer action, the implementation date, whether full service remains available, and the valid outcome. Evidence can include archived terms, service manuals, staffing descriptions, and direct observation. Mark ambiguous cases as uncertain instead of forcing them into a total. This register provides the classification necessary for a time series and makes its interpretation auditable.

The primary unit should be incremental active consumer minutes per valid outcome, relative to a specified earlier or alternative process. Report waiting, travel, retries, and support contacts beside it. Multiply by verified transaction volume only within the covered population and service scope. Weight consumer observations appropriately, account for noncompletion, and report uncertainty. A small convenience sample can describe its setting but cannot justify a national total without a defensible sampling frame.

For the paid side, measure employee hours per valid outcome and the number of outcomes. Pair those with observed payroll or external-service expense, transition costs, prices, and service quality. Employee hours saved can exceed or fall below customer hours added because technology changes task efficiency. Do not

convert consumer minutes mechanically into lost jobs, and do not call an FTE-equivalent calculation realized cash savings without an observed expense change. The economic boundaries should match those used in the enterprise cost measures.

For a longitudinal population estimate, start from ATUS as a general time-use foundation and propose targeted supplementary questions identifying service, task, and former paid provision. Preserve original diary categories rather than rewriting them after the fact. A twenty-year historical reconstruction would need consistent archives or comparable surveys establishing the transfer classification across time. The guide's survey design and coding instructions support estimation, while the new transferred-task label remains an analyst instrument. [1]

An aggregate dashboard should separate verified transferred tasks, uncertain cases, entirely new administrative burdens, and genuine automated execution. It should display consumer time, paid time, service volume, prices, and completion quality on their own scales. Report subgroup burdens and available alternatives. A money-valued unpaid-time total should show its valuation assumptions and sensitivity; an opportunity-cost valuation and a replacement-wage valuation answer different questions and need not agree.

Read this proposed measure alongside unpaid care, employee unpaid-work burden, workflow throughput, cost per valid outcome, and realized labor expense reduction. Its distinct contribution is the movement of commercial task responsibility onto consumers. Evidence of lower total human time, better outcomes, lower prices, and maintained good employment would qualify a compression interpretation. Evidence of sustained paid-hour reduction alongside added unpaid burden and weak replacement opportunities would strengthen it in the measured domain. Neither result should be asserted nationally before the longitudinal account exists.

SOURCES AND REPRODUCTION NOTES

[1] Bureau of Labor Statistics (September 2026). American Time Use Survey User's Guide. September 2026 guide documents diaries, weights, and activity coding from 2003; it does not identify formerly paid commercial tasks. Verified for version two 4 October 2026.

[2] Bureau of Labor Statistics (Methods page accessed 4 October 2026). Occupational Employment and Wage Statistics: Frequently Asked Questions. Official occupational-survey methods and time-series cautions; establishment employment and wage estimates do not directly measure unpaid consumer task time. Verified for version two 4 October 2026.

[3] Bureau of Labor Statistics (2018). In the money: occupational projections for the financial industry. Observed teller employment rose 11.6% during 1997–2007; later staffing projections in this article are forecasts, not realized 2026 outcomes. Verified for version two 4 October 2026.

CHAPTER 132

Publicly financed employment

EVIDENCE STATUS **Proposed metric with observed financing components** · OBSERVATION SPAN United States; health-financing component history 1960–2024; no completed comparable twenty-year employment-attribution series

The public origin of demand can support private payrolls as well as government payrolls. Measuring that financing channel can complement transfer dependence and sectoral employment absorption, but it does not make wages transfers or establish that the financed work is economically unnecessary.

Definition and measurement boundary

Publicly financed employment asks how much paid employment is associated with demand funded by government. It separates the owner of an establishment from the source of its receipts. A privately owned clinic may sell services to a public insurance program; a contractor may build a public facility; a public school employs workers directly. These arrangements have different statistical classifications even when public purchasing helps support each payroll. The proposed measure follows financing into employment without changing the legal identity of the employer or the economic character of the service.

A transparent initial index is: publicly attributed job equivalents equal direct civilian government payroll jobs plus the sum, across eligible private industries, of private payroll jobs multiplied by a matched public-financing share. Divide by total payroll jobs measured on the same geography, period and coverage. The result is an attribution estimate. It is not a count of identifiable people whose salaries come exclusively from taxes, and it is not an estimate of how many jobs would disappear if a program ended. Both of those claims require information that the simple weighting rule does not supply.

The units must remain explicit. CES counts nonfarm payroll jobs rather than unique workers and excludes unincorporated self-employment and military service. An index based on that denominator should keep the same exclusions in its numerator, or publish a separately expanded version with corresponding population coverage. Annual average jobs should be paired with annual financing rather than a single month of employment. [1] Hours or full-time equivalents can provide a second view when publicly financed activities use a different mix of part-time work.

The financial boundary also needs a declared choice. Public-program payments identify a purchasing channel; government-sponsored financing identifies an ultimate funding contribution. These are related but different measures. A useful dashboard publishes each separately and names the weighting assumption. The proposed employment attribution should not be confused with transfer dependence, public employment alone, the share of GDP spent by government, or the care sector’s contribution to net job growth. Each has a different numerator and answers a different question.

Observed evidence and the missing composite

Health care provides a concrete financing component. CMS reports that federal government sponsored 31% and state and local government 16% of national health spending in 2024. National spending totaled $5.3 trillion, equivalent to 18.0% of GDP. Those observed figures establish a substantial public financing role; they are not percentages of health workers or national jobs. The latest historical observation is 2024, even though the accounts were published and updated in 2026. [2]

The underlying CMS historical accounts extend from 1960 through 2024. That meets the twenty-year requirement for a financing history, but a long expenditure series does not automatically create a long employment-attribution series. A defensible composite must join financing and payroll records using consistent services, ownership, geography and annual coverage. This chapter therefore labels the overall employment index proposed rather than presenting a national secular increase that has already been measured. [3] Its historical components are useful starting points for reconstruction.

Payer and sponsor distinctions matter in that reconstruction. CMS allocates financing among governments, households, businesses and other private sponsors. A public program can contain household premiums and business contributions, while private insurance can contain government subsidies or public employers' contributions. National health expenditures also include items outside private care-provider payroll revenue. Consequently, neither the public-program share nor the aggregate government-sponsor share can be applied indiscriminately to every health occupation. [4] Service-specific information is needed before translating financing into attributed employment.

The observed record should initially be displayed as components: direct government payrolls, private care employment, public financing of eligible care services, and separately documented procurement or grant-supported employment. The absence of a clean aggregate is informative. It tells the reader which claims are supported by official accounting and which depend on a proposed model. No reported combined percentage should be inserted simply because the pieces are individually large or because their combination would fit the post-labor thesis.

The initial index is a hybrid: its government term follows institutional payroll, while its private term follows financing. A stricter ultimate-sponsor variant must also allocate public-enterprise sales, tuition and user fees to their actual funding sources.

Historical reconstruction must also address missing intervals. If a sponsor breakdown begins later than the broad spending series, use the genuinely comparable common window. A research team can report an earlier payer-based series alongside a later sponsor-based series, but it should mark the boundary rather than splice them into one smooth chart. Reclassification, reimbursement changes and revisions should be preserved as metadata. Forecast financing shares belong in a separate scenario panel, with their policy assumptions stated; they do not extend the observed trend to the present.

Connection to post labor economics

The connection to post-labor economics is an institutional absorption hypothesis. If some private production needs progressively fewer labor hours per unit, public purchasing may help sustain paid employment in services where demand remains extensive. Labor income can therefore continue flowing through a paycheck

even when the demand supporting it depends partly on public budgets. This offers a different angle from a household transfer ratio: one follows the financing of work, while the other follows income received by households. Neither should stand in for the other.

Publicly financed wages remain payment for work. BEA defines employee compensation as remuneration in return for work, and its government accounts distinguish employee compensation from transfers to persons. A provider's receipt from a public program and an employee's wages also occur at different stages of the income and production accounts. Calling all government-supported wages disguised transfers would erase that distinction and risk counting the same economic flow twice. [5] The financing question is still useful once the accounting is kept intact.

A stronger post-labor pattern would combine a rising financing-attributed employment share with sustained productivity gains or labor displacement in other industries, weak growth in accessible good jobs, and evidence that affected workers or regions move toward publicly financed activities. The attribution index alone contains none of those transitions. Its interpretation becomes stronger when labor-market records show destinations, earnings, stability and skill requirements. If former routine workers cannot enter expanding care or technical roles, apparent national absorption can coexist with substantial individual exclusion.

The measure can also identify a distributional channel. Public demand can turn collectively financed resources into worker compensation and useful services. Whether that channel becomes more important as market labor income grows unevenly is a testable question about budgets, employment and household outcomes. It should not be presumed from a large present-day public share. The relevant secular finding would be a comparable change over at least two decades, followed by an explanation of whether composition, financing within sectors, or both accounts for that change.

This chapter connects most directly to transfer dependence, health and social-assistance employment, sectoral output versus labor input, and occupational transitions. It also belongs beside quality measures: an absorption channel that expands jobs while access or service outcomes deteriorate has a different meaning from one that meets unmet needs. Public financing can sustain economically valuable work. The post-labor question concerns how production and income distribution are organized as labor requirements change, rather than whether public and private activities occupy different moral categories.

Alternative explanations and attribution limits

Several mechanisms can increase public financing without labor displacement. A population can age, require more treatment, choose broader insurance coverage, or vote to finance services collectively. Public budgets may replace household payments for work that was already taking place. In that case the financing share rises while the number of jobs and the labor requirements of production barely change. Conversely, private care employment can expand while the public financing share falls. These possible outcomes make the matched component decomposition central to interpretation.

Revenue weights are convenient but imperfect labor weights. Two customers can buy services that use different amounts of staff time or attract different reimbursement rates. A public purchaser might pay less per visit while purchasing a more labor-intensive mix. Applying its revenue share to the whole payroll then understates or overstates attributable labor. A proposed estimate should report a simple proportional

version alongside alternatives based on service volume, staff hours, or cost allocation where those data exist. Agreement across reasonable methods is more persuasive than one precise-looking point estimate.

Double counting is another major risk. Direct public employment should not be added again through the public financing of government-owned providers. A contractor's purchase of supplies should not become another full job attribution at every upstream firm without an explicit input-output framework. Current services, capital projects, grant administration and insurance overhead also require separate treatment. The analyst must choose between a direct employment measure and a wider supply-chain footprint. Combining the two without labeling their different boundaries inflates apparent dependence.

The counterfactual question is harder than the descriptive question. If a public program were reduced, households, private insurers, charities or different public programs might replace part of the demand. Providers might change prices, staffing, product mix or geographic coverage. An attribution estimate does not model those responses. It therefore cannot establish fiscal unsustainability, the necessity of a particular policy, or the number of workers who have no market alternative. Those claims require a separate behavioral analysis and should not appear as conclusions beneath a simple weighted chart.

Cross-country comparisons also need institutional translation. One country can finance the same service through taxes, another through mandatory social insurance, and another through regulated private premiums. A narrow tax-funded definition may imply very different public dependence even when collective financing and employment are similar. Publish the financing convention and show how results change under a broader collective-financing definition. Do not interpret an ownership difference or accounting difference as a technological difference. The comparator should match the economic question before it is used to rank national post-labor development.

Monitoring design and tests that can change the interpretation

A useful first release would provide an annual worksheet rather than a single national score. For each eligible industry, record average payroll jobs, government-owned jobs already counted directly, eligible current revenue, the public-program payment share, the government-sponsor share where available, and the attributed job-equivalent calculation. Include an unallocated category for financing that cannot be matched reliably. Show coverage as a percentage of the target employment population so that improvements in data availability are not mistaken for growth in public dependence.

Publish three linked charts. The first shows direct government employment relative to matched total employment. The second shows the financing-attributed private component, with uncertainty bands from alternative labor-intensity assumptions. The third decomposes changes into shifts in industry employment weights and changes in public financing within industries. This makes it possible to distinguish expansion of a service sector from a change in who pays for an unchanged service. A fourth optional chart can display publicly associated hours or compensation, because job counts alone do not describe the amount or quality of labor income supported.

The secular test should use at least twenty comparable observed years and report the earliest defensible baseline. Preserve recession and emergency periods rather than selectively omitting them, but distinguish temporary relief programs from enduring financing arrangements. Recalculate prior years when source accounts are revised and keep a vintage note. If the composite cannot yet meet these requirements,

continue publishing its components and state that the employment-dependence trend is unresolved. The absence of a completed series is a research task, not evidence that the proposed direction must be correct.

Interpretation should respond to evidence. A sustained rise driven mainly by demographic care needs would support collective demand expansion more directly than automation absorption. A flat financing-attributed share despite declining hours in automated sectors would weaken the claim that this particular channel is growing. A rise accompanied by strong privately financed job creation and broad wage gains would require a different distributional account. Evidence of workers moving from displaced occupations into stable publicly financed work would strengthen the absorption mechanism, especially when service output and access also improve.

Finally, the dashboard should connect financing to outcomes without turning it into a ranking of deserving workers. Monitor pay, benefits, vacancies, turnover, waiting times, coverage and service quality using measures appropriate to each activity. Protect confidential employer and worker records when linking financing to employment histories. The reported result should state its period, denominator, financing convention, coverage and sensitivity range in the caption. Those details allow public financing to become a useful longitudinal instrument while keeping its descriptive evidence separate from claims about labor displacement, economic value or future policy.

SOURCES AND REPRODUCTION NOTES

[1] U.S. Bureau of Labor Statistics (2025). Current Employment Statistics: Concepts. Nonfarm payroll-job coverage and diffusion-index methods. Short-horizon indexes are seasonally adjusted; twelve-month diffusion is unadjusted and gives unchanged industries half weight. Verified for version two 4 October 2026.

[2] Centers for Medicare & Medicaid Services (2026). NHE Fact Sheet: Historical NHE, 2024. Observed 2024 national health spending and government sponsor shares. Spending shares are not employment weights; subsequent projections are separate. Verified for version two 4 October 2026.

[3] Centers for Medicare & Medicaid Services (2026). Historical National Health Expenditure Data. Observed expenditure history, 1960–2024, updated January 2026. Component history is available; a comparable financing-attributed employment composite has not been reconstructed. Verified for version two 4 October 2026.

[4] Centers for Medicare & Medicaid Services (2026). National Health Expenditure Accounts: Methodology Paper, 2024. January 2026 methods for the 2024 accounts. Defines payer versus sponsor and explains mixed financing; aggregate spending exceeds private provider payroll revenue. Verified for version two 4 October 2026.

[5] U.S. Bureau of Economic Analysis (current edition accessed 2026). NIPA Handbook, Chapter 2: Fundamental Concepts. Employee compensation is remuneration for work; government compensation and transfers are separate entries. Consulted for accounting boundaries, not a new trend estimate. Verified for version two 4 October 2026.

CHAPTER 133

Guard labor

EVIDENCE STATUS **Bounded historical evidence with classification-dependent proxies** · OBSERVATION SPAN United States; original broad history 1890–2002 and later reported occupational evidence 1950–2017; no independently reconstructed extension to 2026

Long histories of supervisory and enforcement work raise a distinct question about labor used to manage economic relationships. They do not establish that these jobs lack value, that automation created them, or that every manager's time is spent extracting labor.

Definition and measurement boundary

Guard labor is a theoretical category for resources used to enforce claims, secure compliance, or obtain effort within economic relationships. It asks about the work required to govern production and distribution, rather than the work devoted directly to making the final product. That distinction can help examine an economy in which production becomes more technically efficient while supervision, security and enforcement remain extensive. The category should be treated as an analytical boundary that requires measurement, not as an automatic judgment about the usefulness of any occupation. An occupation can serve several purposes, so its classification should remain open to revision.

The early Bowles and Jayadev framework uses a broad boundary that includes supervisors and enforcement activities as well as prisoners and estimated unemployment above a frictional benchmark. Such a measure is wider than paid employment. A chart using it must retain its labor-force denominator and explicitly identify its nonemployed components. It cannot be labeled the share of employed people doing pointless work. [1] A narrower occupational measure can instead count selected employed roles, but then it answers a different question and needs a different caption.

For practical monitoring, distinguish three versions. An employed occupational proxy counts specified supervisory or enforcement occupations. A task-based instrument estimates hours actually devoted to monitoring, sanctioning and protecting claims. A broad institutional measure may include nonemployment used in the theory of labor discipline. Publish them separately. Neither the broad total nor a managerial headcount can identify enforcement time precisely, because occupational labels combine activities and workers can perform several functions during the same day.

The denominator should match the purpose: guard employment divided by employed workers, guard job equivalents divided by payroll jobs, or measured guard hours divided by total worked hours. These ratios cannot be interchanged. The numerator must also state whether it includes private security, police, corrections, military personnel, supervisors or selected administrative tasks. A useful definition excludes or separates firefighting, emergency response and other protective services whose principal function differs from enforcing economic claims. Classification choices should be published before the trend is interpreted, with narrow and broad alternatives kept visible.

Historical evidence and the modern update

Bowles and Jayadev's published broad U.S. estimate rises from 6.0% of the labor force in 1890 to 26.1% in 2002. Within that history, components do not all move in the same direction: the reported military share falls from 5.4% in 1966 to 1.5% in 2002. The broad rise therefore does not justify saying that every kind of public enforcement employment expanded continuously. The paper also recognizes productive coordination within supervisory work and limits to causal interpretation. [1]

A later study by Luke Petach and Anastasia Wilson provides a useful extension. Its original publisher abstract reports that the labor-force share employed in guard labor increased from 19.5% in 1950 to 29.4% in 2017, using U.S. Census data at the commuting-zone level. It reports positive association with household income inequality and negative association with unionization. The article appeared online in September 2023 and in the June 2024 issue of Review of Radical Political Economics. [2] The observation window meets the twenty-year threshold.

