

Derived and Essential Demand

Human work, income distribution, and the Fourth Sector

Consolidated research edition prepared for David Shapiro
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THE CENTRAL QUESTION

When machines can supply the functional result, what human work remains—and can its earnings support broad livelihoods?

A unified framework that distinguishes derived demand, which buys human labor as a means to an outcome, from Essential Demand, which buys actual human presence, provenance, accountability, or affinity as part of the outcome itself. It connects research on human preferences with current data and transparent calculations, and it defines the Fourth Sector: the automated economy, in which value is generated with little or no current human labor. Valuable human activity is not, by itself, a sufficient wage-distribution system. The test is how much current work remains necessary, how much compensation it receives, and how broadly people can obtain adequate real earnings from it.

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PART I

The framework

The question that organizes this dossier

Automation changes the value of human work by changing the reasons anyone needs to buy it. A person may be hired because that person can produce a desired result. A person may also be hired because having a human involved is part of the result that someone wants. These reasons can coexist in a single purchase, but they respond differently to improvements in machines.

Derived demand for human labor follows from demand for another outcome. Someone wants a habitable house, a repaired vehicle, a reliable calculation, or an effective treatment, and human work supplies some of the capabilities required. If a machine supplies those capabilities at an acceptable total cost, the original desire can be satisfied with less human work. The desire for the outcome need not disappear; cheaper provision may even expand it while changing which inputs producers buy.

Essential Demand identifies a human-specific requirement. Actual human involvement contributes to what is valued, or a human must participate for the offering to count as legitimately provided. Removing the human changes the offering even when a machine matches its functional performance, because the human is part of what is being bought, authorized, or supported. This is the central distinction in David Shapiro's September 2026 formulation and the organizing proposal developed here. [D01, D02]

The substitution claim is conditional and exact. Wherever humans are wanted solely as instruments, sufficiently capable and economical automation can satisfy the underlying demand without their labor. Wherever actual humanity remains a binding requirement, matching functional output does not satisfy that requirement. The requirement might concern a present encounter, a work created in the past, a particular identity, or an institutionally authorized act. These specifications imply different demands for current paid work.

The practical test is simple: if the functional result were just as good, and everyone knew how it was produced, what would be lost by removing the human? Answering that question identifies a potential human moat. Establishing how much income the moat can distribute requires several more steps.

Core definitions at a glance

The terms below are used throughout the dossier. Later chapters refine each one; this summary fixes their meaning at the outset.

Term	Meaning in this dossier
Derived demand	Demand for human labor that exists because the labor is a means to a separately desired outcome. A capable, economical machine can satisfy it without human work.
Essential Demand (for human involvement)	Demand in which actual human involvement is part of what is valued or required, so removing the human changes the offering even when the functional result is matched.
The substitution test	If the functional result were just as good, and everyone knew how it was produced, what would be lost by removing the human? Whatever is lost identifies Essential Demand.
Presence	Actual human participation in an encounter or activity.
Provenance	Human origin of, or a specified human contribution to, what is supplied.
Accountability	A human who must answer for, authorize, represent, or bear the consequences of an act.
Affinity	A particular person, or a continuing relationship with that person.
Human moat	The part of an offering that no machine can supply because the buyer or institution requires an actual human.
The Fourth Sector	The automated economy: production in which value is generated without, or with minimal, current human labor. It joins the primary (extraction), secondary (transformation), and tertiary (human service) sectors of the classical model.

Three questions that must be answered together

This research asks why human involvement remains valuable, how much current labor is needed to supply it, and how broadly the resulting compensation can support livelihoods. A preference study can answer part of the first question. An occupational count, ticket-sales figure, or example of a successful human provider cannot answer all three.

Consider three purchases motivated by affection for the same musician: a recording, a seat at a large concert, and a private lesson. The recording can use work completed years earlier. The concert shares a limited amount of performer time across many listeners. The lesson requires new attention for a small number of customers. All three can express a strong preference for an actual human. They generate different quantities of current labor, different opportunities for additional workers, and different payments to owners of venues, recordings, and distribution systems.

The distinction makes the distribution argument concrete. A wage-based system must produce a sufficiently large current-compensation pool and give a broad population reliable access to it. A growing human market can fail either test. Receipts can reward existing assets, accrue to a small group of providers, or spread across so many entrants that typical earnings remain inadequate.

Conversely, a smaller compensation pool may purchase a comfortable life if the goods people need become sufficiently cheap. Earnings must therefore be evaluated alongside living costs, household resources, and access to paid work.

The central proposition is that surviving human demand supplies no automatic replacement for the broad wage channel displaced by automation. A claim that relational, luxury, or experience spending will provide that replacement needs evidence connecting spending to new human work and accessible earnings. The arithmetic developed later states the conditions under which such a claim succeeds or fails and compares them with current household budgets. It does not infer impossibility from the mere existence of capital income.

What the research establishes

The framework has substantial antecedents. Marshall's derived-demand analysis, Baumol's treatment of labor as an element of the product, research on relational goods, and modern studies of human attribution illuminate different parts of it. Contemporary work on human-intrinsic and relational goods is especially close. The historical and literature chapters distinguish these antecedents from the contribution of a common definition, four dimensions, and a method for tracing human requirements into labor and income.

The preference evidence shows that human origin can affect evaluations and choices even when visible output is held fixed. Other studies show appreciation of automated provision. Human premiums vary by population, offering, information, experience, and price. The evidence establishes mechanisms worth measuring; it does not provide an economy-wide census of protected jobs.

A further conclusion follows from the form of the contribution. Human-specific value can be embodied in an existing work and supplied repeatedly without new labor from its creator. Essential Demand can therefore support asset income as well as wages. Strong demand for humanity does not, by itself, imply a correspondingly strong demand for current human hours.

The Fourth Sector supplies a second analytical lens. The classical model divides production into primary, secondary, and tertiary sectors; this dossier adds a fourth, the automated economy, in which value is generated without, or with minimal, current human labor. Autonomous systems can grow food, manufacture goods, and deliver services, and each activity joins the Fourth Sector when its production crosses that threshold within a stated boundary. Measuring the sector requires attention to maintenance, upstream work, exceptional interventions, and expansion: an establishment that raises output without adding staff may still depend on indispensable people.

These two lenses intersect. An automated system can deliver a past human performance whose origin remains central to its value. A human worker can perform an entirely instrumental task because a feasible substitute has yet to arrive. The demand specification and the production method must both be recorded. Neither can be recovered reliably from the other.

How to use the dossier

The opening chapters define the framework and its substitution test. The historical and literature chapters establish its intellectual setting. The evidence and applied cases examine

human preferences, institutional requirements, and concrete service bundles. The sector analysis defines the Fourth Sector, while the measurement chapters connect expenditure, hours, compensation, income flows, and livelihood coverage.

Bracketed source identifiers link claims to the annotated source register. The register states the evidence used and the access obtained. A cited study remains evidence about its own population, task, and setting. Hypothetical examples explain the framework; they are not findings attributed to those authors.

The quantitative work separates observed data, calculations from those observations, illustrative scenarios, and behavioral models. The earlier occupation exercise remains an assumption-driven screen. Historical cases reveal mechanisms; where they supply numbers, those numbers keep their coverage labels rather than serving as a universal residual percentage. The funding model recognizes that wages can finance other wages and then uses current household budgets to bound how far that recirculation can go. Each calculation is intended to expose what an employment claim requires.

The endpoint analysis also has a distinct technological premise. Demand theory explains why people buy labor; it cannot establish that an adequate machine substitute exists for every task. Technical capability, total cost, physical infrastructure, risk, and organizational change determine the transition. Essential Demand asks what human requirements survive when the relevant functional barriers have actually been removed.

Defining demand for human involvement

The unit is a reason within an offering

An occupation is too coarse a unit for the primary distinction. A teacher can deliver information, provide feedback, supervise a room, establish an ongoing relationship, and certify progress. Some buyers may value a person for every one of those functions. Other buyers may primarily want learning outcomes and accept any reliable method. The occupation label tells us where to investigate. It does not settle the human requirement.

A purchased offering is more informative, but it can still contain several reasons for demand. Consider an evening class. A participant may want to learn a skill, leave the house, meet peers, interact with an admired instructor, and receive a recognized certificate. Automation could replace the instructional explanation while leaving the social gathering valuable. Alternatively, the person might attend chiefly for a specific teacher. Both purchases are recorded as education, but their susceptibility to substitution differs.

The framework therefore classifies the reason for human involvement within an offering. It asks which human attributes are required, who values them, what work supplies them, and how those requirements change with price or alternatives. It does not require every transaction to be assigned wholly to one side of a binary partition.

The demand can be private or collective. A customer can pay for a person. An institution can allocate a budget to retain human representation or authority. A community can choose to

support a human cultural practice. These are economically different mechanisms, but each can sustain a human requirement. They should be recorded separately when measuring market demand, public expenditure, or unpaid participation.

Functional equivalence must have a defined scope

The phrase "equally good" can hide the whole dispute. A buyer who values human authorship will not regard a machine-authored work as equivalent in every respect. A substitution test that defines equivalence to include human authorship has already assumed the answer. A useful test holds specified functional characteristics constant while allowing human involvement to vary.

For a chair, those characteristics might include comfort, durability, dimensions, appearance, delivery time, and safety. Human origin can then be varied separately. For an explanation, the held-constant characteristics might include accuracy, comprehensibility, relevance, and time to answer. For companionship, the distinction is harder because reciprocity and concern may themselves constitute the desired experience. The researcher must state whether the proposed comparison holds observable conversational behavior constant or claims to hold the relationship itself constant.

This difficulty is informative. It shows why human-specific demand cannot always be captured by a narrow performance benchmark. The benchmark can establish that two providers deliver similar observable outputs. It cannot by itself establish that buyers regard all their attributes as interchangeable. Conversely, a buyer's claim that a machine lacks warmth may concern a remediable quality deficit rather than a requirement for actual humanity. Experimental design needs to separate these possibilities.

The test should also disclose the producer's status. If people mistakenly believe a machine output came from a person, their enjoyment may reveal something about the quality of the output. It does not establish whether they would purchase it with accurate information. Deception can temporarily obscure an essential attribute; it cannot demonstrate that the attribute is irrelevant under informed choice.

"Essential" has a specific meaning here

Essential Demand means human involvement is essential to the offering as valued or legitimately provided. It does not mean the activity is essential to survival. A life-saving function can be instrumentally valuable and become automated. A discretionary encounter with an admired performer can be human-essential. Social importance and human-specific demand are separate dimensions.

The definition also does not rank human beings by economic value. A reduction in the market demand for a person's work says nothing about that person's moral standing or entitlement to a dignified life. The framework studies why money or institutional resources are allocated to labor. It cannot determine the distribution of rights from willingness to pay.

Nor does essential mean every component of production must be performed manually. A human author may use software. A musician may use electronic amplification. A responsible officeholder may use automated analysis. The relevant question is what kind and degree of

actual human involvement the purchaser or institution requires. Different markets can adopt different answers, and the answer can change.

Capitalization can help distinguish the proposed framework from ordinary uses of the phrase "essential demand" for food, electricity, or other necessities. The term should be introduced with the phrase "Essential Demand for human involvement." Once the scope is clear, the shorter label is usable without implying a new theory of all final demand.

The complement operates at the level of motives

In conventional vocabulary, demand for an input is derived from demand for outputs. The ordinary contrast is direct or final demand. A final consumer purchase can still require workers only instrumentally. Buying a finished house directly does not establish an intrinsic preference for human construction. Essential Demand supplies a complementary distinction specifically about the reason for demanding human input. A concert promoter's demand for a singer is still derived from ticket demand in conventional economics, even when the audience insists on that particular human singer. This framework identifies the human-specific requirement inside that chain. It does not replace the established distinction between input demand and final demand.

The word complement should not imply that total spending can be divided into two independently priced buckets. The same service can jointly provide a functional outcome and a valued human relationship. Removing either component can destroy the value of the package. There may be no unique market price for each contribution.

For example, imagine a trusted tutor whose student values both instruction and continuity. The student would reject a pleasant but ineffective tutor and also reject a highly effective replacement who lacks the established relationship. Both conditions matter. It would be misleading to infer that half the fee pays for instruction and half for affinity simply because two reasons have been identified.

Empirical work can instead estimate choices among explicitly described alternatives. It can measure how much participation changes when a human attribute is removed, what premium buyers accept, and which human tasks remain necessary in the selected format. This yields an operational measure without pretending that every motive has a separable accounting value.

The four dimensions of Essential Demand

The four dimensions identify different ways humanity can enter a specification. They are overlapping attributes, not four disjoint sectors. Their value lies in guiding questions that a generic claim about human preference would miss.

Dimension	What must remain human	A diagnostic question	Labor implication to investigate
Presence	Actual human participation in an encounter or activity	Would a disclosed nonhuman substitute change the desired encounter	Whether another unit requires more simultaneous human time

Dimension	What must remain human	A diagnostic question	Labor implication to investigate
Provenance	Human origin or a specified human contribution to making	Would identical output lose value if its human origin were absent	Whether demand requires new making or uses an existing work
Accountability	A human who must answer, authorize, represent, or bear specified consequences	Which responsibility requires a person and which can be held by an organization	How much meaningful human work the responsibility requires
Affinity	A particular person or continuing relationship	Would another equally capable human be an acceptable substitute	Whether the relationship is local and time intensive or widely scalable

Presence

Presence concerns participation by an actual person. The buyer need not require a named individual. An audience may want a live human performance by any suitably skilled musician. Someone may want a conversation with another person rather than a simulated interlocutor. A group may want human participation in a ceremony even though several people could fill the role.

Physical proximity and actual human participation should be recorded separately. A live remote conversation can meet a requirement for another person while failing a requirement for physical company. A room full of people watching an automated display can provide human social presence even if the display has no human operator. A recorded human voice can provide provenance or affinity without live presence.

These distinctions prevent a common employment error. If the customer values being among other customers, the people supplying the essential social ingredient may be patrons rather than employees. A venue can monetize their gathering while automating admission, food preparation, and administration. Human presence exists, but the amount of paid provider labor must still be measured.

Presence also admits different intensities. Being available to respond differs from sustained attention. A person overseeing a large room differs from a person engaged in an uninterrupted private conversation. A customer may accept brief contact embedded in an otherwise automated service. Counting every hour of the surrounding business as protected would exaggerate the labor requirement.

The core empirical question is therefore the minimum acceptable form of actual participation. Must a person be physically there? Must the person attend continuously? Can a group share the attention? Does remote participation count? These are features of demand to discover rather than assumptions to attach to an occupation.

Provenance

Provenance concerns how an offering came into existence. A purchaser may value human authorship, manual fabrication, lived experience, deliberate effort, or the connection between an object and a person's life. The output can be consumed long after the work occurred. A maker need not remain present.

Different provenance claims preserve different work. Human-designed can coexist with automated fabrication. Handmade may require manual execution but allow machine preparation. A personal account may require lived experience and truthful testimony while permitting editing tools. A buyer may value only final human selection among machine-generated candidates. Treating these claims as interchangeable would obscure the actual labor boundary.

Provenance demand can attach to an object, a design, a performance, or a record. A unique handmade chair generally requires new production for an additional chair. A digital recording can reach another listener without another performance. A historic painting can command a higher price without creating a new hour of the original artist's labor. All can involve valued human origin, but their effects on current employment differ sharply. Record the date and nature of the human contribution alongside the date of consumption. A past contribution can remain essential to the buyer while current delivery becomes autonomous. The provenance chapter develops this distinction between a stock of human contribution and a flow of current work.

Verification becomes part of the market. If buyers cannot tell whether the claimed process occurred, a human premium may reward marketing rather than human work. Credible documentation, trusted relationships, audits, or observable production may help sustain the distinction. The work of verification itself may be instrumental and automatable. A human provenance requirement does not automatically require human certification of every claim.

An important boundary concerns participation in the process as consumption. Someone who makes pottery for pleasure supplies human effort without selling labor. A studio might sell instruction, tools, materials, or space. If those functions become automated, the visitor's own human making still survives. Provenance and human activity can flourish outside an employment relationship.

Accountability

Accountability concerns the human who answers for an action, exercises legitimate authority, represents a constituency, or bears a required consequence. The requirement can arise from law, institutional rules, moral expectations, or a customer's preference. Its foundation must be specified because each can change differently.

The phrase "someone must be responsible" is insufficient to establish demand for human labor. Responsibility may be assigned to a company, insurer, owner, officeholder, or individual practitioner. A right to compensation can survive when a production task is fully automated. A requirement for a natural person to make or authorize a decision is more directly connected to human work, but the amount of work remains an open question.

Meaningful accountability can also require capabilities and time. A nominal signatory who cannot inspect, question, or stop a process may fail the intended function. If an institution requires actual review, the human work should be measured by that review obligation. If a system merely requires a person to be named, counting the whole automated process as a human occupation would confuse an administrative designation with labor demand.

This dimension is partly institutional by definition. A society may continue reserving certain acts to humans even when machines can execute all supporting functions. It may also revise those reservations. Essential Demand can include an institutionally essential role without predicting that the current rule will last forever. The stable object of analysis is the stated human requirement under the relevant rules. The funding channel should be tagged separately. A public agency buying a substantive human service creates current compensation; a cash transfer makes resources available without buying that service. Both can be supported by revenues from an automated economy, but they enter the labor and household accounts differently.

Public representation adds a distinctive case. A community may require decisions to be authorized by members of that community, rather than by a technically superior external system. The value can reside in standing, answerability, and a right to contest decisions. Automation of research and administration can coexist with that requirement. Whether it supports a few offices or a large workforce depends on institutional design.

Affinity

Affinity concerns the identity of the participant. A purchaser wants this artist, this adviser, this caregiver, or this longstanding relationship. Another human with equivalent functional ability may not be a substitute. The specificity can come from familiarity, shared history, trust, admiration, or personal attachment.

Affinity should not be restricted to celebrity. A local instructor whom someone trusts can matter specifically to that person. A long-running relationship can make the provider less substitutable without creating a global market. Conversely, a famous person's recorded work can reach a vast audience with little additional time per customer. The labor consequences depend on the delivery format.

Identity and rights also need to be separated. A customer may purchase a licensed simulation of a known person because the association is sufficient. Another may require that person's current participation. A third may want only older authenticated work. These purchases can generate income for rights holders without creating equivalent new work for the person represented.

The most revealing question is what counts as participation by that person. Does approval suffice? Must the person write the words, make the decision, appear live, or reciprocate the relationship? An affinity market can become increasingly automated around a narrow human act while continuing to trade on a personal name.

Affinity can protect an incumbent relationship while making entry harder for others. The existence of a premium for a particular person does not imply that every new supplier can obtain one. At the same time, local and individualized relationships can distribute affinity across

many people. Claims about universal winner-take-all outcomes require evidence about market reach, substitutability, and customer matching.

Additional candidates and a rule for extending the taxonomy

The four dimensions should remain revisable. Participation, solidarity, fairness, ritual, representation, and human achievement are possible additional labels. Before adding one, ask whether it identifies a distinct reason for requiring humanity or a context in which the existing dimensions operate.

Watching a human athlete can involve provenance of achievement, live presence, and affinity. Supporting a neighborhood worker can involve a preference that income reach a person, independent of the product's origin. The latter may deserve a separate solidarity or distributive motive if it cannot be represented adequately by the four dimensions. Retaining a human job to preserve a community is analytically different from buying a superior experience.

Likewise, a person may value their own participation, agency, or right to make a consequential choice. That preference can survive even when no one pays them for it. It is relevant to human involvement in the economy but should not automatically be counted as demand for another person's labor. A research instrument should distinguish the consumer, worker, citizen, and recipient roles.

A useful extension must improve prediction or measurement. It should identify choices the existing dimensions fail to distinguish, specify the human contribution, and clarify how it creates paid hours or institutional obligations. Adding a new name for every valued activity would sacrifice the framework's explanatory economy.

Applying the substitution test

A structured conversation about one transaction

Begin with a concrete purchase or institutional act. Specify who chooses, who pays, who receives the benefit, and which alternatives are available. These roles frequently differ. A parent pays for a child, an insurer funds treatment, a public agency procures a service, or a platform selects content for an audience. The human preference of one participant may be constrained by another's budget or authority.

Next, describe the functional outcome. Avoid putting the desired human attribute inside the outcome before testing it. A service described as a human conversation already assumes a person. A more informative description states the practical purpose and then asks separately whether actual human reciprocity is required.

Offer a disclosed automated alternative that matches the stated functional conditions. This is a conceptual comparison, not a claim that such an alternative exists now. Ask what changes in value or legitimacy. If the answer concerns worse reliability, poorer judgment, missing physical capability, or a higher total cost, the objection may be instrumental. If the answer remains that a

person must be involved even after those deficits are removed, identify the human-specific requirement.

Then vary the form of human involvement. Replace a known person with an unfamiliar one. Replace physical contact with remote participation. Replace manual execution with human direction. Replace continuous attention with occasional review. These comparisons reveal which dimension is binding and how much work it actually protects.

Finally, vary price and quantity. A preference that changes no purchase or allocation is not the same as effective demand. Someone may prefer human service at equal prices but select automation when it is much cheaper. Someone else may accept a substantial premium for a rare event but not for routine use. The scope of the premium matters as much as its existence.

An illustrative house purchase

Consider a buyer seeking a safe, comfortable home. Under the stipulated comparison, automated construction delivers the same location, layout, durability, appearance, and assurance at a lower total price. If the buyer is indifferent to the labor's origin, construction labor is instrumentally demanded. The demand for housing survives; the requirement for builders does not survive that comparison.

Now change the purchase. The buyer wants a house made using a named craft tradition. Human execution may become part of the valued provenance. Alternatively, the buyer wants a particular architect's participation, which may introduce affinity. A local rule might require a qualified human to authorize plans, which introduces an institutional condition. These additions protect specified human contributions rather than all construction tasks.

The example establishes neither that every house can soon be automated nor that no housing buyer cares about builders. It shows how a mixed transaction can be decomposed without assigning an entire industry to one side. It also separates new labor from scarce complementary assets: a premium for the location pays for access to land, not necessarily human work.

An illustrative clinical encounter

Consider a patient who wants effective treatment, a clear explanation, and reassurance. A hypothetical system matches the clinical function and communicates clearly. Some patients might accept it. Others might still require a human who understands their situation, has a continuing relationship with them, or can exercise legitimate clinical authority. The transaction can retain several human-specific requirements.

Those requirements do not tell us how much surrounding work stays human. Scheduling, transcription, research, billing, monitoring, and drafting might become automated while the chosen human contribution remains. The appropriate question is the clinically and institutionally meaningful work that the person must perform. An essential relationship can coexist with major productivity gains around it.

Current safety evidence must be kept separate from the hypothetical comparison. A preference for a human clinician because available AI makes dangerous errors is an entirely reasonable functional judgment. It cannot by itself demonstrate a preference that would remain after a

genuinely equivalent alternative appeared. The applied and empirical chapters maintain that distinction.

An illustrative performance

An audience can want a musical work, a live event, a particular performer, a gathering with other fans, or a witnessed human achievement. Different formats satisfy different combinations. A recording may satisfy affinity and provenance. A live stream can add contemporaneous participation. A local performance can add shared physical presence. A synthetic performance may satisfy the desired sound while failing the desired origin.

The demand cannot be inferred from the ticket price alone. Some revenue may pay for venue scarcity, distribution, promotion, or rights. A larger audience can raise revenue with few additional performer-hours. A higher price for the same performance can increase income without increasing labor. An additional local show, by contrast, may require new contemporaneous participation.

This is why Essential Demand is both a useful moat concept and an incomplete employment forecast. It can explain why a human contribution survives. To explain the number and quality of jobs, it must be combined with the production format, market structure, and distribution of spending.

The conditional human moat

The phrase human moat is strongest when it names a defense rooted in the specification of demand. A machine cannot become an actual human merely by matching a benchmark. It can offer a substitute experience, change preferences, reduce the price of alternatives, or support the human's work. The boundary is real for a buyer or institution whose human requirement remains binding.

The phrase becomes too strong when it promises permanent employment to everyone inside a named profession. The requirement can shrink to a small contribution. Customers can change their preferences. Rules can change. Some human involvement can occur outside paid markets. A narrow market can support excellent livelihoods for a few people, modest livelihoods for many, or unpaid participation with high social value.

The resulting proposition is precise enough to investigate: after functional dependence on human capabilities has been removed, remaining paid human work must be explained by human-specific value, institutional human requirements, or other constraints that have not actually been removed. Essential Demand names the first two. This classification does not establish their prevalence or durability. Those empirical hypotheses require the evidence and measurement developed in the later chapters.

PART II

Intellectual history and economic theory

What Marshall established and what the new distinction adds

The starting point is a question about the object of demand. A person wants a house. Producing it currently requires builders, materials, machines, coordination, finance, and land. Demand for those inputs follows from demand for the house. If the house can be supplied in another way, the customer's housing need does not oblige the customer to preserve the original production process. This is the economic opening through which automation enters. The desired result can persist while the human work formerly required to obtain it contracts.

Alfred Marshall's first edition of *Principles of Economics*, published in 1890, explicitly develops this account. In Book V, Chapter VI, section 1, demand for producers' goods is derived from demand for consumers' goods. His examples include beer and its inputs, followed by houses and the building trades. Section 3 generalizes across the multiple industries using a material or type of labor. The digitized first-edition text confirms the reference to “nearly every kind of labour.” The earlier attribution to Marshall therefore rests on a primary text, rather than a modern textbook's recollection. [H01]

A related statement needs more exact treatment. In the eighth edition, published in 1920, Book V, Chapter VIII, section 1, Marshall describes demand for the majority of articles of commerce as derived from the commodities they help produce. This supports the intuition that the economy contains extensive chains of instrumental demand. It does not estimate the percentage of workers whose human identity matters to a customer, and it does not classify modern employment into Essential and derived components. Those are separate questions. [H03]

The distinction between publication date and edition matters. Some online reproductions display 1890 while including material added decades afterward. An accurate citation may identify the work's original publication in 1890 while specifying the edition actually consulted. In this research, the first-edition passages have been checked separately from the later statement about the majority of commercial articles. [H02] The historical foundation is sound without assigning every sentence in the final edition to the first edition.

Marshall's categories were direct and indirect demand. Essential Demand, as used here, makes a different cut. It asks whether the human source is part of what the buyer values, or part of what makes provision legitimate. Direct demand for bread is not Essential Demand for a baker. Direct demand for a medical outcome is not automatically Essential Demand for a physician.

Conversely, a concert promoter's hiring decision can be derived from ticket sales in the conventional sense while the audience's demand contains an essential requirement that a particular human perform. The conventional production-chain classification and the human-substitutability classification answer different questions.

This point is central to making the framework durable. If Essential Demand is presented as the literal negation of every economist's use of derived demand, an economist can object that all employer demand for labor is derived from demand for the firm's offering. That objection is terminologically correct and substantively incomplete. The relevant inquiry is what constitutes the offering. If the offering includes actual human authorship, participation, relationship, or authority, the producer cannot remove that feature and still supply the same complete offering to that buyer.

The most defensible formulation is therefore a distinction between **purely instrumental demand for human labor** and **demand in which actual human involvement is constitutive**. The short labels can remain derived demand and Essential Demand, provided the scope is stated. This preserves the explanatory force of the framework while connecting it to established economic reasoning. A person can be an intermediate input from the employer's accounting perspective and a valued characteristic from the final customer's perspective. A research design must look through the accounting transaction to the reason that human participation is wanted.

Consider a repair technician. A customer may want a functioning refrigerator, value an explanation, and prefer a familiar person entering the home. The first element concerns an outcome. The second could concern information, reassurance, or interpersonal recognition. The third might reflect a durable relationship or merely confidence that the technician will not damage the property. The occupation title does not identify which motive dominates. Even the customer's statement that they prefer a person is insufficient unless the researcher asks why and compares credible alternatives.

Essential Demand is thus best treated as a property of a transaction, an offering, or a component of demand. It need not be a permanent property of an occupation. A chef preparing anonymous meals for a cafeteria can meet primarily instrumental demand. The same chef appearing at a small dinner for admirers can meet identity-specific demand. A writer producing an internal summary and a writer publishing a personal account may face different demand even when both produce text. An economic framework should classify the valued contribution rather than assign moral or cultural rank to professions.

This also clarifies the meaning of essential. The term does not mean necessary for survival, socially important, legally designated an essential service, or emotionally meaningful to the worker. Food can be essential to life while demand for the farmer's labor is instrumental. Entertainment can be discretionary while demand for a named performer's participation is Essential. A job can be valuable to society yet lack protection against substitution. A market can pay generously for an inessential luxury precisely because a scarce human identity forms part of that luxury.

The framework's contribution lies in bringing these distinctions into a common analysis of automation. Marshall explains how demand reaches productive inputs. Essential Demand asks

which human characteristics remain in the specification of the desired offering when those inputs become substitutable. The second question becomes more important as technical capability expands. If a machine cannot do a task, the distinction can remain hidden: the human must be hired under either explanation. When the machine can do it, the motives separate into observable choices.

A useful thought experiment begins with two otherwise comparable offers. Both deliver the required practical result at acceptable quality and reliability. One includes actual human participation; the other does not. Does the customer still pay for the human version, choose it at equal price, or insist that it alone counts as valid provision? If so, some human-specific demand exists. If the preference disappears after outcome quality and risk are equalized, the original preference was evidence about expected performance rather than evidence that humanity itself was required.

The thought experiment establishes a conceptual distinction, not a population estimate. It leaves open how many customers hold such preferences, how much they pay, how often they buy, and how much labor is needed to serve them. Those questions determine whether Essential Demand supports a small premium market, many modest livelihoods, a concentrated celebrity economy, or a substantial employment base. The intellectual foundation does not decide those empirical outcomes in advance.

Labor as a means, labor as part of the offering

The closest major precursor is William Baumol's 1967 analysis of unbalanced growth. On printed page 416, he contrasts labor as an instrument with labor that is "itself the end product." He uses manufacturing and live performance to illustrate the difference. On page 417, he explicitly describes intermediate cases and recognizes mass media as close substitutes for live performance. His distinction is therefore neither a blanket claim that services resist automation nor a declaration that all performance demand requires physical co-presence. [H04]

Building on that distinction, Essential Demand can be understood as a question about preserving the identity of a product while changing its production method. If a customer buys a quiet room at a specified temperature, changing how the air conditioner was assembled ordinarily changes the production process. If a customer buys admission to an actual human performance, replacing the performers changes a feature of the purchased event. Technical substitution may still produce an attractive alternative. It does not establish that the original product has been supplied unchanged.

This distinction prevents an easy mistake in discussions of automation. Analysts sometimes demonstrate that a machine can produce an indistinguishable output and conclude that every economically relevant difference has vanished. That follows only if buyers value nothing beyond the observable output. An authenticated manuscript, a message personally written by a friend, and an indistinguishable forgery can have different values despite similar sensory properties. The remaining difference need not be mystical. It can be a straightforward preference over facts about the object's origin or the interaction's participants.

Kelvin Lancaster's 1966 consumer theory provides a useful vocabulary. Instead of treating goods as indivisible sources of satisfaction, Lancaster models consumption in terms of the characteristics goods provide. A single offering can supply several valued attributes, and different offerings can overlap in some attributes while differing in others. His discussion of a meal and its social setting is especially useful for separating a practical service from the context in which it is experienced. [H05]

The application to Essential Demand is an extension developed here. An offering can contain practical performance, human presence, authorship, relationship, status, and institutional validity in different proportions. An automated substitute can match several attributes without matching all. Conversely, it can outperform the human offering enough on practical attributes that buyers willingly surrender the human-specific ones. A distinction between products does not guarantee separate viable markets. It identifies what has to be measured when examining substitution.

A live tutor illustrates the problem. One student wants accurate explanations and progress on an exam. Another wants encouragement from an admired teacher. A parent may want an accountable adult supervising a child. A school may want a licensed professional to approve an assessment. These motives can coexist in one session. If automated explanations become excellent, the instructional component may become inexpensive while mentoring, supervision, or authorization remains human. The original bundle can split. The survival of one component does not preserve the former amount of labor devoted to every component.

The four proposed dimensions organize those surviving attributes. Presence concerns an actual human participating in the relevant time or place. Provenance concerns a human origin, effort, experience, or act of creation. Accountability concerns a human occupying a position of answerability, authority, or responsibility that buyers or institutions require. Affinity concerns attachment to a particular person, relationship, or human identity. These dimensions identify reasons that replacing a person can change the offering even when a practical output is reproduced.

They are not four mutually exclusive industries. A wedding photographer might combine technical image production, a relationship with the couple, a visible role in the occasion, and provenance as an artist. A physician may combine diagnosis, communication, continuity, and legal responsibility. A musician may combine composition, recorded provenance, stage presence, and fan attachment. The framework becomes more useful when it can describe these bundles without declaring the whole occupation protected.

Nor does every dimension imply the same amount of labor. Presence in a one-to-one interaction consumes time that cannot be reused simultaneously. Provenance may be established by a single original act whose result is reproduced widely. Affinity can scale through broadcasts, recordings, or an established reputation. Accountability can attach to a decision, an organizational role, or a limited act of approval. These differences explain why human-specific value can remain important even while the labor required to supply it becomes small.

Gary Becker's 1965 time-allocation framework supplies another relevant foundation. Households combine purchased goods with their own time to produce valued activities; the cost

of an activity includes time as well as expenditure. Consumption therefore cannot be inferred simply from how much output producers can manufacture. [H06] Applied here, expanding the technical supply of experiences does not expand a person's day. A thousand available performances still compete for attention, and a desire for friendship need not become a purchase of someone else's working hours.

The boundary between paid service and ordinary life matters especially for relational claims. The fact that humans want other humans is not yet a labor-demand proposition. People can socialize reciprocally, care for relatives, play sports, make art, or participate in civic life without buying professional provision. Economic abundance could increase these activities while reducing the share arranged through paid employment. A viable labor market needs a paying buyer and a remunerated role, not merely a human need.

An appropriate measure consequently separates the value of human activity from the value of paid human input. A community festival might be rich in Essential human participation and poor in paid employment. A celebrity appearance might generate a large fee for very few human hours. A counseling service might require sustained individual attention but face severe affordability constraints. All three cases belong within the conceptual framework, yet they have different implications for jobs, wages, and distribution.

The framework also handles changes in taste. Human provenance can become more desirable when synthetic content becomes abundant, or less important when consumers grow accustomed to synthetic alternatives. Some customers can retain strong preferences while others switch. Calling demand essential means that actual human involvement enters a particular buyer's valuation or an institution's conditions at a particular time. It does not mean preferences are immune to learning, culture, price, or generational change.

The resulting research question is concrete: which parts of an offering lose value or legitimacy when human participation is removed, and what resources will buyers devote to retaining them? This question can be asked across manufacturing, services, culture, care, education, and governance. It avoids treating today's sector labels as the answer to tomorrow's production problem.

Why automation can increase employment while weakening the human moat

A theory of derived demand must explain why previous automation often accompanied expanding employment. The answer cannot be that the workers were never substitutable. Machines plainly replace particular tasks. The relevant issue is what happens to output, remaining tasks, new activities, prices, and incomes after the replacement. The historical existence of compensating effects is compatible with the proposition that human labor in the displaced task was demanded instrumentally.

Autor, Levy, and Murnane's 2003 task analysis distinguishes activities computers could execute through explicit rules from nonroutine activities that the technology of that period complemented. They examine changes within occupations as well as between them. The paper's

durable methodological lesson is to study the changing task content of work rather than assume an occupation remains a fixed package. Its particular boundary of computer capability describes a technological era, not a permanent division between human and machine activities. [H08]

David Autor's 2015 review emphasizes several mechanisms through which automation and labor demand can coexist: substitution in some tasks, complementarity in others, expanding output, and adjustments in labor supply. His argument directs attention to the activities workers continue to supply when other activities become cheaper. [H07] The Essential Demand framework accepts these mechanisms and adds a further question: does the remaining human contribution endure because a person is specifically wanted, or because machines have not yet become suitable substitutes for the remaining work?

Imagine a small design studio. Initially, its staff spend most of their time producing variations, preparing files, checking specifications, and communicating with clients. Automation reduces the time needed for the first three activities. If the studio lowers prices and attracts many more customers, employment can rise. The workers may spend more time on client interaction or project selection. At this stage, automation complements their remaining contribution even though much of the original demand for their labor was instrumental.

Now suppose the same systems become capable of communicating reliably with clients and selecting suitable projects. The earlier employment expansion does not establish that those functions remain protected. It establishes that, at the earlier technological frontier and scale of demand, the residual tasks were valuable. A sequence of temporary complementarities can be economically important for decades without constituting a permanent human moat. The framework requires analysts to specify which frontier and which time horizon they are discussing.

Acemoglu and Restrepo's 2019 task framework distinguishes automation's displacement effect from the reinstatement of labor through new tasks. Productivity gains can coexist with a shift against labor, while new tasks can raise labor demand. Their 2018 model also includes conditions under which the long-run outcome is complete automation, alongside conditions supporting continued creation of labor tasks. Neither paper establishes an unconditional law that machines eliminate jobs or that new jobs always compensate. [H09] [H10]

The implication developed here is that job creation and human necessity must be analyzed separately. A new product can create new tasks without creating tasks reserved for people. An autonomous service might generate a new market for verification, customization, maintenance, or coordination. Whether that market employs humans depends on the available methods of supplying those functions. Novelty alone is not a human characteristic. The appearance of work that did not previously exist is evidence of changing demand; it is not evidence that machines cannot satisfy it.

The large historical database developed by Autor, Chin, Salomons, and Seegmiller documents new occupational titles and relates new work to technological developments and changing demand over 1940-2018. Their research gives empirical substance to the proposition that the content of employment continually changes. [H11] Its relevance is strongest when used as evidence about historical adaptation. Extrapolating the same mechanism to a world where

machines can undertake every instrumental task requires an additional assumption about a continuing source of human advantage.

Output expansion is another compensating mechanism. James Bessen's research on textiles, steel, and automobiles connects employment responses to changes in demand elasticity. Lower costs can expand demand enough to increase employment during one phase, while further productivity improvements accompany employment decline after demand becomes less responsive. [H12] The lesson is that a productivity shock does not determine employment by itself. How many additional units buyers want matters alongside the labor needed for each unit.

A simple hypothetical calculation makes the relationship intuitive. Suppose a service requires ten hours of human work per customer and serves one hundred customers. It uses one thousand hours. Automation reduces the requirement to two hours while the lower price attracts six hundred customers. Total human work rises to twelve hundred hours. If a later system reduces the requirement to one tenth of an hour, even one thousand customers use only one hundred human hours. These are illustrative quantities, not estimates of any industry. They show why employment growth after an early round of automation does not settle the effect of later rounds.

At the limiting case, an automated supplier may produce additional practical output without additional human work. Demand can grow enormously while human employment in that production process does not. This does not deny the possibility of new markets elsewhere. It requires those markets to be examined using the same question: what do buyers want, and why would satisfying that want require human input? Unlimited wants can sustain unlimited demand for output without logically implying unlimited demand for human production labor.

This also resolves a common confusion about complementarity. Two tasks can complement each other without one being intrinsically human. Editing complements drafting; inspection complements assembly; evaluation complements experimentation. If machines perform drafting while people edit, the relationship may raise the demand for human editors. If machines later perform both, the technical complementarity remains while the human employment implication changes. A complement to automation is not automatically a complement that must be supplied by a person.

Essential Demand identifies a different source of persistence. An audience may want a human contestant even when a machine can win the game. A customer may want an authenticated human work even when synthetic production is more fluent. A community may require a human officeholder even when automated administration is more efficient. These cases are not protected merely by an unautomated adjacent task. They are protected to the extent that removing the human changes what is wanted or what counts as valid provision.

The distinction helps interpret positive employment evidence without dismissing it. Rising demand for particular workers can be entirely real. It can reflect expansion, bottlenecks, slow deployment, new tasks, institutional requirements, or a human-specific preference. Each mechanism warrants a different forecast. The research program should identify the mechanism rather than treat the observed survival of a job as proof that its human component is permanently essential.