That update is reported research evidence, not an independently reconstructed national series for this reference. The full coding appendix was access restricted during verification. The publication's original abstract and metadata support the stated endpoints, but they do not allow this chapter to certify every occupation crosswalk, specification or identifying assumption. In particular, the newer occupational estimate must not be spliced onto the older broad measure. Different boundaries, underlying records and population denominators can produce different levels even in the same year.

Official occupational statistics are useful components for a future replication. BLS OEWS classifies jobs by performed work; working supervisors who spend at least 20% of their time doing work like the workers they supervise are classified with those workers. The program has used the 2018 occupational classification since May 2021. These conventions show why an apparent supervisory total depends on the statistical system and why historical comparisons need crosswalks. [3] A recent occupational estimate cannot simply replace a historical Census classification.

The evidence consequently supports a bounded statement: published long-run U.S. proxies show substantial growth in labor associated with supervisory or enforcement categories. It does not supply a fully comparable annual series through the October 2026 cutoff. Modern component data, employer surveys and task records could extend the analysis, but the update must preserve the boundary or show the break explicitly. The proper latest-date label distinguishes the last observed year, 2017 for the newer reported study, from its later publication date.

Connection to post labor economics

The possible connection is a composition mechanism. When technology reduces labor needed for routine production, an organization may change the balance between producing outputs and coordinating, monitoring or protecting the economic relationships around them. A rising supervisory or enforcement share could be consistent with productive labor becoming more concentrated. It could also indicate that distribution and control remain labor-intensive even when some production tasks do not. This is a hypothesis about where labor goes; the historical occupational totals do not themselves identify the cause.

The stronger test would follow comparable establishments over time and measure production hours, valid outputs, enforcement-related hours and ordinary coordination separately. If valid output rises while direct production hours fall and enforcement hours rise, the organization displays a meaningful internal reallocation. It becomes evidence about automation only when the change is linked to a documented production technology, with demand, product mix, outsourcing and risk exposure considered. An aggregate increase in management occupations cannot supply those links by itself.

This distinction addresses skepticism about socially useless jobs. A role can be privately justified by reducing theft, satisfying a safety requirement, assigning complex work, or resolving conflicting incentives. Whether society could obtain the same benefit with fewer resources is a separate counterfactual. Guard labor asks about the cost and organization of maintaining economic relationships. Perceived pointlessness asks how workers assess their jobs. Neither survey feelings nor occupational labels prove that a job generates zero output or that a market is manufacturing empty work to absorb displaced people.

There is also a distributional hypothesis. An organization's supervision practices may affect effort, discretion, bargaining and pay. The newer guard-labor study reports local correlations that are relevant to that question, but this reference does not treat those correlations as proof that automation produces inequality through guard employment. [2] Establishing that chain would require evidence linking technological change to supervision and then linking supervision to worker outcomes. Each step can have a different explanation and should remain a separately assessed claim.

The chapter complements task displacement and reinstatement, new work creation, socially useless jobs, earnings segregation, worker bargaining and manager coordination load. Its distinctive contribution is to make governance of work a potential destination of labor, rather than assuming every new occupation directly expands final service output. The measure can enrich post-labor economics without becoming evidence immune to contradiction. If enforcement hours do not rise after technological change, or if better coordination explains the occupational growth, that finding changes the mechanism the thesis can reasonably claim.

Alternative explanations and classification limits

Coordination is the central competing interpretation. Larger organizations, specialized suppliers, complex products and dispersed teams can require people who schedule, resolve exceptions, maintain quality and integrate information. Those activities can be productive even when they are not visible as units of final output. A supervisor can coordinate one hour and enforce effort the next. Counting the person entirely as guard labor overstates enforcement; excluding the role entirely understates it. Task shares offer a better instrument when the question concerns the amount of labor devoted to control.

Legal authority does not solve the time-allocation problem. The National Labor Relations Act's supervisor definition includes independent-judgment authority over assignment, responsible direction and grievance adjustment as well as hiring, discharge and discipline. Those powers span coordination and enforcement. [4] Using that boundary may be useful for a specific employment-relations study, but legal status is not a stopwatch. It should not be converted into a claim that every covered worker spends all working hours extracting effort from others.

Changes in security demand can also reflect threats, public choices or regulated obligations. A community facing more fraud may purchase more prevention; an employer handling sensitive information may devote more resources to access control. These services can prevent large losses despite producing little visible output in ordinary periods. The appropriate comparison is their resource cost relative to risks prevented and service obligations met. Rising guard employment can therefore be compatible with rising productive complexity or legitimate protection, rather than evidence of surplus labor finding an empty occupation.

Historical occupation coding creates further uncertainty. Changing job titles, ownership, reporting conventions and the treatment of working supervisors can shift employment between categories without changing actual tasks. The difference between all employees and production or nonsupervisory employees is especially unsuitable as a direct guard count: the residual can contain professional and technical workers who do not supervise anyone. Outsourcing can move security staff to a contractor, increasing one industry's apparent guard share while leaving the national task requirement unchanged. Each boundary needs its own reconciliation.

The broad institutional version presents an additional interpretive difficulty. Including excess unemployment requires an assumed frictional baseline, and including prisoners introduces people who are not ordinary employed workers. A change in those components may reflect macroeconomic cycles or criminal-justice policy rather than the production structure of firms. Keep them visible in a separate decomposition. International comparisons are even more sensitive to military participation, incarceration, occupational coding and public-service organization. Ranking countries by a single broad percentage can conceal these institutional differences and should not substitute for a matched comparison of activities.

Monitoring design and tests that can change the interpretation

A rigorous dashboard should begin with an explicit classification register. List included occupations and tasks, their historical codes, denominator, data source, ownership coverage and any estimated nonemployed components. Provide a narrow employed enforcement proxy, a wider supervisory proxy and the original broad theoretical definition as separate panels. Reconstruct at least twenty observed years under a common boundary where possible. If the boundary changes, mark the discontinuity and show an overlap-year comparison rather than implying an uninterrupted secular trend.

The task-based extension should measure enforcement minutes and ordinary coordination minutes per valid output, alongside total labor minutes and worker autonomy. Use sampled diaries or privacy-preserving task studies with a predeclared coding rule. A valid output must meet the same quality and complexity standard before and after organizational change. Lower supervisory time accompanied by more errors or unmanaged risk does not establish useful labor compression. Conversely, stable enforcement time with growing valid output can indicate improved governance productivity, even if the occupational headcount grows.

At the establishment level, distinguish changes within continuing firms from shifts toward industries or employers that historically use more supervisors. Record technology adoption dates, changes in customer demand, acquisitions, outsourcing and new regulatory obligations. Compare the same activity across organizations with different work designs where feasible. Measures of pay, discretion, turnover, grievances and quality can then help determine what additional supervision accomplishes. No single manager-to-worker ratio can identify whether the change reflects control, training, coordination or a change in the skill mix.

Disconfirming results should be reported plainly. A fall in enforcement-related hours after automation would weaken a claim that labor is being absorbed into control. A rise driven entirely by genuinely new risk or more complex output would favor a protection or coordination explanation. A supervisory-share increase caused by production headcount contraction with unchanged supervisory hours would identify a denominator effect, not necessarily new guard work. A stable national share with local increases would require a geographic account rather than a claim of general secular growth.

The final caption should name the measure and avoid language such as useless workers or nonproductive people. Supervisory and protective roles can have mixed purposes, and many workers do not choose the institutional arrangements they implement. Protect individual records, limit access to sensitive monitoring data, and report aggregated task distributions instead of personal surveillance scores. The useful longitudinal question is whether economic production requires a changing quantity of labor to govern relationships, how that labor affects outcomes, and whether alternative arrangements can meet the same obligations with fewer hours and greater worker discretion.

SOURCES AND REPRODUCTION NOTES

[1] Samuel Bowles and Arjun Jayadev (2007). Garrison America. Original broad U.S. history, 1890–2002; includes prisoners and estimated excess unemployment. Components differ, and supervisory roles also perform productive coordination. Verified for version two 4 October 2026.

[2] Luke Petach and Anastasia Wilson (2024). The Rise of Guard Labor in the United States: Evidence from Local Labor Markets. Reported Census evidence, 1950–2017. Original abstract and publication metadata verified; full coding appendix was access restricted and not independently replicated. Verified for version two 4 October 2026.

[3] U.S. Bureau of Labor Statistics (2026). Occupational Employment and Wage Statistics: Concepts. Current occupational-coding conventions and historical classification breaks. Working supervisors may be classified with supervised workers; occupation totals do not isolate enforcement tasks. Verified for version two 4 October 2026.

[4] National Labor Relations Board (current text accessed 2026). National Labor Relations Act, Section 2(11). Current Section 2(11) supervisor definition includes direction and assignment as well as discipline. Legal authority does not measure enforcement time. Verified for version two 4 October 2026.

CHAPTER 134

Superstar firms and the reallocation of labor share

EVIDENCE STATUS Secular historical evidence; causal and distributional interpretation mixed · OBSERVATION SPAN Economic Census research principally 1982–2012, with manufacturing evidence 1967–2012 and public concentration tables for 2022

Production shifting toward firms with lower labor shares can reduce the aggregate share without a general decline at the typical firm; firm dynamics, prices and worker outcomes determine the post labor interpretation.

Firm concentration and the weights behind an aggregate share

Superstar-firm reallocation measures how changes in the distribution of production across firms affect labor's aggregate share. The central quantity is the contribution from firms gaining or losing economic weight, separate from changes inside each firm. This differs from household ownership concentration, which identifies asset holders, and from a markup, which compares price with marginal cost.

For firms measured consistently, the industry labor share equals the sum of firms' labor shares weighted by their shares of industry value added. A firm can change its compensation share, or firms with different shares can change their relative size. Entry and exit provide further margins in a longitudinal decomposition.

An explicitly hypothetical example illustrates reallocation. Two firms initially produce equal value added, with labor shares of 60 and 30 percent. The industry share is 45 percent. If the second firm expands to three quarters of industry value added while individual shares remain unchanged, the industry share falls to 37.5 percent. Neither firm cuts its own share. Total compensation could still rise if output expands sufficiently.

Concentration is a related diagnostic. A four-firm concentration ratio gives the industry sales share of its four largest firms. Employment concentration answers a different question, because firms can have large revenue footprints relative to payroll. Rising sales concentration alone does not establish reallocation: the expanding firms' labor shares must also be known.

Sales and value added require separate denominators. Payroll divided by sales includes purchased materials and services in the denominator, whereas compensation divided by value added measures a factor-income share. Outsourcing can change the employer and purchased-input boundary. Use sales weights for a payroll-to-sales decomposition and value-added weights for a compensation-share decomposition.

The proposed headline is the percentage point contribution of reallocation to a specified industry labor-share change, accompanied by sales and employment concentration. Its historical status depends on a comparable panel across decades. Its post labor interpretation depends on changes in human work requirements, earnings opportunities and access to gains. A large firm's growth becomes relevant through these connections rather than its size alone at any single point in time.

Long historical findings and the importance of firm dynamics

Autor, Dorn, Katz, Patterson and Van Reenen's 2020 study examines Economic Census microdata covering six U.S. sectors, principally over 1982–2012. The authors find rising industry sales concentration, larger labor-share declines in industries with greater concentration increases, and a contribution from reallocation toward firms with low labor shares. Concentrating industries also exhibit faster productivity and innovation growth. This broad historical pattern supports a mechanism through which aggregate labor share falls even when the typical firm's share does not. The central Census window ends in 2012; publication in 2020 does not supply observations through that year. Supplemental datasets have different endpoints. [1]

Kehrig and Vincent provide a complementary but more dynamic account. Their Census working paper, subsequently published in 2021, reports that the U.S. manufacturing labor share fell from about 62 percent in 1967 to 41 percent in 2012 while the typical establishment's share rose by more than three percentage points. Their decomposition emphasizes establishments whose labor shares fall as they expand, rather than a permanent group of already large, low-share establishments simply taking over. Low-share establishments exhibit high revenue labor productivity and product-price premiums; their shares tend to rebound after five to eight years. The result preserves the significance of reallocation while challenging a simple picture of a fixed set of permanently labor-light winners. These estimates concern manufacturing under the study's definitions. [2]

Ganapati's research adds prices and quantities to the interpretation. Using U.S. Census evidence over 1972–2012, he finds that rising concentration is associated with faster productivity and real output growth, lower labor revenue shares, and no corresponding aggregate association with higher prices or overall payroll changes in the reported comparisons. He explicitly cautions that the relationships do not establish causality. This matters because concentration can accompany productive expansion rather than only output restriction. A lower share for payroll can coexist with unchanged or growing compensation in dollars. [3]

There is a public route for more recent concentration monitoring. The Census Bureau released establishment and firm-size statistics from the 2022 Economic Census in April 2025, including the concentration of the largest firms across detailed industries. The tables extend descriptive information beyond the original research windows. They do not automatically reproduce the confidential firm-panel labor-share decompositions. A contemporary concentration checkpoint should therefore remain distinct from a newly estimated reallocation effect. [4]

Together, the studies justify a secular historical classification for changes in the organization of production. They do not justify a uniform statement that every industry became more concentrated, every large firm reduced employment, or every concentration increase arose from automation. The contribution is a concrete way to measure how changing producer weights connect aggregate income shares to individual firms.

How reallocation can change the distribution of productive gains

The post labor mechanism can operate through competitive displacement without a conspicuous layoff at the expanding firm. Consider a supplier whose systems allow output to grow with relatively little additional human work. As customers switch to it, employment may grow there even while competing suppliers lose more work. Following only the successful employer misses industry adjustment; following reported layoffs misses hiring that no longer occurs elsewhere.

This provides a reason to connect company growth to industry totals. A firm that doubles revenue while increasing headcount by one quarter has become less intensive in recorded employees per revenue dollar. Whether the industry uses less human time depends on prices, suppliers, contractors, competitor contraction and total demand. Reallocation supplies the bridge between the enterprise ratio and the aggregate labor outcome; it does not eliminate the need to measure either side carefully.

Scale economies offer one possible channel. A reusable software system or organizational process can spread development costs across more customers. The expanding business may require additional employees, but fewer per additional unit than the businesses losing demand. This is a testable production story when accepted output, total human hours and operating costs are available. Sales growth alone cannot distinguish it from charging higher prices, selling a more expensive product mix or purchasing more intermediate work.

Distribution can change even where workers at leading firms are well paid. The labor share is a ratio of compensation to value added, not a ranking of individual wages. A high-wage producer can devote a small share of its larger output to employees. If activity shifts toward that producer, aggregate labor share can fall while its employees gain. The household effect then depends on how many people obtain those jobs, what happens to workers elsewhere and who owns the residual claims.

The timing can also affect entry opportunities. An industry may continue employing established workers while creating fewer places for new entrants. Expanding firms can recruit specialized workers without reproducing the full occupational ladder of the firms they replace. These possibilities should be examined through hiring, occupations, training access and displaced-worker earnings. They remain hypotheses until the corresponding transitions are observed; concentration is not a direct measure of blocked careers.

The connection to post labor economics is consequently conditional but substantive. If expansion increasingly occurs through firms with low human input requirements, rising demand may create fewer accessible work opportunities than before. If productivity benefits instead translate into substantial real wage gains, lower prices and broadly available new roles, the same reallocation may sustain prosperity through work and consumption. Both outcomes can follow a changing production structure, and a credible framework measures which is occurring.

Alternative mechanisms and tests that can change the interpretation

A decomposition establishes where an aggregate change appears, not what caused it. Sales can move because a producer becomes more efficient, because consumers value its products more, because it acquires rivals or because regulation changes. Each route can alter concentration and labor share. A causal automation claim needs evidence that changes in task technology or adoption costs preceded the reallocation, together with a comparison that addresses changes in demand and selection into adoption.

Revenue productivity must be separated from physical productivity. More revenue per hour can reflect more accepted units, improved quality, a higher price or a change in product mix. Those explanations differ for labor substitution and consumer welfare. Product-level quantities, quality measures and prices make the distinction more concrete. Where those data are unavailable, the result should retain the label revenue productivity rather than being interpreted as a measured engineering improvement.

Firm identity and establishment identity also matter. A company can contain several plants, operate in multiple industries or acquire a business that previously appeared as an independent competitor. Mergers can raise firm concentration immediately without changing the underlying production process. Establishment panels can show whether operating units actually change labor requirements, while enterprise panels show control and allocation across locations. Reconcile both before describing organizational consolidation as a technological reduction in work.

National industry concentration need not describe the alternatives facing a particular buyer or worker. A national chain entering additional localities can gain a larger national share while adding a competitor within each locality. Conversely, a modest national share can conceal substantial power in a specialized local market. Product-market and employer-market analysis therefore require their own geographic and occupational boundaries. The local employer concentration chapter provides the appropriate companion for worker outside options.

The strongest test of a durable superstar mechanism follows cohorts over time. Identify firms before their expansion, measure their initial labor shares and productivity, then observe subsequent growth and changes within them. Separately identify businesses that become low-share as they expand. This distinguishes persistent characteristics from temporary phases and prevents the analyst from defining winners only after observing their success. A new technology may change the frequency or duration of such phases without producing permanent domination.

Evidence would weaken the labor-compression interpretation if growing concentration consistently accompanies broad earnings recovery, expanding accessible employment and lower consumer prices, with little reduction in total human input requirements. It would strengthen that interpretation if verified task savings, reallocation and persistent losses of earnings opportunities align after accounting for competing explanations. Stable concentration would limit a concentration-based explanation, but would leave within-firm automation available for independent testing. Each result changes the mechanism supported by the evidence.

A reproducible reallocation and opportunity dashboard

Use separate panels for sales concentration, employment concentration and labor share. Within a fixed industry classification, show the largest four and largest twenty firms’ shares where available, with the population and geographic boundary stated. Report both weighted and unweighted labor-share measures. Their divergence reveals why an aggregate outcome may differ from that of the typical producer. Retain underlying sales, value added and compensation so that a changed ratio can be traced to its components.