Comparative advantage, scarcity, and the difference between a job and a livelihood

Comparative advantage is the strongest familiar objection to the claim that broadly capable machines could undermine labor. The objection begins correctly: being less productive at everything does not by itself rule out useful specialization. If one producer is relatively less disadvantaged in one activity, both parties can gain by allocating scarce effort appropriately. A serious treatment of post-automation labor must account for that logic rather than confuse absolute superiority with the disappearance of every trading opportunity.

Ricardo's discussion of foreign trade illustrates specialization using the relative requirements for producing cloth and wine. The argument concerns the opportunity cost of assigning productive resources to one use rather than another. [H13] Applied to humans and machines, the useful question is not simply which can perform a task faster. It is what is forgone by allocating the relevant human or machine capacity to that task, given other available uses and the cost of expanding capacity.

An example makes the distinction clear. Suppose one machine can perform legal analysis extremely well and basic scheduling moderately well. A human may be much worse at analysis but only slightly worse at scheduling. If machine capacity is scarce and expensive to expand, assigning the machine to analysis and the person to scheduling can be efficient. This is an entirely instrumental human role. It can remain valuable even though the machine has an absolute advantage in both activities.

The conclusion changes as the constraints change. If another suitable machine can be acquired cheaply, the tradeoff between its two uses weakens. The operator need not reserve a fixed amount of machine time for the highest-value task indefinitely; capacity can grow. Energy, land, capital costs, materials, and supply chains can still constrain this expansion. The point is that comparative advantage cannot be applied while silently assuming either fixed machine capacity or unlimited machine capacity. Those alternatives generate different economic settings.

A human may retain a relative advantage at a very low wage. That is not equivalent to retaining a livelihood at an acceptable standard of living. If firms hire a person only when the price of an hour falls below the cost of a cheap automated substitute, there may be a market-clearing wage in a mathematical model that is socially unattractive. The survival of some positive demand therefore answers a weaker question than whether ordinary households can support themselves through labor income.

Korinek and Juelfs explicitly separate technological substitutability from economic redundancy. Their analysis distinguishes machines' ability to replace labor from the cost conditions under which competitive wages cease to support subsistence, and it considers human-preference jobs. [H16] This supplies an important bridge between automation theory and the present framework: demonstrating a technically feasible substitute is one step; establishing its economic implications requires prices, access, and distribution.

The framework developed here adds a reason to distinguish two wage ceilings. For purely instrumental work, a credible automated alternative constrains what buyers will pay for the

human method, after accounting for all relevant differences in performance and risk. For Essential Demand, the customer may pay more because the human component itself adds value or satisfies an institutional requirement. That premium is conceptually independent of whether the human is the most efficient instrument for the practical task.

The distinction is easy to see in sport. If the purchased offering were simply the greatest possible speed or precision, machine superiority would undermine the purpose of human competition. When spectators value humans competing under agreed conditions, the relevant output includes that contest. Improved machines can supply timing, broadcasting, training tools, and officiating assistance without supplying the athletes' participation. The resulting revenue still depends on how much spectators pay and how it is divided among participants, organizers, and owners.

Scarcity must also be specified. A famous person is scarce in one sense; a local hour of any competent human attention is scarce in another. A signed historical object is scarce in yet another. Essential Demand can create a scarcity premium, but the beneficiaries depend on what is scarce. Demand for a few named performers can concentrate income. Demand for extensive one-to-one human attention can distribute work more broadly but is limited by purchasers' budgets. Demand for an established work's provenance may enrich owners of rights or objects without requiring substantial new labor.

For this reason, high prices for human-linked offerings do not directly establish a large future wage pool. Revenue can reward current labor, intellectual property, brand ownership, a scarce credential, a venue, or monopoly control over access. These are different claims on income. An artist's popularity may generate employment for the artist, profits for a platform, and little paid work for others. The phrase human value should not obscure who receives payment and what they are paid for.

A contemporary theoretical caution is also relevant. Autor and Kausik's 2026 preprint argues, within a competitive constant-returns framework and its empirical implementation, that declining labor share can accompany rising wages. [H19] The general accounting lesson for this dossier is simple: a smaller share of a sufficiently larger output can still produce more labor income. Labor share, total labor compensation, employment, hours, median wages, and capital income are distinct quantities. None should silently substitute for another in testing the framework.

Autor and Kausik add a caution that matters for this dossier: because capital ownership is highly uneven, a falling labor share necessarily increases income and wealth inequality even when average wages rise. [H19] Rising wages and a widening ownership gap can occur together, which is why the capacity and coverage tests below are paired with an explicit account of who receives capital income.

Ricardo himself revised his earlier view of machinery's benefits to labor. In the machinery chapter of the third edition, he allows for circumstances in which gains to the broader economy coexist with losses to workers. [H14] This historical point undermines the idea that concern about automation's distributional effects is automatically incompatible with classical economics. It also discourages the opposite simplification: a demonstration of harm under one set of conditions is not a universal prediction for every technological change.

The central claim can therefore be stated without denying comparative advantage: Essential Demand identifies the human contribution that remains valuable because it is human, while comparative advantage and temporary scarcity explain why instrumental human labor can continue to be employed during partial automation. The former is a possible source of durable differentiation under comprehensive substitutability. The latter can support important employment, but its wage level and persistence depend on the technological and resource constraints that create it.

A future economy can consequently contain some instrumental human jobs, some human-specific jobs, and extensive automated production at the same time. Calling Essential Demand the ultimate human moat is a claim about what survives the removal of instrumental advantages. It is not a claim that every current job without such a moat vanishes the moment a model reaches a benchmark. Economic transitions involve installations, organizational redesign, accumulated capital, customer learning, and political decisions as well as technical capability.

A conditional theory of full automation and a testable research agenda

The strongest version of the thesis is conditional and exact. Suppose automated systems can provide all practically relevant instrumental contributions at acceptable quality and reliability. Suppose they can be deployed and expanded at costs that undercut human provision at viable wages. Suppose buyers and institutions permit their use where no human-specific requirement applies. Under those conditions, derived demand for the relevant output no longer guarantees demand for human labor. What remains specifically human must be explained by a preference, relationship, provenance requirement, or institutional role that includes actual humans.

This is a proposition about the structure of demand under stated conditions. It is separate from a forecast that those conditions will arrive in a particular year. The distinction strengthens the thesis because it identifies where disagreement belongs. A critic might reject comprehensive technical capability, cheap deployment, adequate reliability, permission, the durability of human preferences, or the proposed size of the remaining market. Each disagreement can be investigated. A vague appeal to historical job creation does not identify which premise fails.

Korinek and Suh's AGI scenario analysis makes the shape of the task frontier explicit. Different assumptions about the complexity distribution of tasks produce different paths for wages and output; capital accumulation and automation interact. Their models illustrate why a future with indefinitely remaining tasks differs from one in which the set of human-performable instrumental tasks can be exhausted by automation. [H18] Such models are useful for clarifying scenarios, not for treating an assumed frontier as an observed fact.

Aghion, Benjamin Jones, and Charles Jones likewise examine AI and growth through automation and bottlenecks. Their analysis highlights the importance of activities or inputs that remain difficult to expand even when other production processes become highly productive. [H17] The extension made here is to separate a bottleneck caused by technical inability from one created

by the product's human specification. A machine may eventually remove the first. Removing the second changes the offering or the institution's rules.

This distinction can be expressed through three different statements that are often collapsed. First, a particular human task is currently necessary. Second, humans are always necessary to supply the practical outcome. Third, actual human participation is part of the desired outcome. The first is a present production fact. The second is a strong claim about technological limits. The third is a claim about demand or legitimacy. Essential Demand belongs primarily to the third statement. It does not require proving the second.

The concept also avoids assuming that full automation means an economy without people. People can own assets, consume output, form relationships, govern institutions, and pursue activities for their own sake. The economically consequential change is that their labor ceases to be a binding input to large areas of production. Whether ownership and public arrangements distribute the resulting income widely is a separate institutional problem. A theory of demand for labor cannot alone settle the design of income distribution.

Keynes's 1930 essay on the economic possibilities of future generations separates expanding productive capacity from the question of how people use a life less dominated by economic necessity. He also distinguishes absolute wants from wants related to relative standing. [H15] For the present framework, these are useful distinctions rather than a timetable. People can remain purposive, competitive, creative, and sociable after their activity becomes less necessary as a source of market output.

Nor does continuing status competition automatically regenerate a mass labor requirement. People might compete over scarce land, access, collections, reputation, authentic human work, or highly automated experiences. Some positional expenditures would support Essential Demand; others would capitalize scarce assets or reward automated provision. The existence of insatiable wants is compatible with several production systems. The mechanism linking each want to human employment must be specified.

The relevant unit of investigation is therefore the complete offering and its marginal human requirement. For a given service, researchers should describe the outcome sought, identify every human contribution, state which contribution can be removed without changing the valued offer, and record the evidence for that judgment. If actual human involvement is retained, the research should specify whether it is required throughout production, at a single decisive moment, in a particular relationship, or only as a historical fact about origin.

Consider an automated publishing business with a human author whose name and experience are central to the audience's interest. It could automate distribution, design, research assistance, indexing, customer support, and much of production while retaining a genuine human act of authorship. A researcher who classifies the entire business as either human or automated loses the relevant information. Essential Demand can protect the author's contribution without protecting the surrounding employment structure. Conversely, a nominally automated product may contain a small but economically crucial human contribution.

A useful test also distinguishes technological capability from revealed preference. A survey asking whether respondents want human doctors combines assumptions about competence,

risk, warmth, regulation, and identity. An experiment that holds outcomes and disclosed capabilities constant can isolate some of those motives, although hypothetical answers still differ from purchases. Field evidence from markets with credible alternatives can provide stronger behavioral evidence, but those markets may not generalize to settings where relationships or rights matter more.

The framework suggests several observable contrasts. If human preference falls sharply after verified improvements in automated reliability, the initial barrier was partly instrumental. If buyers retain a premium after outcomes are equalized and origins are disclosed, that supports a human-specific component. If a legal requirement is removed and demand disappears, institutional protection was doing much of the work. If demand concentrates on a few named individuals, affinity is operating differently from a broad preference for any human provider.

Evidence must also distinguish current demand from future demand under widespread displacement. Customers who now pay for personal services may derive their purchasing power from wages elsewhere. If that wage income changes, the market for Essential Demand can change even if the underlying preferences remain intact. Alternatively, broader access to capital income or transfers could sustain spending while reducing the need to work. The scale of a residual human labor market therefore depends on distribution as well as preferences and production technology.

There is a complementary supply-side issue. If many people seek paid work in a small set of human-specific activities, competition among humans can reduce earnings. Protection from machines does not mean protection from other people. Conversely, a strongly differentiated relationship or identity can give particular providers pricing power. An analysis that estimates only the number of activities requiring humans misses the structure of competition within those activities.

The most valuable near-term research would map mechanisms before asserting a single total. It would identify clear instrumental cases, clear human-specific cases, and mixed offerings whose components can be separated. It would compare declared preferences with purchasing behavior, price premiums with labor hours, and revenue with compensation. It would record whether the barrier depends on current technical weakness, regulation, authenticity, social relationships, or genuine physical participation. This creates a foundation on which quantitative estimates can later be built and revised.

The essential insight remains simple even when the research becomes detailed. People demand outcomes, experiences, relationships, and legitimate decisions. Human work is often the present means of obtaining them. When the means becomes replaceable, continued demand for the result is insufficient to protect the original worker. Where the human contribution is part of what is being obtained, automation must either coexist with that contribution or compete by offering something different. The size and economic importance of that surviving demand remain empirical questions, open to investigation rather than settled by the definition.

Human demand, new work, and the conditions for broad livelihoods

The disagreement concerns scale and distribution

Human-specific markets can survive extensive automation. The consequential disagreement concerns what those markets can accomplish. They might support a small prosperous group, a large low-paid service workforce, or broad access to adequate livelihoods. Each possibility is compatible with observing customers who prefer humans. The evidence must distinguish among them.

Three questions organize the debate. Can machines supply the functional result? Does the buyer still value a specifically human contribution? How much accessible human income does the resulting market generate? A production model can illuminate the first question while leaving the other two unresolved. A human-preference experiment can establish the second without answering the third. Keeping those questions separate strengthens the post-labor framework and identifies the evidence needed to assess its central distribution claim.

The strongest opposing case assumes that automation creates prosperity, consumers direct growing budgets toward human-specific services, and those services retain substantial paid human input. Under favorable conditions, the resulting expenditure can sustain employment and compensation. The response must examine those conditions: who receives the prosperity, what they purchase, how much labor each purchase requires, and who can earn the resulting income.

Imas: expenditure can move toward human involvement

Alex Imas argues that richer consumers can redirect spending toward relational products whose value includes human participation. His examples extend through care, education, hospitality, and personal services. He allows aggregate labor share to fall. His technical companion makes expenditure and employment depend on demand parameters, sectoral labor intensity, and relative compensation; it does not estimate future employment. [R01, R03]

This gives Essential Demand a serious expansion mechanism. It also exposes the central measurement problem. A purchase from a human-intensive industry today does not reveal how much specifically human input the buyer would retain after functional automation. A family may value a teacher who knows its child while obtaining lesson preparation, practice exercises, translation, progress measurement, and administration automatically. The market could retain that teacher's relationship while changing both staffing needs and the number of families each teacher serves.

The same distinction applies to a meal associated with a named chef. Revenue may fund the chef's current labor, a license to use the chef's identity, automated preparation, premises, and the operating company. Measuring the restaurant's total sales as Essential Demand for current human labor would combine different income flows. A human-specific premium needs to be followed through to its recipients.

Employment share also needs a denominator. Imagine automated activities shrinking from 90 jobs to one while human-specific services shrink from ten jobs to five. The latter's employment share rises from 10% to approximately 83%, although its own employment halves. These invented numbers demonstrate why reallocation, employment growth, and livelihood sufficiency are separate outcomes.

Trammell: a small human contribution can command a large income share

Philip Trammell presents a theoretical counterexample in which limited human-intrinsic consumption commands an increasing income share as the marginal value of abundant machine goods falls. He then identifies competing forces, including other scarce assets, new machine-produced varieties, consumption-time competition, and concentrated human earnings. His overall conclusion favors a declining labor share, while distinguishing that outcome from declining real wages. [R04]

Trammell has also offered a historical check on the income-effect argument. He observes that we are hundreds of times richer than in the Dark Ages, yet spend a roughly zero share of income on human performers, presumably because technology keeps inventing new non-human things to buy. [R01] Rising income alone does not determine whether additional spending flows toward people.

This counterexample rules out a shortcut: a small physical contribution does not necessarily imply a small income share. A fixed quantity can command a high price. Time constraints therefore cannot establish a dollar ceiling on Essential Demand without an additional account of willingness to pay. A person has limited hours to attend performances, but bidders can pay vastly different amounts for those hours.

The useful inquiry concerns the competition for expenditure. A household can value actual human interaction while also wanting better housing, exclusive access, longer life, new forms of entertainment, or ownership of productive assets. Some purchases support paid human participation; others reward ownership or automated production. Rising affluence does not specify which destination will dominate. Nor does a nonzero expenditure share determine how widely the associated earnings will spread.

A research design should consequently vary the alternatives people can buy. Comparing a human service only with a machine replica of that service can miss substitution toward something entirely different. Consumers may retain a strong preference for human theater yet devote more expenditure and attention to newly available experiences. Conversely, new forms of human performance or community may attract spending that current expenditure surveys cannot observe. Both developments belong in the measurement program.

Restrepo: production can expand while labor loses its central role

Pascual Restrepo's model assumes a fixed task universe, competitive allocation, constant returns, fixed skill supplies, positive finite task-replication costs, and compute growing without bound. Its AGI premise allows sufficient compute to overcome human-touch advantages. It distinguishes growth-critical bottleneck work from supplementary work. In the limit, all bottlenecks are automated, some supplementary work remains human, and labor's income

share approaches zero. Wages remain positive: some equal compute's opportunity value in the relevant work, while supplementary wages can fall below that ceiling. Aggregate wages exceed a no-compute pre-AGI baseline under the model's assumptions. Additional scarce resources can invalidate that welfare argument. These are conditional theoretical results, without an arrival date. [N01]

This provides a formal counterpart to the Fourth Sector proposal: the expansion of productive capacity can become detached from an expansion of human staffing. Continued employment alone would therefore provide insufficient evidence that human labor remained a binding constraint on growth.

The meaning of supplementary work differs from Essential Demand. Work left to humans because automated provision is comparatively expensive remains instrumental when the buyer values only its functional result. Essential Demand concerns the additional value attached to actual human presence, provenance, accountability, or identity. Combining the categories would hide precisely the distinction this framework seeks to explain.

The residual-employment account should therefore retain several mechanisms. Some people supply a human-specific product. Some remain the economical input for an otherwise replicable result. Others remain necessary because capabilities, deployment, or institutions have not enabled substitution. The relative importance of these mechanisms can change over time. None should be inferred merely from a surviving occupational title.

Restrepo's discussants identify limitations involving AGI definitions, constant-return restrictions, worker welfare, and exogenous compute expansion. Their discussion helps locate the assumptions that would need examination before applying the model as a forecast. [N02]

The substitution comparison requires an equivalent result and full costs

For instrumental work, an available machine alternative can constrain what buyers will pay for human production. That comparison needs an operational definition of equivalence: outcome, quality, timing, reliability, and risk. The machine's subscription price alone does not establish its cost of supplying the complete service.

Include the hardware, energy, integration, supervision, maintenance, failures, and complementary inputs required for delivery. Use consistent treatment of costs on the human side. A machine that requires extensive human checking is a different production arrangement from an autonomous service. Capacity shortages or scarce inputs can also make the economic cost of using a machine exceed its immediate operating expense.

Suppose an automated service can deliver a stipulated result for \$20, all costs included. A human supplier needs one hour of labor plus \$5 in other inputs. Under those conditions, the instrumental amount available for that labor is at most \$15 if the supplier must match the alternative's price and cover costs. This invented example is a substitution calculation, not a wage forecast. A valued human-specific feature can support an additional premium; unequal reliability can change the comparison; unavailable machine capacity can prevent substitution altogether.

The machine side of this comparison is moving quickly. Epoch AI estimates that the price of reaching a fixed level of language-model performance has fallen by between 9x and 900x per year, depending on the benchmark, with a median of about 50x per year; the fastest declines are recent and may not persist. [U24] Listed prices are not full delivery costs, for the reasons given above. The direction still matters: wherever demand for human work is purely derived, the ceiling that the machine alternative places on its price falls as the cost of that alternative falls.

The same care applies to institutional demand. A community may require a human officeholder, a named accountable professional, or human review because it values consent, legitimacy, and responsibility. Such requirements can create durable demand even when functional performance is reproducible. Their permanence and staffing intensity remain questions for institutional analysis. A single authorized person supervising a large system implies a different wage-distribution capacity from a requirement for personal human service in every transaction.

Acemoglu, Autor, and Johnson: creating valuable expertise

Acemoglu, Autor, and Johnson distinguish labor augmentation, capital augmentation, automation, expertise leveling, and new-task creation. Their 2026 framework treats new-task creation as unambiguously pro-worker because it generates demand for new human expertise. Expertise leveling can benefit entrants while reducing incumbents' scarcity premiums. They argue for collaborative technology and policy choices that expand workers' capabilities, including settings where autonomous AI remains unreliable. [N03]

This is an argument about technological direction and expertise. It should be examined separately from rising luxury expenditure. The Essential Demand response is that novelty supplies no automatic protection from machines: a newly desired outcome may involve new tasks that either humans or machines can perform. Durable human earnings require an ongoing advantage, institutional protection, or demand specifically for a person's contribution.

The duration of those advantages matters. Defining a task does not instantly provide the data, dexterity, integration, infrastructure, and reliability needed to automate it. During a transition, these barriers can sustain substantial human work. A theory that assumes comprehensive operational capability describes a different frontier from evidence about today's mixed systems. The analysis should specify that frontier rather than treat every new task as either permanently human or immediately automated.

Automation can also change competition among humans. If systems supply much of the expertise behind a service while people supply its interpersonal component, more workers may qualify to offer it. Demand expansion can raise earnings; increased entry can reduce them. The net outcome depends on both changes, along with bargaining, institutions, and the supply of complementary resources. Observing more customers does not settle the wage result.

Historical new work provides a test, not a guaranteed outcome

Autor, Chin, Salomons, and Seegmiller estimate that roughly 60% of 2018 employment occurred in occupational titles introduced after 1940. Their Census and patent analysis links new work to augmentation and favorable demand changes. Since 1980, new work shifted toward high-paid professions and, secondarily, low-paid services. Automation's demand-eroding effect

strengthened across the later four decades, while augmentation's demand-increasing effect did not. Their title index is unsuitable for directly measuring occupational extinction. [H11]

These findings require the framework to accommodate changing work. An audit restricted to today's occupations cannot provide a complete inventory of future opportunities. Equally, historical new-work creation cannot establish the quantity, accessibility, or remuneration of work under a different automation frontier.

A useful next step is to follow cohorts of newly introduced tasks. Measure their employment, total compensation, median compensation, earnings concentration, and human hours per unit of output. Observe when substitutes become technically possible and economically deployable. Distinguish a new industry employing a small specialist group from a broad market that displaced workers can enter at adequate pay.

This approach makes the disagreement testable. Repeated creation of large, accessible, durable livelihood markets would count against a narrow residual-employment thesis. Repeated creation of small or short-lived specialties would provide weaker grounds for relying on wages as the main distribution system. The question concerns the cumulative scale of these outcomes, rather than whether any new job can be named.

Income share, purchasing power, and coverage

A declining labor share does not establish declining real wages. Suppose labor compensation remains at 100 while total income expands from 200 to 2,000. Labor's share falls from 50% to 5%, while its aggregate compensation is unchanged. Falling consumer prices could improve workers' purchasing power. Concentrated earnings or expensive necessities could leave many households worse off. Separate measurements are needed for each outcome.

The claim that wages cannot remain the primary distribution mechanism therefore needs a specified test. An accounting test asks what fraction of household income comes from work. An adequacy test asks whether available work can finance a defined standard of living. A coverage test asks how many people can obtain that income at a stated hours commitment. A participation test asks whether ordinary households share meaningfully in expanding productive capacity. These questions overlap but do not substitute for one another.

Let B represent annual compensation supported by residual human work, N the population expected to rely on it, and w an annual adequacy benchmark. A necessary condition for everyone to receive at least that benchmark is $B \geq N \times w$. Meeting this aggregate condition is insufficient when earnings are concentrated or opportunities inaccessible. Failing it establishes insufficiency for the specified population, benchmark, and scenario. This transparent arithmetic creates a useful test without pretending to estimate preferences that have not been measured.

Broad capital ownership or transfers can change both consumer demand and workers' bargaining positions. Publicly financed human services can also create paid employment; a public employee's wages remain wages in household accounts. The analysis should identify the upstream funding mechanism and the downstream income received. If shared capital returns or fiscal institutions provide purchasing power and support service markets, those arrangements are part of the distribution explanation.

The strongest conclusion is consequently precise: **surviving human-specific markets do not establish that earned income can distribute adequate purchasing power broadly.** Essential Demand may grow substantially. Establishing its livelihood capacity requires measuring paid human input, compensation, concentration, access, and purchasing power together. The Fourth Sector thesis explains how production can expand with diminishing dependence on human labor; the distribution test determines whether the human work that remains can carry the household-income system.

PART III

Relational goods, attention, experience, and meaning

This part situates Essential Demand within research on relationships, attention, experiences, meaning, authenticity, and the future of work. Its purpose is to identify what these literatures establish, what they leave unresolved, and where a common framework adds explanatory value. Historical and empirical claims carry source IDs. The comparisons, hypothetical examples, classification rules, and proposed research designs are this dossier's analytical synthesis; they are not findings attributed to the cited authors. The source register records publication dates and the evidence used.

The intellectual neighborhood: a shared mechanism, different questions

Essential Demand directs attention to a specific question: does the desired offering include actual human involvement, or is human effort currently one way of obtaining something else? That question cuts across much older investigations of sociability, artistic authenticity, service quality, and meaning. It also appears explicitly in current writing about advanced automation. A useful contribution therefore consists of making the distinction more consistent and operational, connecting its mechanisms, and separating the existence of human-specific demand from claims about its eventual economic scale.

Several terms in this neighborhood sound interchangeable because they often describe the same purchase. They need not identify the same economic object. A concert can be an experience, a use of scarce attention, a relationship with an artist, a source of personal meaning, and a purchase requiring human performance. Each label selects a different property. Combining the labels without identifying those properties produces an impressive vocabulary but little predictive discipline.

Alex Imas's April 2026 essay defines a relational sector broadly: human involvement is part of what makes its goods and services valuable. He argues that greater prosperity can redirect spending toward such offerings, while explicitly allowing aggregate labor share to fall. His February essay develops the related idea of a premium for human identity, story, and creative

process. Neither argument is confined to provenance alone. These are close conceptual neighbors of Essential Demand, rather than merely distant hints at it. [R01, R02]

The companion technical note models reallocation between automated and relational output. Its results depend on demand parameters and sectoral labor intensity; it distinguishes this structural-change question from the asymptotic labor-share question. It provides a conditional economic mechanism, not a measurement of how much human-specific demand exists. [R03]

Philip Trammell's March 2026 essay uses the term human-intrinsic goods. It shows how demand for such goods can theoretically preserve a high labor share, then argues that new varieties of machine-produced goods and scarce complements may prevent this outcome. His concern includes the possibility that a positive labor share could be concentrated among a small number of highly paid people. [R04]

In their June discussion with Dwarkesh Patel, Imas and Trammell emphasize missing demand-elasticity evidence. Imas treats full employment as a scenario to investigate, not an established prediction, and proposes comparing otherwise similar offerings with different degrees of human involvement. He accepts that new automated consumption opportunities could weaken the labor-share conclusion. [R05]

Moll and Imas's September 2026 essay distinguishes three impediments to rapid economy-wide growth: difficult production tasks, demand for human participation, and scarce physical inputs. The piece addresses transition over the following decade or so, rather than proving what remains necessary after every technical barrier has disappeared. This distinction helps prevent temporary production bottlenecks from being mistaken for permanent human-specific demand. [R06]

The new-task argument addresses another mechanism. Acemoglu and Restrepo distinguish automation's displacement of labor from the creation of tasks that reinstate demand for it. Those tasks can be entirely instrumental: employment grows because people remain useful inputs in new production. [H09, H10] The relational-demand argument instead asks whether people continue to be wanted because humanity enters the offering. These mechanisms can operate together during a transition, but evidence for one does not establish the other. A forecast must state whether humans retain a productive advantage, a human-specific demand advantage, or both.

These contributions suggest five separate questions. What property makes a particular human input difficult to substitute? How much would buyers sacrifice to preserve it? How much current paid work does satisfying that preference require? Who receives the resulting revenue? How widely can people obtain an adequate livelihood from it? The first question defines the potential moat. The remaining questions determine its capacity to distribute income.

Consider an illustrative portrait business. A customer might choose a human photographer because today's automated alternative produces worse images. This is an instrumental comparison. Another customer wants a portrait taken by a particular photographer whose career they admire. A third wants a record of an afternoon shared with their family, including the photographer's interaction with the children. A fourth wants an image certified as an unaltered record of an event. The same invoice category can contain different substitution

mechanisms. Neither the occupational title nor the existence of a personal interaction identifies which one matters.

The essential-versus-derived axis becomes useful when it forces the analyst to hold the right things constant. Asking whether people prefer a good human photographer to a poor automated product tells us little about the value of humanity itself. Asking whether customers want a trusted professional instead of an unreliable system mixes origin with performance and risk. A cleaner comparison preserves expected image quality, price, reliability, privacy, and accessibility, then changes the relevant human contribution. Even this is difficult: the meaning of a family portrait may change when its production history changes, and that change is precisely what needs to be measured.

The distinction also needs a defined claimant. A client, an employer, a regulator, a family member, and a worker may each value different aspects of the same activity. The client wants the photographer's eye; the insurer wants someone contractually responsible; the employer wants profitable throughput; the worker enjoys making images. Human involvement may be essential to one person's objective and incidental to another's. A complete account names whose demand is under examination and how that demand becomes purchasing power or institutional authority.

This leads to a restrained statement of the framework's contribution. The concepts of relational value, authenticity, human-specific consumption, and noninstrumental participation have substantial antecedents. The presence-provenance-accountability-affinity framework can organize these mechanisms into a practical account of labor substitution. Establishing priority for the exact term Essential Demand would require a separate search of earlier uses and dated publications; this review does not establish such priority. More importantly, the framework's usefulness does not depend on every component being unprecedented.

The word essential itself needs a recurring clarification. Here it identifies a constitutive feature of the desired offering. It does not mean socially indispensable, morally superior, biologically necessary, or exempt from budget constraints. A human performer can be essential to the concert someone wants even if that person can live happily without attending it. Conversely, clean drinking water is essential to life even where no human worker is essential to its eventual production.

For the same reason, this framework is not a ranking of human dignity. A worker performing a derived-demand task is not less valuable as a person. A buyer who chooses a machine-produced service is not necessarily indifferent to people. The classification concerns the route by which demand for an output becomes demand for paid human input. Keeping that route explicit allows the argument to remain economically sharp without turning it into a cultural referendum about which activities deserve respect.

Relational goods: why people can be part of the good

The relational-goods literature provides a strong antecedent for treating interaction as something people value in its own right. Carole Uhlaner's 1989 paper models political

participation with payoffs that depend on interactions among people. This can change the participation incentives predicted by a model focused only on the public outcome. Its subject is collective action, not forecasting employment under AI, but it demonstrates why an account of instrumental results alone can miss a reason people participate. [R07]

Benedetto Gui's 2000 article treats an encounter as a process in which conventional services and relational goods can be produced together. It also distinguishes the immediate interaction from relationship-specific assets that affect later encounters. Gui and Sugden's 2005 introductory chapter places interpersonal relations within a broader economic research agenda, including concerns that ordinary wealth creation can degrade social resources on which well-being depends. The latter was consulted through its publisher's summary, not the entire chapter. [R08, R09]

The analytical connection is straightforward. Some transactions produce more than their administratively recorded output. An hour in a workshop may yield a repaired bicycle and a pleasant conversation. A lesson may yield new knowledge and a relationship of encouragement. Those joint products can have different substitution possibilities. Automating the repair does not logically require eliminating the conversation; preserving the conversation does not logically require preserving all the mechanic's manual work.

This gives Essential Demand a more precise role than simply relabeling relational goods. It identifies when actual human participation is a condition of the value under consideration. Some relational goods are clearly outside commercial labor markets: friendship, neighborly cooperation, family rituals, shared volunteering. Some Essential Demand need not involve an ongoing interpersonal relationship: owning a particular author's manuscript, attending an anonymous human ensemble, or requiring a legitimate human representative to authorize a consequential decision. The two categories overlap without being identical.

Three distinctions help organize this overlap. The first is the difference between a relationship as an instrument and a relationship as part of the goal. A purchasing manager may maintain friendly contact with a supplier to obtain reliable deliveries. If reliability could be guaranteed otherwise, the commercial need for that contact might disappear. A club member may instead pay because regular meetings with the other members are the desired activity. The word relationship covers both cases; the replacement question separates them.

The second distinction concerns reciprocity. A human audience may value an artist who never knows that any particular audience member exists. This can still be affinity-based Essential Demand, but it is not equivalent to friendship. In other cases, the desired good requires mutual recognition: the person wants someone who remembers them, responds to them, and participates in a continuing relationship. These differences matter because recording, broadcasting, and selective personal access can scale one arrangement much more readily than the other.

The third distinction concerns payment. The existence of a valuable interaction does not specify that someone must pay a wage to produce it. Suppose a neighborhood has abundant leisure and organizes a free walking group. Its members may strongly prefer actual human company. That preference creates real value and uses real time, but it need not create an occupation. If the

group hires a guide, part of the fee might compensate route planning, another part safety responsibility, and another part the guide's personality. Only examination of those components reveals the employment implication.

Presence is therefore not equivalent to headcount. A room containing fifty people may offer less felt recognition than a brief one-to-one exchange. Yet essential human presence does not require warmth or affection in every case. A public deliberation may be valued because fellow citizens participate as independent persons. A contest may be meaningful because competitors accept the same rules and vulnerabilities. A customer may want an actual human adversary in a game precisely because that person has their own intentions and can defeat them. These examples widen the lens beyond care occupations.

Affinity adds identity specificity. If the customer wants this coach, artist, community leader, or adviser, another human is also an imperfect substitute. This is a stronger condition than a general human preference, but it does not automatically produce more employment. Identity-specific demand can concentrate revenue, while generic demand for accessible human company may be distributed among many providers. These are contrasting possible market structures, not estimates of their prevalence.

The four dimensions can interact without needing to be collapsed. A local music teacher offers presence during the lesson, provenance through a demonstrable musical career, accountability through a duty to teach responsibly, and affinity arising from a sustained relationship. An automated system might replace the technical exercises without replacing the particular reason a family returns to that teacher. Equally, another family might choose the automated system once instruction and feedback improve. The job category cannot settle the matter in advance.

An important stress test asks whether a purportedly essential component can be separated from the labor-intensive package. Imagine a community organizer whose participants value their recognition and judgment. Scheduling, transcription, room booking, communication, and routine administration might become automated while the organizer remains central to a monthly meeting. Essential Demand would explain the surviving role. It would not establish that the organizer must retain the same weekly workload, nor that the organization needs as many employees as before.

There is also a difference between buying another person's time and buying the possibility of a relationship. A concierge service could promise access to a human without requiring much actual interaction. A membership organization could make a human host visible while most members interact primarily with each other. A subscriber might value knowing that a writer is personally producing a newsletter, even if the writer uses automated distribution and research assistance. The human requirement may attach to a narrow point in a larger system.

That observation should not be used to dismiss relational value as an illusion. An apparently small human contribution may be the reason the whole arrangement is worth paying for. But its value contribution and its time requirement remain different variables. A short personal blessing, autograph, introduction, or endorsement could matter intensely while requiring little labor. If the purpose is understanding jobs rather than merely product differentiation, both variables must be recorded.

Relational goods finally complicate the direction of causation. Income and leisure may support more relationships, while stronger relationships may create occasions for spending. A richer community may support paid festivals; a festival may generate connections that later sustain businesses; the same community may prefer informal gatherings. None of those possibilities follows automatically from the presence of social preferences. The empirical task is to trace when valued human participation is commercialized, when it remains unpaid, and when technology helps people provide it to each other directly.

Attention, experience, and meaning: intersections rather than synonyms

The attention economy asks what happens when opportunities to communicate exceed people's capacity to attend. Herbert Simon's 1971 discussion makes the conservation and allocation of attention a central design problem for information systems. He explicitly considers both human and automated processing as ways to reduce demands on recipients. The argument identifies a scarce resource; it does not imply that producing information must remain a human occupation. [R10]

Michael Goldhaber's 1997 essay develops attention as an organizing principle for life on the internet, including the unequal relationships between those who receive attention and those who give it. It is a conceptual essay rather than an empirical estimate of future employment. Its relevance is the distinction between the scarcity of being attended to and the abundance of reproducible information. [R11]

For Essential Demand, the crucial question is whose human participation matters. An advertiser may want the attention of actual human customers, because those customers make purchases. The advertisement itself might be automatically produced, targeted, and delivered. Human demand exists at the receiving end without requiring human creative labor at the supplying end. Calling this an attention economy does not settle the labor question.

A different transaction occurs when someone pays to receive another person's attention. A fan purchases a conversation with a musician; a client wants an adviser who has personally considered their problem; a patron wants a letter written specifically for them. Here attention is a supplied human contribution. Even then, the buyer might value the outcome of consideration rather than the human fact of it. A financial explanation that is clearer and more reliable may be preferred regardless of its origin. A letter from a loved one is a different case because the identity of the attending person is constitutive.

These examples yield three categories: human attention as the target of commercial activity, human attention as an instrumental input, and human attention as the desired offering. Essential Demand applies most directly to the third. The distinction avoids treating every business that competes for eyeballs as a refuge for workers. It also identifies a real human-specific market without assuming that every minute people spend watching something purchases human time.

Attention imposes a second constraint from the demand side. The willingness to pay for many human offerings requires time to consume them. A person may have enough money for

numerous concerts, lessons, conversations, and memberships but still be unable to attend them all. Providers compete with one another, with unpaid relationships, and with automated entertainment for that time. This does not prove low demand for human labor; it identifies a constraint that income growth alone does not remove.

The experience economy concerns what is offered to customers. Pine and Gilmore's 1998 article distinguishes memorable experiences from more conventional goods and services. [R12] Pine's later white paper explicitly includes digital personalization and technology-mediated experiences within the framework. Thus its own scope does not require a human producer for every experience. [R13]

An illustrative amusement park clarifies the difference. An automated ride can be thrilling, memorable, and commercially valuable. A visitor can have a profound experience looking at a landscape without paying another human to perform. A personalized simulated adventure might be designed largely by machines. Those possibilities fall comfortably within an experience-centered view of consumption. What matters for Essential Demand is whether the customer additionally wants actual human performers, companions, guides, makers, or witnesses.

A theatrical event could contain both forms. Lighting, scenery, ticketing, music production, and concessions might be automated while actors perform live. A visitor might care about seeing an actor take a risk in front of an audience; another might be content with an impressive synthetic spectacle. Both purchases are experiences. Only the former necessarily contains the specified human performance. The experience label describes the form of value; the essential-demand test describes a condition of its provision.

This difference is particularly helpful when evaluating claims about personalization. Something made for one customer is not necessarily something made by a human. Personalization may be achieved by software using the customer's preferences. Its effect on labor demand depends on what the customer values: fit, relevance, responsiveness, a sense of being known by a real person, or some combination. The fact that the output is individually tailored does not establish which mechanism is active.

The purpose economy raises a third set of questions. Aaron Hurst's own definition emphasizes purposeful self-expression, personal growth, community, and serving needs beyond oneself. It addresses both employees and customers. It should be read as a broad account of valued ends and organizational practice, rather than a demonstrated taxonomy of automation-resistant work. [R14]

Ryan and Deci's account of self-determination theory identifies autonomy, competence, and relatedness as important psychological needs. It offers reasons to examine what people gain from activities, relationships, and environments. It does not establish that fulfilling those needs requires selling labor to an employer. [R15]

Ariely, Kamenica, and Prelec's 2008 experiments investigate how recognition and the apparent purpose of a task affect participants' willingness to work. The paper supplies evidence about labor supply and motivation in experimental settings, not a direct estimate of buyers' demand for human-made output. That directional distinction matters when it is used in an automation argument. [R16]

The analytical implication is that a meaning-centered society could develop along several employment paths. People might pay teachers, facilitators, religious leaders, coaches, or artists who help them pursue meaningful lives. They might instead use inexpensive tools to learn, volunteer, make art, care for friends, or organize their own communities. Some activities might combine paid expertise with extensive unpaid participation. All can be meaningful; only some generate substantial labor income.

It is especially easy to confuse a person's desire to do meaningful work with someone else's desire to buy it. The aspiring gardener may love cultivating plants even if customers prefer cheaper produce. The amateur musician may value years of practice without attracting a paying audience. Conversely, a highly paid activity may be exhausting or personally unfulfilling. A theory of demand for human labor must identify the buyer, the valued human contribution, and the terms of exchange separately from the provider's internal motivation.

This does not make meaning irrelevant to demand. Buyers may pay for a product precisely because it supports a community they value, represents the effort of a loved one, or embodies a creator's commitments. Those cases can generate Essential Demand through affinity or provenance. They may also involve patronage: the payment is partly intended to support the person or practice. The central question remains whether the support depends on actual human participation and whether that participation must take the form of paid labor.

Lens	Primary question	Where it intersects Essential Demand	What the label alone cannot establish
Relational goods	What value arises through interaction?	Actual human participation or identity is constitutive	That the interaction requires commercial employment
Attention economy	Who receives scarce attention, and who controls access?	Buyers seek a person's actual attention or identity-specific presence	That attention-grabbing content must be human-produced
Experience economy	What memorable or engaging event is being offered?	The event requires human performers, companions, or makers	That a memorable experience cannot be automated
Meaning or purpose economy	What activities support valued lives and commitments?	Actual human intention, contribution, or relationship matters	That meaningful activity generates wages
Essential Demand	Which specified human contribution must remain in the offering?	The common human-dependent subset of the other lenses	How large, lucrative, or inclusive that subset becomes

The defensible unifying claim is therefore a claim about their human-dependent subsets. Essential Demand supplies a shared substitution test for those subsets. It does not subsume every form of attention, experience, or meaning. This limited scope makes the framework stronger: it explains why superficially similar offerings can have very different implications for the future of work.

Provenance, authenticity, and the difference between people and their traces

Provenance can matter when the visible output is unchanged. Newman and Bloom's experiments investigate original-art valuation through creative performance and contact with the artist. Their findings concern production history in specific scenarios, rather than a universal human premium or an aggregate employment outcome. [R17]

Fuchs, Schreier, and van Osselaer's handmade-effect studies connect product attractiveness to perceived care, with variation by gifting context. This supports examining when human making matters, rather than assuming a uniform premium. The publisher's abstract was consulted. [R18]

These studies strengthen one part of the essential-demand argument. It is economically possible for identical functional outputs to have different values because people understand their histories differently. Production history can enter the consumed good. They do not establish that every preference for an original is a preference for new paid human production. The distinction between an object, its history, and ongoing labor is crucial.

Imagine a valuable painting by a deceased artist. Its provenance may support a high market price. But an increase in that price cannot hire the artist to produce another painting. Most of the payment in a resale transfers ownership of an existing asset. Conservators, dealers, and appraisers may provide services around it, but demand for those services is a separate question. An authenticity market can be economically large without employing a proportionately large population of creators.

The same issue arises with recordings, photographs, manuscripts, and archives. A single human performance may generate an artifact consumed repeatedly for decades. The audience may care intensely that a particular person made it. That is evidence of identity-specific demand, but the ongoing revenue can be disconnected from ongoing human effort. Rights holders, distributors, platforms, heirs, and institutions may receive much of the income. The framework should therefore distinguish demand for human-origin artifacts from demand for current human labor.

A stock of contribution and a flow of work

The distinction between existing contribution and current work connects human preference directly to income distribution. A completed performance, design, book, or game can supply a stock of human-origin material. New listening, reading, licensing, or exhibition can draw on that stock. A private conversation or new commission instead requires a current contribution. An offering can combine both: a creator sells access to an archive and also promises new work each month.

A society could spend heavily on human cultural heritage while commissioning little new work. Another could sustain many living creators through subscriptions and commissions. Both would exhibit strong preferences for human provenance. Their labor-market outcomes would differ because of ownership, substitution between old and new works, access arrangements, and the amount of fresh contribution purchased.

Two independent questions organize the possibilities: is a human attribute required, and does supplying the offering require current human labor? The following examples refer to components of transactions within a specified production boundary. They do not classify whole industries or assert that any present platform has eliminated every upstream worker.

Demand specification	Current human labor is required	Current delivery can be autonomous
No human-specific attribute is required	An instrumental task awaits a capable, economical substitute	Autonomous provision of a functional outcome
A human-specific attribute is required	A new personal commission, live participation, or substantive current responsibility	Reproduction or delivery of an existing human work whose origin or identity remains valued

The lower-right cell is especially consequential. Human origin can remain essential to consumption while the current provision belongs to the automated production regime. The buyer has retained the human preference. The transaction need not create another hour of work by the human whose contribution matters.

This also prevents an overly simple division of income into derived demand paying capital and essential demand paying labor. Essential Demand can reward ownership of an existing catalog or artifact. Derived provision can still pay wages while an instrumental task remains difficult to automate. The path from demand to income depends on when the contribution was made, which current activities remain necessary, and who controls the assets used to deliver it.

A payment described as a royalty does not by itself settle the allocation. The recipient may have supplied new work, own a past contribution, or participate through an agreement that combines both. A creator who owns their work may receive both labor and ownership income. A reseller may receive proceeds from exchanging an existing asset alongside payment for current transaction services. A measurement study should inspect the activity and contract rather than assume every creator receipt is a wage or every royalty is pure capital income.

Historical origin alone is also insufficient for classification. Many machines embody ideas produced by people in the past. If customers care only about the resulting function, that history does not establish Essential Demand. Human-origin demand exists where actual human contribution is part of what the buyer values or the institution requires. This condition keeps the concept from expanding to encompass every product touched by civilization.

What additional spending purchases

A new dollar spent on a human-origin offering can purchase another copy, a new work, a higher price for an existing asset, or more current personal attention. These changes must be recorded separately. Rising sales of a recording can reward past creation; commissioning another composition can demand new work; bidding up a rare manuscript can redistribute an existing ownership claim. Only the associated current production enters the question of new human labor requirements.

The same distinction applies to affinity. Millions of people may be attached to a particular creator's finite body of work. A strong relationship in the audience's experience can coexist with little new interaction from the creator. By contrast, a continuing relationship with a counselor or instructor may require recurring personal time. Affinity identifies whose participation or history matters. The contract and delivery format identify how much new time is purchased.

Bundle compression makes this issue relevant beyond media. A trainer can retain personal sessions while assessment, scheduling, routine program design, billing, and reminders become automated. Customers continue to buy the trainer's presence and judgment. The surrounding business can nevertheless require fewer human hours per customer. Estimating employment from the former occupational bundle would count work that the surviving human requirement no longer protects.

Provenance should also be distinguished from resemblance. A product can look handmade without having been made by hand. A generated image can imitate a familiar artist's visual style. A synthetic voice can resemble a singer. If the buyer values appearance alone, resemblance may substitute effectively. If the buyer values the actual source, disclosure changes the offering. A useful empirical design therefore examines both what people experience before learning the origin and what they choose after receiving credible information about it.

Credible information introduces an infrastructure problem. McGurk and Khachaturov's May 2026 position paper argues for treating human-provenance verification as labor infrastructure. Their proposed standard of constitutive human presence encompasses relational participation, authorship, attention, judgment, and accountability. The paper is a close conceptual neighbor of this dossier's framework. It advances a policy argument and hypotheses about market structure; it does not measure an established post-automation equilibrium. [R19]

The underlying inference is that demand for a property can translate into a price premium only if buyers can distinguish credible claims from cheap imitation, or at least trust a relevant intermediary. A certificate of human involvement is not itself proof that the involvement is economically meaningful. One person approving thousands of automated products may satisfy a loose label while supplying little of the attention, judgment, or creative authorship customers thought they were buying.

An appropriate provenance description therefore specifies a contribution. Did a human originate the concept, choose among alternatives, physically make the object, perform the event, take responsibility for the result, or personally respond to the customer? These are different promises. A single human-made badge can conceal rather than explain them. The best research should measure which promise matters, rather than assuming that any trace of human involvement has the same economic significance.

Hybrid production is consequently not a definitional nuisance to be excluded. A writer can use automated transcription while personally composing an argument. A musician can use sophisticated production software while giving a live performance. A craftsperson can use machine tools while performing the step customers regard as the distinctive act of making. Whether the contribution remains essential depends on the actual good being offered and the audience's understanding of it. Tool use alone cannot classify the transaction.

There may also be a demand for constraints on the process. An audience can value a contest because competitors operate under agreed limits. A customer can value an object because making it required patience or skill. If a machine removes the relevant difficulty, the physical output could remain similar while the achievement disappears. This possibility fits provenance and presence, but it does not imply that all effort is valuable. Unwanted inefficiency is still a cost; valued difficulty must be demonstrated in the particular context.

Status deserves separate treatment. Imas and Madarász's published work models and experimentally investigates how excluding other buyers can increase a good's appeal and the seller's revenue. The mechanism concerns relative access and unmet desire. Human authorship is not required by its definition. [R20]

Consequently, status demand cannot simply be counted as human labor demand. A scarce location, an exclusive machine-generated product, a limited membership entitlement, or a distinctive ownership claim could all provide status. The essential-demand argument requires the additional premise that actual human participation supplies a valued distinction that other scarce attributes cannot adequately replace. That premise may be true in some markets, but positional competition alone does not establish it.

Exclusivity also raises a distribution question. A premium tied to access to one named performer can raise that person's earnings while offering little opportunity to other performers. A limited-edition work can become more expensive without expanding the number of people who produce it. The feature supporting the premium can therefore limit the breadth of the resulting earnings. This is a mechanism to test through sales and provider data.

It is not a universal prohibition on broad human-service employment. Many customers can prefer different local instructors, form separate durable relationships, or purchase personal attention from different people. Time scarcity can support many distinct small markets. Exclusion from one offering does not imply exclusion from every livelihood. The empirical issue is whether the relevant demand concentrates on a few identities and assets or is distributed across enough accessible relationships to support a broad provider population.

The decisive comparison is between growth in the current-compensation pool and growth in the population seeking to earn from it. Income elasticity alone describes neither entry conditions nor allocation among suppliers. Large receipts at the top of a status market cannot stand in for the earnings available to an ordinary entrant.

The practical classification should therefore record four things separately: what happened in the production process; what buyers believe happened; which aspect of that history they value; and who earns income when they pay for it. Those distinctions connect the cultural intuition about authenticity to a labor-market analysis. They also prevent an auction price, a handcrafted label, or a preference survey from doing more argumentative work than the evidence supports.

From overlapping ideas to an empirical program

The neighboring literatures supply reasons to take human-specific value seriously. They do not yield a ready-made census of jobs that survive comprehensive automation. To turn the

framework into a research program, the unit of observation should usually be a purchase, an institutional requirement, or a service component, with occupations used as a later aggregation layer. Otherwise the analysis risks counting every worker in a socially rich occupation as essential, even where much of the job satisfies instrumental demand.

A first research stage would build a catalog of counterfactuals. For each offering, describe what the buyer is obtaining, which human contributions are present, and what would change if those contributions were automated. Preserve performance, convenience, safety, privacy, and price wherever possible. Record when this cannot be done honestly. In a relationship, changing the provider may itself change continuity and trust; in a live performance, changing the performer may change the event. Those are not experimental errors if they are the property being investigated.

The next stage would distinguish four kinds of evidence. Observed purchases show choices under current constraints. Stated preferences reveal what people say they would choose under described alternatives. Experiments isolate selected mechanisms under controlled conditions. Institutional documents establish which acts currently require particular kinds of providers or authorization. None substitutes for the others. A preference survey cannot prove a legal requirement, and a legal requirement cannot prove that customers intrinsically value a human.

This classification makes room for accountability without overclaiming its permanence. A human may be required because someone must answer publicly for a decision, exercise a legitimate office, or bear a legally recognized responsibility. That requirement is economically consequential even if its source is institutional rather than spontaneous consumer preference. But the analysis should state the rule, the jurisdiction, the relevant actor, and the conditions under which the rule could change. Accountability is not an eternal occupational exemption merely because today's system assigns it to a person.

A practical survey could present several versions of the same service. One version is delivered by a human throughout. Another uses automation for technical work but retains a human for explanation and responsibility. A third retains a human only for unusual cases. A fourth is fully automated but backed by an organization offering meaningful recourse. Prices and quality claims should vary independently. The purpose is to discover which contribution affects choice and how that preference behaves as the cost of retaining it changes.

Additional variants should separate a familiar person from an unfamiliar human, and a generic human assurance from a named individual. These comparisons distinguish affinity from a general preference for humanity. Another variant can separate real-time participation from a recording or artifact. That helps determine whether the buyer demands fresh human time or merely continued access to past human work. Neither result is more authentic; they imply different quantities of labor.

The conversion from willingness to pay into jobs needs its own analysis. The measurement chapters develop the budget, time, and distribution tests; the role of this literature comparison is to identify which demand attribute those tests must follow. Suppose customers pay extra to retain a human conversation at the end of an otherwise automated service. The employment effect depends on how long that conversation takes, how many customers buy it, whether a

worker can serve several people together, and whether existing workers expand their hours. It also depends on the price workers receive after equipment, facilities, distribution, and intermediary costs. A premium on the final product is not a wage bill.

A deliberately hypothetical example illustrates the issue. A service previously required several hours of professional work per customer. Automation removes preparation and administration, while customers still buy a short human consultation. Demand for consultations could grow enough to sustain employment, grow only enough to sustain fewer workers, or remain confined to a premium segment. Essential Demand identifies why the consultation remains. It does not choose among those outcomes without evidence about quantity, duration, prices, and available labor supply.

Similarly, an increase in the share of spending on a human-dependent category can reflect different changes. Customers may buy more units, pay more for each unit, choose a more expensive provider, or pay a larger platform fee. The category's revenue can rise while provider employment is unchanged. It can also rise while more providers earn modest amounts. These are distinct outcomes, and a serious white paper should not alternate between them as though they meant the same thing.

Distribution should be measured within the human-dependent market as well as between labor and capital. Identity-specific demand could favor a few celebrated people; local presence could require many geographically dispersed providers; low barriers to entry could increase competition among workers. Ownership of venues, audiences, certifications, or distribution channels could also affect who captures value. The framework does not require any single distributional prediction, but it makes these mechanisms visible.

Unpaid substitution deserves equal attention. A household might replace a paid activity with time spent among friends once automation expands leisure or reduces preparation costs. A community might use automated administration to run its own events. Conversely, easier coordination could make paid human services more accessible and affordable. The sign of the employment effect depends on organization and preferences. Counting every hour of desired social interaction as a potential paid hour would miss this distinction.

The empirical program should also test the durability of preferences. An initial preference for a human can reflect uncertainty about machines, lack of familiarity, present quality differences, or a stable preference for actual persons. Repeated choice after experience can help distinguish these possibilities, although no short experiment settles a permanent preference. Age, culture, context, and the type of decision may all matter. The goal is neither to assume preferences disappear nor to freeze them at their current levels.

Another test asks whether the human requirement is extensive or intensive. A buyer may require at least one human to be involved but gain little from additional human time. Alternatively, the buyer may value a sustained amount of attention. The former supports a threshold; the latter supports a continuing demand for hours. A provenance badge, a brief approval, a one-hour conversation, and an ongoing personal relationship should not be pooled into one undifferentiated measure of humanness.

The sectoral lens becomes useful after these distinctions are established. Agriculture, manufacturing, and services describe broad kinds of output or activity. Automated production and essential human participation describe modes or conditions of provision that can run across them. An artisan food producer, a handmade instrument maker, and a personal guide could all contain essential human components despite occupying different conventional sectors. An automated farm, factory, and advisory service share a production mode despite making different outputs.

It is therefore analytically productive to speak of a future division between automated provision and human-dependent provision, while explaining that this is a different classification axis from the traditional three-sector model. Calling automation a fourth sector can function as a strategic lens. It should not silently imply that statistical classifications already use that definition, nor that human-dependent production must belong only to services. Provenance-based demand can attach to goods; presence-based demand often attaches to encounters.

The most valuable output of the research may be a set of disciplined questions that survive changes in technology. What is the customer or institution actually demanding? Which human contribution changes the identity or legitimacy of the offering? Would that contribution remain valued if an automated alternative matched every instrumental benefit? How much fresh human time is required? Can the demand be met by existing artifacts or unpaid relationships? Who receives the payment? These questions preserve the central intuition while keeping the empirical conclusions open.

Essential Demand thus provides a useful organizing axis for a literature that often talks past itself. Some authors explain why people value other people; others explain how attention is allocated; others describe memorable offerings or meaningful lives; still others model aggregate factor shares. A coherent research agenda links these levels without treating them as equivalent. Actual human involvement can be part of the desired good. Establishing that fact is the beginning of the labor-market analysis, and the point from which its scale, distribution, and institutional consequences can be investigated.

PART IV

Evidence on human preferences

What would count as evidence of essential demand

The empirical question is narrower than whether people like human beings, distrust new technology, or enjoy experiences. It is whether actual human involvement contributes something to what the buyer wants, independently of the practical result that involvement helps produce. A person may choose a human translator because the translation is more accurate. Another may choose that translator because she wants to support a particular writer, hear that writer's interpretation, or obtain a translation personally undertaken by that writer. Those transactions can look identical in an employment dataset while resting on different sources of demand. The distinction concerns the reason a human remains in the transaction, not the occupational title.

This chapter treats essential demand as demand for a human contribution that is constitutive of the valued offering. The word essential does not imply indispensable to survival, morally superior, universal, or immune to changes in taste. It means that replacing the relevant human participation changes an attribute of the offering that the buyer values or that a governing institution requires. The consumer who specifically wants a performance by a living musician has not necessarily made a mistake when refusing an acoustically superior synthetic performance. She may be buying an encounter, an achievement, or a relationship as well as sound. Conversely, pleasant conversation with a machine can satisfy an instrumental psychological objective without becoming human-specific demand simply because the objective is emotional.

Four types of evidence should be kept separate. First is an identity effect: holding the output fixed, changing its attributed source changes evaluation. Second is a purchase effect: source changes an actual choice involving money, time, or another scarce resource. Third is an involvement requirement: the buyer rejects substitutes after receiving credible evidence that they match functional quality. Fourth is an employment effect: the requirement purchases additional human hours at a sustainable compensation level. The first provides evidence relevant to the second, but cannot establish it. The fourth requires information that neither a liking score nor a statistically significant label effect supplies.

This distinction is crucial for the research program. A large literature can demonstrate that human provenance matters without measuring the scale of the labor market it could sustain. A painting's human label may increase a rating from moderately good to good. That does not

disclose whether the evaluator will buy a painting, how much additional money she will pay, or whether one artist can satisfy a million buyers through reproductions. The conceptual framework becomes stronger when these links are treated as research questions rather than silently assumed consequences.

The strongest design for detecting provenance effects crosses actual production with disclosed production. Human-produced and machine-produced examples are assigned labels independently of origin; participants also encounter an unlabeled condition. Comparing labels on the same material isolates an attribution effect. Comparing actual origins without labels estimates differences in the delivered output. Comparing accurately disclosed alternatives approximates the market choice that an informed buyer faces. Art and emotional-support studies reviewed below use versions of this logic. They are particularly informative because a machine may perform well on the unlabeled functional comparison while receiving a penalty once its identity is disclosed. [E01, E03, E06]

Even this design requires interpretation. A label changes beliefs about more than biological origin. An AI label may imply inferior reliability, illicit training data, lack of consent, low effort, manipulative intent, or an impersonal seller. A human label may imply scarcity, accountability, intention, or higher status. These inferences are economically real, but they do not all demonstrate an enduring preference for human participation itself. If opposition disappears when the concern is resolved, then the study may have identified remediable mistrust rather than a durable limit on substitution. A credible research program therefore asks participants what they believe the label implies and experimentally varies those implications.

The relevant counterfactual also depends on whose demand is being measured. Patients may prefer a physician while an insurer chooses the covered delivery model. A child may value a familiar teacher while a school district purchases software and supervision. A company may retain a named consultant because its board wants someone accountable for advice. Researchers should identify the user, payer, decision-maker, and authority that defines an acceptable service. Their preferences can diverge. The resulting arrangement may preserve a human role, but its source could be patient preference, institutional responsibility, or a procurement constraint.

Presence, provenance, accountability, and affinity can be measured as separable attributes. Presence concerns participating with a human here or now. Provenance concerns who actually made, experienced, endorsed, or performed something. Accountability concerns who can authorize, answer for, remedy, or bear consequences. Affinity concerns this particular person or relationship. The dimensions may overlap without becoming interchangeable. A recorded song can carry human provenance and personal affinity without simultaneous presence. An unknown inspector may supply formal accountability without affinity. A live group activity may supply presence without requiring a famous participant or a handmade artifact.

The research reviewed here is selected to discriminate among these possibilities. It is not a systematic meta-analysis, and the studies should not be pooled as though they estimate one common quantity. Their dependent variables include aesthetic ratings, forecasting choices, purchases, momentary loneliness, symptom change, and audience movement. Their populations and products also differ. The appropriate synthesis is a map of mechanisms and evidentiary

strength. It can establish that human-specific value exists in some settings and that superficially similar human preferences are sometimes functional or changeable. It cannot supply a universal percentage of jobs that will survive automation.

One final distinction prevents circularity. A person who says she prefers a human is not automatically classified as expressing essential demand. Researchers must ask what the human supplies. If the answer is better results, stronger privacy protections, easier recourse, or a cheaper price, substitution remains possible when those attributes are reproduced. If the answer is that the person really did it, really attended, personally cares, or is the specific individual sought, then human participation is part of the object of choice. Institutions may additionally require a natural person to occupy a role; that is a separate, explicitly institutional form of essentiality. This distinction makes the framework testable rather than merely a relabeling of every current resistance to automation.

Provenance, art, and the value of human making

Art offers unusually clear experiments because researchers can hold the visible or audible object constant while changing its purported history. This creates a direct test of whether a product's value is exhausted by its sensory properties. It also makes art a hazardous place to infer employment effects: a provenance premium may attach to an original, a signature, or an existing catalog, and those assets can generate income without much new labor. The key empirical finding and the labor-market inference must therefore be stated separately.

Bellaïche and colleagues assigned human-created or AI-created labels to paintings that were all generated by AI. Across two studies, participants evaluated the images more favorably under human labels. The measured dimensions included liking, beauty, profundity, and worth; in the first study the differences were larger for profundity and worth than for liking and beauty. These are ratings rather than purchases. Because the image content was held fixed, sensory quality cannot explain the label difference. The experiment supplies direct evidence that attributed human authorship can matter independently of the visible product, while leaving open why the attribution matters and what premium buyers would actually pay. [E01]

Jacobs and colleagues expose an important measurement problem. Their first experiment, with 250 participants, found no significant human-versus-AI label difference using noncomparative rating procedures. A second experiment, with 102 participants, used direct comparisons and found preferences for human-labeled works. All artworks were human-produced. Thus the findings depend partly on how the choice is presented. The study does not establish that one procedure captures the sole true preference; it shows why researchers should not infer universal indifference from one isolated rating task or universal aversion from an explicit human-versus-machine contest. [E02]

Porter and Machery provide a complementary result in poetry. Their first study used 1,634 participants to assess authorship; discrimination was slightly below chance. A second study with 696 participants independently varied authorship framing. Participants generally rated the AI-generated poems more favorably, while being told a poem was AI-generated reduced evaluations relative to human attribution. The participants were mostly inexperienced poetry

readers. These findings concern the particular poems, prompts, model, and audience studied; they do not rank all poetry or settle expert judgments. They do show that output preference and source preference can move in opposite directions within the same domain. [E03]

Mandel and Imas add evidence from consequential choices: the authors report two preregistered experiments, with 351 participants in total, in which people bid for physical art prints. Bids were lower for artwork believed to involve AI, and the valuation gap narrowed when more copies were available. This links perceived human origin with exclusivity under the experiments' conditions. The author-hosted abstract was available; the full paper was not accessible for this review. [N04] These findings do not establish how many artists can earn a livelihood, whether the premium finances new work, or whether other forms of human-specific value depend on excluding buyers.

These results support an intuitive distinction between two buyers. One needs an attractive image for a wall or an evocative verse for an invitation. Another wants an encounter with the expression of a particular human life. Both may purchase something called art, but their substitution conditions differ. A production technology that satisfies the first buyer does not logically satisfy the second merely because it produces indistinguishable pixels. Nor does the second buyer's existence imply that the first buyer will pay an authorship premium. The relevant market is segmented by motive, context, and budget, not divided neatly into creative and noncreative occupations.

Newman and Bloom's five experiments used hypothetical duplication scenarios to study why originals receive higher valuations. Their findings implicated both the original creative performance and contact with the maker. Production history can therefore affect judgments even when perceptual equivalence is stipulated. These were not auction transactions or tests of AI employment effects. [E04]

Fuchs, Schreier, and van Osselaer investigated handmade versus machine-made product descriptions in four studies. They found a positive handmade effect linked to perceived care or love embodied in the product, while testing alternatives including quality, uniqueness, effort, authenticity, and pride. The effect was sensitive to gifting context: it was stronger when products served to convey affection to close recipients. The paper also reports a payment-related result, although the abstract available for this review does not establish enough procedural detail to treat it as a general market premium. Its central lesson is contextuality: handmade value depends partly on what the purchase is meant to communicate. [E05]

The gift example clarifies why essential demand need not be mystical. A handmade bowl can function as a message about care, discernment, or a relationship to its maker. Its value may depend on truthful production history in the same ordinary way that a personal letter's value depends on who sent it. A machine can reproduce the material object while changing the message. At the same time, a store-bought object can communicate affection because the giver selected it thoughtfully. Human involvement may migrate from fabrication to selection, inscription, or presentation. A premium for human making therefore need not preserve every stage of artisanal production.

This migration creates a practical boundary problem: how much involvement is enough? An artist may use powered tools, digital editing, assistants, generative software, or an automated fabrication system. A binary handmade-versus-machine label suppresses those distinctions. A stronger study would vary conception, execution, selection, revision, and personal endorsement independently. Participants could choose among an entirely handmade object, a human-designed machine-fabricated object, an AI-designed human-finished object, and a fully automated object. The purpose is to locate which contribution is constitutive of value, not to decide in advance that any technological assistance destroys authenticity.

The employment implications depend on that boundary. Suppose, as an illustrative scenario rather than a forecast, that a buyer insists on a named artist's approval but accepts automated production. The artist can approve many more pieces than she could personally manufacture. Demand for authentic authorship survives while production labor per item falls. Conversely, if the buyer insists on an hour of unrehearsed personal interaction with the artist, that requirement directly consumes an hour of scarce human time. Both are essential demand, but one scales through reproducible objects and the other remains tied to elapsed participation. An empirical employment estimate must distinguish them.

Provenance also requires credible information. A premium cannot reliably reward genuine human participation if buyers cannot distinguish it from a false claim. Authentication can take many forms: observed performance, a trusted intermediary, documented process, reputation, or verifiable personal contact. The associated cost affects the size of the market. A small provenance premium may be swallowed by verification expenses. A large premium may justify elaborate certification. This is an economic implication of the framework, not a claim that current art studies have measured a future certification industry.

The most defensible reading of the evidence is that production history can enter value independently of perceptual output. The evidence is weaker on the persistence of particular label effects, the size of real spending premiums, and the amount of human effort required to earn them. A strong white paper should make the first proposition vivid and keep the other three open. The practical question for artists is then precise: which customers pay for human expression, what participation do they require, and how many compensated human hours does fulfilling that requirement entail?

Empathy, care, and companionship: separating the benefit from its source

Care and companionship are often described as intrinsically human. That phrase combines several different propositions. A person may need competent treatment, emotional relief, responsive conversation, reciprocal commitment, a familiar relationship, a responsible professional, or physical assistance. Some of those benefits are defined by outcomes; others depend on who provides them or on the relationship itself. Calling the entire bundle human obscures the precise question the essential-demand framework is designed to answer.

Yin, Jia, and Waksalak separated actual from presumed message source. AI-generated responses made recipients feel more heard, while AI attribution reduced that experience relative to human attribution. This identifies a functional advantage alongside a source disadvantage. The experiment measured message experience, not enduring relationships, willingness to pay, or clinical outcomes. [E06]

Ayers and colleagues compared chatbot and physician responses to 195 questions drawn from Reddit's medical forum. Licensed health professionals evaluated anonymized, randomly ordered responses. They preferred chatbot responses in 78.6% of 585 evaluations and gave them higher quality and empathy ratings. Chatbot responses were substantially longer. The outcome was evaluators' appraisal of written answers, not patients' health, diagnostic safety, or preference for a disclosed provider. This study is evidence against treating empathetic language as an exclusively human functional capability. It is not evidence that an autonomous chatbot can replace a physician across a course of care. [E07]

Heinz and colleagues randomized 210 adults with specified symptom profiles to four weeks of access to the Therabot system or a waitlist. Symptoms improved more in the intervention group, with follow-up at eight weeks. The study supplies evidence that an AI-delivered interaction can produce clinically relevant benefits in its tested setting. It did not randomize participants between Therabot and human psychotherapy. Consequently, its therapeutic-alliance ratings and symptom findings cannot establish equivalence to human therapists, nor can this trial alone establish broad safety, durability, or suitability across conditions. [E08]

De Freitas and colleagues examined AI companions through several studies. Their published article reports reductions in loneliness after use, including momentary reductions measured over a week, and links benefits to feeling heard. The evidence includes experimental work as well as observational app-review analysis; those components have different causal strength. The finding is narrower than a demonstration of durable recovery from chronic loneliness or a net improvement in users' wider social lives. For this framework, its importance is that a synthetic interaction can satisfy part of a seemingly relational demand. [E09]

Together these findings require a more careful vocabulary. Empathic performance refers to behavior that recognizes feelings and responds helpfully. Perceived empathy refers to the recipient's evaluation. Reciprocal concern refers to another person's actual orientation toward the recipient. A therapeutic outcome refers to a measured change in health or functioning. None is a perfect proxy for the others. An automated response may perform well on the first two and improve an outcome while lacking the human relationship someone wants. Equally, a real person may have sincere concern while communicating poorly or failing to help.

For purposes of labor demand, the right question is what the buyer will pay to secure. If the desired good is immediate relief, then effective automated support is a candidate substitute. If the desired good is to be known and cared about by a particular human, improved synthetic support may leave that desire unsatisfied. If the desired good is clinical responsibility under a recognized system of recourse, then accountability enters the bundle. This decomposition does not diminish the moral importance of care. It prevents moral importance from being mistaken for evidence that every task currently performed in care must remain a paid human task.

The framework also distinguishes a caring relationship from purchasing caring behavior. A person cannot necessarily obtain friendship by paying for an hour of conversation; payment changes the relationship and its interpretation. Some human-specific value is sustained through families, peers, neighbors, clubs, and voluntary association rather than labor markets. A world with more demand for human connection could therefore contain more valuable human activity without generating an equivalent increase in paid employment. This is a conceptual possibility, not a forecast about how much unpaid interaction will expand.

Human-machine combinations can further separate paid work from the benefits delivered. Consider a hypothetical support service with automated daily conversation and periodic meetings with a named human professional. Users may insist on the genuine human relationship while accepting automation for reminders, education, routine reflection, and scheduling. Such a service could preserve essential demand for meetings and responsibility while reducing the human time needed per client. A different customer might reject the arrangement because her goal is continuous human availability. The economic unit to measure is the minimum human involvement that sustains the customer's willingness to use and pay for the service.

A robust experiment should therefore include disclosed human service, disclosed automated service, and clearly described combinations. It should match response time, confidentiality commitments, available information, and access to escalation. Initial preferences should be measured before use; outcomes and preferences should be measured after repeated use. Participants should face a real, modest budget tradeoff or choose an actual follow-up session. Researchers should also measure whether users want a human because they expect better outcomes or because human participation is itself desired. These questions would reveal more about essential demand than a one-time question asking whether AI can empathize.

For affinity, continuity matters. An experiment comparing an unfamiliar human with a familiar AI confounds biological identity with relationship history. The reverse comparison does the same. A more informative design crosses familiar versus unfamiliar with human versus automated, while separately describing whether the interaction partner remembers the participant and can make future commitments. In some services, the moat may belong to an established person; in others it may belong to continuity, personalized memory, or responsiveness, attributes that need not be exclusive to humans. Researchers should not infer affinity for humans from affinity for a reliable interlocutor without testing the difference.

Presence also needs disaggregation. A video call, a text exchange, and a physically shared room provide different forms of access. Physical co-presence may be valued for touch, joint action, vulnerability, or witnessing. Some of those functions could potentially be supplied by robotics; others concern an actual person's participation. The framework does not settle the technical question in advance. It asks which elements remain desired after functional capability is matched. This keeps the analysis compatible with rapid changes in both language models and embodied systems.

The practical conclusion is not that caring professions are protected or doomed. It is that their current task bundles conceal several distinct demands. Evidence already shows that certain psychological and communicative benefits can be delivered through AI, while source attribution

and relationships can contribute additional value. The scale of enduring human employment depends on who pays for that additional value, how often they purchase it, what participation they require, and whether the resulting compensation exceeds the cost of supplying it.

Algorithm aversion is evidence about choice, not automatic proof of Essential Demand

A person may reject a machine because she thinks it will do a poor job. That belief can be mistaken, informed, or partly justified by features the experiment did not describe. None of those cases automatically demonstrates that human participation is a constituent of the desired good. The empirical literature on algorithms is valuable precisely because it shows how sensitive human-versus-machine preferences can be to experience, control, task framing, and beliefs about competence.

Dietvorst, Simmons, and Massey found that observing imperfect algorithmic forecasts could reduce participants' willingness to rely on them, even after observing superior average performance relative to a human alternative. Participants made incentivized forecasting choices. The evidence establishes a consequential behavioral asymmetry in reactions to errors, not merely an opinion poll. Its scope is forecasting under the studied conditions. It should not be paraphrased as proof that people universally refuse machines or that they positively value human labor regardless of performance. [E10]

Their subsequent work found greater willingness to use imperfect algorithms when participants could modify their forecasts, even within restricted bounds. This altered reliance and improved performance in the tested tasks. The result indicates that preserving some user control can matter more than preserving an entirely human production process. It also shows why a market that initially appears protected by algorithm aversion may change when the interface or allocation of authority changes. [E11]

Logg, Minson, and Moore documented the opposite tendency in several estimation and forecasting tasks: participants gave more weight to advice they believed came from an algorithm than to human advice. The preference weakened in comparisons with participants' own estimates and among participants with relevant expertise. The published paper and its author-hosted manuscript therefore provide a necessary counterweight to general claims about aversion. The object of trust, comparator, and decision-maker all matter. [E12]

Castelo, Bos, and Lehmann found that algorithms were trusted less for tasks perceived as subjective, but that changing perceived task objectivity or algorithms' perceived affective capabilities could increase their use. Their research included online laboratory and field studies. This is evidence about beliefs concerning suitability, not evidence that subjectivity creates an insurmountable demand for a biological worker. A subjective goal can still generate derived demand if customers mainly seek an enjoyable, fitting, or personally useful outcome. [E13]

Longoni, Bonezzi, and Morewedge investigated resistance to medical AI. Their studies linked reluctance to concerns that automated providers would neglect patients' distinctive circumstances. Resistance diminished under tested conditions involving personalization,

decisions for others, or AI supporting a human provider. The study includes both hypothetical and consequential measures, which should not be conflated. Its mechanism is especially relevant here: wanting individualized treatment does not by itself imply wanting human treatment when personalization can credibly be supplied by another means. [E14]

Luo and colleagues analyzed a field experiment involving more than 6,200 customers receiving structured sales calls. Disclosing chatbot identity before the conversation sharply reduced purchases compared with undisclosed chatbot calls. The authors connected the effect to perceptions of knowledge and empathy and reported moderation by disclosure timing and prior AI experience. This is actual purchase behavior, which makes it stronger than stated intention for establishing economic consequences. Yet it is a particular sales setting with identity disclosure that affects several beliefs at once; its magnitude cannot be generalized into a universal human-service premium. [E15]

Longoni and Cian found that the relative appeal of human and AI recommendations depended on whether utilitarian or hedonic attributes were salient. Their account concerns perceived competence, with additional moderation when matching a person's unique preferences and under human-AI combinations. This helps separate hedonic demand from essential human demand. Wanting pleasure is an objective; wanting another human's participation is a condition on how that objective is fulfilled. The former does not establish the latter. [E16]

These studies are best understood as a set of discriminating tests. A human preference that disappears after providing a performance record is different from a preference that remains after the record is accepted. A preference that disappears when the user retains veto power differs from one that requires a human producer. A preference that depends on a familiar named person differs from one for any accountable institution. A preference that reflects concerns about data use may be satisfied by a privacy-preserving system. The outward choice can be the same while the mechanism and future substitution possibilities differ.

This does not make present-day barriers unreal. A firm choosing a service must operate within actual beliefs and institutions. An unpopular automated process can lose revenue even when its technical performance is strong. The distinction is between explaining today's demand and identifying what is protected under the post-automation counterfactual. For the first purpose, any stable preference or constraint matters. For the second, researchers need to determine whether the demand remains when relevant functional deficits and false beliefs are addressed. A framework that combines those purposes without labeling them will overstate either today's substitutability or tomorrow's human employment.

There is also a danger in controlling away the very attribute under study. If someone values a genuine human commitment, telling her that a machine simulates the same words does not hold the product constant in her terms. Researchers should equalize instrumental attributes while allowing relational attributes to remain explicit. The correct experiment does not insist that the buyer should regard an imitation as equivalent. It asks whether the remaining difference carries value after relevant performance expectations are measured. This respects subjective preferences without treating every expressed concern as an immutable preference.

Statistical mediation can help but should not carry more weight than it deserves. Participants' explanations may be post hoc, and a measured association between a proposed mediator and choice does not automatically identify the causal mechanism. Directly manipulating personalized care, auditability, control, or producer involvement is more informative. Repeated choices after experience can also reveal whether a preference is robust, learned, or initially driven by unfamiliarity. Essential demand should be treated as a hypothesis about what enters value, to be tested with multiple designs, rather than a psychological diagnosis assigned to anyone who dislikes AI.

For an accessible white paper, a simple diagnostic is sufficient: ask what would have to change for the buyer to accept the automated alternative. Better quality, lower price, easier recourse, stronger privacy, or more control indicate potentially substitutable conditions. A demand that the actual person participate, that a real human made it, or that a specified human undertake responsibility points toward essential demand. Mixed answers are expected. Real offerings bundle motives; rigorous classification records the mixture rather than forcing a whole occupation into a single permanent category.

Presence, affinity, sport, and the missing bridge to jobs

Live performance and sport make the core intuition easy to grasp. A spectator can care that a person actually attempted a difficult action, that the result was uncertain, that a favored participant was involved, or that others witnessed the event together. These are plausible examples of human-specific value. They are not interchangeable with a preference for higher resolution, louder sound, or more impressive movement. However, plausible examples are not employment estimates. The empirical task is to identify which part of the event requires people and how that requirement translates into paid work.

Swarbrick and colleagues compared audience movement during a live concert with movement during album playback of the same songs. The final analyzed sample included 49 participants, with fans and neutral listeners. Movement was more vigorous during the live concert; prior attachment to the performer also mattered for engagement. Both conditions involved human-created music. The live and recorded performances differed in presentation and some musical features. Therefore the experiment supports the relevance of live context and affinity, but it does not isolate a pure human-versus-machine effect or measure willingness to pay. [E17]

This limitation is instructive. A live concert packages multiple goods: music, visible performance, shared attention, a social outing, participation in an occasion, and access to an admired person. A study comparing a live band with an audio recording changes many attributes simultaneously. An automated show could preserve some of those attributes while removing others. To locate essential demand, a research design should distinguish a recorded human performance, a live remote human performance, a live in-person human performance, and a disclosed synthetic performance. Audience composition and opportunities for social interaction should be described separately.

The distinction between performers and audiences matters. People may attend an event chiefly to spend time with other attendees. An automated production can supply the focal activity while

humans supply the community through their participation as customers. That is valuable human presence, but it does not necessarily create paid positions for performers. Similarly, a group could gather around a recorded human catalog, preserving affinity and provenance without purchasing new creative labor. Any employment analysis must specify whether the desired human is a worker, another customer, a volunteer, or a historical creator whose work already exists.

Sport presents a related but distinct mechanism. Consider a thought experiment in which an automated runner exceeds every human speed record. That performance does not necessarily replace a race among humans because spectators may be interested in what humans can do under agreed conditions. The category of achievement is part of the product. This is a conceptual example, not a finding from a controlled audience study reviewed here. The example remains useful if presented honestly: it illustrates how improved physical capability can fail to substitute for a desired human contest without asserting that all audiences will prefer the human event.

There are many plausible motives within that contest. A viewer may admire embodied skill, identify with a team, follow a particular athlete, enjoy uncertainty, share an event with friends, or participate in local civic identity. Some motives point toward human essentiality; others could attach to synthetic characters or automated competitions. A strong study would hold competitive balance, narrative investment, production quality, and social viewing conditions as comparable as possible. It would measure actual viewing choices or ticket purchases rather than ask whether people endorse human sport in the abstract. It would also compare new entrants with established favorites, because existing fandom supplies an advantage that an unfamiliar synthetic alternative lacks.

Leung, Paolacci, and Puntoni add an important adjacent finding. Across six studies, people identifying strongly with an activity resisted automated features that undermined attributing the activity's outcome to themselves. The paper concerns consumer activities such as cooking or recreation, rather than demand for hired workers. Its relevance is that doing something can be part of the desired good. However, a person's preference to cook, cycle, or perform personally can sustain leisure and equipment purchases while reducing the need to hire someone else. [\[E18\]](#)

This suggests a useful distinction between demand for human activity and demand for human employment. The former includes playing music with friends, raising children, practicing a craft, participating in sport, worshipping, volunteering, or pursuing a difficult skill. The latter requires a payer willing to compensate another person. A post-automation society could contain abundant human activity even if comparatively little of it were organized as employment. Conversely, paid participation can persist where customers prefer a professional's presence, expertise, or personal relationship. The two propositions do not conflict, and neither follows automatically from the other.