For a longitudinal decomposition, select one published method and document its weighting convention. Distinguish continuing firms’ within-firm changes, reallocation among continuing firms, entry and exit. Some methods assign interaction terms differently, so the contribution labeled reallocation can differ even with identical raw data. Verify that the contributions reconcile to the observed aggregate change. A residual due to missing firms or inconsistent coverage should remain visible rather than being assigned to automation.

Treat public concentration tables as a descriptive layer. The 2022 Economic Census concentration table, EC2200SIZECONCEN, is a useful starting point, with its 2022 NAICS industry definitions. Archive the table, publication date, suppression flags and applicable coverage notes. Comparisons to earlier censuses require

an industry concordance and consistent firm definitions. A public table of the largest firms' combined sales does not reveal every firm's compensation or value added; it cannot by itself supply the full labor-share decomposition. [4]

Add an operating layer wherever linked data permit: real output, hours, total purchased labor, compensation and adoption measures for firms that gain and lose share. Include a worker layer recording hires, separations, occupational transitions, earnings recovery and access for younger entrants. This structure tests whether a shift toward productive leaders creates broad opportunities, redistributes them or reduces their availability. The national labor-share series provides the aggregate outcome but cannot substitute for these transitions.

Keep historical research and contemporary monitoring visually distinct. A chart reproducing the original 1982–2012 study should stop at its documented endpoint. A later concentration line can appear beside it after comparable data are assembled, with a clear statement that the newer observations have not automatically validated the original causal interpretation. Avoid filling the intervening years with stock-market capitalization shares, which describe valuations under a different population and economic concept.

Review results over full cycles and report meaningful departures from the hypothesized mechanism. Archive original and revised estimates, especially after classification changes or revisions to ownership links. Connect the dashboard to labor share, firm markups, frontier productivity, domestic outsourcing, company workforce elasticity and household ownership. Reallocation then contributes a distinct piece of evidence: how changing weights among producers transmit firm-level differences into aggregate production and distribution, and whether workers participate in the resulting gains.

SOURCES AND REPRODUCTION NOTES

[1] David Autor, David Dorn, Lawrence F. Katz, Christina Patterson and John Van Reenen (2020). The Fall of the Labor Share and the Rise of Superstar Firms. Documents concentration and labor-share reallocation across six U.S. sectors, principally 1982–2012; aggregate changes need not describe the typical firm. Verified for version two 4 October 2026.

[2] Matthias Kehrig and Nicolas Vincent (2020). The Micro-Level Anatomy of the Labor Share Decline. Finds temporary low-share episodes at expanding manufacturing establishments, complicating a static account of permanently dominant firms; Census working paper, later published. Verified for version two 4 October 2026.

[3] Sharat Ganapati (2021). Growing Oligopolies, Prices, Output, and Productivity. Associates rising concentration with productivity and output growth using U.S. Census data, 1972–2012; reported relationships do not establish causality. Verified for version two 4 October 2026.

[4] U.S. Census Bureau (2025). New Economic Census Establishment and Firm Size Statistics Available. Releases public 2022 Economic Census firm-size and concentration tables; these support descriptive monitoring but do not reproduce confidential labor-share decompositions. Verified for version two 4 October 2026.

CHAPTER 135

OECD social expenditure and the distribution role of public and private systems

EVIDENCE STATUS Secular evidence · OBSERVATION SPAN OECD countries: verified public-spending comparison 1980–2007; program histories 1980–2019/2021; current detailed SOCX coverage 1980–2021/23, estimates 2022–2024

Social protection carries a larger long-run distribution role across rich economies, especially through pensions and health; its importance for labor compression depends on age, income adequacy and institutional design.

Spending channels and the accounting boundary

Social expenditure measures the resources devoted to social protection through public programs, private arrangements and tax provisions. For the principal indicator, divide gross public social expenditure by gross domestic product for the same country and year, and report a percentage. This expresses publicly controlled social spending relative to the economy's annual output. It is different from asking what percentage of a household's income consists of transfers, how many people receive benefits, or how much poverty policy prevents. Those questions need household resources, recipient records and a needs standard.

The OECD Social Expenditure Database, SOCX, separates public spending, mandatory and voluntary private spending, and net measures accounting for the tax system. Its current metadata covers 38 OECD countries and selected accession countries, with historical data from 1980 to 2021 or 2023, depending on the series, and estimates for 2022–2024. [1] The dataset therefore supplies substantial observed history, but an estimated aggregate is not equivalent to a fully observed program breakdown. An analyst should name the selected channel before comparing countries or attaching a recent endpoint to an older line.

Cash support and services perform different distributional functions. A cash benefit can help pay rent or groceries; a publicly financed health service supports access to care. Both can reduce the resources a household must obtain elsewhere, but they should not be presented as identical spendable income. A dashboard should show each separately before combining them. Expenditure records part of that institutional arrangement; they do not directly establish service quality or household satisfaction.

Cross-country comparisons also depend on whether support is organized through government, employment or private insurance. Imagine two otherwise similar societies paying the same amount for medical protection: one finances it publicly, the other through employer premiums. A gross public spending ranking would differ even if the protected services were identical. A wider comparison could bring them closer, while still revealing different entitlement rules and vulnerabilities when a job ends. This distinction is central to post labor economics because distributing support through an employer can preserve a dependence on work even when the benefit itself is delivered outside a paycheck.

Verified long history and newer observations

Adema, Fron and Ladaique's original OECD study, published in November 2011, reports average gross public social expenditure rising from 15.6 percent of GDP in 1980 to 19.2 percent in 2007. This is a 27-year observation window and a 3.6 percentage point increase. Its broader net and private comparisons also change national rankings. [2] These findings document an expanded distribution institution over several decades. The older endpoint remains useful as a verified historical result, while the publication's title extending to 2012 should not be mistaken for the endpoint of every figure in its analysis.

A later OECD publication reports public spending averaging approximately 20 percent of GDP in 2019, with estimates of 23 percent in 2020 and 21 percent in 2022. Its 2019 net-total comparison places the United States near 30 percent of GDP after incorporating private arrangements and tax effects. [3] These are distinct measures with distinct dates. The pandemic episode illustrates why a recent high value cannot carry the entire secular argument: exceptional programs and a changing output denominator can push the share sharply upward, followed by a substantial reversal.

The September 2026 financing report adds longer program histories: public old-age and survivor cash spending rose from 5.6 percent of GDP in 1980 to 8.1 percent in 2021, while public health spending rose from 4.0 percent in 1980 to 5.9 percent in 2019. Its separate 2024 headline of 23 percent concerns total public and private social protection using combined European and OECD sources. [4] It cannot be appended as a gross-public endpoint. The observed pension and health histories independently meet the two-decade requirement, while identifying substantial demographic and service components of the expansion.

The evidence supports long institutional enlargement more clearly than a universal continuously rising path. Country averages can conceal countries whose spending expands, stabilizes or contracts, and an average itself changes if its membership or missing observations change. A fixed-country panel should therefore accompany the source's published average. A country's later membership in the OECD must not silently change the meaning of the 1980 comparison. Where a source supplies several averages, preserve whether each gives countries equal weight or weights them by economic size; those summaries answer different questions about the typical country and the combined economy.

Current-source availability and current observed history also differ. A website consulted in October 2026 can still contain detailed observations ending several years earlier, with newer estimates on selected aggregates. The dashboard should keep the long verified path and show those estimates with a visible marker. Extending a detailed working-age program line requires actual newer program observations, rather than assigning the aggregate's recent movement to every category. This approach retains the latest information without manufacturing an uninterrupted, fully observed series across accounting changes and publication lags.

The relevance to post labor distribution

Post labor economics asks whether productive growth increasingly requires distribution institutions beyond secure, adequately paid employment. Social spending addresses that question from the recipient side of the national economy. A person can obtain essential resources through a current job, through rights established by past contributions, or through a benefit independent of employment. If public and social institutions allocate a larger part of output, they carry more responsibility for maintaining access. This observation matters even while the economy continues employing many people and producing substantial labor income.

The strongest labor compression interpretation concerns comparable working-age households whose earned resources become less sufficient. A sustained increase in support can protect their living standards while revealing that private earnings carry less of the burden. However, the required evidence is joint: labor earnings and hours, support received, essential costs and final adequacy. Expenditure growth without an earnings comparison can reflect a more generous policy choice. For this reason, working-age poverty before and after policy, employment-linked tax credits and household income composition should accompany the macro spending line. They clarify what the institutional expansion does for people.

Healthcare and pensions provide an additional, broader post labor angle. Distribution already reaches many people outside their current employment, organized across a life cycle rather than restricted to their present labor output. An aging society makes that channel more important even without technological displacement. Automation could help produce the goods and services supporting the arrangement, but the expenditure history cannot tell how much automation caused it. Keeping the demographic mechanism explicit strengthens the framework: it distinguishes an economy's need for broad distribution from the separate question of why particular people are outside employment.

Financing links this measure back to production and ownership. A benefit system can distribute income beyond a current paycheck while still obtaining much of its revenue from employed workers and firms. If the wage base weakens relative to total production, a durable distribution architecture may require either improved labor income, different financing sources or a changed expenditure design. These are conditional analytical possibilities, not inevitable conclusions from the spending ratio. A monitor should pair spending channels with revenue channels and record entitlement rules, rather than assume that an expanding transfer institution has already become financially independent of labor.

International variation is informative because institutional design can alter the consequences of similar production changes. Suppose two countries experience comparable gains in output per human hour. One might translate them into higher compensation and broadly financed services; another into concentrated profits and narrowly targeted assistance. The spending chart alone would not distinguish these trajectories, but a combined labor, ownership and policy dashboard could. For post labor economics, the cross-country comparison is therefore a way to test how security is distributed, and to investigate possible adaptations, rather than simply to collect additional upward-sloping lines.

Competing explanations and measurement risks

Population aging is a major competing explanation because people obtain pensions and medical protection at different stages of life. A spending increase can arise from more eligible recipients, larger benefits per recipient, higher service costs or a different population mix. The analyst should separate these mechanisms before treating the whole increase as replacement for inadequate jobs. Age standardization asks what would happen under fixed demographic weights; it does not establish a causal automation effect. Within-age income, health and household composition still matter, and benefit eligibility can change independently of production technology.

The output denominator creates another risk. Consider a purely hypothetical program that spends 20 units in an economy producing 100 units. Its share is 20 percent. If output falls to 90 while spending remains 20, the ratio becomes 22.2 percent without any new support. Real spending levels, expenditure per recipient and

GDP should therefore appear beside the share. Conversely, a falling ratio during rapid growth can coexist with increased services and better household security. A monitor that records only percentages could mistake those successes and setbacks for the opposite institutional change.

International labor-share comparisons do not supply one uniform story to attach to social expenditure. OECD's September 2026 analysis identifies substantial differences across countries and emphasizes the sensitivity to production and self-employment boundaries. [5] An analyst should pair the spending measure with an explicitly matched labor measure rather than assume that the US nonfarm business record describes the whole OECD. If countries with similar productive gains distribute them differently, that variation can help test institutional mechanisms. It can also weaken a universal prediction of declining labor income. A cross-country framework should preserve both possibilities, with observations and definitions determining the result.

Higher service expenditure is not necessarily proportionately better service. More costly inputs, different treatment intensity and better access can produce similar budget movements with different household outcomes. A healthcare companion should therefore record coverage and meaningful access where consistent series exist. The comparison should neither treat all spending as household cash nor dismiss it because it is noncash. Losing affordable care can impose a large burden even when a wage stays unchanged. The objective is to distinguish what the public system pays, what people receive and how those resources affect their security.

Evidence would strengthen the narrower labor compression account if working-age support became persistently more important within comparable groups, their earned resources lagged essential costs, and credible exposure studies connected those changes to automation or restructuring. It would weaken that account where stronger earnings and reliable employment explain improving security while transfer reliance falls or remains stable. A plateau does not by itself decide whether an institution reached a durable saturation level; that hypothesis needs entitlement, take-up and adequacy evidence. Neither an upward share nor a plateau should make the framework immune to contrary household outcomes.

Reproduction and a useful monitoring dashboard

Reproduce the main series from a single SOCX release, preserving the country identifiers, expenditure channel, policy functions, units and observation years. Archive the source's estimates and revisions alongside the downloaded values. The title should say gross public social expenditure as a percentage of GDP when that is the actual selection. A net-total or combined public/private series belongs in its own panel with its own formula. Matching labels are especially important when a newer report combines European social protection statistics with SOCX for other countries; that comparison should be retained as a clearly identified companion.

Use a long annual chart beginning in 1980 where coverage permits, with the source's published country average and a documented fixed-country average shown separately. Add individual country small multiples so different trajectories remain visible. Give estimates a distinct appearance, and annotate major exceptional policy periods without assuming that all movement within them is temporary. A table of checkpoints should specify the exact observed year, source vintage and status of each value. This permits the reader to distinguish the older verified 1980–2007 comparison from newer, differently bounded institutional evidence.

A composition panel should separate retirement-related cash, healthcare, working-age cash and relevant services. Present both spending shares and real levels, using a documented inflation adjustment for the latter. Add recipient counts or population groups only where their definitions match the expenditure record. For a working-age transfer-income companion, use actual household resources rather than dividing a national program budget by an unrelated age-group income estimate. A program can serve several age groups and transfer payments can benefit a household beyond the named recipient, so allocation rules must remain explicit.

Pair expenditure with outcomes and financing. Household poverty reduction and resources relative to needs assess adequacy; participation and predictable access assess reach; labor earnings and ownership income identify private channels. Revenue composition asks whether public support is financed through social contributions, general revenue or other arrangements. These comparisons should use compatible years and state where an estimate or sample cannot supply the desired breakdown. The point is an interpretable institutional account, rather than a mechanically complete graphic assembled from inconsistent measures that happen to move in a preferred direction.

Update after substantive database releases and review the long-run interpretation over comparable demographic and business-cycle periods. Preserve reversals, country exceptions and policy expansions that improve security. Classify the chapter as secular evidence of the enlarged role of social distribution, with mixed and conditional relevance to labor compression. Its contribution to the reference is the international architecture connecting production to household access. The strongest future extension would reconcile spending, recipients, financing and adequacy within a consistent country panel, while keeping the technological cause a separately testable question.

SOURCES AND REPRODUCTION NOTES

[1] OECD (Current dataset metadata consulted 4 October 2026). Social Expenditure Database (SOCX). SOCX separates public, private and net channels; detailed coverage ends in 2021 or 2023, while newer aggregate estimates cover 2022–2024. Verified for version two 4 October 2026.

[2] Willem Adema, Pauline Fron and Maxime Ladaique, OECD (2011). Is the European Welfare State Really More Expensive? Indicators on Social Spending, 1980–2012; and a Manual to SOCX. Original OECD study verifies gross public social spending at 15.6 percent of GDP in 1980 and 19.2 in 2007. Verified for version two 4 October 2026.

[3] OECD (2024). Society at a Glance 2024: Social spending. Figure 6.10 marks both 2020 and 2022 as estimates; gross-public, net-total and private-inclusive comparisons require separate labels and dates. Verified for version two 4 October 2026.

[4] OECD (2026). Financing of Social Protection, Chapter 1: A stocktaking of current financing mixes in social protection systems. September 2026 financing report supplies pension and health histories; its 2024 headline combines public and private protection under distinct source boundaries. Verified for version two 4 October 2026.

[5] OECD (2026). Financing of Social Protection, Chapter 3: Securing the Revenue Base for Social Protection. OECD employee-compensation comparisons are not adjusted for self-employment and show country differences; US business-sector labor share cannot stand for every economy. Verified for version two 4 October 2026.

CHAPTER 136

Saving concentration and the financing of household and government debt

EVIDENCE STATUS **Historical evidence** · OBSERVATION SPAN United States original research 1963–2016; heavily revised July 2025 study 1963–2019; official wealth and interest-rate companions available later under distinct definitions

Concentrated saving and ultimate debt ownership supply a demand-side distribution mechanism beyond jobs, while the historical financing estimates do not establish automation causation or a current official saving series.

Saving flows and the ultimate holders of debt

Saving concentration asks which groups add to their resources rather than consume them, and what their financial accumulation ultimately funds. The principal research measure expresses saving by a top income or wealth group as a percentage of national income. Its companion traces claims through financial institutions to determine who ultimately holds household and government debt. These are flow and financing questions, distinct from the proportion of total wealth owned by the rich or the economy's total debt ratio. A highly concentrated asset stock need not demonstrate that current saving has become equally concentrated.

For interpretation, separate saving from changes in asset prices. A hypothetical household earning 100 units and consuming 80 saves 20; its existing portfolio could also rise by 30 through valuation. The 50-unit increase in resources is not 50 units of saving from income. Conversely, a portfolio decline can conceal new saving. Reconstructing flows from balance-sheet changes therefore requires adjustments for valuation and other changes. A dashboard should identify those adjustments rather than infer a saving rate directly from growth in a top group's net worth.

Debt positions also require a sign convention. The Mian–Straub–Sufi research defines net household debt position as household debt held as an asset minus household debt owed as a liability. [1] A positive value describes a net claim on other borrowers under that convention. An alternative borrower-positive measure can be useful, but must reverse the associated numbers and directions consistently. Neither is the same as gross borrowing. A household can hold substantial financial claims and owe a mortgage at the same time.

Financial intermediation complicates ownership. Deposits, investment funds and retirement claims can stand between a saver and the final borrower. An ultimate-holder measure traces those layers rather than counting the intermediary and the household claim as separate final lenders. This distinction makes the metric relevant to post labor distribution: ownership may shape not only who receives business returns, but also who receives interest paid by households and the public sector. The analysis should keep these claims separate from the labor and service activity involved in providing finance.

The historical evidence and its measured endpoint

Mian, Straub and Sufi's February 2021 manuscript studies a long US history ending in 2016. Comparing earlier decades with the period after 2000, it estimates top-one-percent saving higher by about three percentage points of national income per year. For 1982–2007, the bottom ninety percent's net household debt position fell by 39 percentage points of national income while the top one's rose by 12, using the paper's lender-positive convention. [1] Those figures are historical research estimates, not official observations extending through 2026.

The heavily revised July 2025 study extends the history to 2019 and introduces a financial-sector unveiling method. It estimates annual saving from the wealthiest top one percent higher by 2.9 percentage points of national income on average relative to 1982, and traces household borrowing before 2008 and federal debt afterward. [2] This is a newer empirical revision, but not a 2025 observation. Its tax-record endpoint remains 2019. Keeping the version and endpoint visible prevents a later publication date from creating an apparent contemporary series.

The older 12-point and 39-point position changes yield approximately thirty percent when divided, but that comparison belongs to its specified period and groups. [1] It is not a share of every outstanding loan. More generally, a stock-change comparison and a financing-flow comparison need not yield the same share, even when both are valid. Group boundaries, observation windows and smoothing also matter. A monitor should preserve a coherent version of each figure rather than select the most dramatic number from several revisions. Differences can reveal improved measurement instead of a new economic event.

Income ranking and wealth ranking are not interchangeable. A household can earn a temporarily large income, possess substantial accumulated assets, or both. A study using different distributions for saving and ultimate asset holdings needs to preserve those distinctions in its figure titles. They also affect the post labor interpretation: concentrated saving can arise from high labor compensation as well as capital and business income. The pattern cannot automatically be described as capital owners lending to people who receive wages. The relevant exposure is the distribution of resources and claims, not an assumed permanent class assignment.

The chapter meets the two-decade rule through the original and revised research windows. Classify it as historical evidence with a supporting demand-side mechanism. The 2021 and 2025 publication dates are separate from their 2016 and 2019 endpoints. Later official wealth, debt or interest-rate observations can supply context, but none alone reproduces the full distributional saving-and-financing exercise. Extending the research beyond 2019 requires compatible flows and financial ownership, rather than appending a newer top-wealth share. A versioned comparison makes genuine new evidence easier to recognize and limits accidental changes in the question being answered.

How concentrated saving bears on post labor economics

The post labor connection is a possible mismatch between productive capacity and the distribution of spending power. If gains reach households that spend a smaller fraction of additional resources, other households may obtain access through borrowing, public support or different prices and income adjustments. Concentrated saving offers a concrete way to examine one part of that transmission. It asks where the resources go after receipt, while household income composition asks where they originated.

Together, the measures can reveal why an economy's aggregate growth need not translate into equally broad financial security.

The related Indebted Demand paper is a theory, not an additional distributional data release. Its model links different saving propensities among savers and borrowers to debt burdens that can depress future demand and the equilibrium real interest rate. Inequality and financial deregulation operate within that framework. [3] For post labor analysis, this supplies a testable mechanism rather than an accounting inevitability: borrowing may sustain current purchases while creating a future stream of payments toward lenders. Whether that mechanism dominates in a particular economy must be established separately.

A hypothetical example makes the distinction clear. Suppose one household receives an additional 20 units but immediately spends 5, while another borrows 15 and spends it. Current purchases increase by 20. The borrower later owes interest and principal, so its future available resources depend on future earnings, refinancing and the loan's terms. This does not prove that the original income concentration caused the loan, or that investment could not have absorbed the funds instead. It shows the mechanism the metric investigates: production gains, spending allocation and financial claims can evolve along different paths.

Government borrowing can alter that path. It may support benefits, public services, investment or other expenditures, financed by many kinds of domestic and foreign holders. A rise in claims held by wealthy households is therefore relevant to the distribution of public interest payments, but cannot identify the purposes of the deficit by itself. Nor does every wealthy lender obtain income solely from capital. The debt ledger and the fiscal-use ledger should remain distinct. Connecting them credibly would clarify whether public distribution broadens access while also creating a concentrated future income claim.

The strongest labor compression interpretation would combine this financing pattern with weaker earned resources among comparable households, declining access to secure jobs and evidence linking productive change to those outcomes. The saving measure alone cannot demonstrate that automation displaced those workers or explain every deficit. Its additional value is to identify a channel beyond employment counts: an economy can remain productive and employed while financial claims increasingly separate households that accumulate resources from households that require financing. A broad ownership policy could potentially change that transmission, but its effects would require their own evaluation.

Alternative explanations and the limits of inference

Balance-sheet measurement is a first constraint. The Federal Reserve's Distributional Financial Accounts provide wealth, selected assets and liabilities across groups from 1989 Q3. They combine aggregate Financial Accounts with triennial Survey of Consumer Finances information, interpolating between surveys and forecasting beyond the latest survey anchor. [4] These are valuable current companions, yet changes in group holdings combine saving, valuation and composition. The DFA does not, by itself, supply a quarterly consumption-and-income account or the original paper's full ultimate-holder financing matrix.

Financial ownership and causal credit supply are different propositions. Tracing a bank's assets to its ultimate claimants helps show who holds the resulting claims. It does not prove that an additional dollar from a specific saver caused an additional mortgage, nor that every institution could lend only after receiving that saver’s cash. Credit decisions also depend on demand, regulation, collateral and expected repayment. A

causal study needs variation that distinguishes those channels. The descriptive ownership account is useful without adopting an overly literal story of dollars physically passed from one group to another.

Fiscal financing supplies a further competing explanation. Bianchi and colleagues' September 2026 working paper uses a structurally estimated model to investigate how a shift from inflationary redistribution toward debt backed by future taxes could contribute to concentrated saving. [5] This is a distinct causal account, with assumptions to test, rather than an official saving-series update. It also demonstrates why the same long-run distribution pattern need not originate in automation. Investment opportunities, tax policy and financing institutions should enter the investigation before assigning the entire observed pattern to labor displacement.

Interest rates supply context rather than a direct verdict. The New York Fed's LW and HLW models estimate a real short-term rate consistent with a fully operating economy and stable inflation, using macroeconomic inputs and model assumptions. They publish current and real-time vintages. [6] A nominal policy-rate increase is not a direct observation of that equilibrium rate, and neither series measures top-group saving. Claims about a new regime require a specified model and endpoint, alongside evidence on inflation, financing and distribution. The old study should not gain a contemporary extension merely because rates later move.

The hypothesis remains open to disconfirmation. It would weaken if a compatible update showed less concentrated new saving, broad improvements in earned resources and financing directed toward productive investment without rising dependence on debt. A plateau might instead reflect a stable high concentration or a changed borrowing regime, but that explanation requires observations on flows and claims. It cannot be invoked automatically whenever the series stops rising. The reference should preserve beneficial deleveraging, stronger household cash flow and broader asset access as meaningful outcomes, even when they complicate a preferred post labor narrative.

A reproducible dashboard and update strategy

Begin with the original research figures, source data and replication materials rather than reconstructing the headline from unrelated contemporary series. Preserve the period, ranking variable, income denominator, saving definition and valuation adjustments for every panel. Label the 2021 version as observed through 2016 and the revised 2025 version through 2019. Report the group labels exactly: the top one percent and top ten percent are not substitutes. Separate a saving flow expressed as a share of annual national income from an accumulated debt position expressed relative to the same annual flow; identical percentage units do not make stock and flow comparable quantities.

The first panel should show saving across income groups and a separate wealth-ranked view where the research permits. Add income and consumption components so a change in saving can be traced to its numerator. The second should show net household debt positions with the chosen sign convention printed in the subtitle. A third can display the final holders of household and government debt after financial intermediation is traced. Keep foreign holders, government institutions and relevant residuals visible rather than force the entire account into a rich-versus-everyone-else diagram.

Use current official companions for context with an explicit boundary. The DFA can show asset and liability composition, while aggregate Financial Accounts and household debt-service measures describe financing scale and burden. None should be labeled a replication of distributional saving unless the missing flow and

valuation work has been completed. A quarterly chart of wealth concentration may be timely but answers a different question. Preserve both: the historical research provides the financing connection, and the newer companion can indicate which parts of the financial environment require renewed investigation.

A full update should reconcile the household totals, saving flows and final claims before interpreting differences. Test sensitivity to income versus wealth ranking, business-income allocation, pension treatment, valuation estimates and alternative financial-intermediary assumptions. Compare results over matched periods so a pandemic transfer year or asset-price peak does not alone determine the trend. Publish unresolved categories and discrepancies. If a particular table cannot be extended reliably, retain the older verified figure and state what is missing instead of extrapolating its result from an aggregate saving rate or an ownership share.

Read this chapter beside income-growth distribution, household debt and debt service, wealth-to-income ratios, capital ownership concentration and transfer dependence. Each measures a different part of the proposed chain: resources received, spending and saving, claims accumulated, financing used and final adequacy. Review the interpretation when genuinely comparable new research appears, rather than promise an official annual update of a series that does not exist in that form. The chapter's durable contribution is a financing question: who accumulates the economy's gains, whose spending they support, and what obligations that distribution creates for the future.

SOURCES AND REPRODUCTION NOTES

[1] Atif Mian, Ludwig Straub and Amir Sufi (2021). The Saving Glut of the Rich, February 2021 author manuscript. February 2021 version ends in 2016; debt held minus debt owed is lender-positive. Numerical findings remain versioned against later revisions. Verified for version two 4 October 2026.

[2] Atif Mian, Ludwig Straub and Amir Sufi (2025). The Saving Glut of the Rich, heavily revised author manuscript, 25 July 2025. Heavily revised July 2025 empirical manuscript extends the history through 2019; its method, groups and financing comparisons must remain version-specific. Verified for version two 4 October 2026.

[3] Atif Mian, Ludwig Straub and Amir Sufi (2021). Indebted Demand. Published theoretical mechanism links different saving propensities, debt burdens and demand; it is a model rather than a newer distributional data release. Verified for version two 4 October 2026.

[4] Board of Governors of the Federal Reserve System (2026). Distributional Financial Accounts Overview. Official wealth distribution starts in 1989 Q3, with survey interpolation and forecasting; wealth holdings do not supply household income-flow shares. Verified for version two 4 October 2026.

[5] Francesco Bianchi, Nicolò Ceneri, Leonardo Melosi and Alessandro T. Villa (2026). Fiscal Policy and the Saving Glut of the Rich, NBER Working Paper 35715 / CEPR Discussion Paper 21912. September 2026 fiscal-financing model offers an alternative explanation for concentrated saving; it neither updates an official series nor identifies automation causation. Verified for version two 4 October 2026.

[6] Federal Reserve Bank of New York (2026). Measuring the Natural Rate of Interest. LW and HLW equilibrium real-rate estimates are model outputs with vintage revisions, distinct from nominal policy rates and official forecasts. Verified for version two 4 October 2026.

CHAPTER 137

China manufacturing employment and labor intensity

EVIDENCE STATUS Mixed evidence; bounded census checkpoints · OBSERVATION SPAN 2013, 2018, and 2023 economic censuses; separate 2025 robot installations

China provides an important global test of manufacturing labor compression, but its reported employment path includes an early contraction and a later plateau rather than an uninterrupted decline.

Employment populations and the manufacturing boundary

China manufacturing employment asks whether industrial expansion still creates accessible work on a comparable scale. The central quantity is people employed in manufacturing under a stated statistical population. Employment share, hours, compensation, and real value added supply distinct companion measures. A falling employment share can coexist with stable or rising headcount. Declining headcount can coexist with increasing hours among those remaining. These outcomes have different implications for labor demand and the distribution of production gains, so they should not be compressed into one description of industrial decline.

This chapter uses published economic census checkpoints rather than constructing an annual national workforce series from unlike sources. The census distinguishes employment in legal entities from employment in self-employed units. The earlier 2013 release identifies the latter population as licensed self-employed units. These labels need to remain attached to their observations. A count for urban units, large industrial enterprises, corporate enterprises, or legal entities is not automatically the count for every manufacturing worker. The three census releases supply useful evidence, while a complete harmonization of coverage and classification remains necessary for a definitive national employment series. [1][2][3]

Manufacturing also differs from the broader secondary sector, which includes other industrial activities and construction. A contraction in construction cannot be attributed to factory automation merely because both activities appear within the same broad economic grouping. Similarly, a shift in employment from a manufacturer's payroll to a logistics or staffing provider can change industry totals without removing all the associated human work. For the production question, a useful extension measures direct employees and purchased labor serving manufacturing. For the occupational opportunity question, the destination and terms of employment matter even when work continues elsewhere.

The preferred production ratio is real manufacturing value added divided by manufacturing hours, with a consistent boundary. Employment can substitute for hours only if the result is labeled output per worker and changes in average hours are investigated. Nominal sales per worker are affected by prices, purchased inputs, and intermediate goods. They should not be relabeled labor productivity. Robot installations establish equipment adoption; they are neither an employment denominator nor a count of displaced workers.

Census checkpoints and the later employment plateau

The third economic census reports 125.151 million people employed by manufacturing legal entities at the end of 2013. The corresponding published legal-entity count is 104.713 million for 2018 and 104.815 million for 2023. Simple subtraction gives a reported decrease of 20.438 million in the first interval and an increase of 0.102 million in the second. Those calculations describe the released checkpoints, subject to their statistical boundaries; they do not establish a continuous annual decline or identify a causal effect of technology. [3][1][2]

The separate manufacturing counts for self-employed units are 16.374 million in 2018 and 18.361 million in 2023. Their reported increase reinforces the need to keep the census categories visible rather than selecting only a falling series. The 2013 release's licensed-unit count should not be appended without a coverage reconciliation. The evidence supports a substantial earlier fall in legal-entity employment followed by a plateau in that population. It does not support describing manufacturing employment as shrinking continuously throughout the decade through 2023. [1][2][3]

A separate deployment checkpoint shows that automation continued to expand. The International Federation of Robotics reports 354,000 industrial robot installations in China during 2025, accounting for 59 percent of worldwide installations. The release appeared on 24 September 2026. Its observation year is therefore 2025, and it cannot extend the manufacturing employment census endpoint beyond 2023. The juxtaposition is useful evidence of large-scale technological adoption, but the dates and populations do not form a matched annual causal comparison. [4]

These observations resolve an important interpretive ambiguity. The plateau is adverse evidence for an uninterrupted-headcount-contraction claim. It leaves open the possibility that employment grew less than real production, which would mean declining labor input per unit if average hours did not offset the relationship. It also leaves open successful absorption into more productive manufacturing roles. Establishing either interpretation requires a comparable real output series and information on hours, pay, and worker transitions. A plateau does not become evidence of saturation merely because saturation is one possible explanation.

The observation window also crosses unusual macroeconomic conditions and substantial changes in the composition of industry. Rather than declare one permanent regime from three dates, an updated investigation should compare subindustries and regions and reconstruct annual paths where the sources permit. It should identify expanding and contracting activities separately. A large aggregate workforce can remain stable while individual production processes become less labor intensive and new products create jobs. That combination is economically important, but its net effect on access to prosperity must be measured, not inferred from the robot count.

What China can establish about post labor mechanisms

China matters to the global argument because a decline in manufacturing employment in an importing country could simply reflect relocation of labor abroad. Evidence about a major exporting producer helps test that explanation. If real production expands across both the importer and exporter while the combined labor required falls, technological or organizational labor saving becomes more plausible. If employment merely

migrates between countries, the same observation has a different global meaning. A country study supplies part of that accounting, while the worldwide conclusion requires coverage of the other production locations.

The key accounting question is the balance between production expansion and productivity. Let real output equal hours multiplied by output per hour. Labor hours fall when productivity grows faster than output, remain unchanged when the growth rates match, and rise when output expands faster. The identity contains no automatic forecast of its components. Industrial upgrading, product innovation, export demand, and cost reductions can expand activity enough to support employment. Conversely, slow demand can reduce employment even when technological progress is modest. The chapter tests the balance rather than assuming which side dominates.

A hypothetical factory illustrates why national headcount alone cannot identify the mechanism. Suppose an automated process halves the human hours needed per unit while orders double. Production workers' total hours can remain stable despite a large change in technical labor requirements. If orders rise only one quarter, hours can fall; if orders triple, they can increase. Adding complementary maintenance, engineering, and sales work changes the total again. These are alternative conditional outcomes, not estimates for China. Their purpose is to make the empirical claims distinguishable before examining the data.

The distribution channel also requires separate evidence. A producer may use productivity gains to raise pay, improve conditions, reduce prices, expand profits, or invest in additional capacity. Factory employment that is numerically flat could still support improving household security. It could also conceal weaker entry opportunities if incumbent positions become more demanding and expansion creates few accessible openings. Testing that concern requires hiring, qualifications, compensation, turnover, and subsequent earnings. It cannot be answered solely by noting that employment once reached a higher level.

International competition can transmit labor-saving pressure without every affected employer adopting robots. More efficient exporters may lower prices or capture market share, altering employment in competing economies. Yet an expanding Chinese industry can also create demand for suppliers elsewhere. A complete global account follows production networks and final demand rather than assigning all foreign losses to one technology variable. The strongest contribution of this chapter is therefore a disciplined comparison of manufacturing capability and employment opportunity, linked to the broader chapters on trade, task displacement, industrialization, and capital services.

Competing readings and tests that can change the conclusion

Several explanations can fit an employment contraction. Lower labor supply may encourage automation and raise wages. A demand slowdown may reduce staffing even without technological acceleration. Competition may shift work between provinces, industries, or countries. Organizational restructuring may move tasks to service providers. Changes in statistical registration may move workers between reporting categories. These mechanisms imply different policies and future paths. Their coexistence is not a reason to abandon causal analysis; it is a reason to specify which explanation a research design actually distinguishes.