Affinity can support high value without supporting many workers. If buyers want one particular author, musician, instructor, or host, the demand is specific rather than freely transferable to anyone seeking work. Reproduction, broadcasting, and group delivery may allow that person's work to reach large audiences. This is a structural possibility inherent in the offering, not an empirical claim that every essential-demand market must become a winner-take-all market.

Local presence, accessibility, language, shared background, and relationship history could instead support many small markets. Research should measure the actual constraints that divide audiences and the degree to which consumers substitute among people.

The conversion from preference to employment requires at least five observations: the number of paying customers, their purchase frequency, the price they accept, the human time required per transaction, and the proportion of revenue available for labor. A sixth concerns whether purchases displace another human-intensive activity. More spending on one person's performance could reduce spending on another person's teaching or care. A source-label experiment supplies none of these accounting quantities by itself. It is therefore inappropriate to multiply a survey's human-preference percentage by current employment and call the result the essential sector.

A practical research agenda would begin with several carefully chosen markets rather than a universal headline percentage. One could study personalized gifts, live classes, advice, performances, and recurring support services. Each study would offer accurately disclosed alternatives, verify relevant quality attributes, vary the price difference, and record actual choices. A follow-up would assess satisfaction and repeat purchase. Provider-side observation would measure the human hours required to deliver the preferred option. The aim would be to estimate the paid human contribution associated with each motive, including combinations of motives, while leaving aggregate extrapolation until the measurement is credible.

Certification should be tested as part of the product. Buyers could be offered an unverified human claim, a documented human process, direct observation, or an established personal relationship. If willingness to pay depends strongly on verification, that finding would identify an informational condition for the market's survival. If inexpensive verification is enough, provenance markets may scale differently than those requiring personal witnessing. In either case, the study should measure the cost and labor content of verification rather than assume authentication creates substantial employment.

The evidence reviewed across these chapters supports a clear but bounded conclusion. Human involvement and beliefs about that involvement can affect value independently of observable output. It can matter through creation history, participation, personal attachment, and assigned responsibility. Some apparent human preferences also weaken when functional beliefs, control, or familiarity change, while AI can already produce benefits commonly described as relational. The unresolved question is not whether essential demand exists. It is which human contributions buyers insist on, how much they will pay for them, and how much paid human time those requirements actually sustain.

PART V

Accountability and applied cases

Accountability can reserve a human role without preserving an occupation

Accountability is the most consequential boundary problem in the four-axis framework. Presence, provenance, and affinity describe reasons someone might want actual human involvement. Accountability sometimes describes that same kind of preference, but it can also describe a method for compensating victims, a professional authorization rule, or an organizational control. These mechanisms have different implications for employment. Combining them into one undifferentiated claim that a human must always be responsible would conceal the question the framework is supposed to answer.

Start with a bridge. The public wants a bridge that remains standing, serves its users, and can be inspected and repaired. A purchasing authority wants reliable commitments from whoever supplies it. If a future automated engineering system could demonstrably design the bridge better than a human team, demand for the calculations would remain demand for a means to the desired result. A requirement that a qualified engineer review and approve those calculations might preserve a human approval role. It would not, by itself, preserve every drafting, calculation, checking, scheduling, or document-production job previously bundled into the project.

This is a counterfactual comparison, not a recommendation to replace engineering supervision today. Its purpose is to locate the human requirement. Is the human needed because the machine lacks competence? Because the law specifies an authorized practitioner? Because the purchaser wants a person who will explain and defend the choice? Or because the purchaser considers a human decision intrinsically necessary to legitimate construction? The first reason is a capability constraint. The second is an institutional constraint. The third may combine a capability constraint with affinity. The fourth is a constitutive demand for human authorization.

Four meanings that should be coded separately

Compensation. Someone injured by a defective service needs a solvent party against whom a claim can be made. That party can be a firm, a fund, or an insurer. A financial remedy does not logically require a human to have performed the original operation. The existence of a legal defendant therefore does not establish essential demand for an operating worker.

Authorization. An institution may reserve an act to a qualified individual. Human authorization is then necessary for valid supply under the applicable rules, even if customers have no independent taste for human involvement. This belongs within a broad definition of essential demand that includes legitimate provision, but it should carry an institutional label. Otherwise a changeable rule becomes mistaken for a permanent consumer preference.

Effective oversight. A human may be required to monitor, understand, challenge, or stop an automated process. That role can involve real labor. Its size depends on the frequency of review, the volume of cases, the complexity of intervention, and the permissible scope of delegation. A nominal signature and a meaningful review are not economically equivalent.

Moral or political answerability. People may insist that decisions affecting their lives be made or ratified by another person who can hear reasons, face criticism, and accept obligations. Here the human role can be part of what counts as an acceptable decision. It should not be collapsed into whether a system predicts outcomes accurately. Even excellent predictions do not determine who should possess decision rights.

The European Union's AI Act illustrates effective oversight rather than a promise of unchanged employment. Article 14 requires covered high-risk systems to permit oversight by natural persons, with measures proportionate to risk, autonomy, and context. Its specified capacities include understanding relevant limitations, monitoring, interpreting outputs, resisting automation bias, overriding outputs, and interrupting operation. This establishes a substantive role in covered settings. It does not establish a universal one-worker-per-system staffing rule. Application must be assessed for the relevant system and applicable implementation schedule. [C01]

Great Britain's Automated and Electric Vehicles Act 2018 illustrates compensation. The official explanatory notes describe initial insurer liability for covered accidents caused by insured automated vehicles while driving themselves, with recovery from responsible parties available under the statutory scheme. The economic lesson is that the compensation route can be organized around the vehicle and insurer. The example is the architecture of an enacted scheme, not a claim that all autonomous services were authorized or deployed when the Act passed. [C02]

Professional Engineers Ontario's 2022 seal guidance illustrates authorization plus genuine professional review. It explains that sealing signifies acceptance of professional responsibility for specified engineering content. Practitioners may accept documents prepared by others after appropriate review; sealing work in which they had no preparing or reviewing role is improper. The guidance also separates a seal from the underlying basis of negligence responsibility. The relevant distinction is professional obligation versus a mere mark on a document. [C03]

The labor intensity question

Consider three illustrative versions of an approval service. In the first, a practitioner independently repeats all the work before approving it. In the second, reliable validation tools allow focused review of consequential assumptions and exceptions. In the third, policy permits a responsible officer to govern a process and investigate exceptions without reviewing every

output. Each arrangement contains human accountability. Their demand for hours of human work can differ substantially.

The framework must therefore ask two questions. Must a human remain? How much human activity must remain per unit of output? Only the first is answered by identifying a human authorization requirement. The second determines how much employment it supports. If output expands, a smaller human contribution per case could still create substantial total employment. If output does not expand sufficiently, the authorized role can survive while aggregate employment contracts. Neither outcome follows from the word accountability alone.

Review also has a quality constraint. A human who is assigned thousands of cases without time, information, or authority may add very little control. It would be analytically misleading to count a ceremonial approval as evidence that society has preserved meaningful human judgment. Conversely, one should not assume that every approval can safely become ceremonial. The proper research object is a documented workflow: what the reviewer must know, what evidence is available, what intervention is possible, and what workload permits the duty to be discharged.

A related error is to count ownership as employment. Suppose an entrepreneur owns an automated service and remains legally responsible for the business. The entrepreneur may earn a return while performing little ongoing work. That income can arise from ownership, risk bearing, or control of scarce rights. Calling the person accountable does not turn the return into a wage. An owner who also spends twenty hours reviewing operations has two distinguishable economic roles, even when one person occupies both.

Finally, institutional demand is capable of change in both directions. Legislators might permit automated decisions once performance and remedies become satisfactory. They might instead reserve more decisions to humans because the public demands participation or legitimacy. Courts, professional bodies, insurers, customers, and workers can influence those choices. The analytical contribution is to identify where the human requirement originates and what it protects. It should neither dismiss every reservation as irrational nor promote every reservation into a timeless technological barrier.

Care and companionship contain separable demands

Care is often treated as the decisive example of work that must remain human. The word, however, bundles medication administration, lifting, monitoring, hygiene, interpreting symptoms, coordinating services, providing reassurance, sustaining relationships, and expressing concern. Some components are means to health and comfort. Others may involve a person's desire to be accompanied by another person. The ethical importance of care does not determine the classification of every activity inside it.

An illustrative patient needs help transferring from bed to a chair. Suppose a machine can perform that transfer more comfortably and safely, while respecting the patient's control over timing and movement. A preference for that machine would not imply rejection of human relationships. The patient might prefer automated physical assistance and still want visits from a familiar nurse. Equally, the patient might prefer a trusted person for intimate assistance even if a

machine achieves the same physical result. The difference concerns what is valued in that particular service, not whether care as a whole is human or mechanical.

There are at least three counterfactuals to distinguish. Can a machine reproduce an observable outcome? Can it reproduce the recipient's experienced quality? Would the recipient still choose it with accurate knowledge of its origin? A service could pass the first test and fail the second because the interaction is uncomfortable. It could pass the second under concealed authorship and fail the third because genuine human concern matters. It could also pass all three for one person while failing the third for another.

What the experimental evidence actually supports

Reis, Reis, and Kunde conducted two preregistered studies of digital medical advice, holding the advice constant while varying whether its source was described as a physician, AI, or physician with AI. AI involvement reduced perceived reliability and empathy and willingness to follow the advice. The design demonstrates an attribution effect. It does not establish that a biological preference would remain unchanged after equal long-term performance, familiarity, price, and institutional assurance. [C11]

Yin, Jia, and Waksalak separated actual message source from the source recipients believed had produced the message. AI responses could help people feel heard, while an AI label reduced that effect. Their findings support studying content quality and attributed human involvement separately. They concern structured supportive messages, not a full clinical relationship or a measure of the future labor market. [C15]

Ovsyannikova, de Mello, and Inzlicht studied third-party evaluations of empathetic responses in four preregistered experiments. AI responses were rated as more compassionate than the human responses used in the studies. The result challenges the claim that supportive wording is intrinsically beyond automation. Third-party judgments of written responses are nevertheless different from receiving sustained care, paying for it, or entrusting someone with a consequential decision. [C12]

Wenger, Cameron, and Inzlicht directly examined choice in four studies published in 2026. Participants tended to choose human empathy even though the AI responses they selected received higher ratings on several experience measures. This is particularly relevant to essential demand: source preference and experienced response quality can diverge. It is not evidence that everybody always prefers humans, that they will pay any price for them, or that a short experimental choice establishes the economics of lifelong support. [C13]

Rubin and colleagues varied human versus AI attribution across nine studies. Human-attributed empathetic responses were valued differently despite common AI origin, with emotional sharing and care especially relevant to the effect. Attribution experiments help isolate the meaning attached to origin. Because changing a label also changes beliefs about an unseen provider, they do not by themselves tell us how much of the preference is intrinsic valuation and how much is inference about reliability, commitment, or inner experience. [C14]

These studies should not be forced into a single verdict. One asks whether a response reads as compassionate. Another asks whether its recipient feels heard. Another asks which source

someone chooses. Another changes the beliefs attached to identical words. Essential demand becomes useful precisely because these are different dependent variables. A source can produce excellent language without satisfying every reason a person seeks another person's attention.

A familiar caregiver and a capable substitute

Consider an older person who has built a relationship with the same caregiver over several years. An automated substitute might know every recorded preference, remember past conversations, and manage practical tasks reliably. Yet the person may value being recognized by that particular caregiver. This would be affinity: the identity and shared history are part of the desired relationship. Hiring an unfamiliar human might also fail to provide it. Counting the entire preference as generic demand for any human would therefore overstate the substitutability of workers within the surviving market.

The same case contains derived elements. A familiar caregiver might be preferred because they know where medicines are kept, recognize a change in gait, or anticipate how to arrange a room. Those are consequential advantages that a better information system or robot could potentially reproduce. The analytic question is what remains after those performance differences are accounted for. Familiarity can be evidence of trustworthiness, a source of operational knowledge, a valued relationship, or all three.

Moyle and colleagues' cluster-randomized trial across Australian long-term-care facilities tested the robotic seal PARO, a look-alike plush toy, and usual care. PARO improved engagement relative to the plush toy; some comparisons with usual care favored PARO, while the agitation inventory did not distinguish the groups. The study establishes limited therapeutic possibilities for a nonhuman interaction, not replacement of the caregiver workforce. Its mixed outcomes are a useful guard against treating any socially responsive device as either useless or universally equivalent to care. [C07]

The practical implication is to examine bundles. A household could purchase fewer hours of manual assistance and more time with a favored person. It could replace paid companionship with machine interaction. It could use automation to free family members for visits, increasing human contact while reducing paid employment. These are distinct scenarios, not asserted forecasts. A finding that people want more connection does not determine which one occurs.

Contact, reciprocity, and consent

Presence should be defined more precisely than having a human body nearby. Physical copresence, synchronous interaction, attention, and reciprocal recognition are different attributes. Someone listening to a live voice call receives human interaction without physical proximity. A person sitting beside a distracted employee has proximity without much attention. An audience can share a room with a performer while receiving little individual recognition. Research should identify which form matters in each case.

Reciprocity may deserve treatment as a subdimension spanning presence and affinity. A person can value that the other party freely cares, is affected by the encounter, and has a life beyond the service. A system that simulates those signals might produce comfort without supplying the same relationship. Whether customers insist on the latter is an empirical question; whether the

system actually has the relevant inner capacities is a separate philosophical and scientific question. The labor-demand framework need not settle machine consciousness to measure choices under clearly stated beliefs.

No inference of essential demand should rely on deceiving recipients about who is present. If a customer pays for real human attention, replacing it with undisclosed automation changes the offered good. If a customer knowingly values a simulated companion, the enjoyment is still real as enjoyment, but it does not demonstrate demand for a human worker. Respecting this distinction allows the framework to describe both markets without making either side's experience disappear.

Education and childcare show why outcomes, relationships, and rules must be separated

Education is an unusually revealing case because the human receiving the service is also supposed to do something. A learner's practice, struggle, attention, and growth are part of the objective. Replacing the learner's intellectual activity with a machine can defeat that objective, even if replacing the instructor's explanation does not. The necessity of human learning therefore cannot be counted automatically as necessity for a human teaching workforce.

An illustrative adult wants to understand an accounting procedure. If an automated tutor provides clearer explanations, better practice, and faster feedback, the instructional component is derived demand: the tutor is a means to understanding. The adult may still prefer a named mentor whose approval matters or whose practical judgment they admire. That adds affinity or provenance. Someone studying for an exam may care little about either. Someone entering an apprenticeship may care substantially about membership in a professional community and recognition by experienced practitioners.

Kestin and colleagues tested a carefully designed AI tutor against in-class active learning in an undergraduate physics course. The randomized study reported superior learning outcomes for the AI tutoring condition in its specific setting. It supplies evidence that a real instructional function can be automated effectively; it does not establish that AI can replace every component of a degree, classroom, or teacher's duties. The comparison was a particular teaching design and bounded learning intervention, not the total institution of education. [C06]

Kuhl, Tsao, and Liu provide a useful counterweight. Their infant phonetic-learning experiments found learning from live Mandarin exposure but not from recorded audiovisual or audio-only exposure using the same speakers and materials. The result demonstrates that interaction can matter to learning in a particular developmental setting. It does not compare infants with contemporary responsive AI or establish a permanent inability of machines to support learning. It also identifies an instrumental advantage of live interaction, which should not automatically be relabeled intrinsic human preference. [C05]

Childcare contains an institutional floor

Childcare combines supervision, safety, nutrition, hygiene, attachment, social development, communication with parents, and opportunities to play. An estimate that classifies its entire wage bill as essential demand would need evidence about all those elements. A robot's eventual competence at cleaning a spill does not establish competence at responding to a distressed toddler. Conversely, the importance of attachment does not make cleaning a spill a human-specific good.

England's statutory Early Years Foundation Stage framework for group and school-based providers, effective from September 2026, requires at least one staff member for every five two-year-olds, alongside qualification requirements. Other ages and settings have different provisions. This is an actual institutional constraint on staffing in the specified setting. It is not evidence of an immutable biological ratio or permission to substitute machines for staff. [C04]

Consider a hypothetical nursery in which automation reduces paperwork, meal preparation, cleaning, and some monitoring burdens. If the applicable staffing ratio remains unchanged and attendance stays constant, the ratio may maintain the minimum number of staff even as their work changes. If the nursery was previously staffed above the minimum, some labor savings could still occur. If enrollment rises, total employment could rise. The rule therefore belongs inside the model, rather than being treated as either irrelevant or proof that all existing work survives.

Parents may also impose a stricter requirement than the law. They could choose a nursery advertising sustained contact with human caregivers even if a lower-cost automated alternative becomes legal. That would be market demand for actual human involvement. Its extent would depend on price, income, beliefs, culture, the child's needs, and the credibility of the service promise. The legal minimum and the voluntarily purchased human premium must be observed separately.

Who supplies the relationship

A classroom contains teachers and other children. If a child needs peer interaction, that does not establish that every explanation, worksheet, assessment, and lesson plan must be produced by a paid adult. A future school could, illustratively, use automated instruction while preserving peer activities and a smaller group of human supervisors. Another school might preserve a strongly human teaching environment and charge for it. Another might use automation to reduce teachers' administrative load while maintaining staffing. The framework distinguishes these possible bundles without pretending to know which will dominate.

There is a deeper measurement issue. The value of a child's friendship is not a teacher's wage. The value of a parent reading with a child is not automatically a commercial tutoring market. If automation frees time for these activities, society can become more relational while measured labor demand falls. Counting human flourishing and counting paid jobs are different exercises. Both matter, but they cannot substitute for one another in an employment estimate.

The same distinction applies to adult seminars. Participants may pay to join a group whose members challenge one another. Some of the service is provided by those paying customers. A

facilitator may organize the encounter, but it does not follow that the facilitator's current preparation and administration hours remain necessary. Participants' willingness to pay for access to one another might flow to a platform, a venue, or a club owner, rather than exclusively to teaching labor.

Mentorship and certification

A mentor can be valuable because they know more, because they know the learner, because they introduce the learner to others, or because their recognition carries status. The knowledge component is potentially derived. Shared history can generate affinity. An introduction can be access to a network. A certificate can be an institutional gate. Describing all four as human mentorship is intuitively reasonable but analytically insufficient.

Consider an examination board that requires a human examiner's decision. The human role is part of valid certification under that rule. It does not follow that the examiner must teach the candidate or personally mark every practice exercise. Consider instead a celebrated musician who personally recognizes a student's achievement. The recognition may have value because of that musician's identity. An otherwise qualified substitute might not satisfy the student, making this a case of affinity and provenance rather than generic professional authorization.

The useful research question is thus not whether teachers remain. It is which educational promises require which people, at what frequency, for how many learners, under which rules. This phrasing is both more demanding and more informative than a list of occupations deemed safe because they involve social contact.

Performance, ritual, and provenance make human participation constitutive

Some activities are defined partly by who performs them and the conditions under which performance occurs. A race is not merely transportation from the starting line to the finish. A chess match is not merely the production of strong moves. A religious rite is not merely a sequence of sounds and gestures. A portrait may be valued partly as an act by its maker. These cases make the distinction between outcome demand and human-specific demand especially intuitive.

The key is to specify the product at the right level. If a customer wants an attractive image for an anonymous background, human authorship may be incidental. If the customer wants a portrait made by their grandmother, a better-looking automated image does not fulfill the request. Both involve images. Their demand structures are different. Likewise, the fastest possible motion across a track and a contest among human athletes are different offerings.

Competition and the rules of achievement

FIDE's Laws of Chess prohibit players from using outside information or advice during play, subject to the rules' particular context and provisions. The restriction helps define the competitive activity. A machine's ability to recommend a stronger move does not make secretly

using it compatible with the same contest. The source establishes a rule-governed case of human performance, not an estimate of chess employment or a universal theory of sports preferences. [C09]

Consider an illustrative chess business. Fans buy tickets to watch human competitors, subscribe to their commentary, and discuss their careers. Human players can be essential to that event's identity. The board setup, lighting, ticketing, translation, scheduling, broadcasting, and some analysis remain separable. Preserving demand for the players does not preserve every job supporting the event. Indeed, automation could lower support costs while expanding access to a small number of highly sought-after players.

The participant side adds another distinction. People can continue playing chess for enjoyment even if no one pays them. Widespread participation establishes demand for an activity, equipment, access, or opponents. It does not establish an equally widespread supply of paid playing positions. A paid coach may survive through instructional quality or personal affinity, but neither follows simply from the continued existence of amateur play.

Rules can deliberately preserve a human contest without claiming humans are the best machines for its abstract task. That is an especially clear example of essential demand: the constraints are part of what spectators and participants want. It also shows why technical superiority alone cannot decide every substitution question. A motor vehicle can travel faster than a runner, but adding one changes the contest rather than improving the runner within it.

Ritual authority

The Catholic Church's Code of Canon Law reserves valid celebration of the Eucharist to a validly ordained priest in canon 900. This supplies a narrow, explicit case in which authorized human participation is part of a rite's validity. It should not be generalized to all religious traditions or every religious service. Nor is the example a claim about the truth of theological beliefs; it describes the institution's own conditions for the practice. [C10]

An automated system might supply a recording, explanatory material, translation, or scheduling assistance. Under the cited rule, reproducing the sensory surface of a celebration does not provide the same sacramental act. This is a different substitution problem from producing a more accurate weather forecast. The accepted identity and authority of the celebrant are constitutive features of the service.

Religious work still contains derived components. Maintaining a building, organizing records, preparing communications, and managing reservations are not made human-essential by association with a rite. Spiritual counsel may mix explanation, personal familiarity, community membership, and a recipient's desire for another person's concern. A single institution can therefore contain all four axes, alongside extensive derived demand.

Art, authorship, and authenticity

Newman and Bloom's experimental work on original artworks examined how valuation responds to an object's origin, creative performance, and connection with its creator. It provides evidence that visually similar objects need not have the same value when their histories differ.

Its findings concern particular judgments of authenticity and originality; they do not establish that every purchaser pays a premium for any human-made item. [C08]

An illustrative household purchases two pictures. One is an inexpensive decorative print selected for color and size. The other is a drawing made by the household's child. Machine production could satisfy the first demand without satisfying the second. The second object has provenance and affinity: its significance depends on who made it. Its value can be immense to the family while supporting no labor-market income at all.

A professional artist adds the possibility of payment, but payment is not identical to current labor hours. A collector may buy an existing work on the secondary market. A publisher may license an old photograph. A musician's catalog may continue earning revenue after recording has stopped. These transactions can reflect demand for human provenance while paying owners of assets or rights. An employment analysis must trace the payment to current human work before treating the entire expenditure as labor demand.

United States copyright policy offers a related institutional boundary. In its January 2025 report announcement, the Copyright Office said AI-assisted works can qualify when a human determines sufficient expressive elements, while mere prompts do not suffice under its analysis. This is a dated statement of the Office's position, not a claim that every later dispute has been resolved. It distinguishes legal authorship from whether consumers enjoy an output. [C16]

Live events and the possibility of splitting the bundle

Imagine a concert where attendees value three things: songs they love, the presence of a specific artist, and time with friends. Automated music might satisfy some demand for the songs. It cannot, by stipulation, supply the actual presence of the named person. Meanwhile the friends are fellow customers, not necessarily paid workers. The demand bundle contains derived production, essential performer involvement, and unpaid social value at the same time.

A recording complicates the picture further. It can preserve authentic provenance without current presence. A live stream can supply real-time performance without local proximity. A meet-and-greet can sell personal acknowledgment in addition to the performance. These are different quantities of scarce human time. Treating them all as experiences obscures how many customers one person can serve and where the resulting income goes.

The framework can accommodate all of this without predicting that entertainment becomes economically insignificant or infinitely expansive. The decisive requirement is narrower: identify the exact human contribution customers would regard as missing if automation supplied everything else. That contribution is the candidate for essential demand. Supporting operations must be evaluated separately.

Affinity, skilled services, and the difference between a surviving role and a large labor market

Affinity means that identity matters. A buyer wants this person, a member of this relationship, or sometimes a person from a meaningful community. It is stronger than saying a person is

currently the easiest source of the service. It is also narrower than generic preference for human provision. A replacement human may fail the affinity test just as a machine does.

Consider a trusted electrician. A homeowner might insist on the same electrician because they know the house, arrive reliably, explain risks clearly, and resolve problems. All of those are valuable. Some are informational or performance advantages, which in principle could be reproduced by another supplier. The homeowner might also enjoy the longstanding relationship and knowingly pay more to sustain it even when other suppliers provide the same results. That residual preference is affinity. The occupation label alone cannot reveal the share attributable to either mechanism.

The distinction does not trivialize skilled trades. Real environments, dexterity, fault diagnosis, access constraints, and safety requirements can make automation difficult. Those difficulties are capability and cost questions. Calling installation derived demand means the customer primarily seeks a functioning system; it does not mean a machine can perform the installation today or that the work is simple. A framework about why an input is demanded should not be mistaken for a current technical feasibility forecast.

Five illustrative service bundles

The haircut. A customer may seek a particular appearance, a familiar stylist's judgment, pleasant conversation, and the reassurance of being touched by a trusted person. The desired appearance is an outcome. The conversation may be human-specific or simply enjoyable. A trusted identity can matter independently of technique. Physical intimacy may make the preference stronger for some customers and automation more attractive to others. None of these possibilities licenses a universal classification of hairdressing.

The restaurant. A diner can value food, convenience, atmosphere, hospitality, and a chef's personal authorship. An automated kitchen could potentially provide the meal while a human host provides welcome. A chef's restaurant might preserve provenance even when most preparation is delegated. Another diner might value the social gathering with friends, where the human experience is supplied by the dining party. Spending on a meal therefore cannot be assigned wholesale to essential labor demand.

The executive adviser. A leader may purchase analysis, outside perspective, confidentiality, personal challenge, political cover, and a relationship with a named adviser. Analysis can be derived demand. A specific person's judgment or independent commitment may be part of the product. Political cover can be an institutional convention. If AI does the research and the adviser holds a shorter conversation, the valued human role can remain while the labor required for each engagement changes substantially.

The tour. A visitor may want accurate facts, navigation, local interpretation, safety, and conversation. Automated translation and explanation can address some elements. A resident telling stories about their own life supplies personal provenance. A trip with an admired explorer adds affinity. A walk with friends supplies peer interaction. The word experience fits every version while telling us little about which paid human inputs are indispensable.

The personal trainer. A customer may seek improved fitness, technique correction, scheduling, encouragement, social accountability, or the approval of a trusted trainer. Some functions could be performed by automated coaching. Others might depend on the felt significance of another person's attention. The relevant experiment would vary the provider and price while maintaining credible safety and effectiveness, rather than assuming that motivation must be human because humans currently supply it.

These cases are deliberately mixed. The framework becomes useful when it cuts through the bundle, not when it assigns every occupation permanently to one side. Different customers can demand different bundles from the same provider. One customer's essential component can be another customer's irrelevant expense.

Affinity can protect an individual without protecting entrants

If buyers want a particular person, increasing the supply of qualified strangers may do little to satisfy them. A retired musician does not automatically create demand for an unknown musician of equal technical ability. A departing counselor's clients may choose a substitute, but the relationship itself cannot simply be transferred like a file. The strength of identity-specific demand therefore has ambiguous implications for displaced workers seeking new occupations.

The supply of attention is also bounded. A person can have many recordings, subscribers, or admirers, but only so many hours of reciprocal engagement. Broadcasting expands the number of buyers reached by one creator; direct attention limits that scale. Both can support income. Their implications for the number of earners differ. A market organized around a few popular identities can be large in revenue while absorbing relatively few workers.

Locality can support a different pattern. A neighborhood class may survive because its members value a nearby instructor and each other's company. Yet geographical convenience by itself is not essential demand for humans: a nearby automated facility could also be convenient. The human-specific element must be identified separately. Nor does the persistence of local establishments establish that they can pay the wages workers previously earned elsewhere.

Control and property are not automatically labor

Coase's account of the firm distinguishes market contracting from coordination under an entrepreneur's authority. It provides a useful historical vocabulary for separating who directs resources from every operation carried out inside the organization. His article is not an automation forecast and does not establish what future management employment will be. The application here is to avoid assuming that the persistence of a directing institution preserves its current division of labor. [C17]

Imagine an owner who specifies acceptable outcomes, delegates operations, and receives profits. Some instructions may involve ongoing work. Some authority may arise simply from ownership. A manager employed to supervise a process supplies labor; a shareholder exercising a voting right exercises a property right; an elected official exercising public authority occupies a political role. A person may occupy all three roles across different settings. Aggregating them under human control makes the income consequences unintelligible.

Similarly, a scarce license may command returns because supply is restricted. An identity may command returns because fans want access. An artistic work may command returns because ownership rights exclude copying. Essential demand can coexist with all three, but the source and destination of income must be traced. The fact that a human receives money does not show that continuing expenditure requires continuing human labor in proportion to production.

A disciplined case record

Every occupation-level claim should be translated into a service-level record. Identify the buyer, the beneficiary, the particular output, and the existing human contribution. State what an automated alternative would have to match: quality, safety, speed, convenience, reliability, rights, and remedy. Then identify what would still be missing if those conditions were satisfied. Possible answers include a human's real presence, authentic authorship, valid authorization, or this person's participation. If nothing remains missing, the case concerns derived demand even when substitution is currently infeasible.

The record should also identify the purchaser's information. Does the customer know the source? Is the claimed human role genuine and verifiable? Is a stated preference backed by a purchase, a willingness-to-pay measure, or only a survey response? Are prices equal? Are users drawing reasonable inferences about risks that the experiment has not actually held constant? These questions prevent observed discomfort with a new technology from being treated automatically as permanent demand for biological labor.

Finally, record labor intensity and who receives income. Does one human serve one person, a room, an audience, or a population? Is the human work performed now or embodied in an old asset? Is it paid employment, self-employment, volunteering, household activity, or ownership? Can nonessential tasks be automated while the promised human involvement remains intact? A credible estimate of surviving work needs these distinctions before multiplying anything by the number of workers in an occupation.

The central implication is exact: actual human involvement can remain indispensable to particular valued services, while much of the labor currently surrounding those services remains instrumental. Finding the indispensable contribution is the first step. Establishing how many people it employs, for how many hours, at what pay, is a separate empirical task.

What past transitions reveal about the work that remains

Historical examples make the distinction between derived and essential demand concrete. They also show why the continued existence of a valued activity cannot answer the distribution question. An activity can survive while requiring fewer inputs; a human creation can reach more people while requiring fewer performances; and an employment category can remain large while containing extensive functional work and unfavorable conditions. Horses, cinema musicians, and domestic servants illuminate these separate mechanisms.

The cases supply observations about particular transitions. Their populations, job counts, and institutional arrangements measure different things. They become useful when the mechanism is identified before the numbers are interpreted.

Horses: the disappearance of an instrumental role

In 1915, USDA estimated 21.431 million horses and 5.062 million mules on American farms. By January 1960, its farm inventory recorded 3.089 million horses and mules combined. The American Horse Council estimated approximately 6.6 million horses nationwide in 2023. The modern estimate has broader geographic coverage beyond farms, and the 1960 observation combines two animals that the earlier series counted separately. Each number must retain its coverage label. [T01, T02, T03]

Scaled by population, the series runs from about 264 horses and mules per 1,000 Americans in 1915 (213 counting horses alone) to about 17 horses and mules per 1,000 in 1960 and about 20 horses per 1,000 in 2023. These are author calculations using rounded Census population estimates of 100.5 million, 179.3 million, and 334.9 million. Because the 1915 and 1960 counts cover farms only while the 2023 estimate covers all horses, the long-run decline is understated and the later recovery overstated. Even so, after six decades of rising income and recreational demand, the horse population stands below a tenth of its 1915 per-capita level.

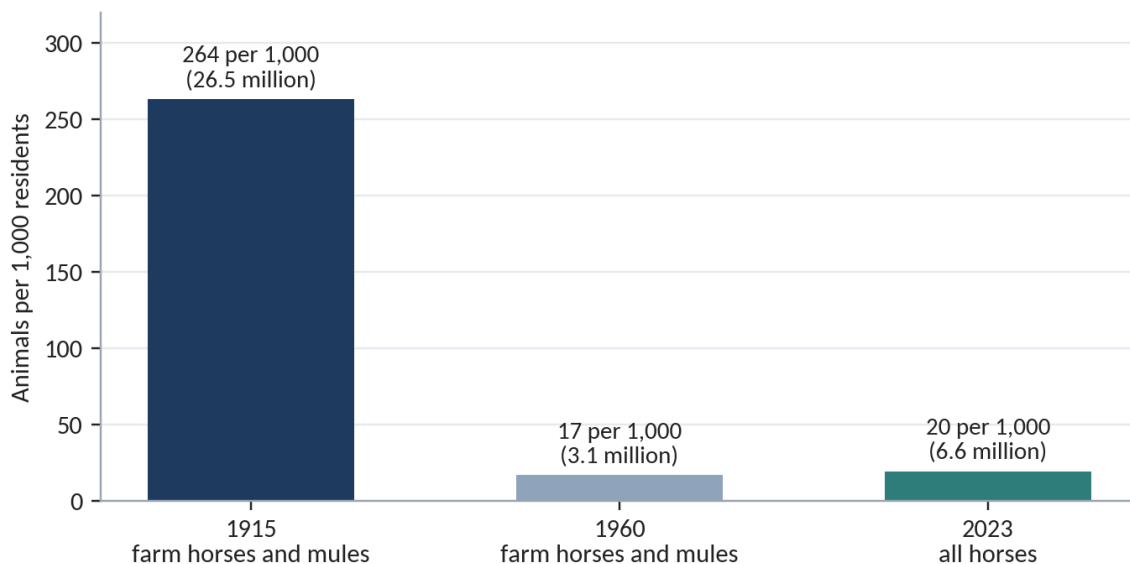


Figure 1. Animals per 1,000 U.S. residents: farm horses and mules in 1915 and 1960 (USDA), all horses in 2023 (American Horse Council). Counting horses alone, 1915 stands at 213 per 1,000. Author calculations using rounded Census population estimates.

The basic distinction is easy to see. A farmer seeking cultivated acreage could employ a horse to supply traction. The animal served as an input into an independently desired result. A tractor could perform that role without preserving the animal. Someone who wants to ride a horse, develop a relationship with it, or participate in an equestrian tradition buys a different experience. The horse's presence helps constitute the activity itself. This is an application of the

demand framework to the case; the historical statistics do not classify motives as derived or essential.

The two forms of demand can move in different directions. Losing an instrumental role does not eliminate every reason to keep horses. Equally, the persistence of equestrian activities does not establish that they will reproduce the population formerly required for agricultural and transport functions. Survival and restored scale are separate propositions.

The modern study adds another useful distinction. AHC reports its horse estimate declining from 7.2 million in 2017 to 6.6 million in 2023 while estimated economic impact and linked employment increased. Its reported employment impact covers direct and indirect jobs, and its study also analyzes induced effects. [T03] Thus the size of an animal population, spending associated with that population, and employment throughout its supply chains can tell different stories. An increase in an industry's economic footprint cannot automatically be translated into increased demand for the particular input whose survival is at issue.

The corresponding research discipline for human labor is to follow expenditure all the way to paid current hours and compensation. A flourishing cultural or recreational market could spend more on facilities, land, equipment, distribution, or rights while employing few additional people in the supposedly protected activity. That possibility must be measured within each market. It cannot be resolved by observing that customers still care about the activity.

There are clear boundaries to the horse analogy. Horses do not receive wages, choose occupations, own productive assets, or design public institutions. Their population is a biological stock managed substantially by people. Employment measures work relationships and labor supplied over time. The modern horse population also includes working uses alongside recreation. Consequently, the horse counts provide no numerical ceiling on future human employment.

The comparison has a lineage. In 1983 Wassily Leontief argued that humans would lose their place as the most important factor of production, much as tractors first reduced and then eliminated the role of horses on farms. [T09] In their best-known reply, Erik Brynjolfsson and Andrew McAfee identified two differences between people and horses: people's social demand for one another, and the fact that humans can own capital while horses cannot. [T10] The first difference is the subject of Essential Demand. The second is the subject of post-labor distribution policy.

The lesson is narrower and stronger: enduring demand for something can coexist with a dramatic reduction in its former instrumental role. Whether essential human demand is large enough to support broad livelihoods requires human spending and compensation evidence.

Sound film: human provenance and current human performance

The history of cinema accompaniment shows how human-created output can circulate more widely while repeated human performance contracts. AFM Local 47 reports that approximately 22,000 theater-musician jobs disappeared within three years of synchronized sound's introduction in 1927, while only a few hundred soundtrack jobs appeared. The national AFM's retrospective reports fewer than 200 new jobs. These are estimates in institutional histories,

rather than a matched longitudinal census of all displaced musicians and their later employment. [T04, T05]

The mechanism is replication. A soundtrack can preserve a human composition and a human performance while removing the need to perform the music anew at every screening. The audience may consume art with human provenance without purchasing the presence of a musician in the room. Labor embodied in a recording can serve many audiences. Revenue from replay can then reward production, ownership, and distribution in different proportions.

This mechanism sharpens the framework's distinction between presence and provenance. A live performance consumes current performer time. A recording makes earlier performer time available repeatedly. A right to distribute that recording can generate income for a rights holder. All three can involve something of human origin, but they need not generate the same number of paid human hours. The identity of the recipient matters: the performer, a studio, an intermediary, and a subsequent rights purchaser may have different claims on the proceeds.

Consider the implications for the statement that people will continue paying for humans. Some consumers may value a specific performer intensely. If those preferences can be satisfied through repeatable media, a small number of performances can serve a large number of purchases. The retained human contribution may be highly valuable while the quantity of new labor required per customer declines. The historical case identifies this possibility without requiring an assumption that every audience member preferred human provenance or that every recorded performance commanded a premium for it.

Institutions also changed the relationship between scalable output and paid work. AFM's history describes residual arrangements beginning in 1944 and disbursements in 1947 through a predecessor of the Music Performance Trust Fund. The fund's own account dates its establishment as an independent nonprofit to 1948. It describes funding from royalties paid by signatory recording companies, supplemented by co-sponsors, to support live performances offered free to audiences. [T05, T08]

This is an implemented distribution mechanism. Revenue from recorded products helps finance current musical employment and public access. Its existence demonstrates that ownership rules, bargaining, and funding arrangements can change who benefits from scalable production. It does not establish that those arrangements could support every displaced worker, nor that spending on recordings would automatically generate equivalent live work without the agreement.

The longer history also prevents a misleading residual calculation. Local 47 reports new opportunities from television and its membership reaching 18,000 during the 1940s-1960s. Membership in one local is not a national employment count or a full-time-equivalent measure, so it cannot be mechanically offset against earlier losses. [T04] It does show that a short transition in one use of music cannot describe the eventual size of the profession. The useful conclusion concerns production structure: human authorship can survive as repeated local labor gives way to concentrated creation and extensive reproduction.

Domestic service: task bundles and the terms of employment

Domestic service supplies a different lesson. The 1911 England and Wales census, reproduced in a 1923 U.S. Bureau of Labor Statistics bulletin, reported a net domestic-indoor-service industry total of 1,302,438 people, including 1,260,673 women. Its separate occupation classification counted 1,389,618 people. The industry table recorded 1,229,555 in agriculture and 971,236 in coal mining. Domestic service was therefore substantial, although industry and occupation counts must remain distinct. [T06]

Those totals do not measure essential demand. Domestic service bundles tasks with different reasons for purchase. Cleaning, carrying water, heating rooms, washing clothes, and preparing meals produce functional results. A preference for a particular carer, for personal attendance, or for the status conveyed by human service can add another component. Classifying an entire occupation as essential would count functional labor alongside the human-specific contribution and obscure the very distinction the framework seeks to measure.