The first test is descriptive: harmonize employment boundaries and match them to real output and hours. If reported headcount decline disappears under a stable population definition, the original claim needs revision. If headcount is stable but hours per worker rise, output per worker overstates the improvement in output per hour. If manufacturing output grows and total related human hours fall, the production

compression claim gains stronger support. None of these results alone establishes that the displaced people subsequently experienced permanent exclusion from useful employment.

The second test follows workers. Compare transitions from manufacturing into formal services, self-employment, unemployment, education, retirement, and other nonparticipation. Earnings recovery and access to benefits distinguish beneficial upgrading from a move into insecure work. Where feasible, use linked worker and employer records rather than an ecological comparison of regional averages. Workers remaining in an automated plant may gain even if competitors lose employment; workers leaving a plant may find better positions. The welfare question concerns the distribution of those outcomes, including new entrants who never obtained the former manufacturing opportunity.

The third test examines competing producers and entry. A plant-level gain in employment after automation could reflect market-share capture rather than a net industry gain. An industry contraction could coexist with new activity elsewhere that restores aggregate opportunities. The relevant counterfactual should therefore state its geographic and sector scope. A China-only estimate cannot prove that manufacturing employment is shrinking worldwide. Nor should gains elsewhere be dismissed as temporary absorption without evidence about their durability, earnings, and capacity to accommodate affected groups.

Evidence would strengthen a broad labor-compression interpretation if comparable production growth repeatedly generated fewer accessible jobs, replacement earnings weakened, and those patterns were linked credibly to technological change. Sustained growth in well-paid employment across affected workers and successor activities would constrain a claim of lost opportunity. Continued employment stability would directly weaken forecasts of rapid absolute contraction while remaining compatible with lower hours per unit. These possibilities should be registered in advance so that new observations change the assessment rather than being assigned an accommodating explanation afterward.

A reproducible China manufacturing dashboard

Begin the dashboard with the three dated legal-entity census observations and a separate series for self-employed units. Display only verified points and retain the original source labels. Mark 2013's licensed-unit distinction, reporting units, reference date, release date, and any classification notes. Do not interpolate a smooth annual trajectory through the checkpoints. Add annual yearbook observations only after documenting their population and reconciling overlap years. The monitoring file should record which differences represent genuine new information and which reflect a changed coverage boundary.

Place real manufacturing value added, manufacturing employment, and hours in separate panels before calculating ratios. Use the same national accounts vintage for output comparisons and preserve revisions. If suitable hours are unavailable, publish output per worker with an explicit missing-hours field rather than assuming a fixed workweek. Keep nominal turnover and export value separate from real value added. A reproduction note should identify the deflator, whether output is domestic value added or gross production, and how outsourced labor is treated in the intended analytical boundary.

Update robot deployment in a companion panel using installation flow, operational stock, and a stated employment denominator for density. Match the observation year rather than the publication year. Where industry breakdowns are available, distinguish adoption in existing production from equipment installed alongside newly created capacity. A rising density caused partly by employment contraction differs from one

driven entirely by a growing equipment stock. Avoid converting machines into displaced positions with an assumed universal coefficient; useful productive capacity and staffing consequences require their own observations.

For opportunity, monitor real compensation, vacancies, entry wages, training requirements, turnover, and employment transitions by age, sex, education, and region. Aggregate manufacturing resilience can conceal declining access for some groups, but subgroup deterioration cannot establish the same direction for the whole economy. Publish both where data quality permits. Establish a revision log for the point at which an exploratory subgroup pattern becomes sufficiently persistent and well identified to alter the chapter's assessment. Missing worker-transition evidence should remain an open research item.

Read this chapter alongside premature deindustrialization, industrial robot deployment, manufacturing output and labor input, and global labor underutilization. Its immediate finding is a bounded correction: published Chinese census employment fell substantially between the first two checkpoints and was approximately stable in manufacturing legal entities between the latter two. The next research step is to determine how production, hours, wages, and transitions evolved around that pattern. That approach preserves China's importance to the global post labor question while allowing its evidence to support some propositions and challenge others.

SOURCES AND REPRODUCTION NOTES

[1] National Bureau of Statistics of China (2019). Communiqué on the Fourth National Economic Census (No. 2). Table 2-4 reports manufacturing workers in legal entities and self-employed units at the end of 2018; preserve these distinct populations. Verified for version two 4 October 2026.

[2] National Bureau of Statistics of China (2024). Communiqué on the Fifth National Economic Census (No. 2). Table 2-3 reports manufacturing employment at the end of 2023; compare census categories separately and retain the release date. Verified for version two 4 October 2026.

[3] National Bureau of Statistics of China (2014). Communiqué on Major Data of the Third National Economic Census (No. 1). Table 1-4 reports end-2013 manufacturing employment in legal entities and licensed self-employed units; reconcile the licensed-unit coverage before extending comparisons. Verified for version two 4 October 2026.

[4] International Federation of Robotics (2026). Five Million Robots now Operate in Factories Globally. Primary IFR release dated 24 September 2026; China installation figures describe calendar 2025 and do not measure employment displacement. Verified for version two 4 October 2026.

CHAPTER 138

Global labor underutilization and the jobs gap

EVIDENCE STATUS **Mixed evidence; global outcome measures with competing causal accounts** · OBSERVATION SPAN ILO modelled estimates and country surveys; 2024 estimate and 2026 forecast kept separate

The world contains substantial unmet demand for paid work and widespread inadequate employment, but neither level alone identifies automation as its cause or establishes an uninterrupted secular deterioration.

Measuring unmet employment and inadequate work

Global labor underdemand is an interpretive proposition: the economy does not generate sufficient opportunities for the people who want paid work at acceptable terms. It is not one standardized official statistic. This chapter gives the proposition measurable content through unemployment, the jobs gap, time-related underemployment, informality, and earnings. Those measures capture different groups and dimensions. They must not be added indiscriminately into a single number of people whom the economy does not need. A person may appear in several measures, and someone doing informal work is already contributing labor to production.

The International Labour Organization defines unemployment through lack of employment, recent search, and current availability. Its potential labor force includes people who meet one of the search or availability conditions but not both, under the stated rules. Time-related underemployment concerns employed people who want and are available for additional hours while working below a specified threshold. These concepts distinguish complete joblessness from insufficient hours and weaker labor-market attachment. They also require a short reference period and consistent survey questions. [1]

The jobs gap broadens the joblessness inquiry to people without employment who want it, including some who do not meet the unemployment or potential-labor-force criteria. It complements the unemployment rate rather than replacing it. Its denominator must follow the published definition and should appear beside its headcount. The composite labor-underutilization measure LU4 also includes time-related underemployment, so it answers a different question. An analysis should retrieve each official series and its metadata instead of relabeling one as the other or treating their levels as directly interchangeable. [2]

Informality is a job-quality and institutional dimension. Informal jobs can exist within formal enterprises, informal enterprises, and households. An informal worker may work long hours and produce valued output while lacking employment protections or reliable income. Conversely, a formal job may provide too few hours or poor pay. A dashboard should therefore cross-classify formality, hours adequacy, earnings, and employment status where the underlying data permit. This preserves the distinction between too little paid work and work that fails to provide security. [3]

Global evidence and the importance of release vintage

The ILO's Employment and Social Trends 2026 projects a global jobs gap of 408 million people in 2026 and an unemployment rate of 4.9 percent. It also projects about 2.1 billion people in informal employment. These figures demonstrate the scale of unmet employment and weak protection in the forecast baseline, while remaining distinct populations and concepts. The annual 2026 values are projections published in January 2026, not completed full-year observations as of the reference's October cutoff. [4]

The earlier World Employment and Social Outlook: Trends 2025 estimates the 2024 jobs gap at about 402.4 million and describes a decline since the pandemic. That improvement matters for a claim of continuously worsening labor underutilization. At the same time, a declining rate or level can leave a very large unresolved problem. Comparing these two report headlines does not yield a clean change estimate: the observation years differ, one endpoint is a forecast, and model revisions can alter the historical series between releases. [5]

Historical reconstruction should use one consistent release vintage rather than selecting large values from different publications. Separate population growth from changes in the proportion seeking employment without obtaining it. The number of affected people can rise while their share falls if the underlying population expands. Either can be important, but they address different questions about the reach and intensity of the problem. Country aggregation also matters: an improvement in populous economies can dominate the world average while smaller economies deteriorate, or vice versa.

Statistical standards create an additional boundary. The 19th International Conference of Labour Statisticians separated own-use goods production from employment, affecting the measured population of informal workers in countries transitioning to the newer definition. A lower reported informality total can therefore partly reflect who counts as employed. Historical tables should identify the standard, the implementation date, and breaks rather than attach all estimates to a single uninterrupted line. Changes in the visibility of unpaid and subsistence activities can improve measurement without representing the disappearance of the work itself. [6]

The reviewed evidence supports a large global deficit in access to satisfactory employment. It does not, by itself, establish the entire long-run trajectory or identify the cause. A secular claim needs comparable histories extending across decades, with the movement of both rates and counts examined through economic cycles. The proposed dashboard preserves current checkpoints because they are consequential, while withholding a stronger historical conclusion until the underlying series has been reconstructed. This separates the seriousness of the present outcome from the strength of a particular story about its evolution.

Stagnation automation and the labor demand identity

Aaron Benanav's original account attributes persistent labor underdemand primarily to weak growth and industrial overcapacity rather than unusually rapid automation. The distinction is substantive. A diagnosis of inadequate expansion implies different constraints and responses from one in which technical capability removes most demand for labor despite abundant output. The argument belongs in this reference as a competing causal account that overlaps with concern about job quality and exclusion. Agreement about those outcomes does not amount to independent confirmation of an automation-led explanation. [7]

The accounting identity helps specify the disagreement. With output per worker defined as real output divided by employment, employment growth equals output growth minus growth in output per worker in logarithms. If productivity is measured per hour, the corresponding identity concerns hours; employment also depends on average hours per worker. Slow productivity growth can accompany declining employment when output grows even more slowly. Rapid productivity growth can accompany rising employment when production expands faster. The identity organizes observations but cannot establish why any component changed.

A post labor mechanism would become more concrete if successful production systems expanded with fewer human hours per unit and if replacement activities failed to restore accessible earnings and security. This can occur through lower hiring as well as layoffs. In a growing population, employment can rise while adequate opportunities fail to keep pace with entrants. Testing that concern requires a stated benchmark for adequate opportunity and a comparison population. An increase in labor supply does not itself prove a fall in labor demand, and the two should not be silently conflated.

Global underutilization also concerns institutions that translate need into effective demand. A community may need better housing, care, transport, and education while households and governments lack the purchasing power to employ people to provide them. The coexistence of unmet needs and unemployed workers is therefore compatible with resource, distribution, financing, and coordination constraints. It need not imply that no useful work remains. The role of ownership and public provision is relevant precisely because technical production capacity and the ability to pay for socially valuable activity can move differently.

The global framing adds a migration and development dimension. Expanding formal sectors can absorb workers from informal activities without raising total employment much, while improving productivity and security. Conversely, weak formal entry can leave people economically active but unable to reach higher earnings. Manufacturing is one potential pathway and services another. The relevant post labor question is whether the pathways collectively become narrower relative to the population seeking them. That proposition must be tested across successful and unsuccessful economies, including cases where new institutions or industries broaden opportunity.

Alternative explanations and discriminating evidence

Demography, conflict, public health, education, credit constraints, infrastructure, trade, and domestic policy can affect labor-market outcomes independently of automation. In some economies, slow productivity reflects insufficient capital and organizational capability rather than the excessive availability of labor-saving machines. An observed scarcity of good jobs can therefore coexist with an urgent need for investment that raises productivity. A credible causal comparison should identify the local constraint instead of assuming that a technology-rich economy and a capital-poor economy reach similar outcomes for the same reason.

Informality particularly requires careful interpretation. It can reflect low productivity and limited opportunity, but also enforcement, registration costs, tax design, firm size, or the structure of household production. An increase in registration may improve measured formality without immediately raising income. A worker leaving a formal position for profitable self-employment may improve economically despite moving outside an employee-benefit system. These possibilities do not erase the institutional risks of informal work. They

imply that formality should be assessed with earnings, hours, stability, and protection rather than serve as a universal quality score.

The most useful discrimination separates output weakness from labor-saving substitution. Compare sectors with different automation exposure while accounting for demand and trade, and inspect actual adoption and workflow changes where possible. Measure whether gains occur mainly through increased output with stable labor, reduced labor with stable output, or both. Follow complementary occupations and new firms. If labor underutilization worsens primarily where demand contracts and technological adoption remains weak, that supports a different mechanism from persistent exclusion concentrated around successful labor-saving production.

The plateau or saturation hypothesis also needs an observable implication. A stable informality share might mean a structural ceiling has been reached, successful formalization is offset by population change, or little structural change is occurring. To support saturation, show the stock and flow process that keeps the share stable: who enters, who exits, and what constrains further movement. An unchanged aggregate cannot confirm those mechanisms by itself. Equally, a falling share is evidence of improvement in that measured outcome even if other parts of the post labor framework remain plausible.

Evidence would weaken generalized exclusion if broad groups gained adequate hours, rising real earnings, protection, and access to productive employment over sustained comparable periods. It would strengthen an underdemand diagnosis if willing workers repeatedly failed to obtain those opportunities despite improving productive capacity. Whether technology caused that gap remains a further question. Maintaining the separation makes the framework falsifiable at several levels: the outcome can improve, a proposed mechanism can fail, or one country's experience can diverge from the global average.

Monitoring without double counting or predetermined conclusions

Build a country-year panel from ILOSTAT with identifiers for the survey source, employment standard, modelled or observed status, population, and release vintage. Retain unemployment, the jobs gap, time-related underemployment, and informality as separate variables. Record missingness explicitly and avoid treating a modelled annual estimate as a direct national survey observation. Where definitions change, present separate segments or use an authorized harmonized back series. The purpose is a reproducible comparison, not the longest possible line at the expense of meaning.

Publish counts and rates together, grouped by region, income group, sex, and age where coverage supports it. Alongside weighted world totals, show the distribution of country changes so that large economies do not conceal different development experiences. Decompose aggregate changes into within-country movements and changes in population weights. For worker outcomes, pair employment indicators with real earnings, poverty, and protection, preserving their own denominators. Avoid adding overlapping populations into an alleged total displaced workforce.

Maintain an explicit observation and forecast boundary. Archive each annual ILO release and evaluate whether projected deterioration or improvement materialized in later comparable estimates. Revisions should be separated from economic changes wherever possible. An endpoint sourced from a January forecast belongs on a forecast segment until an observed or revised estimate replaces it. This is especially

important when a current headline is used to update a long historical narrative: publication recency does not transform all underlying inputs into current observations.

To test labor underdemand, specify what counts as adequate work before looking at the outcome. One version can use desired additional hours; another can evaluate real earnings and formal protection; a third can examine entry into a stable employment relationship. They are complementary tests, not interchangeable thresholds. Track how workers move across categories and whether improvements survive beyond a recovery year. Where microdata are unavailable, present aggregate evidence with a narrower interpretation rather than invent transitions from changes in stocks.

Read the dashboard alongside premature deindustrialization, Chinese manufacturing, task displacement, new work, labor share, and household provision. The global perspective guards against mistaking international relocation for a worldwide disappearance of employment. It also reveals pressures that unemployment alone misses. Its contribution is strongest when it keeps the large scale of inadequate employment visible while allowing the trajectory, geography, and causal explanation to change with the evidence. A bounded diagnosis of unmet opportunity is more informative than treating every unfavorable outcome as one independent confirmation of the same mechanism.

SOURCES AND REPRODUCTION NOTES

[1] International Labour Organization (2016). Labour underutilization. Official definitions distinguish unemployment, potential labor force, and time-related underemployment; apply each measure's population and reference-period rules consistently. Verified for version two 4 October 2026.

[2] ILOSTAT (2024). Women are more likely than men to want a job but not have one. Methodological discussion of the jobs gap as a complement to unemployment; broader desire for employment is not identical to immediate availability. Verified for version two 4 October 2026.

[3] ILOSTAT (2026). Decent Work Reality Check: Informality Across the World of Work. Official account distinguishes informal employment from informal enterprises; informal jobs can also occur in formal firms and households. Verified for version two 4 October 2026.

[4] International Labour Organization (2026). Employment and Social Trends 2026. January 2026 report and publication summary; retain forecast labels for annual 2026 jobs-gap, unemployment, and informal-employment estimates. Verified for version two 4 October 2026.

[5] International Labour Organization (2025). World Employment and Social Outlook: Trends 2025. Executive summary reports the 2024 jobs-gap estimate; use a consistent model vintage before comparing estimates across annual reports. Verified for version two 4 October 2026.

[6] ILOSTAT (2023). New standards, increased visibility: improving measurement of the informal economy. Official explanation of statistical-standard changes separates own-use goods production from employment; preserve breaks when interpreting historical informal-employment series. Verified for version two 4 October 2026.

[7] Aaron Benanav (2019). Automation and the Future of Work—1. Original author essay develops the stagnation account of labor underdemand; retain it as a competing causal explanation of inadequate employment. Verified for version two 4 October 2026.

CHAPTER 139

Long run annual and lifetime paid work

EVIDENCE STATUS **Secular historical evidence; changing statistical coverage and uneven national paths** · OBSERVATION SPAN Annual-hours reconstruction 1870–2000; UK lifetime estimates 1856–1981; modern OECD monitoring kept separate

Industrial history shows substantial reductions in paid working time, but shorter chosen schedules and involuntary exclusion have different meanings and cannot be inferred from the same average.

Annual hours lifetime hours and population exposure

Annual paid working time is the number of hours actually worked during a year divided by the relevant employed population. It combines weekly schedules, weeks worked, holidays, absences, and part-time employment. Hours per employed person differs from hours per adult, because the latter also includes people without employment. Lifetime paid work introduces a further dimension: how participation and hours vary across ages. These measures describe time committed to paid production. They do not directly count all socially useful activity or establish whether a person wanted to work more or less.

A practical lifetime measure adds expected paid hours at each age, using clearly stated employment probabilities and annual schedules. It can be constructed for an actual birth cohort as its experience unfolds, or as a synthetic profile using conditions observed in one period. The latter is not the completed biography of people born in that year. Changes in longevity, education, retirement, and labor-force participation can alter the estimate even when a standard weekly schedule stays fixed. Conditional estimates for workers also differ from estimates covering the entire population.

The denominator matters especially when describing a share of life. Paid hours can be divided by all lifetime hours, waking hours, or a separately defined disposable-time budget. The resulting percentages are not interchangeable. A fall in the share of life devoted to paid work can reflect longer life as well as fewer paid hours. It can be an important welfare improvement, but it is not automatically a fall in employers' desired labor input. Publishing both the absolute paid-hour total and the lifetime denominator makes that distinction visible.

For contemporary monitoring, the OECD annual-hours dataset supplies a practical starting point. Its metadata cautions that differences in national sources make the series better suited to comparisons of trends than direct rankings of annual-hour levels across countries. A comparison should retain each country's methods and distinguish employees from all employed persons, including the self-employed. Combining an establishment-based employee series with a household-based all-worker series can introduce an apparent difference that is partly statistical rather than behavioral. [1]

Historical reconstructions and their limits

Huberman and Minns reconstruct annual working hours for selected European countries, North America, and Australia from 1870 to 2000. Their Table 3 reports U.S. hours of 3,096 in 1870 and 1,878 in 2000; Germany,

3,284 and 1,463; and the United Kingdom, 2,755 and 1,653. These are substantial long-run declines across the reported endpoints. They are historical estimates under the paper's methods, not observations from a single unchanged survey and not a current-year comparison. [2]

The reconstruction changes statistical basis across the long interval: its earlier annual estimates concern full-time production workers, whereas the post-1950 figures use total hours divided by workers. The authors explain the transition in relation to changing participation and part-time work. That is a defensible research construction to examine, not a reason to hide the boundary. The paper also shows uneven paths: some later intervals are flat or rising, including U.S. annual hours between 1980 and 2000 in its table. A secular decline does not mean uninterrupted annual decline. [2]

Ausubel and Grübler provide a separate lifetime reconstruction for the United Kingdom. Their table estimates male lifetime paid hours at 149,700 in 1856 and 88,000 in 1981, and female hours at 62,800 and 39,800. They explicitly describe averages for working populations rather than tracked successive birth cohorts. Their calculations distinguish the contributions of weekly hours, weeks worked, and career length. Consequently, these numbers should not be described as the realized careers of men and women born in 1856 and 1981. [3]

A theoretical interpretation appears in Boppart and Krusell's work on labor supply and balanced growth. They emphasize a long-run tendency toward declining hours while treating the absence of a comparable trend in the postwar United States as an exception. Their framework allows rising income to produce demand for more leisure. It offers an alternative to reading every reduction in paid time as involuntary labor displacement. The historical association between prosperity and shorter hours is consequential even when the adjustment is chosen. [4]

These sources establish a strong historical backdrop, with observation windows that should remain explicit. They do not supply a fully harmonized annual series from the nineteenth century through October 2026. A modern extension requires a documented bridge to current national or OECD data, and lifetime updates need age profiles rather than extrapolated old totals. The proper presentation preserves dated historical checkpoints and separately labels the contemporary series. It avoids calling a century-spanning reconstruction a precise measurement of how much every present worker works relative to an otherwise identical predecessor.

Less paid work as a possible dividend of production progress

Rising productivity makes more output possible per hour, creating a feasible choice between more consumption and less paid work. The realized choice depends on preferences, bargaining, distribution, and institutions. A society can convert part of its increased productive capability into shorter schedules without reducing living standards. That is a meaningful sense in which work becomes less central to life. It differs from the claim that employers have no use for willing workers, and the historical hours evidence should not be made to choose between those propositions without additional information.

The income channel is straightforward as a conditional mechanism. If a worker can maintain desired consumption with fewer paid hours, that worker may prefer more time for care, education, rest, or other activities. Whether that choice is feasible depends on wages, household obligations, benefits, and the availability of shorter schedules. A worker facing high housing or medical costs may need to maintain or

increase paid hours even as productivity rises. Average time use therefore combines production possibilities with the distribution of resources and constraints on individual decisions.

Institutions shape how gains become time. Collective agreements, leave rights, retirement systems, and employer scheduling practices can coordinate reductions that individuals would struggle to negotiate alone. Conversely, fixed benefit costs and career incentives can concentrate hours among a smaller group of employees. These are mechanisms to test in particular settings rather than assumptions about a uniform historical process. The same rise in productive capability can support higher annual pay, more leave, fewer scheduled hours, or higher returns to owners, depending on the institutions and bargaining relationships involved.

Consider an explicitly hypothetical economy where output per hour rises by one quarter. Maintaining the same output would require one fifth fewer hours. One response is for everyone to work a shorter schedule while retaining purchasing power; another is to expand output using the original hours; a third is to retain full schedules for fewer workers. Mixed outcomes are also possible. The calculation defines a production possibility, not a forecast. Evidence about demand, compensation, participation, and preferences determines which path occurs and whether households benefit.

This distinction connects long-run worktime to post labor distribution. A reduced need for human time per unit becomes a broad social dividend when people can meet their needs with less obligatory paid effort. If some people instead lose earnings and opportunity while others remain overworked, the distribution is less favorable even if aggregate hours fall by the same amount. The relevant question is therefore both how much paid time declines and how control over the saved time and income is allocated. Averages are the starting point, not the welfare verdict.

Chosen leisure excluded labor and changing work boundaries

The first competing reading is voluntary labor supply. Shorter hours accompanied by adequate income and a preference for more free time can represent success rather than labor-market failure. To distinguish it from constraint, examine desired hours, availability for extra work, financial strain, and earnings. A low annual average generated by paid leave has a different meaning from one generated by involuntary interruptions. Even reported preferences should be interpreted with attention to constraints: someone may prefer fewer paid hours because care services are unavailable, not because household resources are abundant.

The second reading is composition. Average hours can fall when part-time workers gain employment, even if nobody's individual schedule shortens. Rising employment among groups historically excluded from paid work can increase total hours while reducing hours per worker. Ageing can lower hours per adult through retirement while prime-age schedules remain unchanged. These patterns require subgroup and age-standardized comparisons. It would be misleading to infer a universal shorter workweek from a composition-driven decline, just as it would be misleading to call expanded part-time opportunity an automatic deterioration.

The third boundary concerns unpaid work. Reducing paid employment can transfer more household production, care, and administration to individuals. Conversely, market services and household technology can reduce unpaid burdens. The lifetime study itself excludes unpaid labor from its paid-work concept and warns that non-work includes more than leisure. A modern analysis should therefore add time-use evidence

before claiming that every saved paid hour becomes freely chosen time. Different household members may experience opposite changes in paid and unpaid responsibilities. [3]

The fourth reading concerns historical institutions and crises. Wars, depressions, legal changes, and transitions in schooling and retirement can produce sharp movements rather than a smooth technological trend. A historical peak associated with unusually long factory schedules is not a timeless baseline for all human work. The proper causal inquiry asks which changes in capability, bargaining, preferences, and constraints produced each phase. A large endpoint decline remains real under the source's definitions even if several mechanisms contributed and some intervals moved in the opposite direction.

A continuing fall in hours per worker would support the descriptive long-run tendency where measured comparably. A persistent reversal across many comparable countries would constrain its extrapolation. Neither result alone resolves the stronger hypothesis of involuntary exclusion. That hypothesis needs employment and desired-hours evidence, while a broad prosperity dividend needs income and time-use outcomes. These separate tests allow both favorable and unfavorable changes to affect the interpretation. They prevent the framework from treating shorter hours as support when they occur and unchanged hours as equally strong support without specifying the mechanism.

Reproducing a historical and contemporary worktime account

Present the historical annual-hour observations as dated points under the original study's country coverage and methods. Use separate panels for annual hours per worker, weekly schedules, and weeks worked where available. Mark source transitions directly in captions. Contemporary series can begin in a separate panel with a documented overlap comparison; do not force continuity by rescaling a break away. Compute endpoint percentage changes from the displayed values and retain appropriate precision for reconstructed nineteenth-century observations. The visual should convey scale without implying annual certainty that the sources do not provide.

For current monitoring, retain actual hours, usual hours, employed headcount, and working-age population as distinct inputs. Report annual hours per worker together with hours per adult and employment rates. Break out age, sex, education, and part-time status where the data support it. A constant-composition calculation can show how much of a change reflects schedules within groups and how much reflects a different employment mix. Its weights and base year should be published so that the result can be reproduced and interpreted alongside the actual aggregate.

Build lifetime estimates from explicit age-specific probabilities and schedules, including the treatment of mortality and partial years. State whether the estimate is conditional on employment or covers everyone. A synthetic period estimate should be labeled as the experience implied by current age profiles, while a cohort estimate should state which future years remain unobserved. Sensitivity analysis can vary career-entry, retirement, and participation assumptions. It should not turn an uncertain projected career into an observed historical fact simply because the calculation yields a precise total.

Add indicators of desired hours, involuntary part-time work, income adequacy, leave, unpaid care, and time autonomy. These reveal whether reduced paid work constitutes chosen leisure, constrained employment, or a transfer of obligations to the household. Track the distribution as well as the mean: a lower national average can conceal long schedules among some employees and complete employment exclusion among

others. The monitoring question is not only whether hours fell, but whether people gained control over their time while retaining access to essentials and opportunity.

Read this chapter with the hours-and-employment decomposition, labor participation, job quality, household provision, and productivity chapters. Long-run paid-time reduction gives the post labor discussion historical depth beyond contemporary AI. Its strongest finding is that societies have repeatedly changed the amount of paid work embedded in a year and a lifetime. The subsequent path remains a question about production, distribution, and choice. Reproducing those components carefully allows the reference to recognize genuine gains in free time while still identifying unequal or involuntary reductions in access to work.

SOURCES AND REPRODUCTION NOTES

[1] Organisation for Economic Co-operation and Development (2026). Average annual hours actually worked per worker. Dataset metadata describes annual hours per worker and cautions against comparing country levels when source methods differ; preserve series definitions. Verified for version two 4 October 2026.

[2] Michael Huberman and Chris Minns (2007). The times they are not changin': Days and hours of work in Old and New Worlds, 1870–2000. Table 3 provides annual-hours checkpoints for 1870–2000; methods distinguish early production-worker estimates from later total-economy hours per worker. Verified for version two 4 October 2026.

[3] Jesse H. Ausubel and Arnulf Grübler (1995). Working less and living longer: Long-term trends in working time and time budgets. Table 1 reports UK lifetime-hours estimates for 1856, 1931, and 1981; the text explicitly distinguishes averages from successive cohort histories. Verified for version two 4 October 2026.

[4] Timo Boppart and Per Krusell (2020). Labor Supply in the Past, Present, and Future: A Balanced-Growth Perspective. Published labor-supply model examines long-run hours decline and the postwar U.S. exception; the income-effect interpretation differs from involuntary exclusion. Verified for version two 4 October 2026.

CHAPTER 140

Hours and employment decomposition

EVIDENCE STATUS **Proposed metric; channel-switch hypothesis untested** · OBSERVATION SPAN Historical reconstruction to be built from comparable household microdata; no verified break date

Hours per person can change through schedules and employment rates; the proposed shift from shared shorter hours toward concentrated nonemployment requires a direct subgroup decomposition and separate causal tests.

The intensive and extensive margins of paid work

Hours per person can be decomposed exactly into hours per employed person multiplied by the employment-to-population ratio. Write H for total actual hours in employment, E for employed people, and N for the relevant population. Then H/N = (H/E) × (E/N). The first component is the intensive margin, or work time conditional on employment. The second is the extensive margin, or the fraction employed. The equation identifies how paid time is distributed between schedules and employment incidence, provided all three quantities cover the same people and reference period. Use the survey's employment boundary consistently, including self-employment and qualifying family work.

The proposed channel-switch hypothesis is more specific than that identity. It suggests that reductions in paid work became less broadly shared through shorter schedules and more concentrated through nonemployment, particularly among groups facing weak opportunities. Establishing it requires showing an actual change in the contributions of the two margins over comparable periods. A flat median workweek and a declining employment rate in one subgroup are suggestive building blocks, not the completed test. The break date and geographic scope remain empirical questions rather than facts established by the label.

The population must be chosen before calculation. Adults, working-age residents, prime-age residents, and particular education groups answer different questions. An all-adult calculation incorporates retirement and schooling; a prime-age calculation narrows those influences but does not eliminate health, care, migration, or compositional change. The numerator should include actual hours from all jobs without counting a multiple jobholder twice in employed headcount. People classified as employed but absent for the reference period require explicit treatment so that the hours average and employment denominator remain aligned.

An informative decomposition reports the components and their changes, not only their relative shares. If total hours per person barely change because shorter schedules offset rising employment, dividing either contribution by the tiny net change can produce misleading percentages. Percentage-point or log-point contributions retain the offsetting movements. A second analysis should describe the distribution of hours and the reasons for nonemployment. The accounting can show which margin moved; determining whether the movement reflects chosen leisure, family constraints, or insufficient demand for work requires additional evidence.

What existing evidence establishes and what remains unbuilt

The historical hours literature establishes substantial reductions in working time across long intervals, but does not by itself provide this chapter's harmonized U.S. subgroup decomposition. Similarly, the reference's participation and employment chapters describe extensive-margin histories without combining them with consistent actual-hour profiles. Their conjunction motivates the proposed analysis. It cannot establish how much each margin contributed within a specified population or whether their relative importance changed around 1980. The chapter's evidence status is therefore proposed, with no verified historical switch date.

One institutional checkpoint is well established. The original Fair Labor Standards Act phased a forty-hour threshold into its covered population by 1940. The contemporary rule requires overtime pay after forty weekly hours for covered nonexempt employees. That threshold is neither a universal maximum workweek nor a measurement of actual hours. It also does not cover every worker under identical rules. Its long persistence can motivate research on schedule rigidity, but it cannot substitute for an observed time series of hours worked. [1][2]

The Current Population Survey supplies an important measurement distinction. BLS counts people with a job but temporarily absent as employed, whereas published hours-at-work averages concern people who worked at least one hour in the reference week. A decomposition using all employed people must therefore construct its actual-hour numerator and denominator consistently, including zero hours for qualifying absences. Otherwise, multiplying an at-work-only average by the broader employment rate overstates hours per person. BLS also distinguishes actual hours from usual schedules, which serve different analytical purposes. [3]

A hypothetical example makes the calculation tangible. Suppose a population of one hundred adults initially contains eighty employed people averaging forty hours, producing thirty-two hours per adult. Later, seventy-five are employed at thirty-eight hours, producing 28.5 hours per adult. Both margins declined. Using a symmetric decomposition, the schedule contribution is the change in hours, minus two, multiplied by the average employment rate, 0.775: minus 1.55 hours per adult. The employment contribution is the rate change, minus 0.05, multiplied by average hours, thirty-nine: minus 1.95. Their sum is minus 3.5.

Those numbers are illustrative rather than historical estimates. They show why an exact accounting is preferable to a narrative based on separate endpoints. The same total decline could instead come entirely from shorter schedules or entirely from fewer people employed. Neither the equation nor its decomposition says whether the outcome was desired. The empirical research still needs comparable survey observations, subgroup estimates, uncertainty, and a defensible interpretation of the reasons behind the change. Until those steps are completed, this reference retains the channel switch as a testable hypothesis.

The distributional mechanism and the limits of accounting

The proposed mechanism concerns the allocation of labor-saving gains. If productive capability rises while demand for output expands less rapidly, fewer human hours may be needed. Institutions and firm decisions can distribute that adjustment across shorter schedules, fewer positions, slower hiring, or other changes. A reduced standard schedule could share the time reduction among employed people. Concentrated nonemployment could instead leave some households without earnings. Those alternatives give the

decomposition its relevance to post labor economics, while actual outcomes depend on wages, transfers, demand, and preferences.

For positive aggregate components, the log identity is exact: the change in log hours per person equals the change in log hours per worker plus the change in log employment rate. Log changes conveniently separate proportional contributions. For a level decomposition, let h denote hours per employed person and e the employment rate. The change in h×e equals average e multiplied by the change in h, plus average h multiplied by the change in e, where the averages use the two endpoints. This symmetric allocation assigns the interaction without privileging one ordering.

Population composition supplies a further layer. If the share of older adults rises, aggregate hours per adult can fall even when each age group's schedule and employment rate are unchanged. If employment expands among people seeking shorter schedules, average hours per worker can fall while access to work improves. A fixed-composition analysis should therefore accompany the observed aggregate, with age, sex, and education weights stated. The standardized result answers a counterfactual demographic question and should remain distinct from the actual hours experienced by the population.

A schedule reduction is not necessarily shared equally merely because it appears on the intensive margin. Involuntary part-time work concentrated among a minority can lower the average while leaving most workers' schedules unchanged. Conversely, a lower employment rate can reflect voluntary retirement, longer schooling, or a household member choosing to provide care. To evaluate distribution, examine individual hours bands, desired hours, income, and reasons for nonemployment. The extensive-versus-intensive distinction is analytically useful, but it is not a ready-made classification into harmful exclusion and beneficial leisure.

The connection to technology requires another identification step. Productivity is output per hour, and the hours decomposition is an accounting relationship. Neither gives a causal estimate of automation's effect. A convincing mechanism would connect observed technological adoption or task changes to the distribution of hours, with attention to demand, labor supply, trade, and complementary jobs. It should also investigate whether displaced earnings are restored through new employment or other income channels. This makes the proposed measure a bridge between production and household outcomes rather than a substitute for either.