Northumberland Archives describes daily work through household records and oral testimony: tending fires, fetching hot water, cleaning, managing supplies, and obeying detailed household routines. Its account also describes long working days and restricted time off. [T07] These details show how much practical production was involved in maintaining a household. A servant could participate in a social hierarchy while simultaneously performing labor whose demand was overwhelmingly instrumental.

The counterfactual question must therefore be applied task by task. If a machine supplied equally satisfactory clean clothes and the employer accepted them, the laundering component would be derived demand. If the employer continued paying for a specific person's company or attendance despite an adequate machine alternative, that component would meet the essential-demand test. Historical occupational totals alone cannot reveal the fractions.

The case also separates employment scale from employment quality. A market can absorb many workers while offering limited control over hours, unstable access to income, or little freedom within the employment relationship. To evaluate personal service as a distribution mechanism, researchers must examine compensation, predictability, autonomy, and the worker's ability to refuse or leave. A headcount does not contain those answers.

Patronage should be identified where the relationship warrants it. Domestic employment was not automatically a gift, artistic sponsorship, or allowance. Historical employers could finance household staff through wages, business income, property income, or combinations of these. The census does not identify their funding sources or purchasing motives. It therefore cannot establish that domestic service was universally sustained by capital ownership or that a future human-service economy must reproduce the same arrangement.

The defensible lesson is that a large personal-service workforce can coexist with significant inequalities in bargaining power. That makes the terms of employment central to the post-labor inquiry. It also reinforces the need to distinguish human-specific work from functional tasks embedded within human-facing occupations.

What the three cases permit us to infer

Together, these histories identify three questions that every essential-demand claim should answer. What exactly survives: an input, an activity, a person's current time, or a reusable product? How much current labor does the surviving activity require? How are its proceeds divided, and on what terms do people obtain them?

The answers cannot be inferred from preference alone. A buyer can continue valuing horses after replacing their traction; audiences can keep enjoying human music after replacing repeated local accompaniment; and households can employ many servants for largely functional tasks. Each example breaks a different assumed connection between valued activity and protected employment.

The cases also show why institutional design belongs beside demand analysis. The recording-fund example links scalable production to financed human work through explicit arrangements. Domestic service directs attention to bargaining and autonomy. These are mechanisms to investigate and compare with contemporary data. They provide no common numerical residual and no historical law fixing the share of livelihoods that essential demand can support.

PART VI

The Fourth Sector and structural transformation

The Fourth Sector: the automated economy as a quaternary sector

Why automation deserves its own sector

The classical three-sector model sorts production by how value is created: extraction from nature (primary), transformation of materials (secondary), and services (tertiary). Each sector came with a characteristic workforce, such as farmers, factory hands, and service workers, because until now every kind of production required people. Labor was incidental to the classification but central to its use: the history of structural change has largely been told as the movement of workers from one sector to the next.

Automation adds a fourth way of creating value: production by autonomous systems with little or no current human input. Food is still grown, equipment still built, and passengers still carried, but once those activities run autonomously, their defining economic feature is no longer the material they work on or the service they render. It is the absence of a required human workforce. That is why this dossier treats the automated economy as a true quaternary sector rather than as a technology trend inside the existing three. It is also the sector most congruent with post-labor theory, because it is the first one defined by what production no longer needs.

The Fourth Sector is the automated economy: production in which goods and services are generated without, or with minimal, current human labor within a stated production boundary. Activities enter it from the primary, secondary, and tertiary sectors as their production becomes autonomous, much as activities once moved from households into markets and from farms into factories. Its economic significance is that a growing share of useful production can expand without hiring people, so the income it generates flows chiefly to the owners of capital, land, energy, and data, and to the public through taxes.

Three classifications must still be kept apart. An industry code says what kind of activity is performed; the sector assignment says whether it requires current human labor; the derived-Essential distinction says why any remaining human input is wanted. An autonomous farm remains agricultural in industry statistics while belonging to the Fourth Sector, and a handmade

chair remains manufacturing while carrying human provenance. Keeping the three questions separate is what allows the four-sector account to be measured without double counting.

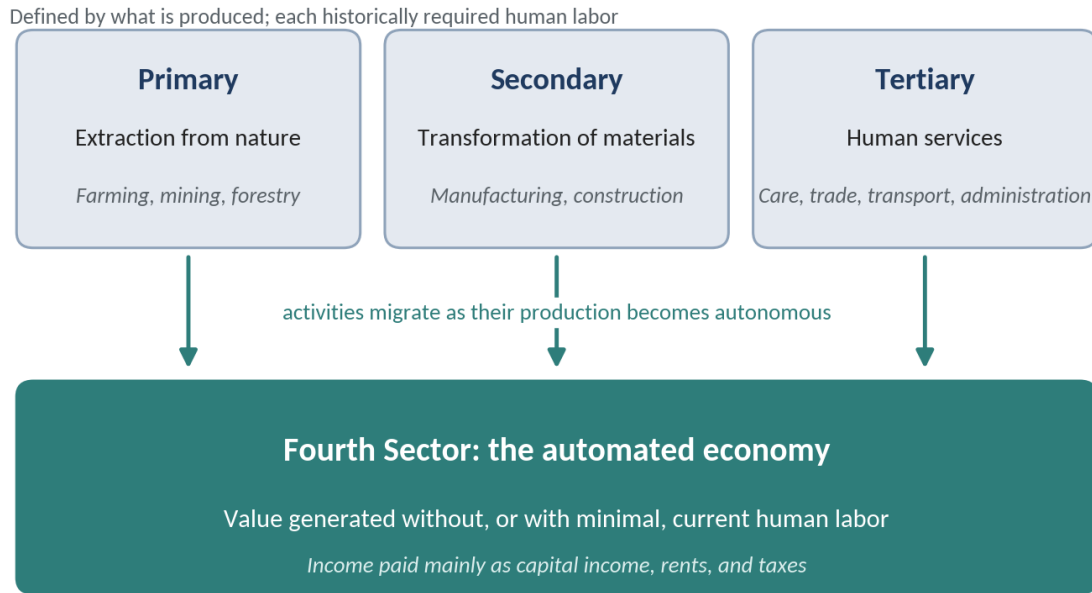


Figure 2. The four-sector model. The first three sectors are defined by what they produce, and each has historically required human labor. The Fourth Sector is defined by production that no longer requires it; activities migrate into it as their production becomes autonomous.

The historical sequence was never a single immutable taxonomy

Allan G. B. Fisher published “Production, Primary, Secondary and Tertiary” in 1939. [S01] Colin Clark’s *The Conditions of Economic Progress* followed in 1940. Clark associated higher real incomes with larger tertiary employment shares and described movement away from primary production. His boundaries also differed from some present textbook summaries: he placed mining with manufacturing and building in the secondary group. [S02]

Jean Fourastié’s *Le grand espoir du XXe siècle* appeared in 1949. In his own 1966 reflection, Fourastié revisited that book’s intentions, methods, and interpretation. [S03] His 1989 retrospective is particularly relevant here. He argued that attention should increasingly turn from a sequential rise and fall of sectors toward their interconnection and their broad exposure to technical progress. He discussed information technology and robotics as important parts of that development. This provides a historical bridge to an automation lens without implying that Fourastié forecast contemporary AI. [S04]

Fourastié’s own version of the model provides the bridge. He characterized the sectors by the pace of technical progress, moderate in the primary sector, strong in the secondary, and weak or negligible in the tertiary, and he expected services to absorb displaced workers precisely because their work resisted mechanization. [S03, S21] The Fourth Sector is the limiting case of his criterion: activities in which technical progress has removed current human labor from

production altogether. It completes the sequence on Fourastié's own terms while overturning his expectation that services would remain a permanent refuge for employment.

These contributions should be treated as a family of approaches to structural change. They do not establish that economic history must proceed through a fixed staircase, or that a sector receiving workers in one period must absorb them in every subsequent period. A historical transition can establish that a destination existed under certain technologies, institutions, prices, and preferences. It cannot, by itself, demonstrate that a destination with the same employment capacity will exist after those conditions change.

The distinction matters when service growth is presented as a complete answer to automation. "Workers previously moved into services" is a historical observation. "Services must always require enough human labor to employ everyone who wants work" is an additional proposition. The Essential-Derived framework investigates that additional proposition by examining the source of demand within services. It asks which human inputs buyers would retain after an adequate alternative becomes available.

Fourth and fifth sectors already have multiple meanings

Zoltan Kenessey proposed four broad groupings in 1987. His quaternary group included finance, insurance, real estate, services, and public administration, while his tertiary group emphasized transportation, utilities, and trade. He also discussed an earlier scheme by Foote and Hatt that used both quaternary and quinary categories differently. Kenessey's article therefore demonstrates variation in the labels; it does not establish one universally binding fourth sector. [S05]

A separate usage also exists in organizational theory. Heerad Sabeti's 2009 Aspen paper calls organizations that combine social missions and business practices a fourth sector; its starting categories are public, private, and social organizations. [Q01] In this dossier, "Fourth Sector" means the automated economy. Defining the term on first use keeps the two classifications distinct.

Earlier quaternary proposals, such as Kenessey's grouping of finance, insurance, real estate, services, and public administration, or the information and knowledge sectors proposed by other writers, carved human cognitive work out of the tertiary residual. They remained labor-defined categories whose members were knowledge workers, and advanced AI now automates much of that work. The quaternary sector implied by the model's own logic is therefore not a further subdivision of human services but the autonomous production that replaces them. Moving research or management from one human-service category to another does not settle whether people will be hired to do it; the Fourth Sector asks that question directly.

The derived-Essential distinction then operates inside every sector. One set of transactions purchases outcomes that autonomous systems can supply, and those transactions migrate toward the Fourth Sector as automation matures. Another set retains a human-specific component, and that component stays in human-dependent production wherever it occurs: a named grower's harvest, a craftsperson's chair, a teacher's mentorship, or an officeholder's decision. Existing industries need not disappear for their employment logic to change.

What official classifications do and do not establish

The U.S. Census Bureau describes NAICS as a production-oriented classification of establishments, grouping them by similarities in the processes used to make goods or services. It contains twenty broad sectors, rather than a four-stage sequence. [S06] Statistics Canada adds that input structures, labor skills, and production processes inform these groupings; its 2022 guidance also generally places internet-delivered activities with their nondigital counterparts. [S07] The UN's ISIC Revision 5, endorsed in 2023, updates an international classification of economic activities. [S08]

These systems are indispensable for organizing evidence, but none is an existing measure of Essential Demand. A payroll count in education tells us how many employees are classified in education. It does not reveal how much of their work customers demand because a human performs it. Likewise, an industry's high use of machinery does not establish that its remaining human roles lack essential components.

The Fourth Sector can nonetheless be measured with these systems. Retain each establishment's industry code for comparability, add a measure of its dependence on current human labor, and assign autonomous activity to the Fourth Sector without altering the industry totals. A workable assignment rule combines the autonomy levels defined below with an income test, such as labor compensation below a stated share of value added (for example, 10%), applied within a defined boundary and period. NAICS itself groups establishments by similarity of production process [S06], so a production-mode partition follows the logic of the official system even though no statistical agency yet publishes one.

The word “vestigial” should be reserved for a conditional scenario in which paid human activity has become small. Using it as the name of the residual category would quietly assume the outcome that the research is meant to investigate. “Human-essential production” leaves its eventual scale open. The framework can support a small residual market, a large market, or a mixture of thriving and shrinking niches without changing its definitions.

A matrix that separates industry, production mode, and human demand

Three questions for every case

An adequate map of the transition should ask three questions in sequence. First, what output or service is being supplied? Second, what combination of people, machines, software, and infrastructure supplies it? Third, which aspects of human participation would buyers deliberately retain if they could obtain the instrumental outcome without them? This sequence prevents the technology currently in use from deciding the demand classification in advance.

Consider a small architectural practice. Its current output includes drawings, regulatory submissions, spatial design, coordination, reassurance, and a named professional's responsibility. These are not economically identical. Some customers may value the building's eventual performance regardless of who drafted its plans. Others may purchase the authorship

of a particular architect. An institution may require a designated human decision maker. Those motivations can coexist within one project and one occupational title.

A single label such as “creative industry” or “professional service” loses this distinction. So does describing the whole practice as automated because drafting has been automated. The relevant unit is often a transaction or component of a transaction, followed by the human work necessary to honor it.

Illustrative cross-industry matrix

The following examples are conceptual classifications, not findings about measured current employment or about which technologies are already feasible.

Industry or activity	Outcome for which human labor may be derived	Human-specific component that could remain	Measurement implication
Agriculture	Reliable production and delivery of food	A named grower’s participation, a community harvest, or authenticated hand cultivation	Separate ordinary production from any verified human-origin premium
Manufacturing	A functional, durable object	A particular craftsperson’s authorship or documented manual process	Count the human contribution, rather than assigning every production task to it
Construction	A safe, usable building	Commissioned authorship, owner participation, or specifically required human responsibility	Distinguish design attribution, construction effort, and institutional sign-off
Transportation	Movement to a destination	A particular guide’s company or a human participant in a ritual journey	Separate transportation value from the purchased relationship or presence
Education	Learning, practice, feedback, assessment	Mentorship by a specific person, shared membership, or human recognition	Test which interaction is desired independently of learning performance
Health and personal care	Diagnosis, treatment, physical assistance	Chosen human companionship, continuity, or accountable judgment	Do not treat all contact time as proof of an irreducible human preference
Entertainment	An enjoyable experience	Authentic human performance, achievement, identity, or participation	Separate audience expenditure from the amount of paid human labor required
Administration	Coordination, records, allocation, and decisions	Legitimate human representation or assigned human responsibility	Identify the exact human obligation and its workload

The matrix illustrates why Essential Demand cannot simply become the new name for tertiary employment. It appears wherever a human-specific attribute is part of the purchased object. At

the same time, a service can be almost entirely instrumental. Physical proximity, conversation, and sophisticated cognition do not automatically transform instrumental demand into demand for humanity.

Production mode should describe dependence, not appearance

“Automated” needs an operational boundary. A shop with no customer-facing staff might depend on substantial remote support, maintenance, exception handling, model development, cleaning, and logistics. A workshop full of people might use automation for almost all the reproducible production while humans supply the valued performance and authorship. Looking through a window is not a labor-accounting method.

Three operational levels make the autonomy claim testable.

Production level	What has been established	What remains to be demonstrated
Human-assisted automation	Systems reduce effort while depending on human work	Reliable operation without the remaining required intervention
Autonomous operation	A defined output is supplied without current human intervention during a specified period	Maintenance, exceptions, replacement, and capacity expansion beyond that boundary
Autonomous renewal and expansion	The system can sustain and expand the defined production process, including its necessary inputs	Dependencies outside the measured system and any remaining resource constraints

A factory that runs unattended overnight has demonstrated a narrower capability than a supply chain that can replace its machines without workers. Likewise, a fixed crew can permit output growth while remaining indispensable. “Output expands without hiring” is a useful transition indicator, but it cannot by itself establish full autonomy. A few minutes of required human intervention can still be a critical bottleneck.

These states must be defined relative to a boundary and a period. “Autonomous dispatch during a shift” is narrower than “autonomous operation of the entire transport system over a year.” The broader claim includes maintenance, unusual events, upgrades, financing decisions, and infrastructure. A research paper can analyze the implications of eventual broad autonomy without pretending that a successful narrow demonstration already establishes it.

The demand axis is separate. A task can be technically difficult and purely derived. It can also be technically easy while containing Essential Demand: a buyer may want a friend to write a short personal message even when a machine could generate more polished prose. Difficulty measures a current production challenge. Essentiality concerns the desired character of the contribution.

Human-specific value and current labor form separate axes

The stock-and-flow matrix in the provenance chapter separates two questions: whether buyers require a human attribute and whether delivery requires current human labor. This distinction also belongs in the production accounts. A recording can retain human provenance while its

delivery becomes autonomous; a live encounter requires the promised person to participate again.

BEA classifies entertainment, literary, and artistic originals among intellectual property fixed assets. [Q09] For the proposed sector account, identify the human attribute, measure the current work required to supply it, and trace receipts to workers and owners. A human-origin sale does not automatically belong in the current-labor compensation column.

Bundles, premiums, and the minimum human contribution

One of the most consequential outcomes is a change in the size of the bundle supported by Essential Demand. A customer who wants a particular performer may currently finance a whole organization of assistants, coordinators, editors, distributors, and venue workers. The customer's preference can preserve the performer without preserving the previous labor requirements of the surrounding organization.

The same logic applies to personal advice. A client may insist that a trusted adviser review a decision. That preference establishes demand for the adviser's involvement. It does not establish demand for every hour of document preparation, scheduling, data gathering, or monitoring that formerly accompanied it. If those components become cheaper, the adviser can potentially serve more clients while each client still receives the desired human contribution.

The central empirical quantity is therefore not merely whether a human remains somewhere in the process. It is **how much authenticated human participation the buyer requires, at what price, and with what scope of responsibility**. A minimum contribution might be extensive, such as prolonged one-to-one presence. It might be brief but valuable, such as a personal decision. It might be a one-time contribution whose provenance supports repeated sales.

This distinction prevents a common counting error: retaining one essential component does not imply retaining the current occupation unchanged. Occupational survival, task survival, hours survival, and income survival are separate outcomes. Any later BLS-based exercise should report which of these it estimates.

How to measure the Fourth Sector without double counting

A proposed automated-production account must not add the same output twice. A robot-made appliance already appears within manufacturing output. Its sale cannot be counted once as manufacturing and again as an additional contribution from automation when calculating total GDP. Instead, researchers can allocate existing value added among production modes, or publish a supplementary indicator of exposure, adoption, and labor dependence.

The distinction also applies to inputs. Buying automation equipment is investment. The later output produced with it is part of subsequent production. Assigning all downstream output to the equipment manufacturer would collapse the input-output chain and erase useful distinctions between suppliers and users. The automation lens should illuminate that chain, not replace it with an inflated total.

A practical account preserves industry totals and subdivides activities using explicitly stated criteria. To produce the four-sector view, autonomous production is first removed from the

conventional primary, secondary, and tertiary groups and placed in the Fourth Sector. The resulting partition must still sum to the original total: the industry tables remain unchanged, and the four-sector table is a second view of the same value added.

The OECD's Digital Supply and Use Tables provide a useful methodological precedent. They distinguish transactions, products, and producers within a framework based on conventional supply and use accounts. [Q02] An autonomy account would extend that approach to a different question. It would remain a proposed research account, rather than a statistic already produced by the OECD or BEA.

Field in an autonomy account	Why it is needed
Product, industry, boundary, and reference period	Defines the output and the system being evaluated
Direct paid and unpaid human hours	Captures work that a payroll-only measure can miss
Upstream labor and imported inputs	Detects dependence moved into suppliers or other countries
Required interventions and their causes	Identifies rare but indispensable human decisions or repairs
Renewal and expansion requirements	Tests whether autonomy persists as equipment wears out or capacity grows
Verified human attributes	Separates chosen human participation from instrumental necessity
Value added, compensation, and ownership	Connects production dependence to income distribution

BEA's requirements tables trace production needed directly and through input suppliers. [Q04] Combining such relationships with compatible human-hours data can estimate embodied labor under the observed technology. Those coefficients describe the production system from which they were measured; replacing them with assumptions about future machines creates a scenario. Domestic tables also leave imported labor outside their direct coverage.

Durable capital needs its own explicit boundary. Producing replacement equipment requires resources even when the equipment later operates autonomously. A life-cycle analysis can allocate that production over the equipment's useful output, provided it avoids counting the same capital formation twice. Low direct employment in a power plant or data center therefore invites an investigation of its suppliers, maintenance, and replacement cycle. It does not finish that investigation.

A low compensation-to-value-added ratio is similarly an indicator requiring interpretation. It can result from automation, high rents, low pay, or outsourcing. Physical labor requirements and critical dependencies must be measured alongside the income share. The proposed Fourth Sector account becomes useful precisely because it keeps these different mechanisms visible.

The Fourth Sector in today's accounts

Prototypes already appear in the national accounts. BEA records owner-occupied housing as a service that homeowners rent to themselves [Q06]; the imputed rental of owner-occupied nonfarm housing was about \$2.52 trillion in 2025 [Q05], on the order of 8% of GDP [Q12]. It is a consumer service generated almost entirely by a capital stock, and the income it represents is distributed by ownership rather than by current work. The housing discussion later in this part explains why it is only a partial analogy; as an accounting object, it shows that the national accounts already record large flows of value whose income follows ownership.

Some industries already operate near the threshold in direct terms. EPI's tabulation of the BLS employment requirements matrix shows about 1.0 direct job per \$1 million of final demand in electric power generation, transmission, and distribution, 1.3 in oil and gas extraction, and 0.7 in natural gas distribution. [Q10] Direct employment omits suppliers, maintenance, and capital replacement, as the preceding paragraphs caution. The BLS matrix also reports total requirements, including indirect employment through suppliers, which makes it the natural starting point for a Fourth Sector indicator. BLS withdrew those tables in February 2026 to correct an error and said corrected tables would accompany its next projections release, published on 27 August 2026. [Q11]

None of these observations establishes full autonomy. Together they show where measurement can begin: labor content per dollar of final demand, compensation as a share of value added, and the autonomy levels defined above, tracked over time as activities cross into the Fourth Sector.

Why higher spending on human services does not settle employment scale

Four outcomes that must be kept apart

A future Essential Demand market could be large in expenditure and small in employment. It could also employ many people while generating modest total income. Understanding this requires distinguishing the quantity of experiences purchased, the human hours needed to supply them, the prices paid, and the distribution of receipts. The existence of one does not fix the others.

Suppose households become wealthier and spend more on a celebrated performer. A larger audience can increase total revenue without a proportional increase in the performer's working hours. Alternatively, households might buy more individual instruction, where additional customers require additional appointments. Both markets contain a human-specific preference; their employment consequences differ because the human contribution scales differently.

For clarity, a minimal accounting identity is enough:

Within one service type and period, paid human hours = purchased units × human hours required per unit. Sum across service types for a total.

The identity is not a behavioral theory. It reveals which claims require separate evidence. Rising purchased quantity cannot guarantee rising labor hours when the hours needed per unit decline. Rising revenue cannot guarantee rising quantity when the price increases. And rising compensation at the top cannot demonstrate that opportunities are spreading across workers.

What structural change research contributes

Herrendorf, Rogerson, and Valentinyi show that the interpretation of structural change depends on whether sectors are defined through final expenditures or industry value added. In their U.S. analysis, the relative importance of income and price effects differs between those approaches, with input-output relationships reconciling the results. [S10] This is a direct warning against moving casually from “people spend more on services” to “service labor necessarily gains.”

Ngai and Pissarides derive conditions under which employment producing consumption goods shifts toward the sector with the lowest productivity growth while aggregate growth remains balanced. Their result depends on a specified model, including preferences and technologies; it is not an unconditional employment guarantee for every future service. [S11] Boppart’s analysis allows both relative-price changes and income effects to contribute to structural transformation, and recognizes that expenditure patterns differ across household income levels. [S12]

These papers establish useful mechanisms and distinctions. The further application to Essential Demand is this dossier’s inference: one must investigate the human-specific component of expenditure, then its production requirements. Treating all future services as the low-productivity destination assumes exactly what advanced automation puts in question. Some services may retain a human time constraint; others may become highly scalable even if their output remains categorized as a service.

A luxury can become a machine-produced luxury

The proposition that demand expands with income is compatible with several futures for labor. A wealthy household might seek more educational support, elaborate virtual environments, improved health, tailored entertainment, or finer control over its surroundings. Those are expanding desires for outcomes. Their income elasticity does not establish that their production must employ humans.

For a human-specific market, the question is narrower: how much additional income is spent *because* a human is present, responsible, personally favored, or the authenticated source? An expensive product can embody little additional human labor. A cheap product can embody much. Price and essentiality are separate dimensions.

A luxury watch makes the ambiguity visible without resolving it in advance. Buyers might value mechanical performance, brand membership, scarce design, historical continuity, hand finishing, resale expectations, or association with a particular maker. Only some of these attributes require present human labor. Even authenticated human provenance may be supplied by a relatively small contribution. The analyst must examine the claim the buyer values rather than translate “luxury” into “many protected jobs.”

Conversely, an inexpensive local activity may rely heavily on human presence. A modestly priced discussion group can contain more recurring human time per dollar than a prestigious collectible. If the research focuses exclusively on high-spending markets, it can miss dispersed forms of Essential Demand. The appropriate comparison is between the content, amount, price, and distribution of human participation.

Baumol's mechanism under a changed wage anchor

Baumol's 1967 analysis links divergent productivity growth with relative service costs under assumptions about wages across activities. He also distinguishes labor serving as an input from labor constituting the product. [H04] The historical analysis is discussed elsewhere in this dossier; the following is a new conditional application.

Suppose automated production becomes highly productive but employs very few people. One cannot simply carry over the assumption that rising productivity there will bid up the wages of a large workforce, which will then transmit those wage increases into human-intensive services. The former outside option may have changed. Income might reach households through ownership, transfers, public provision, employment elsewhere, or some combination. The resulting demand for human services must be modeled using those channels explicitly.

This does not mean that human-intensive wages must fall. A society with broad purchasing power and a strong preference for human services could support high compensation. But the mechanism would depend on the distribution of income, willingness to pay, scarcity of suitable providers, institutions, and competition. It would not follow merely from improved machine productivity.

Now consider a human service whose real quantity is fixed while its price rises. Its share of nominal expenditure can grow substantially. This can increase provider income and measured value added without employing more people. In another case, automated goods become much cheaper while human service prices stay unchanged. The share spent on the human service can rise even with unchanged purchases. Both examples show why expenditure shares alone are insufficient evidence of labor absorption.

A larger expenditure share can require no additional work

Relative-price changes can make a human-service sector look larger while its real workload stays unchanged. Consider a household buying two fixed baskets:

Illustrative spending at unchanged quantities	Automated basket	Human-service basket	Human-service share
Initial prices	\$800	\$200	20%
Automated basket becomes cheaper	\$200	\$200	50%

The household buys the same human services in both cases. Their share of its spending rises from one-fifth to one-half entirely because the other basket becomes cheaper. No additional human hours follow from the arithmetic. How the household spends its remaining budget is a further behavioral question. The example isolates a denominator effect; it is not a complete economy-wide equilibrium.

The reverse lesson matters for the automated sector. Autonomous systems might supply most useful outcomes while their falling prices keep their nominal value-added share modest. “Most physical output,” “most useful services,” “most nominal income,” and “most consumer benefit” identify different forms of dominance. A post-labor account should name the measure it claims to explain. BEA also cautions that separately chained industry values generally cannot be added to construct exact real-output shares. [Q03]

A worked contrast without a forecast

Imagine two hypothetical communities with equal total spending on human-specific services. In the first, consumers devote most of it to a few creators whose work is distributed widely. In the second, consumers purchase scheduled sessions from many local providers. The spending totals match, but the hours and people supported can differ greatly.

Now give both communities better automated administration. Creators may increase distribution without hiring a support team. Local providers may spend more of their working day in direct interaction and less on paperwork. That improvement can raise their income or lower customer prices. Depending on demand, it can increase total sessions while reducing the number of providers needed for any given quantity of sessions.

Neither community proves that Essential Demand is too small or large enough. They demonstrate why the scale question has several moving parts. A convincing answer needs preferences, purchasing power, technical delivery, and labor organization. The framework is most useful when it makes these dependencies explicit, rather than replacing one unsupported assurance with an unsupported collapse estimate.

Time, attention, concentration, and unpaid alternatives

Consumers have a production constraint too

Becker’s time-allocation framework treats households as combining purchased inputs with their own time to produce valued activities. Consumption therefore faces a time constraint as well as a money constraint. [H06] Simon’s account of information abundance emphasizes the scarce attention of recipients and the importance of conserving it. [R10] Neither author estimates future Essential Demand; both help identify variables that a serious estimate must contain.

The application here is straightforward. More purchasing power can increase spending on human activities, but consumers must still participate, watch, read, listen, travel, or maintain a relationship. Some activities can overlap; others compete directly for the same hour. The possibility of unlimited monetary spending does not imply unlimited time spent receiving human services.

This constraint is especially relevant to scenarios in which everyone becomes a performer, guide, mentor, adviser, or companion. Each provider's market consists of other people who also have finite attention. Adding suppliers does not itself create more hours of customer participation. It can create more choice, better matching, lower prices, or finer specialization, all of which may be valuable. Whether it creates enough paid work depends on how much additional consumption these improvements induce.

Time scarcity is not a hard ceiling on monetary value

Finite time does not mean that revenue must stop growing. Consumers can spend more per experience, choose higher-priced providers, purchase scarce access, or acquire objects with valued human provenance. A person can also pay for an option that is rarely exercised. The time budget limits some quantities; it does not put a fixed ceiling on prices, asset values, or willingness to pay.

Nor does a physical time limit immediately establish a small employment share. One-to-one activities can require one provider hour for each consumer hour. If many consumers devote substantial time to them, the aggregate workload can be large. Some activities involve several providers per consumer, such as an ensemble performing for a private audience. Others involve one provider serving many consumers simultaneously. The relationship between customer hours and worker hours must be specified.

This is why an intuitive argument about saturation should distinguish three objects: available consumer time, the share of that time devoted to paid human participation, and the labor intensity of the resulting activities. All can change. Reducing obligatory work could expand available time, while attractive unpaid alternatives could reduce the paid share. Group delivery could increase access while lowering worker hours per participant. A useful model allows these changes to work in different directions.

Superstar markets demonstrate one possible distribution

Rosen's superstar analysis combines imperfect substitution between providers with technologies that allow many consumers to share a provider's output. Under those conditions, relatively small quality differences can support very large differences in earnings and market reach. [S14] Applied to Essential Demand, this suggests that protecting human identity does not necessarily protect a broad distribution of work.

The inference should remain conditional. Not every human-specific market has a single ranking, globally scalable delivery, or consumers who agree on the best provider. Affinity can be intensely personal. Language, place, schedule, shared history, community membership, and taste can produce many separate markets. A person who wants a familiar local host may not regard a famous remote host as a close substitute.

The contrast is between two plausible forms of differentiation. In vertical differentiation, consumers largely agree about whom they prefer, and greater reach can concentrate demand. In horizontal differentiation, consumers want different people for different reasons, allowing more providers to coexist. Actual markets can contain both: widely recognized celebrities alongside local or highly specialized relationships.

For this reason, “Essential Demand will be winner-take-all” is too strong as a general proposition. “Some scalable forms of Essential Demand are vulnerable to strong concentration” is defensible. The empirical task is to identify which markets have the relevant structure and whether their growth generates income broadly or mainly raises the receipts of a small group.

The unpaid alternative is central, not peripheral

A society can contain more valuable human interaction while employing fewer people to provide it. Friends may spend more time together, parents may have more time with children, amateur groups may perform more often, and communities may organize more mutual support. These are possible sources of human flourishing. Their expansion does not automatically appear as paid labor demand.

The BEA’s household-production accounts explicitly measure activities outside standard market GDP, including cooking, cleaning, and care. [S18] Its 2026 expansion reports household production at 16 percent of extended GDP and 30 percent of extended personal consumption expenditures in 2024. The differing shares reflect differing denominators. These figures describe a broad nonmarket-production account; they are not measurements of Essential Demand. [S19]

The methodological implication is more useful than treating either percentage as a forecast. Human activity and market activity overlap only partly. An imputed value for unpaid care does not mean that households would buy the same amount of care at that price, or that the care intrinsically requires a human. BEA’s valuation procedure uses survey time and replacement-wage information; an accounting value is distinct from a demonstrated willingness to pay. [S20]

The same distinction applies to relationships. Wanting companionship may lead someone to pay a provider, join a free group, spend time with relatives, or choose a machine-mediated alternative. A credible forecast cannot count all desired social interaction as future employment. It needs evidence about the share that becomes a transaction and about why that share would change.

Marketization can run in more than one direction

Buera and Kaboski explain a historical growth mechanism in which demand shifts toward specialized, skill-intensive output as productivity rises, increasing the importance of market services relative to home production. [S13] This establishes a reason that richer households can buy more services. It does not establish that every future rise in productivity must marketize the same activities.

The new question is what households can produce for themselves with automated assistance. If professional-quality planning, instruction, or equipment becomes available at low cost, some services may move into the household. At the same time, greater income can support new specialized purchases. These forces can coexist: households might do more of one activity themselves and buy more human participation in another.

A post-labor research agenda should therefore treat marketization as an outcome rather than a permanent direction of travel. For Essential Demand, it matters whether customers want the human provider or merely lack another convenient way to obtain the result. It also matters

whether the desired human is someone already present in their personal life. A household member's newly available time can be a competitor to paid services without reducing the value of human presence.

What time use data can actually tell us

The 2025 American Time Use Survey, released in June 2026, reports roughly 5.2 daily hours of leisure and sports for people age fifteen and over, with about 2.6 hours devoted to television and 35 minutes to socializing and communicating. [S17] These figures describe present activity under present conditions. They cannot be read as a fixed capacity for future human-service consumption.

Their best use is disciplined calibration. Researchers can ask which existing activities would lose or gain time, distinguish main from simultaneous activities, and preserve differences across ages and household situations. They should not treat retirement or unemployment as an experimental preview of universal abundance: income, health, social expectations, and selection into those states differ. Time data constrain a scenario; they do not determine preferences in a world that does not yet exist.

What wage sufficiency would require

"Support an economy" contains several questions

The phrase "Can Essential Demand support an entire economy?" needs unpacking before it can be answered. One question concerns the production of material necessities. Another concerns whether most adults can obtain income by selling their labor. A third concerns whether people can participate in valuable activity. A fourth concerns whether purchasing power reaches households sustainably and broadly enough to maintain demand.

In a hypothetical economy where automated systems produce most material output, Essential Demand would not have to manufacture every necessity through human labor. It could be a small share of total production while human welfare remained high, provided people had access to automated output. That would not demonstrate that Essential Demand can sustain universal employment. It would demonstrate that welfare and employment had become partly separable.

Conversely, a large number of human-service jobs would not by itself guarantee broad prosperity. Jobs might be poorly paid, irregular, unequally distributed, or dependent on a narrow group of purchasers. The relevant evaluation needs the joint distribution of hours, earnings, costs, and access to goods. A count of occupational titles is insufficient.

Individual earnings, household income, and access

A primary wage-distribution mechanism must give a broad range of households a dependable route to an adequate standard of living through paid work. That is a stronger requirement than positive employment, rising average earnings, or a large wage bill concentrated among a few providers. It includes the people who can obtain paid work, the compensation they receive, its reliability, and the needs of those who share their income.

The unit matters. One good job may support several household members; two intermittent jobs may fail to support one household. Adults differ in their ability to work, caring responsibilities, health, and access to local markets. A headcount of workers cannot be equated to a count of adequately supported households. A serious sufficiency test therefore follows earnings into households, allows pooling, and records dependents and household size.

Access must be measured separately from cash. Publicly provided housing, healthcare, transport, or education can reduce the income required to live well. Broad capital ownership can allow households to combine modest earnings with adequate nonwage resources. In either case, a small wage contribution can coexist with a high living standard. That outcome would show the success of a combined distribution system, rather than establish wages as its primary source.

Test	What it asks
Compensation capacity	How much current human compensation can the market fund?
Worker coverage	How many people can obtain adequate, sufficiently reliable earnings?
Household coverage	After income pooling and dependents, how many households are adequately supported?
Access to necessities	Which needs are met through cash purchases, assets, or public and nonmarket provision?
Resilience	How well does access survive illness, unemployment, aging, or a loss of customers?

Adequacy needs a stated benchmark and period. The same nominal compensation can buy more when reproducible goods become cheap, while scarce housing locations, care needs, or access fees remain expensive. Comparing a future income share with today's share cannot replace a real household-budget test. Nor can a favorable aggregate average substitute for the distribution of outcomes.

The funding question cannot be skipped

Demand requires purchasing power. If the scenario under investigation removes a substantial portion of wage income, a claim that households will buy enough new human services must specify where their budgets come from. Possibilities include income from remaining employment, ownership of productive assets, transfers, public purchasing, and access to services outside monetary exchange. Each implies different patterns of demand.

This does not prescribe one allocation system. It identifies a dependency in the analysis. A forecast that assumes widespread consumer purchasing power while separately assuming the disappearance of its current source must join those assumptions with an explicit mechanism. Otherwise, the conclusion is supplied by an unexplained budget.

It is equally important not to confuse nominal recirculation with the source of real prosperity. People paying one another for human services can generate genuine value and income. Whether those incomes buy abundant material goods depends on the automated productive base, ownership and pricing, public institutions, and resource constraints. The distinction between

human-essential transactions and instrumental production helps make those relationships visible.

Concentrated purchasing power: measure the relevant demand

The distribution of purchasing power matters because providers need paying customers. However, a statistic about all consumption does not reveal the share spent on human-essential services. Nor does an income decile correspond neatly to a group of capital owners: high-income households can receive substantial earnings from work.

The available spending measures illustrate the problem. Moody's Analytics estimates personal outlays by allocating financial flows and disposable income across demographic groups, then subtracting estimated saving. Its March 2026 methodology includes federal-tax adjustments and defines outlays more broadly than consumption alone. [Q07] These are model-derived estimates. They should not be described as an official Federal Reserve observation of household purchases.

A 2026 Minneapolis Fed comparison reported a top-decile share above 45% in Moody's outlays estimates, compared with 23% in 2024 Consumer Expenditure Survey spending and 25.7% in the 2023 prototype PCE distribution. The periods, coverage, and methods differ. [Q08] Those discrepancies prevent the older 49.2% headline from serving as a precise calibration for a future human-service economy. Analysts note that the CE tends to understate spending by high-income households, while Moody's figure is model-based, so the true share is uncertain and plausibly lies between the two. [Q08]

The appropriate next step is to identify human-essential purchases by income and wealth group, then trace what share reaches current workers. Until that evidence exists, concentrated purchasing power belongs in explicit scenarios. It cannot be converted into a measured human-demand share by relabeling total consumption as luxury spending.

Three coherent scenarios, none established by definition

Broad access with diverse local demand. Automated production creates affordable goods and services; purchasing power is widely distributed; households devote substantial time and money to human relationships, community activities, and personalized participation. Many providers can participate because preferences differ and local presence matters. This scenario offers favorable conditions for dispersed Essential Demand. Its uncertain variables are the paid share of interaction, the amount of human time required, and how many people wish to supply it.

Broad access with extensive unpaid participation. Material access is again widespread, but people prefer to spend much of their additional time with family, friends, clubs, and voluntary associations. Paid human markets exist and some flourish, yet much human-centered activity remains outside employment. This scenario can generate substantial social value alongside a modest labor market. It demonstrates why a small employment share need not imply an impoverished human life.

Concentrated purchasing power with concentrated human markets. Automated productive income accrues narrowly, and human-specific spending is dominated by affluent buyers or by

scalable star markets. Some people earn very high incomes; many others compete for limited local work. Essential Demand exists, but its distribution does not automatically replace the broad wage base. This scenario illustrates a distributional risk, not an inevitable consequence of the framework.

The scenarios differ without requiring changes to the core distinction between essential and derived human inputs. Their differences arise from institutions, market organization, preferences, and production technology. The framework locates the remaining human dependence. It does not secretly determine the society built around it.

A scale analysis that does not start with a predetermined percentage

A useful first pass would identify transaction types rather than announce a national job-survival number. For each type, record the human attribute requested, the amount of participation required, the availability of unpaid alternatives, the degree of simultaneous service, and the distribution of current receipts. Then record where evidence is observed and where it is assumed.

Next distinguish a baseline accounting exercise from a scenario exercise. The baseline asks how current work and spending are arranged. The scenario asks how they might change under specified technologies and institutions. A baseline classification of current occupations cannot, without additional assumptions, predict the future composition of work. Entirely new human activities might develop; familiar activities might move outside markets; and current human premiums might strengthen or weaken.

The analysis should also distinguish a lower-bound presence claim from an employment claim. Finding that some consumers pay for verified human participation demonstrates that Essential Demand is nonzero in that market. It does not measure how many providers can earn a livelihood there. Estimating the latter requires quantity, price, hours, and distribution.

For example, an experiment might show that buyers prefer an authenticated human-made object to a machine-made equivalent at the same price. The next research steps would test the size of the premium, demand at different prices, repeat purchasing, verification costs, and how much human effort is necessary to justify the label. Those steps turn an intuitive preference into an economically interpretable demand curve.