Tests of a historical channel switch

Begin with a preregistered descriptive question or an explicit analysis plan: for which population, over which intervals, did paid hours per person fall, and which margin carried the change? Use comparable cycle endpoints where possible. Report intervals in which hours rose as well as those in which they fell. Choosing only contraction periods would turn an economy's normal fluctuations into an apparent secular pattern. The hypothesized post-1980 shift should be tested against alternative break dates and gradual-change specifications rather than imposed without comparison.

The strongest subgroup claim may differ from the aggregate claim. Declining employment among less-educated men can coexist with rising employment among women and higher educational attainment. Both matter, and neither should erase the other. Publish the total population result alongside predetermined subgroups and constant-composition calculations. If the proposed switch is present only in a specific group,

state that boundary. Expanding it into a claim about every worker or the whole economy would require additional evidence that the subgroup pattern represents the broader adjustment.

The counterevidence is also specific. If postulated reductions in hours per person are mainly explained by shorter schedules rather than lower employment rates, that weakens the proposed shift toward the extensive margin for that population and period. If hours per person rise, the analysis cannot describe an observed aggregate reduction during that interval. It can still investigate unmet desired employment or inequality, but those become different claims. A satisfactory framework records this distinction before seeing results, allowing the original proposition to fail without relabeling the outcome.

A saturation explanation for a stable schedule or employment rate requires more than a flat line. It should identify a constraint, such as an institutional scheduling floor or a depleted pool of workers able to exit, and show corresponding movements in transitions or desired hours. Otherwise, stability may simply mean little change in the measured margin. Similarly, recovery in employment can weaken a persistent-exclusion prediction while leaving prior damage or lower labor intensity intact. Claim-specific updates preserve those nuances without making the hypothesis immune to improvement.

Cross-country comparisons can examine whether institutions distribute similar production changes differently. Match age groups, employment concepts, reference periods, and hours definitions before comparing contributions. Changes within each country may be more defensible than precise rankings of hour levels when statistical methods differ. Short-time work, leave, part-time access, retirement, and wage-setting institutions are candidate mechanisms to investigate. Their effect on employment cannot be assumed from association alone, because countries also differ in demand, demographics, sector structure, and policy responses to shocks.

Building the series and retaining a genuine research test

Construct the baseline from a single household-survey framework wherever possible. For each reference period, sum weighted actual hours over all jobs and divide by the weighted population. Count employed people with the same weights and population restrictions, then derive hours per employed person from the identical numerator. Verify numerically that the product of the two components reproduces hours per person. Average the underlying totals consistently across periods before computing annual ratios; an unweighted average of monthly ratios can produce a different answer.

Retain separate actual- and usual-hours calculations. Actual hours capture absences and temporary interruptions, while usual schedules can help distinguish a persistent scheduling change. Document treatment of missing responses, top coding, variable-hours workers, multiple jobs, and survey redesigns. Do not infer annual hours by blindly multiplying one reference week's usual schedule by fifty-two. Where the historical microdata cannot support a consistent definition, begin the comparable series later and preserve older evidence as a separate checkpoint rather than splice it invisibly.

Use BLS productivity accounts as a companion production series with their own sector boundary. Their output and hours measures combine source inputs for the covered production sector. They should not be divided by a different household-survey employment population and treated as if the original identity still described one universe. A bridge between the datasets needs an explicit reconciliation. The household

decomposition answers who supplies paid time; the productivity series asks how that time relates to measured output within its production scope. [4]

Publish levels, log-point or level contributions, subgroup uncertainty, and sensitivity to interval choice. Include the hours distribution and a decomposition of composition effects. The research record should state which findings survive alternative population definitions and which depend on one measure. Add desired additional hours, reasons for nonparticipation, earnings, and household income where available. These companion outcomes make it possible to distinguish a chosen reduction in paid work from insufficient access to work without embedding that conclusion in the accounting itself.

Update the series annually after source revisions, preserving the earlier vintage and documenting any new break. The chapter should move from proposed to empirical evidence only when the decomposition has been constructed and its results inspected. A confirmed switch would clarify one distributional pathway through which reduced labor input affects households. An absent, reversed, or narrowly localized switch would constrain that particular post labor claim. Either result would improve the reference by replacing a plausible narrative with a reproducible test of where paid work time actually changed.

SOURCES AND REPRODUCTION NOTES

[1] U.S. Department of Labor (undated). Chapter 3: The Department in the New Deal and World War II, 1933–1945. Department history describes the original FLSA and phased forty-hour threshold; it is institutional context rather than an actual-hours series. Verified for version two 4 October 2026.

[2] U.S. Department of Labor (2026). Overtime. Current federal guidance states overtime-pay rules for covered nonexempt employees; the threshold is neither a universal maximum nor observed workweek. Verified for version two 4 October 2026.

[3] U.S. Bureau of Labor Statistics (2026). Concepts and Definitions: Current Population Survey. Definitions distinguish employed people temporarily absent from workers at work; align actual hours and headcount before constructing hours per person. Verified for version two 4 October 2026.

[4] U.S. Bureau of Labor Statistics (2026). Handbook of Methods: Office of Productivity and Technology, Calculation. Official productivity methods explain output and labor-input calculations; preserve sector coverage when using these accounts beside household survey decompositions. Verified for version two 4 October 2026.

Alphabetical metric index

Absolute intergenerational income mobility · Chapter 041 239
Agricultural output relative to labor hours · Chapter 065 354
AI capability relative to cost · Chapter 094 499
AI enabled contribution margin · Chapter 119 626
AI enabled gross margin · Chapter 100 529
Automation and loss of wage premiums · Chapter 086 459
Automation displacement and task reinstatement · Chapter 084 449
Avoided hiring and historical staffing benchmarks · Chapter 077 414
Backlog days · Chapter 122 641
Broad underemployment and headline unemployment · Chapter 010 83
Capacity realization and redeployment · Chapter 110 579
Capital Allocation Ratio · Chapter 038 224
Capital deepening contribution to growth · Chapter 051 288
Capital input relative to labor hours · Chapter 049 279
Capital services cost share · Chapter 097 514
Capital services per labor hour · Chapter 050 283
China manufacturing employment and labor intensity · Chapter 137 716
Chronic pain and labor force withdrawal · Chapter 029 179
Collective bargaining coverage · Chapter 021 138
College graduate underemployment · Chapter 015 108
Company revenue per employee · Chapter 072 389
Compliance security and incident losses · Chapter 112 590
Concentration of capital ownership · Chapter 063 344
Concentration of job growth in health and care · Chapter 027 168
Contingent and alternative employment arrangements · Chapter 018 123
Corporate dividends and share repurchases · Chapter 061 334
Corporate profits relative to GDP · Chapter 060 329
Cost per valid outcome · Chapter 104 549
County transfer dependence · Chapter 034 204
Customer retention and service outcomes · Chapter 111 584
Cycle time and waiting time · Chapter 105 554
Deaths of despair · Chapter 028 174
Decision latency · Chapter 120 631
Defined benefit retirement participation · Chapter 022 143
Demographic dependency ratios · Chapter 099 524

Digital and AI capital expenditure relative to GDP · Chapter 058 319
Disability and labor force attachment · Chapter 031 189
Distribution of household income growth · Chapter 040 234
Domestic outsourcing and fissured employment · Chapter 019 128
Early career hiring and entry opportunities · Chapter 025 158
Earnings recovery after displacement · Chapter 026 163
Earnings segregation between employers · Chapter 087 464
Economy wide output relative to labor hours · Chapter 071 384
Employee engagement and meaningful work · Chapter 032 194
Employer firm birth and startup rates · Chapter 082 439
Employer health insurance and benefit access · Chapter 023 148
Employment per new establishment · Chapter 081 434
End to end workflow throughput · Chapter 103 544
Equipment investment · Chapter 056 310
Female labor force participation · Chapter 002 43
Financial benefit to total cost of ownership ratio · Chapter 126 661
Financial sector output relative to employment · Chapter 069 374
Firm markups · Chapter 090 479
First pass yield · Chapter 106 559
Freelance earnings · Chapter 079 424
Freelance job postings · Chapter 078 419
Frontier and laggard productivity · Chapter 092 489
Full AI cost per valid outcome · Chapter 109 574
Global labor underutilization and the jobs gap · Chapter 138 721
Good job coverage · Chapter 024 153
Great Reversal in cognitive task demand · Chapter 128 671
Guard labor · Chapter 133 696
Home prices relative to household income · Chapter 043 249
Hours and employment decomposition · Chapter 140 731
Household capital income · Chapter 064 349
Household debt relative to income · Chapter 045 259
Household debt service burden · Chapter 046 264
Household labor capital and transfer income composition · Chapter 037 219
Human escalation and exception handling · Chapter 108 569
Human work per valid unit · Chapter 101 534
Humanoid robot cost and useful capability · Chapter 095 504
Independent contracting · Chapter 017 118
Industrial robot installations and stock · Chapter 093 494
Information sector output relative to employment · Chapter 067 364

Inheritance and gift flows · Chapter 044 254
Initiative conversion and retirement rates · Chapter 124 651
Intellectual property and intangible investment · Chapter 057 314
Involuntary part time employment · Chapter 011 88
Job creation destruction and reallocation · Chapter 083 444
Job tenure · Chapter 048 274
Labor composition contribution to growth · Chapter 052 293
Labor income share · Chapter 007 68
Local employer concentration · Chapter 091 484
Long-run annual and lifetime paid work · Chapter 139 726
Manager coordination load · Chapter 121 636
Manufacturing output relative to labor hours · Chapter 066 359
Marginal attachment to the labor force · Chapter 012 93
Middle-income population and income shares · Chapter 130 681
Multiple jobholding · Chapter 047 269
National transfer dependence · Chapter 033 199
Net realized AI value · Chapter 125 656
New work creation and occupational polarization · Chapter 085 454
Nonresidential structures investment · Chapter 055 306
OECD social expenditure and the distribution role of public and private systems · Chapter 135 706
Operating profit per work dollar · Chapter 117 616
Operating profit per workforce equivalent · Chapter 076 409
Operational resilience and vendor concentration · Chapter 114 601
Opioid exposure and labor market outcomes · Chapter 030 184
Overall participation and population aging · Chapter 003 48
People outside the labor force who want a job · Chapter 013 98
Perceived socially useless jobs · Chapter 096 509
Premature deindustrialization · Chapter 089 474
Prime age employment to population ratio · Chapter 004 53
Prime age male employment to population ratio · Chapter 098 519
Prime age male labor force participation · Chapter 001 38
Private Sector Job Quality Index · Chapter 129 676
Productive fixed capital stock · Chapter 054 302
Productivity and average real compensation · Chapter 006 63
Productivity and typical compensation · Chapter 005 58
Professional services output relative to employment · Chapter 068 369
Public Wealth Ratio · Chapter 039 229
Publicly financed employment · Chapter 132 691
Purchased labor expenditure relative to AI expenditure · Chapter 080 429

Real median earnings · Chapter 008 73
Real minimum wage · Chapter 009 78
Real value added per total workforce equivalent · Chapter 074 399
Realized labor expense reduction · Chapter 118 621
Refundable tax credit supplementation · Chapter 036 214
Relative price of machinery and equipment · Chapter 059 324
Renter housing cost burden · Chapter 042 244
Revenue per employee alpha · Chapter 115 606
Revenue workforce growth elasticity · Chapter 073 394
Rework and defect rates · Chapter 107 564
Saving concentration and the financing of household and government debt · Chapter 136 711
Shadow work and unpaid consumer service labor · Chapter 131 686
Software publishing output relative to labor hours · Chapter 070 379
Straight through completion · Chapter 102 539
Superstar firms and the reallocation of labor share · Chapter 134 701
Teen labor force participation · Chapter 127 666
Time to sustained value · Chapter 123 646
Total factor productivity · Chapter 053 298
Total human work cost share · Chapter 075 404
Unemployment duration and long term unemployment · Chapter 014 103
Union membership density · Chapter 020 133
Urban wage opportunity for noncollege workers · Chapter 088 469
Value per work dollar · Chapter 116 611
Wealth relative to national income · Chapter 062 339
Workforce health and workload · Chapter 113 596
Working age poverty before and after taxes and transfers · Chapter 035 209
Youth not in employment education or training · Chapter 016 113

Concordance with supplementary research

The supplied Post Labor Evidence Glossary contains 58 umbrella metrics. This table records where each is retained, expanded, or qualified in version two. Related measures share source families and are not counted as independent corroboration. Original chapter identifiers remain stable.

Supplementary metric	Ch	Integration decision
1 Prime-Age Men Withdrawing from Work	001, 004, 029, 030, 031, 098	Enrich existing. Core long-run withdrawal, definitions and alternatives are already covered. Add the original CEA education shift-share result; reject mechanical nonparticipation=demand/no economic need and mismatched 25–64 updates.
2 End of Labor-Force Expansion	002, 003, 099	Enrich existing. V 1 already preserves female prime-age records and demographic accounting. Add Blau/Kahn policy comparison; do not import older projection or claim a falling participation rate means declining labor-force headcount or demand.
3 Persistent Underemployment	010, 011, 012, 013, 015	Refine framing. The persistent floor is meaningful vulnerability but does not establish a secular rise; retain current U 6 and recoveries. Add the desired-hours research method to 011 with its missing US data and endpoint limits.
4 Gigification and Precarity	017, 018, 019, 022, 023, 024	Refine framing. V 1 already distinguishes risk, preference and main-job incidence. Add administrative tax evidence and explicit testable plateau/saturation framing; add US outsourced-service wage evidence rather than duplicating broad insecurity prose.
5 Jobs That Never Appear	025, 071, 074, 075, 076, 077	Already covered. V 1 contains a reproducible revised staffing benchmark and distinguishes capacity, payroll and counterfactual causation. Preserve 350400 professional-service Q 2 conditional gap; Claude 788000 has different scope/vintage and is not independently reproduced. Correct hours-versus-headcount identity in review notes.
6 Contract-Market Substitution	078, 079, 080, 104	Already covered. V 1 already includes Demirci/Hui, complementary demand and current platform disclosures. No valuable distinct metric to add. Reject blanket external-market-first and national-statistics-invisibility claims.

Supplementary metric	Ch	Integration decision
7 Youth Disconnection and Lasting Unemployment	014, 015, 016, 025, 127	Add standalone. NEET, duration and cohort scarring are already covered. Teen 16–19 LFPR is a distinct observable population attachment measure with a multidecade history, schooling alternative and 2015–25 rebound. Teen participation receives a standalone chapter; the net desired-hours gap remains a companion measure in Chapter 011.
8 Recovery After Displacement	026, 028, 048	Enrich existing. Core administrative persistence and current DWS data already covered. Explicitly add the information-sector reemployment reversal to prevent mixing 2024 weakness with 2026 cohort counts; preserve lower overall earnings restoration.
9 Social Damage Accompanying Labor Withdrawal	028, 029, 030, 031, 035	Enrich existing. Add identified county trade shock and original Ruhm counterevidence together, plus carefully labeled 2025 provisional update. V 1 has final mortality series and already avoids national causal attribution; do not import mixed-vintage peak rates or broad social-meaning assertions as measurements.
10 The Polarization Ratchet	014, 077, 084, 085	Enrich existing. Useful original mechanism/timing evidence currently absent: routine-job losses cluster in recessions and can underlie slow employment recovery. Enrich occupational polarization 085; ratchet describes the timing of routine employment rather than an independently defined new metric. Do not extend pre-pandemic research universally to 2020/2026.
11 The Great Reversal	015, 025, 085, 128	Add standalone. Chapter 015 explains graduate downgrading but does not include Beaudry, Green, and Sand's historical cognitive-demand reversal or organizational-capital model. A separate bounded historical chapter adds a distinct research construct; it does not establish continuous deterioration from 2000 through 2026.
12 The Job Quality Index	008, 011, 024, 129	Add standalone. Chapter 024 measures a fixed real-pay and benefits good-job threshold. JQI instead measures the relative composition of private production and nonsupervisory payroll positions by weekly pay. Its denominator, industry classification, and moving benchmark warrant a separate chapter, with the latest release's timing ambiguities disclosed.

Supplementary metric	Ch	Integration decision
13 Middle-Income Shrinkage	037, 040, 041, 130	Add standalone. Chapter 040 compares income growth across fixed-rank groups; Pew's middle-income tier is a moving band around the size-adjusted median. Population membership and the tier's income share add distinct long-run outcomes, with upward expansion and real income gains retained as counterevidence to generalized impoverishment.
14 Narrowing Career Entry	015, 025, 077	Already covered. Chapter 025 already includes the August 2026 Stanford revision through June 2026, its 19% relative gap and reduced-hiring mechanism, and limitations absent from Claude's older 13% figure. Retain the newer existing chapter rather than append a duplicate entry or an outdated endpoint.
15 Weakening Labor Institutions and Job Quality	009, 020, 021, 022, 023, 024	Already covered. The original reference already gives separate chapters to union density, bargaining coverage, pensions, health insurance, good-job coverage, and related bargaining measures. Claude's combined chapter adds no distinct instrument and its short-run election comparison is insufficient evidence of a secular institutional reversal.
16 Task Displacement Versus Reinstatement	059, 075, 084, 086	Already covered. Chapter 084 already explains displacement, reinstatement, productivity, wage-bill units, and the verified 1947–1987 versus 1987–2017 decomposition. Chapter 086 adds a newer rent-dissipation framework. Claude's older inequality attribution uses another outcome and model; its percentages should not replace the newer scoped estimates or be read as counts of automated jobs.
17 The Locus of New Work	084, 085	Enrich existing. Chapter 085 already covers the 1940–2018 research and the shift in new-work location after 1980. Add the approximately 60% employment imputation, its micro-title construction, and the asymmetric historical patent-exposure findings. A second standalone chapter would duplicate the existing construct.
18 Farm Output Versus Labor Hours	065	Already covered. Chapter 065 already separates raw hours from quality-adjusted labor input and updates agricultural output through 2023. The older Claude window adds no distinct metric.
19 Manufacturing Output Versus Hours	019, 066, 089	Enrich existing. The output-hours construct is already covered. Add Houseman's original computer-industry measurement critique while retaining trade, outsourcing and demand distinctions.
20 Nonfarm Business Output Versus Hours	071	Refine framing. The long-run output-hours metric is covered. Add the compensation identity because flat hours alone do not establish a falling wage bill or labor share.

Supplementary metric	Ch	Integration decision
21 Information Sector Output Versus Payrolls	026, 067	Already covered. Chapter 067 already includes the stronger Q2 2026 matched comparison and explicitly preserves the older Q1 vintage. Earnings recovery belongs in Chapter 026.
22 Professional Services Output Versus Payrolls	068, 085	Already covered. Chapter 068 already updates the staffing plateau through Q2 2026. A short net-employment plateau does not establish that gross hiring or new work has ended.
23 Finance and Insurance Output Versus Payrolls	069	Enrich existing. Retain the updated output-payroll comparison. Add Philippon's different intermediation-cost denominator and the 2026 output-measurement change using labor inputs for one component.
24 Software Publishing Output Versus Hours	070	Already covered. Chapter 070 already includes both the 2025 hours decline and the 1987–2025 history in which total hours rose. The recent decline is not a decades-long absolute contraction.
25 Company Growth Versus Staffing	072, 073, 074	Already covered. Company revenue per employee, workforce-growth elasticity and total-workforce value added are already covered with newer financial statements and explicit supplier boundaries.
26 Baumol Absorption into Education, Health and Care	027	Enrich existing. Enrich Chapter 027 with a productivity-composition framework, the matched private-employment comparison and tests of absorption. A separate Baumol chapter would duplicate its construct.
27 Changing Composition of Job Growth	027	Enrich existing. Chapter 027 already measures care employment and net-growth contributions. Add industry diffusion to distinguish concentrated net gains from broader hiring conditions.
28 Publicly Financed Employment	027, 033, 034, 132	Add standalone. Public financing of private payrolls is distinct from direct public employment and household transfers. Define attributed job equivalents and label the unconstructed composite as proposed.
29 Guard Labor	084, 085, 096, 121, 133	Add standalone. Supervision and enforcement form a distinct labor-allocation proxy. Add the newer 1950–2017 study and preserve classification and economic-value limits.
30 Capital Input Outgrowing Labor Input	049, 050, 097	Refine framing. The original reference has newer, precise BLS observations. Capital growing faster than hours does not identify substitution, and a falling labor share does not demonstrate an absence of labor scarcity.

Supplementary metric	Ch	Integration decision
31 Capital Deepening	050, 051, 057, 058	Enrich existing. Add research on investment relative to Tobin's Q and the competing intangible-capital, competition and governance explanations. Retain the observed BLS pace instead of asserting a realized AI acceleration.
32 Capital's Contribution to Productivity Growth	051, 052, 053	Already covered. The original reference already supplies the accounting example, capital-share weights and residual interpretation. Growth contributions do not allocate subsequent income to owners by default.
33 Expanding Productive Capital Stock	054, 055, 056, 057	Already covered. Existing chapters cover depreciation, stocks versus services and flows, current-cost versus real quantities, and omitted assets. Their official checkpoints are more precise than Claude's broad stock-growth claims.
34 Digital and AI Investment	055, 056, 057, 058	Refine framing. AI spending composites, worldwide hyperscaler budgets, domestic investment and GDP growth contributions are different quantities. No compatible primary update was verified that warrants replacing the original measurements.
35 Growing Intangible Capital	050, 053, 057	Enrich existing. Incorporate the useful weak-physical-investment and intangible-capital mechanism once in Chapter 50. Chapter 57 already explains broad intangible boundaries and scaling. Avoid universal near-zero operating costs or deterministic claims that value bypasses labor.
36 Capital Claiming More Income	060, 061, 064, 097	Enrich existing. Add Barkai's distinction between required capital costs and pure profits in Chapter 97. Keep the existing adjusted profit series and financial-transaction treatment of buybacks.
37 Markups and Market Power	090, 091	Already covered. Chapter 90 already uses the final 1.21-to-1.61 markup estimates, upper-tail reallocation, measurement critiques and the distinction from monopsony. No separate markup chapter or duplicate prose is needed.
38 Rising Wealth-to-Income Ratios	062, 063	Refine framing. The published Piketty–Zucman ranges support v1: 200–300 percent rising to 400–600 percent. Rising wealth does not mechanically imply rising capital income because returns and valuations change.
39 Ownership Concentration and Superstar Firms	007, 063, 090, 092, 134	Add standalone. Household asset ownership is already covered. The approved new chapter addresses firm-level reallocation, keeps the newer audited DFA observations separate, and includes dynamic-establishment evidence.

Supplementary metric	Ch	Integration decision
40 Productivity-Pay Decoupling	005, 006	Enrich existing. Core divergence, compensation definitions and deflator decomposition already covered with a newer 2026 endpoint. Add the original Stansbury–Summers finding that a positive productivity-pay relationship can survive a widening long-run gap.
41 Falling Labor Share	007	Enrich existing. Current US 52.8% level and index distinction already covered. Add fresh OECD comparison with a different production/self-employment boundary; do not import worldwide accelerating decline or unconditional automation claims.
42 Wage Share of Household Income	023, 037, 064	Enrich existing. Income source shares fit existing composition chapter. Correct the important 2016 date and five-series denominator; no separate duplicate wage-source chapter needed.
43 Transfer Dependence, National	033	Already covered. Same EIG historical government-only observation, recession/medical/age caveats and current broader PCTR companion already covered. Claude wrongly treats historical government transfers and PCTR as identical.
44 Transfer Dependence, Geographic	034	Already covered. Same 25% county-count threshold and 2022 endpoint. V1 additionally distinguishes population weighting and identifies CAINC35 discontinuation, omitted by Claude.
45 Working-Age Transfer Dependence	031, 033, 035, 036, 037	Enrich existing. Age decomposition and employment-linked supplementation already present, but a precise in-work transfer-share companion is useful. Integrate construction in 033/036; do not award secular duration to an unbuilt series or use DFA wealth as an income denominator.
46 Social Spending Across Rich Countries	033, 035, 036, 135	Add standalone. Distinct cross-country institutional expenditure history, with public/private/net accounting, OECD program composition and current financing context absent as a full entry.
47 The Saving Glut of the Rich	040, 045, 046, 062, 063, 064, 136	Add standalone. Distinct saving-flow concentration and ultimate household/government debt ownership, rather than another wealth stock or aggregate leverage measure. Version the 2021 history through 2016 separately from the heavily revised 2025 history through 2019; distinguish financing models from measurement.

Supplementary metric	Ch	Integration decision
48 Premature Deindustrialization	089	Enrich existing. Core metric, country heterogeneity, regional exceptions, and monitoring already covered in v1. Add the distinct Huneeus–Rogerson agricultural-productivity mechanism. Reject universal manufacturing-automation reading and preserve Rodrik's trade mechanism.
49 China's Manufacturing Employment	065, 089, 093, 137	Add standalone. Distinct geographic test absent as a standalone metric. Replace unqualified decade-long contraction with primary census checkpoints: legal entities 125.151m in 2013, 104.713m in 2018, 104.815m in 2023; 2018–2023 self-employed-unit employment also rises. Coverage reconciliation remains necessary. Update robot observation to 2025, released 2026.
50 Global Labor Underdemand	007, 010, 011, 012, 013, 089, 138	Add standalone. Adds global rather than U.S. outcome populations; separate jobs gap, LU4, time-related underemployment, informality, earnings, and causes. Include ILO 2026 forecast and 2024 estimate with vintage boundaries. Benanav remains a competing causal interpretation, not independent corroboration of automation.
51 The 150-Year Decline in Working Hours	003, 011, 071, 099, 139	Add standalone. Distinct long historical context not redundant with output per hour. Verify original annual and lifetime reconstructions, identify changing population definitions, correct birth-cohort wording, and distinguish chosen reductions from involuntary exclusion.
52 Hours Versus Headcount: The Channel Switch	001, 002, 003, 004, 011, 071, 098, 140	Add standalone. Valuable new proposed measurement design. Exact identity plus symmetric and log decomposition, absent-worker denominator correction, subgroup and composition tests. No verified post-1980 channel switch; FLSA overtime threshold is not actual hours or a universal maximum.
53 The Falling Price of Capital	059	Enrich existing. Add the verified historical 78 percent PIRIC comparison while distinguishing its research consumption denominator from equipment/GDP and ordinary private-investment/PCE ratios.
54 AI Capability Versus Inference Cost	094, 104, 109	Already covered. Chapter 94 already includes the fixed-performance price decline and newer research distinguishing frontier costs. Preserve the actual dates: November 2022 to October 2024 spans 23 months, not eighteen.

Supplementary metric	Ch	Integration decision
55 Industrial Robotics	093	Enrich existing. Add the U.S. and German labor-market estimates alongside existing global deployment and Graetz–Michaels evidence. Preserve the newer 2025 deployment observations and distinguish local from model-implied aggregate effects.
56 Humanoid Robot Economics	095	Enrich existing. Add the dated Goldman Sachs manufacturing-cost estimate as a research checkpoint. Do not combine a 20,000 estimated 2025 shipment figure with IFR's 7,000 narrowly defined actual count. Future market and shipment projections remain forecasts.
57 Declining Labor-Market Fluidity	025, 048, 082, 083	Enrich existing. Chapter 083 already provides the establishment job-reallocation series and current BED checkpoint. Add the distinct worker-transition literature and its partial demographic explanation. Job-to-job mobility and worker turnover should complement establishment flows rather than be collapsed into them.
58 Shadow Work	069, 075, 101, 131	Add standalone. Chapter 069 concerns unpaid household care and chapter 101 enterprise unpaid-work burden. Neither isolates consumers performing tasks previously bundled into paid commercial service. A proposed measurement chapter is useful, but no harmonized national series establishing twenty years of growth has been verified.

Supplementary appendix decisions

APPENDIX A ASSESSED AND REJECTED BULLSHIT JOBS

Already covered. V1 already compares original Dur–van Lent, Soffia et al., and Walo studies with correct survey and temporal scope. Do not import a stronger blanket rejection of all social uselessness or the unsupported inference that perceived pointlessness leads automation exposure.

APPENDIX B REBUTTALS AND RESPONSES

Refine framing. V1 already contains claim-specific counterevidence and front-matter independence warning. Reject automatic absorption of stagnation, low churn, better job quality, and every improved indicator as evidence for the overall thesis. Better outcomes constrain the claims they measure without automatically refuting unrelated PLE claims.

APPENDIX C RESEARCH PRIORITIES AND OPEN WORK

Enrich existing. Useful research agenda is integrated in relevant monitoring sections, not copied as a redundant appendix. Preserve distinct outstanding work: comparable China series and transitions, consistent

global vintages, lifetime update, and channel-switch construction. Other assigned reviewers cover working-age transfers, publicly financed work, and shadow work.

Concordance with the original dashboard

The original seven signals were umbrella categories. This concordance shows where their distinct measures now appear. It preserves the vocabulary of the earlier work while making clear that an umbrella category can contain measures with different evidence statuses. It is a lookup aid rather than a count of independent effects.

The capital side likewise separates productive services, assets, investment flows, income flows, and wealth values. The distinction is essential because a market value increase can occur without a comparable expansion in productive services, and productive capital can increase without transferring ownership income broadly to households.

Original category	Chapters in the reference
Prime age male withdrawal	001 participation and 098 employment
Female entry and overall participation	002 female participation 003 overall participation 004 prime age employment and 099 dependency
Productivity and pay	005 typical compensation 006 average compensation 008 median earnings and 009 minimum wage
Labor share	007 labor income share and 097 capital services cost share
Underemployment	010 broad rates 011 involuntary part time 012 marginal attachment 013 want a job 014 duration 015 graduate mismatch and 016 NEET
Gigification and fissuring	017 independent contracting 018 contingency and alternative arrangements 019 outsourcing
Transfer dependence	033 national 034 county 035 poverty before and after policy 036 refundable credits
Capital input and intensity	049 input growth 050 capital services per hour 051 deepening 052 labor composition and 053 TFP
Capital assets and investment	054 stocks 055 structures 056 equipment 057 intellectual property 058 digital expenditure and 059 relative prices
Capital returns and ownership	060 profits 061 payouts 062 wealth income ratios 063 ownership concentration and 064 household capital income

Enterprise measurement concordance

The earlier enterprise material described economic outcomes, workflow mechanisms, and safeguards. They have different roles in a post labor research program. Enterprise outcomes can reveal whether growth scales with less human work. Workflow mechanisms can explain how that happens. Safeguards test whether apparent productivity came from valid improvements or from transferred work, degraded service, or hidden risk.

An outcome and its safeguard should be read together. A fall in work cost with increasing defects is a different observation from a fall in work cost with stable quality. No operational diagnostic is presented as a national secular time series merely because the concept existed in an earlier report.

Earlier term or measurement layer	Reference chapters
Real organic revenue per employee	072 company revenue per employee with inflation currency acquisition and workforce boundaries
Revenue and workforce elasticity	073 relationship between output and workforce growth
Adjusted value added per total workforce FTE	074 value added and contractor accounting
Total work cost share	075 employee and purchased human work costs
Operating profit per total workforce FTE	076 profit after recurring technology and transition costs
Avoided FTE and capacity realization	077 counterfactual staffing and 110 realized capacity disposition
AI enabled gross margin	100 gross margin reconciliation and attribution
Workflow mechanisms	101 human work per valid unit 102 straight through completion 103 throughput 104 cost 105 cycle time 106 yield 107 rework 108 escalation
Complete AI cost	109 full AI cost per valid outcome
Outcome safeguards	111 customer outcomes 112 compliance and incidents 113 workforce health 114 resilience and vendor dependence
Relative productivity and work dollar ratios	115 revenue per employee alpha 116 value per work dollar 117 operating profit per work dollar
Realized expense and contribution capture	118 realized labor expense reduction 119 incremental contribution margin
Organizational work and demand	120 decision latency 121 manager coordination load 122 backlog days
Portfolio evidence and complete return	123 time to sustained value 124 initiative conversion and retirement 125 net realized value and portfolio aggregation 126 benefit to total cost ratio

Units denominators and accounting boundaries

Percent and percentage points describe different changes. A share rising from 10 percent to 15 percent increases by 5 percentage points and by 50 percent relative to its original level. Growth accounting contributions are normally percentage points of growth, not a percentage of jobs or of the population. The relevant units should stay on the chart and beside the quoted observation.

A stock is measured at a date and a flow over a period. Wealth, fixed asset stock, robot stock, and outstanding debt are stocks. Income, output, investment, dividends, and new robot installations are flows. A wealth to income ratio compares a stock with an annual flow. A debt service ratio compares annual payments with an income flow. A rise in one is not interchangeable with a rise in the other.

A seasonally adjusted annual rate expresses a current flow at an annualized rate. It is not necessarily the realized calendar year total. Compare quarterly annualized output with a compatible quarterly labor measure, and label the reference quarter. A year end company headcount is a stock; annual revenue is a flow. Average full time equivalents or hours usually provide a stronger denominator than a closing headcount.

Real and nominal values answer different questions. Nominal income records current money; real income adjusts for prices. Output and consumer price deflators serve different purposes. Chain weighted real output components generally cannot be added as if they were ordinary current dollar totals. A share of GDP normally uses compatible current dollar numerators and denominators, while volume growth uses suitable real series.

Population boundaries are equally important. Persons differ from jobs, households from tax units, and all adults from prime age adults. The labor force differs from the whole population. Benefit access differs from participation, participation from eligibility, and coverage from the value of a benefit. A change in the boundary should be treated as a definition change unless a documented reconciliation preserves comparability.

For enterprise measures, a legal payroll boundary can hide purchased labor. Record the workforce and the financial inputs over the same production perimeter. If contractor hours enter the denominator, do not subtract the corresponding labor component a second time from the numerator. Where supplier work is opaque, report that uncertainty and use a cost companion rather than inventing equivalent employees. These accounting rules are elaborated in chapters 072 to 080 and 100 to 126.

Reading charts and keeping a revision record

A useful longitudinal chart displays actual dates and comparable units. Sparse surveys should show observed points. A cohort comparison should label cohort years and the age at which the outcome was measured. A break in classification, questionnaire, coverage, price method, or population controls belongs on the chart or in its immediate note. A smooth line does not justify inventing observations between survey waves.

Use a full historical window and an explicitly identified recent window when both are relevant. A productivity ratio can rise for decades while its growth rate slows. A recent decline after a peak can coexist with a long rise relative to the early baseline. The window should follow the economic question rather than be chosen after seeing which endpoints produce the strongest headline.

Keep components visible beside ratios. Output per worker can rise because output increases, employment falls, or both occur. Transfer share can rise because transfers increase or other income contracts. A labor share can move because its numerator changes, its denominator changes, or the mix of industries changes. Components reveal which mechanism needs explaining.

The reproduction record should contain the source title, series or table identifier, geography, population, unit, seasonal treatment, observation dates, release vintage, transformation, and any exclusions. For calculated ratios, preserve both inputs and the formula. A release date records when the estimate became available; it does not replace the observation date.

When a source revises historical data, retain the earlier calculation with its original vintage and calculate the current comparison on a consistent new vintage. Do not combine an old baseline with a new endpoint without checking whether the baseline changed. The updated BEA service sector comparisons in this reference illustrate why revisions can change the size of a result materially.

Evidence status should also be revised when the record changes. A recent indicator can eventually acquire a twenty year history, while a supposed secular decline can reverse or fail a comparability test. Recording these changes is part of testing the framework. The question remains whether labor is changing its economic role, and the answer must remain open to the observed path.

Primary source register

This register groups sources by their exact link and shows the chapters that cite them. Chapter references preserve the observation date, measurement boundary, and source location relevant to each claim. A shared source is one evidence family even when it appears in several chapters.

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