Institutional demand deserves separate scenarios

Human accountability may be sustained by law, organizational policy, democratic legitimacy, or social convention. Such requirements can create real demand for human participation even when a machine can perform much of the underlying work. Their economic scale depends on the required function: personal review of every case, periodic supervision, responsibility for a portfolio, or symbolic representation imply very different workloads.

The research should avoid treating existing institutional requirements as permanent facts about human nature. It should also avoid assuming they will disappear merely because automation becomes capable. Institutions embody choices about authority, accountability, membership, and

legitimacy. Those choices may retain humans for reasons that ordinary performance comparisons do not resolve.

A careful study would therefore present more than one institutional arrangement and estimate the associated labor requirements separately. It would distinguish meaningful human participation from nominal sign-off. If the obligation is personal responsibility, the research must identify what the person is expected to know, decide, and do. Otherwise, a human name on a process can be mistaken for a large protected occupation.

What would establish or overturn wage insufficiency

The Fourth Sector lens identifies production that can expand without relying on a broad wage bill. Essential Demand identifies the human participation buyers or institutions continue to require. The remaining empirical question is whether the compensation supported by that participation can reach enough households, at adequate real levels, with sufficient reliability.

Evidence of growing human-service expenditure addresses only part of that test. Strong evidence against wage insufficiency would show a sustained expansion in adequately paid opportunities across varied skill levels and locations, with compensation widely distributed after support work is automated. Evidence for insufficiency would show that essential spending, paid human hours, and compensation reach a ceiling well below the household access requirement even under favorable assumptions.

The framework supplies a demanding test for claims that new human markets will restore broad wage access. It also allows that test to be passed. Its force comes from specifying the missing quantities and mechanisms so that the argument can be confronted with evidence.

From autonomous production to ownership and access

Follow the income through production

Consumers demand outcomes. Producers derive demand for the inputs that supply them. As automated systems replace instrumental labor, that input demand can shift toward machines, software, energy, land, and infrastructure. The central distributional change is that paying a large workforce becomes less necessary for supplying the functional result.

The resulting benefits can take several forms. Owners may receive income, customers may pay lower prices, governments may collect revenue or directly provide services, and households may use productive assets themselves. Scarce land, infrastructure, intellectual property, or market power can capture returns. The technology alone does not decide who holds these claims.

BEA's industry accounts separate value added into employee compensation, production taxes less subsidies, and gross operating surplus. Gross surplus includes capital consumption. [Q03] This supplies the starting point for distinguishing the resources needed to sustain a productive system from the income available for other uses.

Consider an incorporated producer with \$100 of output and \$40 of purchased intermediate inputs. The following invented allocation illustrates the accounting:

Value-added component	Amount
Employee compensation	\$2
Production taxes less subsidies	\$3
Capital consumption	\$20
Net operating surplus	\$35
Total value added	\$60

The \$35 residual is not automatically a cash dividend. Financing, income taxes, retained earnings, distributions, and cross-border ownership enter subsequent accounts. Self-employed businesses can also combine labor and ownership income. Meanwhile, the \$40 of purchased inputs may embody wages paid elsewhere. A producer's low payroll tells us little about those upstream claims until they are traced.

This distinction matters when explaining the capital transition. An economy may generate far more useful output while providing less income through employment. The sustainable distribution question concerns access to that output and to the net resources remaining after maintenance and replacement. Counting all gross receipts as spendable owner income overstates the available pool.

Housing provides a limited but useful ownership analogy

Owner-occupied housing shows how an asset can provide a valuable service without a current paycheck as its principal counterpart. BEA recorded about \$2.52 trillion of imputed rental services from owner-occupied nonfarm housing in 2025. [Q05] It treats an owner-occupant as a landlord renting to themselves so that measured output does not change merely because a dwelling switches between rental and owner occupancy. [Q06]

This is a gross consumption-service imputation. It is not cash paid to homeowners, net rental income, or a measurement of autonomous production. Buildings require construction, maintenance, replacement, and supporting services. The useful analogy is narrower: ownership can give a household direct access to a stream of services. That access can improve living standards even when no wage or cash dividend changes hands.

An autonomous household asset could similarly reduce the need for purchased services; a publicly owned system could supply services directly; a collectively held enterprise could distribute net income. These are distinct institutional ways of sharing productive capability. Their evaluation belongs in the household-income intervention stream. Here they clarify why labor-market sufficiency and household welfare need separate measures.

Production autonomy and ownership concentration are different choices

The same automated production technology can operate under concentrated private ownership, dispersed household ownership, public ownership, or a cooperative arrangement. Those

arrangements can produce very different customer budgets and outside options for workers. A forecast that fixes one arrangement should name it explicitly.

Competition also affects the result. If reproducible automated services become abundant and easy to enter, prices and profits may fall even as consumers receive more useful output. Where bottlenecks remain, payments can accumulate around scarce resources or exclusive rights. The relevant distribution question is therefore broader than a simple transfer from wages to corporate profits: which claims remain scarce, who owns them, and how do other households obtain access?

Essential human markets operate inside that distribution system. They can support meaningful activity and additional earnings. Some can provide excellent livelihoods. Their existence, growth, or cultural importance does not establish that they can carry the full burden of household income distribution. The wage channel must be evaluated against the actual coverage and access requirements set out above.

PART VII

Measurement and the research agenda

Research contribution for the Essential versus Derived Demand dossier. The measurement framework and proposed studies below are original analytical recommendations. They are not completed empirical studies. Sources support the descriptions of existing datasets and established research methods; they do not independently validate the proposed essential-demand classifications.

What exactly would we measure?

Begin with the transaction

The strongest unit for studying essential demand is a purchase or provision decision in which the role of the human can be specified. An occupation is a convenient reporting category, but a weak starting point for identifying why anybody pays for its work. A nurse can deliver a medication, explain an uncertainty, provide comforting company, complete documentation, and satisfy a staffing requirement during one shift. Those activities are bundled into an employment relationship. The bundle does not establish that each activity is wanted because its supplier is human.

A transaction-level question is more revealing: if an alternative delivered the instrumental outcome as well, at the same price and under the same relevant conditions, would the buyer still value human participation? A positive answer identifies a candidate essential-demand component. It does not yet establish the size of the premium, the number of people who share it, the amount of human time required, or whether the buyer will pay enough to sustain a job. Those are separate measurements.

For clarity, each observation should name the buyer, beneficiary, payer, supplier, and person whose humanity matters. These can be different actors. A parent buys childcare for a child; an insurer pays for a patient's treatment; a corporation hires a spokesperson whom an audience follows; a public agency funds community activities. An interview with only the supplier can miss whose preference or institutional requirement controls the payment. A study of consumer preferences alone can miss procurement decisions made by employers, insurers, or governments.

The outcome should also be described concretely. “Human care” combines a technical outcome, an emotional experience, and an identity claim. A more measurable description specifies the

service: a thirty-minute conversation with a known person; a safe transfer from bed to chair; an explanation of test results; a signed professional approval. The question then becomes which attributes disappear if the human is removed. This makes mixed cases intelligible without pretending that every job belongs wholly to one side of the framework.

Keep five quantities separate

At least five quantities deserve distinct names. The **human preference rate** is the fraction of buyers who prefer a verified human option under specified conditions. The **human premium** is the additional amount they will pay for that attribute. The **human service volume** is the quantity purchased at actual prices. The **human labor requirement** is the paid human time needed to supply that volume after other work has been automated. The **labor income generated** is what workers receive from those hours or transactions.

These quantities can move in different directions. Many people may prefer a human option by a small amount, yet choose an automated option when the price difference grows. A small group may pay a large premium for an established artist while generating little employment beyond that artist. A large population may want substantial human contact but obtain it from friends and family. A service may remain popular while automation reduces its administrative work. Measuring one quantity does not settle the others.

The simplest labor accounting identity is:

Essential human hours = the sum, across service types, of units purchased multiplied by essential human hours per unit.

Count the paid units of each service purchased during a defined period and the essential human hours required per unit. The result is total essential human hours over that same period. This is an accounting framework, not an empirical estimate. Service units must be defined so shared sessions are counted consistently. Twenty customers attending one instructor's hour do not require twenty instructor-hours. Conversely, a private appointment may require preparation, travel, and recovery time, some of which remains human-dependent and some of which can be automated.

For existing businesses, distinguish total human hours from the incremental hours required to preserve the valued human attribute. If an author spends an hour in a live discussion and an assistant spends five hours arranging it, the six hours support the same business. That does not make all six hours essential demand. A demand classification should ask whether the arrangement work would still need a human after a satisfactory automated alternative became available. The classification concerns the reason for requiring human input, not whether today's business happens to employ people.

Four dimensions, one unit of labor

Presence, provenance, accountability, and affinity should initially be treated as overlapping explanatory tags. A regular client may pay a particular therapist because they want reciprocal human interaction, continuity with that individual, and professional responsibility. Counting the

session under three tags is useful descriptively. Adding three session-hours to the employment total is incorrect.

A practical database therefore needs two layers. The first records the total essential human time associated with the transaction. The second records every mechanism believed to contribute to its value. If a decomposition is needed, use mutually exclusive combinations - presence alone, affinity alone, presence with affinity, and so forth - or explicitly estimate marginal contributions in an experimental design. The sum of separately elicited premiums may exceed the value of the bundle because the attributes reinforce one another or substitute for one another.

Accountability needs additional disaggregation. A buyer may want an identifiable person to answer questions, a professional who faces sanctions, a financially solvent party that will compensate losses, or a human decision-maker because public rules require one. These arrangements do not have identical labor requirements. Some may require continuous judgment; others may involve occasional approval; still others may be supplied through institutions whose liability does not depend on a large human workforce. The study should record the required action and the source of the requirement, not infer protected employment from the word “accountability.”

Paid, unpaid, and purchased through institutions

The framework can identify valuable human activity that never becomes employment. A friend’s presence can be essential to an enjoyable evening while the restaurant’s ordering and cooking are automated. An amateur choir can create meaning for its members without paying them. A neighborhood sports match may require human opponents but no paid players. The humanity remains important; labor demand does not necessarily follow.

Maintain separate reporting for household-funded paid services, organization-funded paid services, and unpaid human activity. A jointly funded session enters total labor hours once, even if its payments are split between reporting categories. This avoids interpreting all meaningful social life as an employment opportunity. It also avoids the opposite mistake of treating unpaid activity as economically or socially worthless. The question of whether essential demand supports wages is narrower than the question of whether human interaction remains valuable.

The Current Population Survey and the establishment employment statistics illustrate why units matter: the household measure counts employed people, while payroll measures count jobs and can count a multiple jobholder more than once. An essential-demand study must state whether its denominator is people, jobs, hours, expenditure, or income. [M04] No single denominator answers all questions. The first defensible result may therefore be a carefully described distribution of transactions rather than a headline percentage of the economy.

What existing labor datasets can and cannot tell us

An occupational map is an index, not a direct observation

An occupational audit is useful because it forces an analyst to inspect the whole labor market, including large categories that attract little public attention. It can reveal whether a thesis

depends on a handful of glamorous examples while overlooking routine employment. Its limitation is equally important: the classification system describes occupations, not counterfactual buyer preferences for human participation.

The current BLS occupational projections table reports 170,280.8 thousand jobs for 2025. It contains both summary rows and detailed line items, which must not be added together. [M01] The National Employment Matrix draws on several statistical programs and incorporates self-employment using CPS data and occupational crosswalks. [M02] This makes it a broader employment baseline than a direct use of OEWS alone, but it does not turn the table into a survey of essential demand.

The previous author audit reported 831 detailed categories covering 170,267,200 jobs. The difference from the published all-occupation total is 13,600 jobs and should remain an explicitly unreconciled coverage difference unless a reproducible reconciliation identifies it. It should not be assigned wholesale to any particular omitted occupation without evidence. The published BLS headline denominator is verified here; the previous occupational audit has not been independently reproduced.

That prior audit's low, central, and high outputs - approximately 2.705 million, 9.317 million, and 25.288 million job-weighted equivalents, or 1.59%, 5.47%, and 14.85% of covered employment - are author scenarios. The occupational coefficients were provisional judgments, assisted by AI. They were not observed task-time shares or measured market shares. The baseline counts jobs, including self-employment, rather than full-time equivalents; multiplying those counts by judgment coefficients does not produce full-time equivalents. Those qualifications are integral to the results. [D01]

"Job-weighted scenario equivalents" is a more defensible description than "jobs that will survive" or "essential-demand employment." A multiplication of current jobs by a conjectured retained fraction can help compare assumptions. It cannot identify actual future jobs without changes in service demand, work organization, hours per worker, prices, market access, and policy. An estimate expressed to two decimal places remains uncertain if its coefficients are uncertain.

Why the underlying baseline matters

OEWS provides detailed occupational employment and wage estimates for covered wage and salary work. It excludes the self-employed, proprietors and partners in unincorporated businesses, unpaid family workers, and private household workers. [M03] Those exclusions are especially relevant here: independent artists, personal services, and other candidate human-premium markets may include substantial work outside payroll employment. An OEWS-only analysis would need a separate treatment of those populations.

The solution is not to add every available dataset together. The National Employment Matrix already incorporates information from several sources, so adding an independent self-employment estimate to its total can duplicate people or jobs already represented. Record the coverage of each dataset and create a reconciliation table before combining them. Treat

differences between annual, monthly, and point-in-time reference periods as measurement choices that require explanation.

Occupational groupings also conceal different markets. A teacher serving a compulsory school system, a private tutor, and an instructor running a recreational class may face different buyers, rules, and alternatives. The same occupational code can span transactions with different essential-demand mechanisms. Industry-by-occupation cells provide one improvement, but interviews and transaction data remain necessary where the purchasing context drives the classification.

The occupational audit should be reproducible row by row. Each row needs its code, title, base employment, source version, classification rationale, component tags, assumptions, uncertainty interval, and reviewer comments. An outside reader should be able to change a disputed classification and see how much the total changes. A conclusion that survives reasonable disagreement is stronger than one protected by inaccessible judgment calls.

What an occupation screen cannot establish about competition

The earlier screen's central 9.317 million job-weighted equivalents should not be compared with a broad relational-sector count as if the gap were an observed employment loss. The two measures classify different things. One counts present jobs in broad industries; the other applies assumed coefficients to present occupational employment. Neither measures the future number of accessible full-time livelihoods after functional automation.

Dividing the 170.267 million jobs in the audit by its low, central, and high scenario outputs produces ratios of about 63.0, 18.3, and 6.7. Those are reciprocals of assumed retained fractions, not measured competitive dilution or predicted wage cuts. They hold neither demand nor labor-market entry behavior in an identified equilibrium. Some people will retire, retrain, work fewer hours, rely on household resources, or leave employment; the remaining market's demand and prices can change. The valid research hypothesis is that attempted entry can grow faster than the compensation pool. Testing it requires data on both.

Task lists help, but frequency is not duration

O*NET can supply task descriptions and occupational context for that audit. Its task ratings distinguish importance, relevance to incumbents, and frequency of occurrence. [M07] Those are valuable inputs to a coding guide, but none is automatically a share of working hours. A task performed several times a day may take seconds; another performed weekly may consume a full afternoon. A high importance score likewise does not establish a large labor input.

An analyst who counts five “human” tasks out of twenty listed tasks and assigns a 25% essential share has silently given every task the same time weight. This is a modeling assumption, not a result from O*NET. It becomes particularly misleading when the human element is a short but important approval or, in the other direction, a continuous relationship that appears as one line among many administrative tasks.

A better next step samples establishments and records work episodes. Each episode should identify its duration, participants, deliverable, purchaser, and reason for human involvement.

Short diaries can be checked against schedules and anonymized workflow records. The coding should distinguish observed current human work from a judgment that human identity is valued under a functional substitute. Workers can accurately describe their activities while disagreeing with buyers about why a human is necessary; that disagreement itself deserves study.

The BLS Occupational Requirements Survey provides information on job demands, including physical, cognitive, and interpersonal requirements. [M12] It can help locate settings for further investigation. A current requirement to interact with people, however, does not establish that customers value a human supplier independently of the outcome. “People skills required today” and “human identity valued after functional automation” answer different questions.

Time use and spending supply the other half

The American Time Use Survey can ground claims about how people allocate their days. Its primary-activity structure and treatment of secondary childcare are documented explicitly; most simultaneous activities are not comprehensively measured. [M05] For this project, it can identify time devoted to socializing, arts, recreation, caregiving, and obtaining services. It cannot by itself determine how much of that time involves paid providers or how consumers would substitute between human and automated alternatives.

The Consumer Expenditure Surveys measure household spending and related characteristics using the consumer unit as their organizing unit. [M06] They can help establish budget constraints and the distribution of relevant spending. Their categories do not generally isolate the premium attributable to human origin. Spending on a concert includes more than the performer's labor; spending on a salon includes space, equipment, and other costs. The human premium must be investigated inside those categories.

The research opportunity is to connect these perspectives without pretending they are already connected. Employment data describe suppliers, expenditure data describe payments, time-use data describe activities, and transaction studies describe motives and alternatives. A credible estimate triangulates among them. It does not treat any one dataset as if it directly contained the answer to a question it was never designed to ask.

A dated empirical snapshot

These observations establish present scale and demonstrate why human value, market expenditure, and good jobs must be measured separately. None is a direct estimate of the counterfactual essential-demand share. Dates identify the observation period; they are not forecasts of full automation.

Official datasets do not contain a field for essential human demand. They measure industries, occupations, expenditures, hours, or income. The observations below establish starting scale and expose weak inferences. They do not measure the eventual size of a post-automation human sector.

Household spending provides a scale benchmark

The BLS Consumer Expenditure Survey reports the following 2024 averages per consumer unit. A consumer unit is a spending unit under BLS definitions and is not identical to a person or every ordinary use of household. Percentages are shares of CE total expenditure, which differs from the national-accounts consumption measure. [U10, U11]

2024 spending category	All consumer units	Lowest income fifth	Highest income fifth
Entertainment per year	\$3,609	\$1,316	\$7,660
Entertainment share	4.6%	3.8%	5.1%
Fees and admissions per year	\$935	\$197	\$2,546
Fees and admissions share	1.2%	0.6%	1.7%

Source: BLS Table 1101, 2024. Entertainment includes nonhuman goods and services; fees and admissions includes memberships, lessons, movies, sports, and events. Income groups also differ in household composition. These figures support the claim that richer spending units buy more in these categories. They do not identify a causal income elasticity or an upper limit on future human-service spending. [U11]

Using the reported 135.760 million consumer units and rounded averages gives approximately \$490 billion of entertainment expenditure and \$127 billion of fees and admissions. At an illustrative annual compensation package of \$60,000, allocating every dollar to current human compensation would fund about 8.17 million and 2.12 million such packages respectively. Fees and admissions is inside entertainment, so the two must not be added. These are generous current-scale yardsticks. Other essential-demand markets lie outside them, and future spending can change. [U11] (author calculations)

Human contact and growing demand do not guarantee high pay

In May 2025, the childcare median hourly wage was \$16.82, compared with \$24.51 across occupations: 68.6% of the benchmark. These wage estimates exclude self-employed workers and certain other categories. Human contact and social necessity coexist with relatively low compensation. They do not establish an immutable price of human care. [U12]

Home health and personal care aides had a median annual wage of \$35,800, compared with \$50,980 across occupations, or 70.2% of the benchmark. BLS nevertheless projects employment growth of 18% from 2025 to 2035. This is a substantial possible source of work. The projection describes BLS's baseline, not a scenario of complete automation, and the wage statistic is not a guarantee of an individual's annual earnings. [U13]

Care is therefore an essential test case for both sides of the argument. Its current scale challenges a casual claim that every surviving human market must be tiny. Its current pay challenges a casual claim that extensive human need automatically produces good jobs. Future results will depend on reimbursement, bargaining power, funding, substitution, and the amount of current human time that clients or institutions continue to require.

Output and employment can move very differently

BEA's 2023 arts and cultural production account reports \$1.17 trillion, 4.2% of GDP, and 5.4 million jobs. Real value added grew 6.6% that year while employment grew 0.3%. This broad account includes many supporting industries and instrumental tasks. It is not a measure of essential demand, and one year's divergence does not identify an AI effect. It does show why market growth cannot be translated directly into proportional job growth. BEA's landing page now states that regular production of these statistics has ended; 2023 is the latest displayed release used here. [U15]

Human time has many competing uses

The 2025 American Time Use Survey reports 5.16 hours of leisure and sports per day for the civilian population age 15 and over, including 2.61 hours watching television and 0.58 hours socializing and communicating. These averages include nonparticipants. They neither measure paid human-service purchases nor fix a future ceiling. They show why human attention cannot simply be counted as employment for a corresponding number of providers. [U14]

People can satisfy human-specific wants through friends, family, clubs, volunteer activity, amateur creation, and archived media. More free time can expand these alternatives as well as paid services. The empirical question is how much additional time becomes paid demand for another person's current labor.

A transparent model of residual human work

Separate the mechanisms before constructing a total

A useful model has three layers. The first describes why a human is wanted. The second describes how much paid human activity that preference or requirement generates. The third describes how that activity is distributed across workers. Jumping directly from the first layer to the third creates most misleading estimates of an economy sustained by human uniqueness.

The prior audit used a combination rule of the form $c + (1 - c) \times a$, where c represented a consumer-essential coefficient and a an accountability coefficient applied to the remaining share. This prevents the combined coefficient from exceeding one. It also contains a substantive interpretation: accountability preserves a proportion of the portion not already preserved by the consumer component. If a is instead interpreted as an unconditional whole-job share, the same algebra imposes a particular overlap structure. The meaning of each coefficient must therefore be written down before the formula is used. [D01]

For a revised occupational exercise, the safe reporting format is a scenario index:

Scenario index = the sum of employment multiplied by its assumed essential fraction, divided by total covered employment.

Employment refers to the base year; the essential fraction is a stated assumption for each occupation. Call it an index until empirical work supplies the weights. This formula is useful because it shows exactly where the answer comes from. It is insufficient because it retains today's occupational structure and quantity of work. It should sit alongside a transaction model, not stand in for one.

For future paid hours, expand the accounting identity to include customer segments, prices, income, and service format. A group event, a private appointment, a recorded performance, and a personalized live performance can share a human-origin preference while producing very different labor requirements. A model that treats them as one product will obscure the main employment mechanism.

Quantity can grow while hours fall

Consider an explicitly hypothetical service. Suppose a business initially supplies 100 paid appointments, each requiring one hour of human service and one hour of administration. It therefore uses 200 human hours. After administration is automated, appointments increase to 150 while each still requires one hour of human interaction. Total human hours fall to 150 even though the human service grows by half. The example does not estimate any industry; it demonstrates why market expansion alone cannot establish employment expansion.

Now change the format. If some buyers accept a shared session with ten participants, human hours per customer may fall further. If others pay for longer private sessions, hours may rise. If customers value a creator's historical authorship and buy recordings, current sales may require little new creative labor. Essential demand can coexist with labor-saving technology inside its own delivery system.

The relevant growth condition is whether paid service quantity grows faster than human time per service falls. This is a testable relationship for a particular market. It is not resolved by calling demand unlimited. An unlimited desire to hear music does not imply unlimited payments, listening time, or demand for new performances by an unlimited number of workers.

Income is a mechanism, not background scenery

Any aggregate projection must specify who can buy essential human services. If automation increases output but purchasing power becomes concentrated, aggregate wealth may grow without a proportional expansion of customers who can afford local providers. If broad household incomes grow, human services may gain a larger market. These are alternative economic environments, not interchangeable assumptions.

Do not build a forecast in which wages disappear and then silently preserve the wage income that finances the projected human-service market. Specify the income pathway: continued wages, capital ownership, transfers, public service provision, or another arrangement. Leaving the aggregate economy question open is compatible with modeling several pathways. It is better than hiding one pathway inside a numerical demand coefficient.

Prices must also be treated consistently. A premium expressed as a percentage can be misleading if the automated alternative becomes almost free. Buyers might value human authorship at a stable dollar amount even while the percentage premium becomes enormous. Conversely, a large percentage premium over a tiny price may fund very little labor. Report both the absolute payment and the comparison price.

The supply side determines who receives that payment. A platform may capture much of the revenue; a highly established provider may serve a global audience; a local practitioner may face substantial overhead and limited demand. Human-origin spending is not identical to labor compensation. Research should estimate the share reaching workers and distinguish earnings from ownership income when the same individual receives both.

Scenarios should expose disagreement

A credible scenario matrix changes named assumptions. One axis can vary the share of buyers who continue to demand verified human participation after repeated experience with automated alternatives. A second can vary the required human time per service. A third can vary broad purchasing power. A fourth can vary institutional requirements. These assumptions have distinct empirical meanings and should not all be collapsed into one low-central-high label.

The published central scenario should not be presented as the most likely future unless there is a defensible probability model. If the scenarios are judgment-based, call them illustrations or conditional cases. Reporting a probability distribution generated from arbitrary input distributions does not transform uncertainty into evidence. Monte Carlo simulation can propagate specified uncertainty; it cannot supply knowledge missing from the inputs.

Sensitivity analysis should prioritize consequential assumptions. Which ten occupational or transaction categories contribute most to the total? Which coefficients cause the greatest variation? How much does the total change when institutional requirements weaken, when group formats spread, or when the market concentrates? Those answers identify where further research has the highest value.

Report uncertainty in layers: sampling uncertainty in observed data; classification disagreement; uncertainty about the counterfactual alternative; and uncertainty about future market structure. A narrow confidence interval for a survey mean should not be attached to a forecast whose main uncertainty lies elsewhere. A broad, transparent range can communicate more knowledge than a falsely precise point estimate.

The compensation budget and its necessary threshold

The compensation calculation needs only a budget, a compensation share, and a target. It establishes what a proposed human-service economy would have to finance.

Let E be a specified annual final-spending budget. Let s be the fraction spent on offerings that retain essential human contributions. Let a be the fraction of that spending that reaches current human labor compensation within the chosen scope. Then the annual compensation pool W is:

$$W = E s a$$

The multiplication is an accounting identity once the scope and shares are defined. It is not an estimated behavioral law. For heterogeneous markets, calculate each market's compensation separately and add the resulting pools. Include employee compensation and an explicit estimate of self-employed labor earnings; exclude the return attributable to ownership of existing assets from the current-labor component. At the strict autonomous endpoint, a should count only the essential current-human work retained in the scenario. During the transition, residual instrumental labor should be identified separately.

Define N as the target number of earners under stated household pooling and support assumptions, and c as a chosen annual compensation floor. A necessary condition for every one of those earners to receive at least that package is:

$$W \geq N c$$

The pool divided by the floor gives a ceiling on the number of people who could receive that amount. It assumes the money could be allocated without leakage to recipients outside the target and without anyone receiving more than the floor. Actual coverage can be much lower. It is not a forecast of jobs, full-time equivalents, or people who can enter the market.

A worked illustration

Every number in the following illustration is an assumption. The \$20 trillion budget and 160 million earners are round-number scale choices, not reported US PCE or labor-force observations. Dollar quantities are held in constant 2024 purchasing-power units for comparison.

Input or result	Illustration
Annual final-spending budget	\$20 trillion
Share devoted to essential-human offerings	20%
Share reaching current human compensation	60%
Resulting compensation pool	\$2.4 trillion
Compensation floor per earner	\$60,000 per year including benefits
Maximum packages at that floor	40 million
Target earners	160 million
Aggregate capacity relative to target	25%

The package includes benefits and is not take-home pay. The example does not say that essential demand is 20%, that workers capture 60%, or that \$60,000 defines an adequate life everywhere. For an actual livelihood test, derive the compensation requirement from household needs, local

prices, taxes, benefits, and household composition. It shows exactly why growing demand alone is insufficient information. Change the assumptions and the result changes openly.

The reverse calculation is often more useful. To fund 160 million packages of \$60,000 requires \$9.6 trillion of annual compensation. What share of a specified spending budget would have to reach these markets?

$$S_{\text{required}} = \frac{N c}{E a}$$

Annual spending budget	60% reaches labor	75% reaches labor	100% reaches labor
\$20 trillion	80%	64%	48%
\$40 trillion	40%	32%	24%
\$80 trillion	20%	16%	12%

All rows are hypothetical, in the same purchasing-power units, with the same target and compensation floor. The larger budgets represent real expansion, not an inflation adjustment. This table deliberately includes outcomes favorable to a large human-service economy. It reveals the assumptions that would make broad compensation arithmetically possible.

The workbook also includes a target-cohort receipt fraction. If only half the compensation pool reaches the group whose livelihoods are being assessed, only half is available for its compensation packages. This is a scenario control, not a measured concentration statistic. Do not apply it mechanically when the target already includes every recipient.

For context, BEA's 2025 annual update reported \$15.0271 trillion of employee compensation for 2024, including \$12.3879 trillion of wages and salaries. This historical scale includes the whole economy and excludes self-employed labor as a separate component. It is not a calibration of essential demand or the latest possible data vintage. [U17]

Respect the accounting boundary

The spending budget must include the relevant payer. Publicly financed care and education can be material even when household out-of-pocket spending is small. A consumer-only budget cannot be used to rule out employment financed by government, employers, foreign buyers, or investment. Add those final uses consistently when they belong in scope.

Do not add supplier revenue to final sales and count both as separate spending. If an admission ticket finances a venue, platform, and performer, trace the original payment through the chain. The current-labor share can include relevant upstream human work if the model explicitly includes it. In a strict autonomous-supply scenario, upstream instrumental labor cannot silently remain at today's level.

This calculation supplies a valid conditional failure result: whenever the available current-labor pool falls below the target compensation requirement, that pool cannot support the target. An

unconditional claim about all possible futures would require defensible upper limits on future spending, labor capture, and access, alongside a defensible lower limit on the real resources people need.

Paid time and competition

Some essential demand requires simultaneous personal attention. For these services, hours provide an independent check on a money-based story.

Let C be service recipients, t their average purchased hours per week, k the effective concurrent recipients per provider, and h the provider's annual billable hours. Define k as total recipient-hours divided by total provider-hours, so mixed service formats are weighted correctly. Work-volume equivalents are:

$$L_{\text{volume}} = \frac{52 C t}{k h}$$

This describes annual service hours divided by a stated workload. Billable hours exclude unpaid administration and availability, so these equivalents are not automatically full-time jobs. Nor does the calculation establish compensation. Both the budget and the time account must fit the same service model.

Use an illustrative 250 million recipients, 1,500 billable hours per provider-year, and one-to-one provision. These are assumed quantities, not demographic estimates.

Paid hours purchased per recipient each week	Provider work equivalents
1 hour	8.67 million
5 hours	43.33 million
10 hours	86.67 million

To supply 160 million such work equivalents would require 18.46 purchased hours per recipient per week. If each provider serves five recipients at once, the same customer-hours support one fifth as many provider-hours. A group format can increase access while reducing the labor required for each customer.

These examples are not an upper bound on essential demand. Children, care recipients, public responsibilities, production outside leisure, and services requiring multiple providers can change the structure. Recordings and provenance also do not follow the same time equation. The point is to force an employment claim to specify who purchases whose time and in what format.

Demand growth has to be compared with supply growth

Suppose the available compensation pool doubles while the number of people seeking access to it grows fivefold. The amount per potential provider falls to 40% of its former level. This is an illustrative ratio, not a wage forecast. Hours, entry decisions, bargaining, and the distribution of customers determine what each person actually earns.

Entry is particularly relevant when AI supplies expertise around a human interaction. More people may be able to offer a service once diagnosis, preparation, translation, planning, or technical execution is automated. The demand for human participation can rise while the skill scarcity supporting its former pay weakens.

Competition therefore strengthens the insufficiency argument when supply expands faster than the relevant compensation pool. It does not prove falling wages in every market. Strong demand growth, collective bargaining, licensing, public pay scales, limited willingness to work, or highly differentiated local relationships can support earnings. Acemoglu, Autor, and Johnson explicitly identify downward wage pressure when displaced higher-paid workers compete for lower-paid jobs. Their argument supports this mechanism; it does not make them proponents of automatic luxury-led full employment. [U08]

The distribution study should include attempted entrants and people who exit. The median among successful incumbents can look healthy while most potential workers fail to obtain customers. Report earnings after business expenses and across all work-related hours, including acquisition, preparation, administration, and waiting. A high advertised hourly rate can coexist with low annual income.

Do not equate a small share with a small life

A declining share of employment in essential human services would not establish that human interaction is becoming unimportant. Automation could expand unpaid relationships and cultural participation while reducing paid hours. Equally, a large cultural role does not establish an employment base sufficient to distribute income broadly. The paper should retain these distinctions because the policy implications differ.

The proper conclusion from a model is conditional: under the specified preferences, service formats, institutions, and income distribution, this amount of human work would be demanded. The model helps identify which assumptions would need to change for a larger or smaller outcome. It does not need to close the question of an entire economy to make the derived-versus-essential distinction analytically useful.

A circular flow model of essential demand and distribution

What the funding question can establish

The funding question requires an account of who buys human services and how those purchases become income. An expenditure-income closure can identify spending patterns under which essential work produces too little income to support broad livelihoods. It also permits patterns that produce a majority labor share without transfers or broad capital ownership. The result depends on the assumptions about spending and current human compensation.

The useful result is a conditional one. Essential work can distribute only the compensation its customers finance. That compensation depends on spending decisions throughout the economy, including workers buying services from other workers. An adequate theory must represent

those transactions alongside the expenditure of capital owners. It must then ask whether the resulting earnings reach a broad population at adequate real levels.

Four questions require separate answers: how much people spend on human-essential offerings; how much reaches current human labor; how many people receive it; and what those earnings can buy. A large wage bill can be concentrated among a few people. A small labor share can support adequate livelihoods if other output becomes sufficiently cheap. Full employment can coexist with poverty. These possibilities make an explicit definition of distributional success necessary.

For this chapter, work serves as the primary distribution mechanism when a broad target population can obtain adequate, dependable resources mainly through current labor earnings at attainable working hours. A majority labor share is a useful accounting benchmark, but it is not the definition. The model below concerns the size of the wage pool. Evidence about access, concentration, hours, and living costs must complete the livelihood assessment.

Fix the accounting boundary first

Begin with a deliberately simplified closed economy containing two kinds of final output. Autonomous production requires no current human labor. Essential-service production retains a required human contribution and may also pay capital income. Assume no intermediate inputs, depreciation, taxes, foreign trade, or inventory changes. These restrictions make final sales equal value added and make gross and net income coincide. They are simplifying boundaries for an illustration, not descriptions of the present economy.

Notation in this chapter is local. V_E denotes essential-sector value added, which equals its final receipts under these assumptions; V_A denotes autonomous-sector value added. W denotes compensation for current human labor, and K denotes all capital income. K includes capital income within the essential sector as well as the autonomous sector. Total income and output are Y . The symbol h below denotes a spending fraction.

$$Y = V_E + V_A = W + K$$

Define λ as current human labor compensation divided by essential-sector value added. Under the assumption of a viable sector with nonnegative residual capital income, λ lies between zero and one.

$$\lambda = \frac{W}{V_E}, \quad W = \lambda V_E$$

The useful accounting bound follows directly. Let e be essential-sector value added divided by total value added. At the strict autonomous endpoint, all current labor compensation comes from the essential sector, so:

$$e = \frac{V_E}{Y}, \quad s_L = \frac{W}{Y} = \lambda e \leq e$$

Labor's share cannot exceed that sector's share of value added under these assumptions. The inequality does not show that either share is small. It also cannot use a household budget share

in place of e or assume that a current broad service industry's entire value added is essential. During a transition, compensation from remaining instrumental work must be added separately. This is the valid conditional accounting result behind the argument.

A receipt that rewards ownership of a previously created human work belongs in the capital component of this analytical split unless it compensates additional current work. Actual accounts may classify mixed payments differently. The empirical study needs a consistent allocation of self-employed earnings and rights income rather than treating every receipt paid to a creator as current labor compensation.

The distinction between final receipts and value added matters outside the illustration. A performer receiving half a ticket's price does not prove that half the associated value added goes to labor. Venue staff, intermediaries, imported inputs, taxes, and other payments can change the accounting. An empirical version must either trace domestic compensation through final expenditure or work with compensation and value added within a consistently defined production boundary.

Similarly, a household consumption share cannot silently become a share of GDP. Public purchases, investment, and external demand can finance human work. A national compensation share requires a national denominator. Nonfarm-business labor share is a different statistic from total-economy labor share, and gross measures differ from net income available after replacing worn-out capital.

Spending behavior completes the closure

Divide households into two illustrative groups. The broad household group receives all W and a fraction τ of K . The concentrated-owner group receives the remaining fraction of K . This is an allocation of existing factor income. A dividend or transfer does not add another copy of the income to Y .

The broad group spends all its disposable income in the illustration. A fraction h goes to essential services. Owners consume a fraction c_K of their income and allocate a fraction h_K of that consumption to essential services. Define q as the fraction of owners' entire disposable income spent on essential services.

$$q = c_K h_K$$

When c_K is below one, the owners' saving purchases new investment goods supplied entirely by the autonomous sector. This assumption closes the nonconsumption part of expenditure. Without it, omitted investment, borrowing, inventory accumulation, or changing output would leave an incomplete account. The model does not predict whether that saving will actually be invested or how the resulting capital stock changes future production.

With these definitions, essential-service purchases are:

$$V_E = h(W + \tau K) + q(1 - \tau)K$$

The first term includes workers buying from other workers. This is a large potential source of gross service receipts. The second term describes purchases financed by concentrated capital

income. Define b as the effective essential-service expenditure fraction associated with the allocation of capital income:

$$b = h\tau + q(1 - \tau)$$

Combining expenditure with current labor compensation produces:

$$W = \lambda hW + \lambda bK$$

Solving the same-period expenditure-income closure gives the ratio of labor to capital income and labor's share of total income:

$$\frac{W}{K} = \frac{\lambda b}{1 - \lambda h}$$

$$s_L = \frac{W}{W + K} = \frac{\lambda b}{1 - \lambda h + \lambda b}$$

A positive, nondegenerate solution requires $1 - \lambda h$ to be positive when b and K are positive. The boundary in which every unit of service receipts becomes wages and every wage is spent again on those services requires separate treatment; this model does not determine a finite scale there.

The equations combine an accounting relationship with specified behavior. The spending fractions are assumptions, not identities or forecasts. Constant fractions also abstract from changing prices, tastes, rationing, and income effects. The resulting figures are scenarios unless independent evidence establishes parameter bounds.

Illustrative spending patterns

Consider a case in which every essential-service receipt becomes labor income, so λ equals one, and there is no broad allocation of capital income, so τ equals zero. The general expression reduces to:

$$s_L = \frac{q}{1 - h + q} \quad (\lambda = 1, \tau = 0)$$

If owners devote 15% of their income to essential services and workers devote 30%, labor's share is approximately 17.6%. The 15% combines an assumed 75% consumption propensity with an assumed 20% essential-service share of consumption.

Scenario assumptions	Resulting labor share
$q = 15\%$; $h = 30\%$; $\lambda = 100\%$; $\tau = 0$	17.6%
$q = 30\%$; $h = 30\%$; $\lambda = 100\%$; $\tau = 0$	30.0%
$q = 50\%$; $h = 50\%$; $\lambda = 100\%$; $\tau = 0$	50.0%
$q = 20\%$; $h = 95\%$; $\lambda = 100\%$; $\tau = 0$	80.0%

Every row is an assumed scenario. The last row uses the same equation and reveals how strongly the result depends on workers' spending patterns. The argument for a large future human-service market specifically proposes that cheap automated goods could release expenditure for human services. That possibility must appear in the sensitivity analysis before the model can assess it.

A defensible upper bound requires evidence about the plausible future range of expenditure, with prices and preferences relevant to the automation scenario. Selecting a range for a sensitivity table does not establish that larger values are impossible.

Worker-to-worker trade can support a large wage bill

Consider an economy producing 20 units of autonomous value added and 80 units of essential human services. All essential receipts pay current workers. Owners receive the entire 20 units of capital income; workers receive 80 units of wages. There are no transfers and no broad ownership.

Owners spend 20% of their income on essential services. Workers spend 95% of wages on essential services. Both groups spend their remaining income on autonomous goods.

Buyer group	Essential services	Autonomous goods	Total expenditure
Owners	4	16	20
Workers	76	4	80
Total	80	20	100

Both markets clear, and labor receives 80% of income. The essential wage bill could be spread evenly across a specified population of providers if demand and service provision are correspondingly distributed. The construction establishes logical possibility. It does not establish that future preferences, skills, hours, or living costs will produce this outcome.

Worker-to-worker purchases finance distinct final services. A therapist buying a concert ticket and a musician buying childcare support separate production. Their transactions do not double count the same output. The money changes hands repeatedly because different people produce different services.

The counterexample also shows that a high labor share does not require owners to spend most of their income on people. With extensive worker-to-worker expenditure, a modest external inflow can support a much larger volume of service receipts. In the special case with λ equal to one and τ equal to zero, the net-flow condition is:

$$(1 - h)W = qK$$

The left side is workers' expenditure outside the essential sector. The right side is the concentrated owners' purchases from that sector. The condition balances those cross-sector flows. Gross wage income can greatly exceed the external inflow.

Wages can finance other wages, so a circular flow has no obligatory first source of income. An earlier formulation in this project, that every dollar of Essential Demand must first be distributed as capital income or a transfer, was therefore too strong. The precise statement concerns net flows. In the special case above, the essential sector's gross wage bill equals its external inflow multiplied by $1/(1 - h)$. Worker-to-worker trade multiplies the inflow from owners and public purchasers; it cannot replace that inflow unless workers spend almost nothing outside the essential sector.

What household budgets imply for worker-to-worker trade

The size of that multiplier is an empirical question about household budgets, and current data constrain it. In the 2024 Consumer Expenditure Survey, housing accounted for 33.4% of average spending, transportation 17.0%, food at home 7.9%, and personal insurance and pensions 12.5%. [U10, U25] Those four categories, consisting mostly of shelter and utilities, vehicles and fuel, groceries, and saving, total about 71% of spending. In a thoroughly automated economy they are supplied largely by land, structures, vehicles, energy, and financial assets rather than by human-essential work. The remaining categories, food away from home (5.0%), healthcare (7.9%), entertainment (4.6%), and all smaller categories combined (11.7%), total about 29%. [U11]

Even if every dollar in those remaining categories paid for current human-essential work, an extreme assumption since much dining, healthcare, and entertainment spending buys goods, facilities, and instrumental services, workers' essential-service share h would be about 0.29 at today's budget structure. The table compares that ceiling with the share the counterexample above requires, holding owners' essential spending at $q = 15\%$ of their income and $\lambda = 1$.

Workers' essential-service share, h	Worker-to-worker multiplier, $1/(1 - h)$	Labor share ($q = 15\%$)	Budget left for housing, transport, groceries, insurance, and goods
0.29 (extreme upper bound at 2024 budget shares)	1.4x	17.4%	71%
0.50	2.0x	23.1%	50%
0.80	5.0x	42.9%	20%
0.95 (as in the counterexample)	20x	75.0%	5%

Author calculations from the closure equation above and 2024 CE shares. The counterexample's 80% labor share assumes $q = 20\%$; at $q = 15\%$, the same h yields 75%.

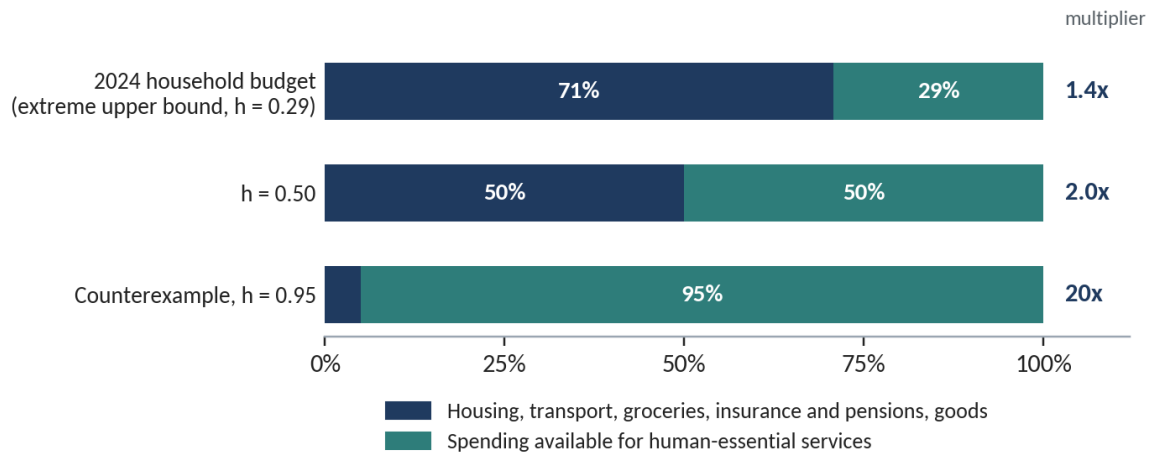


Figure 3. What worker-to-worker trade would require of household budgets. The top bar counts every dollar outside housing, transportation, groceries, and insurance and pensions as human-essential, an extreme upper bound. The multiplier is $1/(1 - h)$.

A majority labor share carried mainly by workers buying from one another would therefore require the combined budget share of shelter, mobility, groceries, insurance, and goods to fall from about 71% today to well under half, and to about 5% in the counterexample. Cheap automated goods push in that direction, but land and location do not become cheap merely because construction is automated, and Imas acknowledges that land, energy, and compute may absorb a great deal of income. [R01] At any budget structure close to today's, worker-to-worker trade multiplies the inflow from owners and public purchasers by a factor of roughly 1.4 to 2; it cannot by itself carry the household-income system. For scale, labor's share of income in the U.S. nonfarm business sector was 52.8% in the second quarter of 2026, the lowest since the series began in 1947. [U23]

Capital capture changes the spending feedback

Changing λ affects more than the initial division of service receipts. Lower current-labor compensation changes worker spending, while retained essential-sector income becomes part of K and follows its recipients' spending behavior. Each value of λ therefore requires solving the closure again.

Holding h at 30%, q at 15%, and τ at zero gives:

Current labor compensation / essential value added, λ	Economy-wide labor share
100%	17.65%
80%	13.64%
60%	9.89%

Multiplying the first row's labor share by 60% would give 10.59%, rather than the closure's 9.89%. The difference arises from subsequent spending. Under other spending patterns, this feedback can change the result in the opposite direction.

If a model uses capital income from autonomous production alone, call that quantity K_A . Essential-sector capital income must then be added explicitly:

$$K = K_A + (1 - \lambda)V_E$$

Substituting this expression into the closure gives:

$$\frac{W}{K_A} = \frac{\lambda b}{1 - \lambda h - b(1 - \lambda)}$$

This version yields the same economy-wide labor share when the denominator is positive. Treating K_A as though it were all K would omit the capital income earned by essential-service businesses.

Distribution and preferences work together

Broader ownership or transfers can increase the human-service market, but that effect depends on spending behavior. Holding the other parameters fixed, the change in labor share as τ increases is:

$$\frac{\partial s_L}{\partial \tau} = \frac{\lambda(1 - \lambda h)(h - q)}{(1 - \lambda h + \lambda b)^2}$$

The sign depends on $h - q$. Allocating capital income to the broad group expands essential labor income when that group spends a larger fraction of its income on essential services than the concentrated owners do. If the fractions are equal, allocation does not change the essential labor share in this illustration. If the relationship is reversed, allocation lowers it.

Distribution can still improve household security in the latter cases. Its benefits do not depend on creating more service work. Ownership income and transfers can finance consumption, reduce unwanted working hours, or improve bargaining power even when the essential wage bill stays constant.

Public provision requires further care. A government hiring teachers or carers makes a purchase with its own allocation rule. A government transferring money to households lets those households choose purchases. The model can include both, but treating them as an identical τ assumes away that difference. A fuller account should add explicit public demand whenever its composition materially differs from household spending.

The closure therefore establishes an interaction among income allocation, spending patterns, and labor capture. It does not establish that distribution always dominates preferences, or that broad ownership is mathematically necessary for a majority labor share.

What competition adds

The closure identifies a compensation pool; it does not determine who obtains work. Compensation divided by paid providers measures average earnings among recipients. Dividing by all people seeking entry measures resources per seeker, counting unsuccessful entrants at zero. If the pool doubles while seekers increase fivefold, compensation per seeker falls to 40% of its former level. Actual wages also depend on hours, entry, bargaining, and customer concentration.

Residual occupation weights cannot establish a future wage pool or predict dilution without assumptions about demand, compensation, and participation. Similarly, abundant labor does not mechanically set every wage equal to income available without working. Transfers can improve workers' ability to refuse poor terms, while differentiation, licensing, local scarcity, public pay scales, and work costs also matter. The livelihood-capacity analysis must assess access and real earnings alongside the aggregate pool, including people who seek work but obtain none.

The conclusion this model supports

The model provides a disciplined way to test a proposed future. Specify an expenditure pattern, the share paid for current human work, the allocation of capital income, and the target population's real compensation requirement. Calculate the available labor income, then test its coverage and accessibility. If even a defensible upper estimate of that pool falls short, the proposed labor market cannot meet the stated livelihood requirement.

Applied to current budget data, the test already yields a clear result. Essential Demand recirculates income among workers, but at observed spending patterns that recirculation multiplies external inflows by less than a factor of two. The inflows themselves come from owners' purchases, public purchases, and the broad distribution of capital income. Essential Demand can therefore amplify a distribution system; it cannot serve as the primary one. Growing luxury demand alone does not change that conclusion, and neither does the mere existence of human-specific preferences. The remaining steps are measurable: current labor capture, customer spending, competition for receipts, and the real resources that earnings command.

Studies that could identify the human premium

Ask buyers to make choices, not endorse humanity

The easiest survey question is also one of the least informative: "Do you value human connection?" Almost everyone can affirm the statement without committing time or money. An employment study needs choices among services at specified prices, with clear descriptions of performance, origin, continuity, and responsibility. An option to buy neither is essential; otherwise every respondent is forced into a market they may never enter.

The preference-elicitation literature explains why question format and perceived consequences can alter responses. Carson and Groves analyze the incentives and information conveyed by survey questions. [M09] Wertenbroch and Skiera compare willingness-to-pay elicitation

methods at the point of purchase and find that incentive constraints can materially affect reported values. [M10] These studies do not answer the human-demand question. They explain why a survey that merely asks how much people “would pay” is an incomplete foundation.

A first study should therefore compare hypothetical choices with consequential purchases. Participants can receive a budget and choose among real, deliverable services. Not every research question permits a full market experiment, but even a modest actual purchase can reveal whether a professed preference survives a budget trade-off. Comprehension checks should ensure participants understand the service, the payment rule, and the disclosed human involvement.

Vary attributes independently where possible

A proposed choice experiment would vary several attributes: verified human versus automated origin; independently assessed instrumental performance; price; waiting time; continuity with a named provider; and responsibility arrangements. Hainmueller, Hopkins, and Yamamoto provide a causal framework for conjoint experiments with randomized attributes. [M08] Their method helps separate attribute effects under a defined design, but the resulting effects depend on the attributes, comparison profiles, and population actually studied.

The study must avoid implausible combinations. A claim that an automated system has a human biography is not an independent attribute level; it is a contradiction or a deception. A legal duty cannot be experimentally removed from real professional practice simply to produce symmetry. Build lawful, credible choices and state which comparisons remain unavailable. An imperfect but realistic comparison can be more informative than a perfectly balanced fictional choice.

Equal performance requires care. The researcher should hold instrumental results constant while allowing the human attribute to differ. If “quality” is defined to include human presence, then declaring equal quality has already removed the phenomenon under investigation. Conversely, if an experiment leaves the automated option demonstrably worse at the practical task, a preference for the human option cannot be attributed wholly to humanity. Pretesting should identify the functional dimensions buyers actually use.

A human-origin effect also need not imply a desire for more human hours. Some buyers may care that a person conceived the idea but accept extensive automated execution. Others may require hand production throughout. Present several accurate production histories rather than a binary human/AI label: human-created with automated administration, human-directed with automated execution, fully automated with human approval, and fully automated without individual involvement. The allowed categories should fit the market being studied.

Test the four mechanisms directly

For **presence**, compare a service delivered alone, with other customers, with a paid human provider, and with an automated provider. This distinguishes the value of human peers from demand for an employee. A recreational class is especially useful because participants may value one another more than the instructor's functional contribution. Measure both experience and purchasing decisions after actual participation.

For **provenance**, keep the artifact's observable features as similar as practicable while varying truthful information about its origin. Use verified production records rather than unsubstantiated labels. Compare a newly produced work with a licensed reproduction: buyers may value human authorship without generating new labor each time they purchase. A disclosure effect on an existing artifact establishes that origin information matters; it does not alone establish the volume of future paid creation.

For **accountability**, distinguish personal answerability, professional oversight, compensation guarantees, and formal authority. Test whether buyers still prefer a human when an automated option has reliable appeal and compensation arrangements. Where law requires a human, measure the actual labor needed for compliance and explore permitted variation rather than treating the legal rule as an immutable property of technology.

For **affinity**, compare continuation with a known person against a new human provider and an automated alternative. This distinguishes preference for humanity in general from attachment to a particular individual. A longitudinal design is important because affinity develops through a history. A single encounter with a stranger is a poor test of the value of a durable relationship.

Disclosure, belief, and authenticity

People choose based on what they believe about origin and agency, not on information they cannot access. Record both the disclosed facts and the participant's beliefs. Someone may distrust an accurate human-origin certification or incorrectly attribute a recorded response to a live person. Those cases reveal a verification problem, not necessarily the absence of an underlying preference.

Actual production and disclosed production should not be conflated. A blind assessment can establish instrumental performance; an informed assessment can establish how origin information changes valuation. A study that intentionally mislabels origin would need independent ethical review, appropriate consent and debriefing, and careful interpretation. Most initial studies can use truthful disclosure and randomized information timing without making deception their central instrument.

Repeated exposure matters. A human premium may reflect unfamiliarity with an automated alternative, or it may strengthen after users experience what automated interaction lacks. Measure choices before use, after several uses, and after an interval long enough for novelty to decline. Track switching, cancellation, repeat purchase, and willingness to wait. A durable pattern is stronger evidence of an employment moat than a one-time reaction to a label.

Design the sample around the economic question

Recruit beyond the author's audience and beyond technology enthusiasts. Sample across income, age, geography, relevant service experience, and present AI use. Oversample groups central to particular markets, then report population-weighted and subgroup results separately. A nationally representative general survey can miss small, high-spending groups; a luxury-client sample cannot represent the whole labor market.

Estimate sample size from the smallest effect that would change the economic conclusion, using pilot variance and the planned design. Do not select a large round number merely because it sounds authoritative. Specify exclusions, primary outcomes, subgroup comparisons, and stopping rules before analysis. The study should produce a reusable codebook and anonymized research data where consent and privacy permit.

The strongest initial result may be modest: under a specified set of choices, a certain group repeatedly pays a measurable premium for a defined form of human participation. Such a result is narrower than a universal claim, but it can be replicated, challenged, and connected to actual labor requirements. That is how an intuitive framework becomes an empirical research program.

Falsifiability, transition evidence, and a research program

Make the claim strong enough to matter and specific enough to test

The statement that essential demand is whatever demand remains for humans can become tautological. Any surviving job would then be classified as essential after the fact, and the framework could never be wrong. To avoid that, classify the reason for human involvement before observing the outcome. Predict how buyers and employers should respond when functional performance, costs, and relevant institutions change.

A derived-demand classification predicts substitution pressure when an automated alternative becomes a satisfactory means to the desired outcome. It does not, by itself, predict immediate adoption, a particular date, or elimination of every associated job. A claim about eventual complete substitution requires an additional technological premise: every relevant instrumental human contribution must become reproducible at acceptable cost and reliability. Demand theory cannot establish that premise on its own.

An essential-demand classification predicts a residual value for the human attribute under a specified counterfactual. That prediction can fail. Buyers may cease paying after they use a substitute, origin premiums may vanish when labels are verified, or personal affinity may transfer to an artificial agent. The framework remains useful if such findings cause particular classifications or scale estimates to change. It becomes unhelpful if every contrary result is explained away as an inadequate test of a permanently receding future.

Distinguish four reasons a job remains

For every observed human job in an automated environment, ask which explanation fits: the automated system cannot yet perform the required work; it can perform the work but is not economically attractive; it is attractive but adoption is blocked or delayed; or buyers and institutions require human participation despite a satisfactory substitute. Only the last category directly identifies essential demand under the proposed framework.

These explanations can coexist. A client may prefer a familiar professional while the available automated system is also less reliable. An organization may retain staff because of implementation costs and a legal approval requirement. Record multiple explanations and

investigate which is binding. The existence of a person on payroll cannot resolve the classification.

This is why exposure studies should not be relabeled as unemployment forecasts. Eloundou and colleagues construct an LLM task-exposure rubric and explicitly do not forecast adoption timing. [M13] Exposure, realized productivity, adoption, staffing change, and enduring preference for humans are different outcomes. Combining them requires evidence linking the stages rather than a change of terminology.

What would count against the thesis

Several observations would weaken a narrow interpretation of essential demand. If buyers consistently pay for human suppliers in apparently instrumental markets after equivalent automated alternatives have become established, the original classifications may have missed a mechanism. If human involvement improves outcomes in ways omitted from the experiment, the supposed equivalence was inadequate. If new tasks continually arise faster than automation absorbs them, the argument for a small residual labor market needs an account of that process.

Other findings would weaken expansive interpretations. If human premiums largely disappear under consequential choices, stated preferences exaggerate their economic importance. If spending concentrates among a few providers, aggregate demand may support high incomes for some people without providing broad employment. If human contact is mostly supplied through unpaid relationships or fellow customers, an increase in social activity may create little paid work. If required approval is brief and scalable, accountability may preserve authority while supporting few hours.

There is also a possible conceptual counterexample: value may attach to a community, institution, or collective identity without attaching neatly to an individual worker. A human institution might automate much of its operation while retaining legitimacy through membership and governance. The four-part taxonomy should be open to this case rather than forcing every collective relationship into individual affinity. Research can test whether this is a distinct mechanism or a combination of the existing four.

The paper should precommit to changes of mind. A chapter can list the observations that would raise or lower estimates of paid human demand, and identify which claims are definitional, conditional, or empirical. The central distinction need not be abandoned because one occupation was misclassified. The estimate must nevertheless respond when important classifications are wrong.

Track actual change without confusing it with the endpoint

A longitudinal establishment study would collect the same information repeatedly: service output, prices, human hours, employment, automated capability, customer composition, and reasons for retaining people. Where possible, compare similar organizations before and after a well-defined adoption event. Examine prior trends and concurrent changes. A simple comparison of adopters and non-adopters is vulnerable to the possibility that growing, better managed, or differently positioned firms adopt earlier.

The Census BTOS AI supplement is a useful model of separating task replacement, task augmentation, new tasks, operational changes, and employment effects. [M11] Its questions remain broader than essential demand, and business reports are not a substitute for independent causal identification. A purpose-built study can add the missing buyer-preference and human-time measures while retaining comparable adoption concepts.

Time-series consistency requires particular care. Census changed its core AI-use wording in November 2025, broadening the question from production of goods or services to use in any business function. [M15] A chart crossing that change must mark the break rather than interpret the whole level shift as adoption. This small example illustrates a larger principle: longitudinal claims are only as sound as the stability of what is being measured.

Monitor exits and non-entry as well as layoffs. A market may keep current employment stable while output grows, reduce hours without eliminating positions, or stop hiring for work that previously required new staff. Conversely, an increase in employment can coexist with labor substitution if demand rises faster. The useful outcome is human labor per unit alongside total labor, not a single count of announced redundancies.

A practical sequence of studies

The first stage is a transparent classification pilot. Select a varied set of markets, publish the decision rules, and have independent reviewers classify transactions before they see aggregate results. Include clearly instrumental cases, clearly person-specific cases, and mixed cases. Report disagreements and revise the codebook. The goal is to discover where the framework is ambiguous, not manufacture agreement.

The second stage is a series of consequential choice studies. Begin where real services can be delivered and their outcomes assessed without excessive complexity. Candidate settings include tutoring, recreational instruction, creative commissions, administrative assistance, and nonclinical companionship. Each study should isolate one or two mechanisms and measure actual required human time. A smaller set of credible studies is more useful than a large survey filled with unrealizable scenarios.

The third stage follows customers and providers over time. Measure persistence of the premium, the development of affinity, adoption of group or recorded formats, and the allocation of revenue. Add institutional buyers whose purchasing processes differ from individual consumers. Retain respondents who switch away; otherwise the apparent human premium will become inflated by survivor selection.

The fourth stage connects results to aggregate data. Apply estimates only to markets sufficiently similar to those studied, show the coverage gap, and preserve unresolved categories. Use occupational and expenditure data to scale a demonstrated mechanism rather than assigning an unobserved premium to every related job. Produce both a conservative measured subtotal and explicitly modeled extensions.

The final stage tests generality across countries, institutions, and income distributions. A legal requirement in one jurisdiction, a status convention in one community, or an attachment pattern

among early adopters may not generalize. Cross-market replication can reveal which mechanisms persist and which depend on local arrangements.

Registration and pre-analysis plans can make this program more credible. J-PAL's methodological guidance explains trial registration and the role of prespecifying planned analyses. [M14] Registration does not guarantee a good design, but it creates a public distinction between intended tests and exploratory findings. Publish null results and failed classifications as part of the program.

The resulting contribution would be larger than a single percentage. It would show where humanity enters the product, how strongly buyers value it, how much paid time it requires, how institutions change that requirement, and which findings survive experience with capable alternatives. That evidence can support the core intuition of derived versus essential demand while leaving the ultimate scale of the residual labor market an open, measurable question.

PART VIII

Synthesis and the shorter white paper

What follows from the framework

The claim that can carry the argument

The demand for an outcome can survive the disappearance of the job that once supplied it. Where people serve as instrumental inputs, capable and economical automation can replace their work while continuing to satisfy the underlying demand. Where actual human participation remains part of the valued or authorized offering, its removal changes what is being supplied. Essential Demand identifies that second requirement and organizes it around presence, provenance, accountability, and affinity.

This distinction identifies a reason for retaining humans. A forecast of broadly available livelihoods needs much more. It must establish how frequently the human attribute is purchased, how much current human time the preferred format requires, how much revenue reaches that work, and how many people can obtain adequate earnings. Human preference is the beginning of that calculation.

The central distribution argument is that Essential Demand supplies no automatic replacement for the wage income associated with instrumental work. Rising luxury spending, a preference for human care, or a thriving creator market can coexist with a small or concentrated compensation pool. A market can expand while its current labor requirement falls. Its human-origin assets can appreciate while most potential workers earn little from them.

The argument becomes testable when these possibilities are stated as mechanisms. Automated preparation can compress a surviving service bundle. Group delivery can reduce provider-hours per customer. Existing works can satisfy provenance and affinity without new creation. Entry can expand faster than the compensation available to entrants. Platforms, venues, rights, and other assets can capture receipts. Unpaid relationships can satisfy desires for human interaction. Each mechanism predicts something observable about expenditure, hours, recipients, or access.

Several countervailing mechanisms are also possible. Greater real purchasing power can support more personal services. People may want recurring relationships with many local providers. Public institutions can purchase substantial human work. Shorter working weeks can alter what counts as an adequate job. Lower living costs can make a smaller wage sufficient. These possibilities specify the evidence an optimistic account must supply; they also prevent a narrow set of assumptions from becoming an impossibility theorem.

The strongest conclusion is therefore concrete: a post-automation economy cannot rely on surviving human markets to distribute broad livelihoods merely because those markets exist or grow. The required current-compensation pool, its allocation, and its real purchasing power must be demonstrated. The framework shows how to conduct that test and what would count as failure.

Claims and their evidentiary status

The ledger separates definitions, bounded empirical findings, accounting results, conditional models, and unresolved aggregate propositions. This distinction keeps simple arithmetic useful without assigning it the authority of observed data.

Claim	Evidentiary status	Implication for further work
Demand for productive inputs follows from demand for outputs	Established economic mechanism	Identify the output and the substitutable input
Matching functional performance does not satisfy an unchanged requirement for actual humanity	Conditional implication of the requirement	Specify the human attribute, disclosure, and comparison
Human attribution can affect evaluation of otherwise identical output	Supported in particular experiments	Test consequential purchases, persistence, and population coverage
Every consumer permanently prefers a human	Unsupported universal claim	Preserve observed heterogeneity and responses to experience
Human-specific value always requires current human labor	False as a general proposition	Separate new participation from use of existing human works
Essential Demand necessarily pays wages	False as a general proposition	Trace current compensation, existing assets, and mixed receipts
Rising human-service revenue implies proportionate growth in paid hours	Does not follow	Measure prices, quantity, delivery format, and time per unit
A compensation pool can fund only a finite number of specified compensation packages	Accounting capacity condition	State the pool, real target, population, and allocation assumptions
A large enough aggregate pool guarantees broad earnings	False as a general proposition	Measure access, concentration, reliability, and work burden
Funding assumptions constrain a proposed human-service economy	Conditional model result	Specify income groups, propensities, saving, public purchases, and institutions

Claim	Evidentiary status	Implication for further work
Worker-to-worker spending can carry a majority labor share without large inflows from owners or public purchases	Requires essential-service budget shares far above observed levels	At 2024 budget shares the worker-to-worker multiplier is about 1.4; measure leakage to housing, energy, and autonomous goods by income group
Essential requirements are a small share of today's paid work	Quantitative hypothesis	Validate task and transaction classifications; current budgets and historical residuals point the same way
Future essential work will be too small or poorly paid to provide broad livelihoods	Quantitative and institutional hypothesis	Test demand, current labor content, earnings access, and real costs jointly
Rising luxury spending establishes full employment	Unsupported inference	Identify the part purchasing current human work and its distribution
Historical substitution cases reveal useful mechanisms	Supported within their respective cases	Preserve different populations, units, technologies, and institutions
Historical residual percentages form a universal calibration for human employment	Not established	Do not pool horse stocks, occupational jobs, and judgment-based audit weights
The Fourth Sector can be measured as a fourth partition of value added	Defined construct with operational criteria	Apply autonomy and compensation thresholds within stated boundaries; publish beside unchanged industry totals
Low payroll or output growth without hiring proves complete autonomy	Insufficient evidence	Check indispensable people, upstream work, maintenance, and renewal
The earlier occupation screen measures an observed essential share	Incorrect interpretation	Its coefficients remain unvalidated author scenarios

The ledger supports stronger measurement without converting the research question into a foregone conclusion. A measured ceiling on accessible compensation below a stated livelihood requirement would establish insufficiency within that scope. A chosen parameter grid demonstrates only the outcomes allowed by its assumptions. Present-day spending categories and occupation labels supply starting data; their connection to essential current-human work must still be established.

Production independence, wage adequacy, and household independence

Three outcomes are often compressed into the phrase post-labor. They should be reported separately.

Production independence concerns whether output and its expansion remain constrained by human labor within a defined boundary. A system can operate autonomously at one stage while

relying on people for maintenance, upstream inputs, or exceptional decisions. A stronger claim of autonomous renewal and expansion requires those wider dependencies to be assessed.

Wage adequacy concerns whether ordinary people seeking paid work can obtain earnings sufficient for a stated living standard at attainable hours. This depends on demand, compensation, access, and prices. A labor market can offer excellent returns to a few prominent providers while failing this test for most entrants. It can also support adequate livelihoods even as labor's share of a much larger economy declines.

Household independence from wages concerns whether people can secure a decent life without selling labor. Ownership income, transfers, public provision, accumulated resources, and household arrangements can contribute. A household can be independent of wages while its members choose to work. An economy can also automate much of its production while leaving households highly dependent on obtaining increasingly difficult paid work.

The last two dimensions produce four logically distinct situations. The table describes possible arrangements, not forecasts.

Household access to a decent life without wages	Broadly adequate earnings opportunities	Inadequate or narrowly accessible earnings opportunities
Secure	Work can be a voluntary source of additional income and participation	People retain material security despite weak labor-market access
Insecure	Wages remain an effective but necessary route to resources	Households face a distribution gap and pressure to compete for insufficient work

Autonomous technology alone selects none of these arrangements. The production boundary determines whether people are needed to make goods and services. Institutions and market outcomes determine who can obtain those goods and services, and on what terms.

This distinction sharpens the connection to capital distribution. If ordinary households require assets, dividends, transfers, or public provision to secure their livelihoods, those channels are doing necessary distribution work even if paid human activities remain popular. Their presence does not make the resulting jobs economically meaningless. It establishes that employment is operating alongside another foundation for material access.

Publicly purchased labor should be recorded accurately. A government paying people to provide substantive care or representation creates compensation for current work. A government transferring money without purchasing that work creates a different receipt. Both may draw on revenues associated with automated production. The fact that public employment has a fiscal source does not turn its wages into transfers, and the fact that a transfer finances later service purchases does not erase the provider's labor income.

A capacity test and a coverage test

Aggregate capacity asks whether the available current-labor compensation could finance the target population's required compensation packages. If the pool falls below that total, wages in

the measured market cannot meet the stated objective even under perfectly favorable allocation. That is a useful and exact failure condition. It requires a consistently defined pool and an explicit target, rather than a forecast of every individual transaction.

A sufficient aggregate pool passes only the first test. Coverage asks who actually reaches the target. Suppose a pool could fund one million identical adequate packages. Concentration among a few earners, payment to people outside the target population, or intermittent opportunities can leave far fewer than one million people adequately supported. Dividing a pool by a target gives an allocation ceiling. It does not count jobs or predict how a market distributes its receipts.

Coverage must include prospective entrants and people who exit. Median earnings among successful incumbents answer a different question from the chance that a displaced worker can establish an adequate livelihood. A study that observes only currently active creators, coaches, or therapists can miss substantial failed entry. Record all work-related time and expenses, including searching for customers and waiting for bookings, before interpreting a quoted hourly price as a livelihood.

The target also requires a stated household model. Some households pool one person's earnings across several members; others need several earners. Individual compensation and household disposable resources are different measures. Taxes, benefits, business costs, dependents, and local living costs determine the conversion. The analysis should state whether it is testing access to an individual job, a compensation package, or adequate household resources.

Finally, the target should respond to actual purchasing power. Holding today's nominal earnings threshold constant while assuming very large price declines would prejudice the result. Assuming all relevant costs disappear would do the same in the opposite direction. Housing, healthcare, food, mobility, and social participation must be priced under the scenario being examined. A falling labor share is important evidence about distribution, but it cannot substitute for this real-access calculation.

What could make paid Essential Demand large

A large human-essential labor market requires a conjunction of conditions. Buyers and public institutions must have sufficient purchasing power. A substantial part of their expenditure must require actual human contribution. Preferred formats must purchase enough new human time. A substantial fraction of receipts must reach current compensation. Demand must be distributed across enough accessible providers to support the target population.

People can value relationships, collective practices, personal attention, and human achievement. A prosperous society can choose to spend more resources on them. The framework permits preferences to strengthen and new human offerings to appear. It also allows modest quantities of scarce human time to command high prices. A small physical labor requirement does not establish a small nominal income share.

Breadth depends on market organization. Recurring local relationships could distribute purchases among many providers. Institutions could fund access for beneficiaries with limited purchasing power. Customers could prefer different people, giving entrants opportunities that a

single global ranking would suppress. Evidence of these mechanisms would strengthen the case for broad human-service employment.

Their financing should be visible. The funding model connects household resources to expenditure rather than preserving today's customer budgets after removing their source. Wages can circulate through further service purchases; owners can spend capital receipts; public institutions can purchase services; broad ownership and transfers can sustain customer income. At current budget shares, however, recirculation among workers multiplies the other inflows by less than a factor of two, so the size of the human-service economy is governed mainly by those other inflows.

What could limit paid Essential Demand

Several mechanisms can jointly produce a small or poorly distributed labor market. Functional substitutes may meet most practical needs at attractive prices. Human premiums may attach to occasional purchases. A small amount of current participation may preserve the valued human attribute while automation removes the surrounding work. Recordings, archives, and other existing contributions may absorb much of the demand for human origin. Additional leisure may expand unpaid relationships.

Demand can also concentrate. A buyer may want one performer, one public figure, or one scarce object. Higher spending can then increase earnings or asset prices without creating opportunities for many additional workers. Venues, rights, access systems, and other complementary assets can receive a substantial part of the payment. A human market's gross receipts may consequently overstate its ability to pay current providers.

Supply matters alongside demand. If the compensation pool doubles while the number of people seeking access grows fivefold, resources per prospective provider fall to two-fifths of their former level. This is illustrative arithmetic, not a wage forecast. Markets can adjust through hours, prices, participation, bargaining, and exit. The example identifies why a growing market may still offer deteriorating opportunities to the population expected to rely on it.

Automation may itself expand entry by supplying preparation, technical knowledge, translation, or administration around a human encounter. The human requirement survives while the skill scarcity that previously limited competition weakens. Whether earnings fall depends on how rapidly purchases grow and how the market allocates them. Licensing, public pay scales, bargaining institutions, differentiated relationships, and limited willingness to work can alter the result.

These mechanisms support a serious insufficiency hypothesis. They do not supply a universal numerical bound without measurements. The research priority is to estimate their joint effect across the largest consequential markets and determine whether even an evidence-based favorable scenario falls short of the specified coverage target.

The Fourth Sector and the remaining human economy

The Fourth Sector is the automated economy: primary, secondary, and tertiary activities whose production no longer requires current human labor within the chosen boundary. Its growth can

expand provision without creating a proportional destination for displaced workers, which gives it a different explanatory role from simply identifying another category of services. In the limit, derived demand is supplied by the Fourth Sector and paid out as capital income, rents, and taxes, while Essential Demand is supplied by people and paid out partly as wages.

The income consequences require their own accounts. A reduction in wages needed for production can increase the importance of ownership claims, public revenues, and access arrangements. Productivity gains can also reach consumers through lower prices. Gross operating surplus includes replacement of capital, and receipts need not become cash income for domestic households. Production technology does not determine whether ownership is concentrated, broadly held, public, or cooperative.

The human economy also extends beyond its paid labor market. People remain consumers, citizens, owners, companions, creators, and participants in shared institutions. Automated administration can help them organize unpaid activities. Existing human works can remain widely enjoyed. A decline in necessary paid hours therefore need not imply a decline in human activity, significance, or social connection.

The distribution question concerns access to the output of this combined system. Essential Demand can supply meaningful work and substantial income in particular markets. To establish wages as the main route to broad material security, it must satisfy the capacity and coverage tests. Where it fails those tests, other income and access channels are required regardless of how compelling the surviving human activities may be.

A publication strategy for the shorter white paper

The core explanatory sequence

A shorter account can establish the distinction through one familiar outcome purchase. Someone wants a house, a repaired vehicle, or an accurate explanation. Explain how that demand supports human work while human capabilities are a useful means. Then introduce an offering whose specification includes an actual person: a desired performer, continuing relationship, human-origin work, or accountable representative. Hold the functional comparison clear in both cases.

Present the four dimensions with one concrete example each. Show their overlap through one extended case rather than a long catalog of supposedly protected professions. A lesson, clinical encounter, or live event can reveal functional outcomes, human attributes, institutional requirements, and separable supporting tasks within the same transaction.

Establish the lineage briefly. Marshall explains derived input demand. Baumol and relational-goods research establish important antecedents for labor entering the valued offering. Contemporary human-intrinsic and relational accounts connect that issue to advanced automation. Distinguish this demand mechanism from new-task arguments about continued instrumental employment.

The evidence should include a human-attribution experiment, a consequential choice or purchase, and a result showing acceptance of automated provision. Explain what each design isolates. Historical cases can then make three mechanisms intuitive: instrumental substitution, replication of human performance, and the effect of unequal purchasing power on service work. Their different units should remain explicit.

Introduce the stock-and-flow distinction before discussing aggregate jobs. A recording, a live concert, and a private lesson can all express affinity for the same person while requiring very different current work. The two-axis matrix of human-specific value and current human labor makes that difference visible. It also explains why some Essential Demand can pay owners of existing assets.

Then move through the capacity and coverage tests. Start with the size of the compensation pool, the target number of earners, and a stated real compensation floor. Add delivery format, current hours, entry, and concentration. One transparent illustration can expose the scale of the requirement without pretending its assumed inputs are observed facts. A separate funding example should show how results change when purchasing power and spending propensities change.

Introduce the Fourth Sector near the end as the fourth part of the classical sector model: the automated economy. It extends the explanation from individual offerings to production across the whole economy. Distinguish direct autonomous operation from autonomous maintenance and expansion. End by identifying the distribution channels required if the measured wage opportunities cannot support the population expected to rely on them.

A suggested thirty-page allocation

Pages	Function	Main material
1 to 3	Establish the question and central claim	Familiar outcome purchase; surviving value versus livelihood capacity
4 to 7	Define Essential Demand	Counterfactual, four dimensions, mixed transactions
8 to 10	Establish lineage and the debate	Marshall, Baumol, relational goods, new tasks and human-intrinsic demand
11 to 14	Show preference evidence and historical mechanisms	Attribution, purchases, automated acceptance, bounded historical cases
15 to 18	Explain current labor requirements	Human-origin assets, service bundles, delivery formats, unpaid alternatives
19 to 23	Test distribution capacity	Compensation, coverage, competition, real access, explicit financing
24 to 26	Introduce the Fourth Sector	The automated economy as the quaternary sector; accounting boundary; income recipients

Pages	Function	Main material
27 to 28	State conclusions and discriminating tests	Failure conditions and evidence that would support wage adequacy
29 to 30	Provide source access	Selected references and access to the full dossier

The shorter paper should carry the explanatory chain rather than compress every source into a small font. The full dossier provides the empirical qualifications, derivations, case detail, and competing accounts needed to scrutinize it.

A concise statement of the argument

Most production buys human work to obtain an outcome. Autonomous systems can replace that instrumental role wherever they supply the desired result at acceptable total cost and reliability. Human participation can retain value through presence, provenance, accountability, and affinity. Satisfying those preferences may require current labor, use an existing human contribution, or occur outside a paid market.

The livelihood question follows the money and the time. How much new human work is purchased? How much compensation reaches it? How many people can obtain that compensation? What can it buy? Rising human-service revenue establishes none of those answers on its own.

The Fourth Sector, the automated economy, can expand the supply of goods and services while reducing the need to pay wages to produce them. A society can retain valuable human occupations under those conditions. Whether those occupations can provide its primary distribution system is a separate, measurable question, and current budget data indicate that they cannot do so without substantial income from ownership, transfers, or public purchase. The relevant standard is broad, reliable access to adequate resources, and the framework makes the evidence needed to meet that standard explicit.

Sources and evidence register

Source identifiers match the bracketed references in the text. Entries state the evidence used, limits on interpretation, and access level. Repeated works are combined under one entry that lists all citation aliases. The original historical and experimental review was completed on 2 October 2026; additions and current data were reviewed through 4 October 2026. A source date identifies publication or the relevant data release, not a forecast date. Click a source title to open the reference.

The originating framework

[D01] David Shapiro (2026). Essential Demand: A framework for human value beyond instrumental labor (white paper manuscript)

Evidence. Author's September 2026 whitepaper defines the four dimensions and documents a provisional occupation screen. Current Library DOCX read October 2 2026; relevant definition pages 5-8 and audit pages 20-25.

Limits. Author framework and assumption-driven calculations, not independent validation. The earlier audit was not rerun for this dossier.

Access. full text of author supplied Library document

[D02] David Shapiro (2026). Most jobs are going away

Evidence. Public September 20 2026 statement of derived versus essential demand, with presence, provenance, liability, and affinity.

Limits. An author's conceptual argument and forecasts; cited for the formulation rather than as empirical proof of labor-market scale.

Access. full text

Intellectual history and theory

[H01] Alfred Marshall (1890). Principles of Economics, volume I, first edition, Book V, Chapter VI, sections 1 and 3

Evidence. Primary first-edition OCR inspected. Section 1 derives producers-goods demand from consumers-goods demand and discusses beer, houses, and plasterers. Section 3 discusses nearly every kind of labor across several uses. Archive catalog separately dates volume 1890.

Limits. OCR is noisy. It verifies the concepts and passages; exact typographic quotations should be checked against page images. The majority-of-commerce sentence was verified in the later edition, not located in this first-edition OCR.

Access. full text

Locator. Book V, Chapter VI, sections 1 and 3; OCR text near printed pp.430–435

[H02] Alfred Marshall (1920). Principles of Economics, eighth edition, Book V, Chapter VI: Joint and Composite Demand. Joint and Composite Supply

Evidence. Publisher metadata explicitly separates original publication 1890 from consulted eighth edition 1920. Chapter develops direct versus indirect demand and substitution among productive inputs.

Limits. Do not assign every sentence in this version to 1890. General input-demand theory does not estimate Essential Demand employment.

Access. full text

Locator. Edition metadata; Book V, Chapter VI, sections 1–3

[H03] Alfred Marshall (1920). Principles of Economics, eighth edition, Book V, Chapter VIII: Marginal Costs in Relation to Values. General Principles

Evidence. Section 1 expressly describes demand for the majority of articles of commerce as derived. Section 2 discusses substituting productive agents and impediments arising from custom and law.

Limits. Articles of commerce is not a measured proportion of employment, labor income, or final expenditure. Do not cite the majority sentence as verified first-edition wording.

Access. full text

Locator. Book V, Chapter VIII, sections 1–2

[H04, S09] William J. Baumol (1967). Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis

Evidence. Printed p.416 distinguishes instrumental labor from labor as the end product; p.417 recognizes intermediate cases and media substitutes for live performance.

Limits. Primary article inspected through a public OCR reproduction because institutional PDF retrieval failed. Historical service examples are not permanent technological limits.

Access. full text

Locator. American Economic Review 57(3), pp.415–426; especially pp.416–417

[H05] Kelvin J. Lancaster (1966). A New Approach to Consumer Theory

Evidence. Section II models valued characteristics supplied by goods and combinations of goods, including a meal and a social setting.

Limits. Applying the characteristics approach to Essential Demand and the four dimensions is this dossier's extension, not Lancaster's named framework.

Access. full text

Locator. Journal of Political Economy 74(2), pp.132–157; section II, pp.133–134

[H06, S15] Gary S. Becker (1965). A Theory of the Allocation of Time

Evidence. Opening discussion and section 1 place the cost of time alongside purchased goods and model households combining time and goods into valued activities. PDF pages visually inspected.

Limits. The paper is a foundation for time allocation, not an empirical estimate of how attention or leisure limits future paid Essential Demand.

Access. full text

Locator. Economic Journal 75(299), pp.493–517; opening pp.493–494

[H07] David H. Autor (2015). Why Are There Still So Many Jobs? The History and Future of Workplace Automation

Evidence. Review explains task substitution, complementary human work, output expansion, and labor supply adjustments.

Limits. Historical mechanisms are not a proof of mass employment under complete instrumental substitutability; the dossier's distinction between temporary and human-specific complements is its own analysis.

Access. full text

Locator. Journal of Economic Perspectives 29(3), pp.3–30; opening and section How Automation and Employment Interact

[H08] David H. Autor; Frank Levy; Richard J. Murnane (2003). The Skill Content of Recent Technological Change: An Empirical Exploration

Evidence. Task model treats rule-based routine tasks as susceptible to computers of that period and nonroutine activities as complements; studies changes within occupations.

Limits. Accessed June 2003 prepublication version. Its account of then-current computer capability should not be treated as a timeless boundary.

Access. full text

Locator. Abstract, introduction, and section I: The Task Model; final publication QJE 118(4), pp.1279–1333

[H09] Daron Acemoglu; Pascual Restrepo (2019). Automation and New Tasks: How Technology Displaces and Reinstates Labor

Evidence. Authors' abstract identifies displacement through automation and reinstatement through new tasks with labor comparative advantage.

Limits. Abstract and repository metadata inspected; linked PDF retrieval failed. Detailed empirical estimates are not used.

Access. abstract

Locator. Authors' abstract; Journal of Economic Perspectives 33(2), pp.3–30

[H10] Daron Acemoglu; Pascual Restrepo (2018). The Race between Man and Machine: Implications of Technology for Growth, Factor Shares, and Employment

Evidence. Authors' abstract states model conditions for full automation versus balanced growth with both automation and new tasks.

Limits. Abstract and repository metadata inspected; linked PDF retrieval failed. Claim is model-conditional, not a date forecast.

Access. abstract

Locator. Authors' abstract; American Economic Review 108(6), pp.1488–1542

[H11] David Autor; Caroline Chin; Anna Salomons; Bryan Seegmiller (2024). New Frontiers: The Origins and Content of New Work, 1940–2018

Evidence. Historical Census-title and patent analysis measures new work and the differing effects of augmentation, automation, and demand shifts.

Limits. Final Quarterly Journal of Economics 139(3):1399–1465, DOI 10.1093/qje/qjae008, replacing the earlier 2022 working-paper citation. Evidence ends in 2018; title index does not directly measure extinction or future machine capability.

Access. Full publisher-version PDF in Utrecht University repository inspected.

Locator. Abstract and introduction; working-paper title page dated August 14, 2022

[H12] James Bessen (2019). Automation and Jobs: When Technology Boosts Employment

Evidence. Authors' abstract describes textile, steel, and automobile evidence connecting early automation-related job growth and later decline to changing demand elasticity.

Limits. Repository abstract inspected; full-text download was unavailable. No specific quantitative estimates reproduced.

Access. abstract

Locator. Abstract; Economic Policy 34(100)

[H13] David Ricardo (1821). On the Principles of Political Economy and Taxation, third edition, Chapter 7: On Foreign Trade

Evidence. Cloth-and-wine example explains specialization by relative productive requirements.

Limits. Work first published 1817; inspected text follows third edition. Application to reproducible machine capacity and human labor is this dossier's analysis.

Access. full text

Locator. Chapter 7, cloth-and-wine discussion

[H14] David Ricardo (1821). On the Principles of Political Economy and Taxation, third edition, Chapter 31: On Machinery

Evidence. Ricardo revises his prior view and allows machinery to harm laboring classes under the conditions he analyzes.

Limits. Machinery chapter is a third-edition addition; do not date this argument to 1817. It does not assert universal labor losses from every innovation.

Access. full text

Locator. Chapter 31, opening explanation and stated conclusions

[H15] John Maynard Keynes (1930). Economic Possibilities for our Grandchildren

Evidence. Distinguishes absolute and relative wants; discusses life, activity, and purpose under greater material abundance.

Limits. Essay is a conditional speculative argument, not evidence validating its hundred-year timetable.

Access. full text

Locator. Section II; first published October 11 and 18, 1930

[H16, U07] Anton Korinek; Megan Juelfs (2022). Preparing for the (Non-Existent?) Future of Work

Evidence. Separates perfect technological substitutability from economic redundancy; discusses human-preference jobs and comparative advantage objections.

Limits. Scenario analysis; cited for conceptual distinctions, not for current capability claims in its 2022 technology discussion.

Access. full text

Locator. Sections 2.2–2.4; printed pp.6–12

[H17] Philippe Aghion; Benjamin F. Jones; Charles I. Jones (2019). Artificial Intelligence and Economic Growth

Evidence. Studies automation, growth, and bottlenecks that persist when some activities become highly productive.

Limits. The human-specification versus technical-inability distinction is the dossier's application. Scenario models do not establish a date for full automation.

Access. full text

Locator. The Economics of Artificial Intelligence: An Agenda, chapter 9, pp.237–282

[H18] Anton Korinek; Donghyun Suh (2024). Scenarios for the Transition to AGI

Evidence. Analyzes task-complexity distributions, automation, and capital accumulation under different AGI scenarios.

Limits. March 2024 version. Conclusions depend on modeled frontier and accumulation assumptions; not evidence that the assumed frontier already exists.

Access. full text

Locator. Abstract, introduction, and model discussion

[H19] David Autor; B. N. Kausik (2026). Resolving the automation paradox: falling labor share, rising wages

Evidence. Preprint gives conditions under which declining labor share and rising wages coexist within a competitive constant-returns framework. The paper also finds that falling labor share accounted for 16% of U.S. real wage growth from 1954 to 2019, and notes that a falling labor share necessarily increases income and wealth inequality because capital ownership is highly uneven.

Limits. January 9, 2026 preprint, not presented here as peer-reviewed consensus. The dossier uses only the distinction between wage levels and labor share, not its country estimates.

Access. full text

Locator. Abstract and section Resolving the automation-wage paradox

Adjacent economic ideas

[R01, U04] Alex Imas (2026-04-14). What will be scarce? The economics of structural change and the post-commodity future of work

Evidence. Defines relational output by valued human involvement; allows falling aggregate labor share. A reader comment by Philip Trammell (15 April 2026) contrasts real incomes hundreds of times higher than in the Dark Ages with a roughly zero spending share on human performers.

Limits. Argument and scenario, not a calibrated estimate of surviving jobs; chapter synopsis approximately 60 words.

Access. full text

[R02] Alex Imas (2026-02-09). Someday we will all be artists: How AI will change the nature of work and art

Evidence. Discusses human identity and creative process as components of artistic value.

Limits. Conceptual essay; not evidence that all artistic output requires human authorship.

Access. full text

[R03, U05] Alex Imas (2026-04). Structural Change, AI, and the Relational Sector: Companion technical note to What will be scarce?

Evidence. Conditional two-sector model links demand parameters, spending, labor intensity, wages, and employment.

Limits. Four-page uncalibrated technical note. The rendered title says Structural Change; searchable text says Sectoral Change. Title follows the visual PDF. Does not claim an asymptotic labor share under unlimited capital accumulation.

Access. Full PDF text inspected and title visually verified on rendered page 1.

[R04, U06] Philip Trammell (2026-03-27). Is labor a luxury in the long run?

Evidence. Analyzes human-intrinsic goods and competing long-run effects on labor share.

Limits. Theoretical essay and arguments, not an empirical forecast; distinction between aggregate and typical wages matters.

Access. full text

[R05] Dwarkesh Patel; Alex Imas; Philip Trammell (2026-06-04). Alex Imas and Phil Trammell – What remains scarce after AGI?

Evidence. Original interview clarifies uncertainty about demand elasticities and scenario-dependent employment outcomes.

Limits. Spoken discussion, not peer-reviewed evidence. Relevant statements in opening 20 minutes; chapter synopsis under 100 words.

Access. full text

[R06] Ben Moll; Alex Imas (2026-09-09). Will AI soon lead to double-digit growth? Probably not. Here is why.

Evidence. Separates difficult production, human-dependent demand, and scarce physical inputs.

Limits. Near- to medium-term growth argument; not proof of permanent occupational immunity. Synopsis under 100 words.

Access. full text

[R07] Carole Jean Uhlaner (1989). Relational goods and participation: Incorporating sociability into a theory of rational action

Evidence. Models political participation using payoffs from interactions among persons.

Limits. Publisher abstract consulted; full article is subscription-restricted. Public Choice 62, 253-285.

Access. abstract

[R08] Benedetto Gui (2000). Beyond Transactions: On the Interpersonal Dimension of Economic Reality

Evidence. Encounters jointly produce conventional outputs and relational goods; relationship-specific assets also matter.

Limits. Publisher abstract consulted. June 2000 issue date; website's later online date is not original publication year.

Access. abstract

[R09] Benedetto Gui; Robert Sugden (2005). Why interpersonal relations matter for economics, chapter 1 in Economics and Social Interaction: Accounting for Interpersonal Relations

Evidence. Introduces economic analysis of interpersonal relations and degradation of social resources.

Limits. Publisher summary only; print publication 2005, online publication 2009. No claim to reading entire chapter.

Access. abstract

[R10, S16] Herbert A. Simon (1971). Designing Organizations for an Information-Rich World

Evidence. Attention-conserving information systems may employ human or automated processing.

Limits. Primary chapter scan hosted by a third party; includes discussion by other speakers, whose comments must not be attributed to Simon.

Access. full text

[R11] Michael H. Goldhaber (1997). The attention economy and the Net

Evidence. Conceptual account of attention scarcity, audiences, stars, and online exchange.

Limits. First Monday 2(4), DOI 10.5210/fm.v2i4.519. Conceptual essay; not a quantitative labor-market study.

Access. full text

[R12] B. Joseph Pine II; James H. Gilmore (1998). Welcome to the experience economy

Evidence. Conceptual taxonomy.

Limits. Abstract consulted; not an automation study.

Access. abstract

[R13] B. Joseph Pine II (n.d.). It's the Experience Economy, Stupid...

Evidence. Experience offerings explicitly include technology and digital personalization.

Limits. Author-hosted commercial white paper for RichRelevance; date not established from document. Not independent empirical evaluation.

Access. full text

[R14] Aaron Hurst (n.d.; companion site to 2014 book). Purpose Economy: official definition and introduction

Evidence. Defines purpose-oriented value in terms of self-expression, growth, community, and contribution.

Limits. Full official webpage read; underlying book not read. Broad management framework rather than an employment forecast.

Access. full text

[R15] Richard M. Ryan; Edward L. Deci (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being

Evidence. Review identifies autonomy, competence, and relatedness as psychological needs.

Limits. American Psychologist 55(1), 68-78. Motivation and well-being are distinct from paid labor demand.

Access. full text

[R16] Dan Ariely; Emir Kamenica; Dražen Prelec (2008). Man's search for meaning: The case of Legos

Evidence. Experiments manipulate task recognition and purpose and examine willingness to work.

Limits. Journal of Economic Behavior & Organization 67, 671-677. Labor-supply evidence; does not identify consumer demand for humanity.

Access. full text

[R17, E04, C08] George E. Newman; Paul Bloom (2012). Art and authenticity: The importance of originals in judgments of value

Evidence. Experiments examine original-art valuation through creative performance and artist-contact mechanisms.

Limits. Online first 2011; final journal publication 2012. Hypothetical scenarios; no aggregate employment inference.

Access. full text

[R18, E05] Christoph Fuchs; Martin Schreier; Stijn M. J. van Osselaer (2015). The Handmade Effect: What's Love Got to Do with It?

Evidence. Handmade appeal varies with perceived care, gift recipient, and purchasing purpose.

Limits. Publisher abstract only. Journal of Marketing 79(2), 98-110. Context-specific effect, not universal human premium.

Access. abstract

[R19] Erin McGurk; David Khachaturov (2026-05-04). Human-Provenance Verification should be Treated as Labor Infrastructure in AI-Saturated Markets

Evidence. Proposes constitutive human presence and human-provenance verification as labor infrastructure.

Limits. Position paper/preprint, not peer-reviewed empirical evidence or a measured labor-market equilibrium.

Access. full text

[R20] Alex Imas; Kristof Madarász (2024). Superiority-Seeking and the Preference for Exclusion

Evidence. Theory and experiments examine value generated by excluding other prospective buyers.

Limits. Review of Economic Studies 91(4), 2347-2386; online first 2023. Human provenance is not required by the mechanism.

Access. full text

Empirical preference research

[E01] Lucas Bellaiche; Rohin Shahi; Martin Harry Turpin; Anya Ragnhildstveit; Shawn Sprockett; Nathaniel Barr; Alexander Christensen; Paul Seli (2023). **Humans versus AI: whether and why we prefer human-created compared to AI-created artwork**. Cognitive Research: Principles and Implications 8, 42

Evidence. Randomized provenance labels on AI images altered aesthetic evaluations.

Limits. Ratings do not establish purchases, long-run preferences, or employment.

Access. full text

[E02] Oliver Jacobs; Farid Pazhoohi; Grayson Mullen; Alan Kingstone (2025). **Comparative Designs Reveal Preferences for Human-Generated Rather Than AI-Generated art**. Empirical Studies of the Arts; first online July 28, 2025; volume 44(2), 2026

Evidence. Direct comparative judgments revealed human-label preference absent in a separate rating design.

Limits. Experimental presentation changes the result; valuation questions were not binding market purchases.

Access. full text

[E03] Brian Porter; Edouard Machery (2024). **AI-generated poetry is indistinguishable from human-written poetry and is rated more favorably**. Scientific Reports 14, 26133

Evidence. Poem output and attributed authorship produced separable effects on evaluations.

Limits. Specific stimuli and mostly nonexpert readers; no labor-demand estimate.

Access. full text

[E06, C15] Yidan Yin; Nan Jia; Cheryl J. Waksak (2024). **AI can help people feel heard, but an AI label diminishes this impact**. PNAS 121(14), e2319112121

Evidence. Message source and presumed source had distinct effects on feeling heard.

Limits. Message experiment; neither durable relationships nor paid service demand established.

Access. abstract

[E07] John W. Ayers; Adam Poliak; Mark Dredze; Eric C. Leas; Zechariah Zhu; Jessica B. Kelley; Dennis J. Faix; Aaron M. Goodman; Christopher A. Longhurst; Michael Hogarth; Davey M. Smith (2023). **Comparing Physician and Artificial Intelligence Chatbot Responses to Patient Questions Posted to a Public Social Media Forum**. JAMA Internal Medicine 183(6), 589–596

Evidence. Professional raters favored chatbot answers in the tested written-response comparison.

Limits. Different response lengths; no patient outcome or disclosed-provider choice trial.

Access. full text

[E08] M. V. Heinz; D. M. Mackin; B. M. Trudeau; S. Bhattacharya; Y. Wang; H. A. Banta; A. D. Jewett; A. J. Salzhauer; T. Z. Griffin; Nicholas C. Jacobson (2025). **Randomized Trial of a Generative AI Chatbot for Mental Health Treatment**. NEJM AI 2(4)

Evidence. Therabot intervention improved symptoms versus waitlist in a randomized trial.

Limits. No randomized human-therapy comparator; limited follow-up and selected symptom groups.

Access. abstract

[E09] Julian De Freitas; Zeliha Oğuz-Uğuralp; Ahmet Kaan Uğuralp; Stefano Puntoni (2025). **AI Companions Reduce Loneliness**. Journal of Consumer Research 52(6), 1126–1148; online 2025; issue April 2026

Evidence. Companion interactions reduced reported momentary loneliness in the studied settings.

Limits. Momentary benefit and one-week observation do not establish enduring social welfare gains.

Access. abstract

[E10] Berkeley J. Dietvorst; Joseph P. Simmons; Cade Massey (2015). Algorithm aversion: People erroneously avoid algorithms after seeing them err. *Journal of Experimental Psychology: General* 144(1), 114–126

Evidence. Observing imperfect performance reduced algorithm reliance in incentivized forecasting choices.

Limits. Forecasting settings and reactions to error; not universal aversion or intrinsic human preference.

Access. full text

[E11] Berkeley J. Dietvorst; Joseph P. Simmons; Cade Massey (2018). Overcoming Algorithm Aversion: People Will Use Imperfect Algorithms If They Can (Even Slightly) Modify Them. *Management Science* 64(3), 1155–1170; online 2016

Evidence. Limited modification rights increased acceptance of imperfect forecasts.

Limits. User control may explain acceptance without requiring a separate paid human producer.

Access. full text

[E12] Jennifer M. Logg; Julia A. Minson; Don A. Moore (2019). Algorithm appreciation: People prefer algorithmic to human judgment. *Organizational Behavior and Human Decision Processes* 151, 90–103

Evidence. Algorithm attribution increased reliance on advice under several tested conditions.

Limits. Effect depends on comparator and expertise; forecasting studies do not generalize automatically.

Access. full text

[E13] Noah Castelo; Maarten W. Bos; Donald R. Lehmann (2019). Task-Dependent Algorithm Aversion. *Journal of Marketing Research* 56(5), 809–825

Evidence. Perceived subjectivity and capability beliefs affected algorithm use.

Limits. Task framing and competence beliefs should not be equated with intrinsic source requirements.

Access. abstract

[E14] Chiara Longoni; Andrea Bonezzi; Carey K. Morewedge (2019). Resistance to Medical Artificial Intelligence. *Journal of Consumer Research* 46(4), 629–650

Evidence. Concern about neglecting patient uniqueness contributed to medical-AI resistance.

Limits. Mixed measures and experimentally specific moderators; no timeless preference estimate.

Access. abstract

[E15] Xueming Luo; Siliang Tong; Zheng Fang; Zhe Qu (2019). Frontiers: Machines vs. Humans: The Impact of Artificial Intelligence Chatbot Disclosure on Customer Purchases. *Marketing Science* 38(6), 937–947

Evidence. Early chatbot disclosure reduced real purchases in structured outbound sales calls.

Limits. Disclosure affects perceived competence and empathy; one setting is not a general human premium.

Access. abstract

[E16] Chiara Longoni; Luca Cian (2022). Artificial Intelligence in Utilitarian vs. Hedonic Contexts: The Word-of-Machine Effect. *Journal of Marketing* 86(1); first online November 2, 2020

Evidence. Recommendation source preferences changed with attribute salience and perceived competence.

Limits. Pleasure-seeking does not necessarily entail requiring a human recommender.

Access. abstract

[E17] D. Swarbrick; D. Bosnyak; S. R. Livingstone; J. Bansal; S. Marsh-Rollo; M. H. Woolhouse; L. J. Trainor (2019). How Live Music Moves Us: Head Movement Differences in Audiences to Live Versus Recorded Music. *Frontiers in Psychology* 9, 2682; published January 11, 2019

Evidence. Live performance and fandom related to audience movement measures.

Limits. Both conditions involved human music; presentation differed; movement is not willingness to pay.

Access. full text

[E18] Eugina Leung; Gabriele Paolacci; Stefano Puntoni (2018). *Man Versus Machine: Resisting Automation in Identity-Based Consumer Behavior*. Journal of Marketing Research 55(6), 818–831

Evidence. Identity-relevant self-attribution contributed to resistance to automated product features.

Limits. Consumer participation can sustain unpaid activity without creating demand for hired labor.

Access. abstract

Institutions and applied cases

[C01] European Parliament and Council of the European Union; European Commission AI Act Service Desk (2024). *Regulation (EU) 2024/1689, Article 14: Human oversight*

Evidence. Covered high-risk systems must permit effective oversight by natural persons. The text specifies proportionate oversight, understanding limitations, monitoring, interpretation, awareness of automation bias, overriding outputs, and interruption.

Limits. A system-specific legal requirement, not a universal staffing ratio. The chapter deliberately makes no blanket claim about commencement dates across all system categories.

Access. Official European Commission page opened and operative Article 14 text inspected, 2 October 2026.

[C02] United Kingdom Parliament; Department for Transport (2018). *Automated and Electric Vehicles Act 2018: Explanatory Notes, commentary on sections 1–5*

Evidence. The official notes explain initial insurer liability for covered automated-vehicle accidents and subsequent recovery from legally responsible parties.

Limits. Used as an example of an enacted liability architecture. It is not evidence that all autonomous vehicles are authorized, that all provisions apply to every vehicle, or that responsibility eliminates oversight needs.

Access. Official explanatory notes opened; paragraphs 11-20 inspected, 2 October 2026. Direct section 2 retrieval failed.

[C03] Professional Engineers Ontario (2022). *Guideline for Use of the Professional Engineer’s Seal*

Evidence. The seal signifies professional responsibility; practitioners may accept reviewed work prepared by others but must not seal documents with which they had no preparing or reviewing involvement. Guidance distinguishes a seal from the basis of negligence liability.

Limits. Ontario professional guidance, not a global law of engineering or an instruction to approve automated work without meaningful review.

Access. Regulator PDF opened; sections 7.2-7.3 and 9.1-9.2 inspected. Current PEO resource listing still identifies the 2022 guideline. Retrieved 2 October 2026.

[C04] Department for Education, England (2026). *Early years foundation stage statutory framework for group and school-based providers, effective September 2026*

Evidence. Paragraph 3.49 specifies at least one staff member per five two-year-olds, with qualification conditions.

Limits. Applies to England and the stated provider category; other ages and settings have different rules. A current staffing rule is not a permanent biological necessity or evidence of permission to replace staff with machines.

Access. Current GOV.UK landing page and linked official September 2026 PDF opened; paragraph 3.49 inspected, 2 October 2026.

[C05] Patricia K. Kuhl; Feng-Ming Tsao; Huei-Mei Liu (2003). Foreign-language experience in infancy: Effects of short-term exposure and social interaction on phonetic learning

Evidence. Infants exposed to live Mandarin speakers showed phonetic learning; audiovisual and audio-only recordings of the same speakers and material did not produce the same learning effect.

Limits. An age-specific learning experiment comparing live interaction with recordings. It did not test contemporary interactive AI or prove permanent human indispensability.

Access. Primary-study abstract and bibliographic record opened through PubMed, 2 October 2026. DOI 10.1073/pnas.1532872100.

[C06] Greg Kestin; Kelly Miller; Anna Klales; Timothy Milbourne; Gregorio Ponti (2025). AI tutoring outperforms in-class active learning: an RCT introducing a novel research-based design in an authentic educational setting

Evidence. A randomized undergraduate physics intervention reported greater learning for a carefully designed AI tutor than the active-learning classroom comparison.

Limits. Bounded intervention and particular tutor design; does not establish equivalence across every educational function, age, subject, or institutional outcome.

Access. Publisher and PubMed primary-study search records inspected, 2 October 2026. Publisher full-text open redirected to an inaccessible login intermediary; PMC retrieval encountered a browser check. DOI 10.1038/s41598-025-97652-6.

[C07] Wendy Moyle; Cindy J. Jones; Jenny E. Murfield; Lukman Thalib; Elizabeth R. A. Beattie; David K. H. Shum; Siobhan T. O'Dwyer; M. Cindy Mervin; Brian M. Draper (2017). Use of a Robotic Seal as a Therapeutic Tool to Improve Dementia Symptoms: A Cluster-Randomized Controlled Trial

Evidence. PARO, a robotic seal, was compared with a similar plush toy and usual care. Engagement favored PARO over the plush toy; results depended on outcome and comparison, including no between-group difference on the agitation inventory.

Limits. A therapeutic intervention in Australian long-term-care facilities, not a test of replacing caregivers or establishing complete equivalence of robotic and human care.

Access. Primary-study abstract and full bibliographic record opened, 2 October 2026. DOI 10.1016/j.jamda.2017.03.018.

[C09] Fédération Internationale des Échecs (FIDE) (2023). FIDE Laws of Chess taking effect from 1 January 2023

Evidence. Article 11.3.1 prohibits players from using notes, outside information or advice, or analysis on another board during play; related rules address electronic devices.

Limits. A specific competition rule illustrating constitutive constraints, not evidence about aggregate sports employment or all chess formats.

Access. Official FIDE Handbook opened and Article 11.3 search extract inspected, 2 October 2026.

[C10] Catholic Church, Code of Canon Law (1983). Code of Canon Law, Book IV, canon 900

Evidence. Canon 900 reserves valid celebration of the Eucharist to a validly ordained priest.

Limits. A narrow statement of Catholic institutional validity, not a claim about every religion, every sacrament, or theological truth.

Access. Official Vatican English text opened, 2 October 2026.

[C11] Moritz Reis; Florian Reis; Wilfried Kunde (2024). Influence of believed AI involvement on the perception of digital medical advice

Evidence. Two preregistered studies varied the attributed source of identical advice; AI and human-plus-AI labels reduced perceived empathy, reliability, and willingness to follow advice relative to human labels.

Limits. Attribution effects can reflect beliefs about reliability as well as intrinsic preferences. Scenario-based advice judgments are not long-term treatment choices or labor-demand estimates.

Access. Open-access primary publisher article inspected, 2 October 2026. DOI 10.1038/s41591-024-03180-7.

[C12] Dariya Ovsyannikova; Victoria Oldemburgo de Mello; Michael Inzlicht (2025). Third-party evaluators perceive AI as more compassionate than expert humans

Evidence. Four preregistered experiments assessed written responses; third-party evaluators judged AI responses as more compassionate than the human comparators.

Limits. Third-party response ratings, not sustained clinical outcomes, recipient purchasing decisions, or evidence that all interpersonal work is replaceable.

Access. Primary-study PubMed record opened, and indexed primary full-text results inspected, 2 October 2026. DOI 10.1038/s44271-024-00182-6.

[C13] Joshua D. Wenger; C. Daryl Cameron; Michael Inzlicht (2026). People choose to receive human empathy despite rating AI empathy higher

Evidence. Four studies found a tendency to choose human empathy despite favorable ratings of the AI responses chosen. This separates source choice from experienced response quality.

Limits. Choice patterns were heterogeneous. The studies do not establish unlimited willingness to pay, permanent preferences, or the economics of whole occupations.

Access. Open-access primary publisher article opened; abstract and authors inspected, 2 October 2026. Published 31 January 2026. DOI 10.1038/s44271-025-00387-3.

[C14] Matan Rubin; Joanna Z. Li; Federico Zimmerman; Desmond C. Ong; Amit Goldenberg; Anat Perry (2025). Comparing the value of perceived human versus AI-generated empathy

Evidence. Nine studies varied human-versus-AI attribution for AI-generated empathic responses and found attribution-dependent perceptions, particularly around emotional sharing and care.

Limits. Source labels influence beliefs about unseen providers; label effects alone do not identify pure intrinsic biological preferences or market willingness to pay.

Access. Primary-study PubMed record opened and publisher-indexed abstract inspected, 2 October 2026. DOI 10.1038/s41562-025-02247-w.

[C16] United States Copyright Office (2025). Copyright Office Releases Part 2 of Artificial Intelligence Report, NewsNet Issue 1060

Evidence. The Office's January 2025 position recognizes copyright where sufficient expressive elements are human-determined, including qualifying AI-assisted works; mere prompting does not suffice under its stated analysis.

Limits. A dated agency position and summary of its report, not a claim that all subsequent litigation is settled or that copyright determines consumer preference.

Access. Official agency announcement opened and operative paragraphs inspected, 2 October 2026.

[C17] R. H. Coase (1937). The Nature of the Firm

Evidence. Coase distinguishes market transactions from coordination under an entrepreneur's authority within a firm.

Limits. Used only for a conceptual distinction between organizational authority and operations. It supplies no direct evidence about modern automation or the future size of management employment.

Access. University-hosted primary-article PDF opened; publisher abstract/search text cross-checked, 2 October 2026. DOI 10.1111/j.1468-0335.1937.tb00002.x.

Sectors and economic scale

[S01] Allan G. B. Fisher (1939). **Production, Primary, Secondary and Tertiary**

Evidence. Publisher confirms author, title, Economic Record 15(1), pp.24-38, June 1939. Supports bibliographic genealogy only.

Limits. Full article not exposed by publisher page. Do not attribute detailed definitions or priority beyond verified publication facts.

Access. Opened publisher record on 2026-10-02; metadata and first-page link only.

[S02] Colin Clark (1940). **The Conditions of Economic Progress**

Evidence. Original 1940 text, summary pp.7-8 and chapter X pp.337-342: rising tertiary employment; demand-side explanation; mining included in secondary grouping.

Limits. OCR of original book on third-party host; typography unreliable. Historical definitions and empirical claims do not describe contemporary industries. No direct quotations used.

Access. Opened primary book transcription; read title-page publication date and relevant passages via search/find on 2026-10-02.

[S03] Jean Fourastié (1966). **Le progrès technique et les activités économiques**

Evidence. Author's retrospective explicitly identifies his *Le grand espoir du XXe siècle* as published in 1949 and discusses its intentions, methods, and interpretation.

Limits. Only opening page text inspected. Used for the narrow historical statement; no detailed attribution beyond available text.

Access. Opened scholarly archive containing primary article, *Revue économique* 17(1), pp.115-126, on 2026-10-02.

[S04] Jean Fourastié (1989). **Du grand espoir du XXe siècle à la grande interrogation du XXIe**

Evidence. Author's 1989 retrospective discusses informatics, robotics, and interconnection of sectors exposed broadly to technical progress.

Limits. Retrospective republished by Fourastié-Sauvy association. Does not establish a prediction of modern AI or an automated fourth sector.

Access. Opened complete primary text transcription; sections on technology and primary/secondary/tertiary structure read on 2026-10-02.

[S05, U18] Zoltan Kenessey (1987). **The Primary, Secondary, Tertiary and Quaternary Sectors of the Economy**

Evidence. Primary paper pp.363-364 proposes specific four-sector mapping and notes Foote/Hatt's different earlier quaternary/quinary scheme.

Limits. One proposed scheme rather than official consensus; Foote/Hatt description is reported through Kenessey, not independently verified from their original.

Access. Opened journal-hosted primary PDF, 27 pages; relevant taxonomy and footnote14 inspected on 2026-10-02.

[S06, U19] U.S. Census Bureau (2022 classification; accessed 2026). **Economic Census: NAICS Codes & Understanding Industry Classification Systems**

Evidence. NAICS classifies establishments using production-process similarity; twenty sectors and hierarchical levels.

Limits. Industry classification provides no direct measure of Essential Demand or human labor irreducibility.

Access. Opened official guidance on 2026-10-02.

[S07] Statistics Canada (2022). Introduction to NAICS Canada 2022 Version 1.0

Evidence. Production-oriented classification uses input structures, labor skills, production processes; digital delivery generally classified with nondigital counterpart.

Limits. Canadian 2022 classification guidance, not a forecast or a full-autonomy accounting standard.

Access. Opened official guidance; conceptual framework and 2022 digital-economy revisions inspected on 2026-10-02.

[S08] United Nations Statistics Division (2023 endorsement; accessed 2026). International Standard Industrial Classification of All Economic Activities: ISIC Revision 5

Evidence. Official page reports UN Statistical Commission endorsement in 2023 and describes revised activity classification.

Limits. ISIC is an activity classification, not evidence that automation is formally recognized as a fourth sector.

Access. Opened official classification page on 2026-10-02; page says publication undergoing copyediting.

[S10] Berthold Herrendorf; Richard Rogerson; Ákos Valentinyi (2013). Two Perspectives on Preferences and Structural Transformation

Evidence. Final-expenditure versus value-added definitions change assessed importance of income and price effects; input-output structure reconciles findings.

Limits. Paper concerns postwar U.S. structural transformation, not future demand for human-specific services.

Access. Opened primary publisher abstract and publication details on 2026-10-02; full paper not required for stated abstract-level claim.

[S11] L. Rachel Ngai; Christopher A. Pissarides (2007). Structural Change in a Multisector Model of Growth

Evidence. Specified multisector model permits labor reallocation toward low-productivity-growth consumption sector alongside aggregate balanced growth.

Limits. Conditional model result. Intermediate and capital goods employment treated separately; not a universal prediction that all labor enters services.

Access. Opened primary publisher abstract on 2026-10-02.

[S12] Timo Boppart (2014). Structural Change and the Kaldor Facts in a Growth Model With Relative Price Effects and Non-Gorman Preferences

Evidence. Primary paper jointly models relative-price and income effects; different household income levels yield different expenditure patterns.

Limits. Historical calibration and specific preferences do not estimate future Essential Demand. No numerical decomposition reused.

Access. Opened original Econometrica article PDF hosted on academic teaching site; introduction inspected on 2026-10-02.

[S13] Francisco J. Buera; Joseph P. Kaboski (2012). The Rise of the Service Economy

Evidence. Model links productivity growth, demand for specialized skill-intensive output, and increasing importance of market services relative to home production.

Limits. Does not establish irreversible marketization after generalized automation. Reverse-marketization discussion is own conditional extension.

Access. Opened primary publisher abstract and details on 2026-10-02.

[S14] Sherwin Rosen (1981). The Economics of Superstars

Evidence. Original paper pp.846-847: imperfect substitution and joint-consumption technology support skewed earnings and concentrated markets.

Limits. Specific model and mechanisms, not a proof that all human-essential markets become winner-take-all.

Access. Opened university-hosted primary PDF and inspected first pages; readable original text also opened at <https://www.scribd.com/document/521085250/The-Economics-of-Superstars> on 2026-10-02. Host AI summary excluded.

[S17] U.S. Bureau of Labor Statistics (2026 release; 2025 data). American Time Use Survey — 2025 Results

Evidence. June 25 2026 release reports 5.2 average leisure/sport hours daily, 2.6 television hours, 35 minutes socializing/communicating for population age 15+.

Limits. Present time use under current institutions, not a fixed future ceiling. Main-activity measures exclude many simultaneous activities; population and subgroup denominators differ. ATUS operations were suspended from 1 October to 12 November 2025 during the federal government shutdown, so 2025 annual estimates omit that period.

Access. Opened official archived release and time-use tables on 2026-10-02.

[S18] U.S. Bureau of Economic Analysis (2026 page update). Household Production Economic Statistics

Evidence. Official supplementary accounts value unpaid cooking, cleaning, care, and related household services outside standard GDP.

Limits. Broad nonmarket production is not interchangeable with Essential Demand; many included activities are instrumental.

Access. Opened official accounts landing page and descriptions on 2026-10-02.

[S19] U.S. Bureau of Economic Analysis; Benjamin R. Bridgman underlying working paper (2026; 2024 estimates). Research Spotlight: Expanded Indicators in U.S. Household Production Statistics

Evidence. Reports household production as 16% of extended GDP and 30% of extended PCE in 2024; explains denominator and account expansion.

Limits. Both denominators include household production; figures must not be presented as shares of conventional GDP/PCE or as essential-human shares.

Access. Opened official research spotlight dated July 14 2026 on 2026-10-02.

[S20] U.S. Bureau of Economic Analysis (2018). How does BEA measure household production?

Evidence. Explains use of time surveys and wages of general-purpose domestic workers to value unpaid household work.

Limits. Replacement-cost accounting is not willingness-to-pay evidence. Source's old international-comparison statement not reused.

Access. Opened official methodological FAQ on 2026-10-02.

[S21] Wikipedia contributors (accessed 4 October 2026). Three-sector model

Evidence. Summarizes Fourastié's description of the tertiary sector as enjoying little or no technical progress and his prediction that the shift to services would eliminate unemployment because the sector could not be rationalized. French teaching summaries describe the same classification: moderate technical progress in the primary sector, strong in the secondary, weak or negligible in the tertiary.

Limits. Secondary encyclopedia summary; consult Fourastié (1949) and S03 for original wording.

Access. full text

Measurement methods and data

[M01] U.S. Bureau of Labor Statistics (2026). **Table 1.2: Occupational projections, 2025–35, and worker characteristics, 2025**

Evidence. Official table reports 2025 total employment of 170,280.8 thousand and identifies Summary and Line item rows. Directly verifies the baseline total used to contextualize the earlier author audit.

Limits. BLS does not classify essential demand. This contribution did not independently recount or sum the earlier audit's 831 detailed rows. The earlier covered subtotal is an author-reported figure, not a newly reproduced BLS result.

Access. Official full HTML table opened 2026-10-02; relevant header and total row inspected.

[M02] U.S. Bureau of Labor Statistics (2026). **Employment Projections Data Overview**

Evidence. Describes National Employment Matrix source programs, SOC-based classification, CPS-based self-employment estimates and crosswalks, annual projections updates, and limitations of occupational forecasts.

Limits. Documentation of a statistical baseline and forecast process; it supplies no direct measure of human-origin preferences or essential labor shares.

Access. Official full page opened and relevant lines inspected 2026-10-02. Page last modified August 27, 2026.

[M03] U.S. Bureau of Labor Statistics (n.d.). **Handbook of Methods: Occupational Employment and Wage Statistics — Concepts**

Evidence. Defines covered wage and salary employment and exclusions including self-employment, owners and partners of unincorporated firms, private household employees, and unpaid family workers.

Limits. OEWS coverage should not be confused with the broader National Employment Matrix; neither program directly observes essential demand.

Access. Official full documentation page opened 2026-10-02.

[M04] U.S. Bureau of Labor Statistics (n.d.). **Comparing employment from the BLS household and payroll surveys**

Evidence. Distinguishes employed people counted in the household survey from jobs counted in payroll statistics; multiple jobholders can therefore enter the two measures differently.

Limits. This comparison is about CPS and payroll employment concepts, not a direct assertion that the National Employment Matrix is identical to either program.

Access. Official full page opened 2026-10-02.

[M05] U.S. Bureau of Labor Statistics (2026). **American Time Use Survey — 2025 Results: Technical Note**

Evidence. Describes time diaries, primary activities, secondary childcare, categories of obtaining services and leisure, and limitations of employment measures from ATUS.

Limits. Time spent in an activity does not identify paid provider-hours or willingness to pay for human identity. Most simultaneous activities are not comprehensively collected.

Access. Official full page opened, primary/secondary activity definitions inspected 2026-10-02. Dynamic URL currently serves 2025 results.

[M06] U.S. Bureau of Labor Statistics (n.d.). **Handbook of Methods: Consumer Expenditures and Income — Concepts**

Evidence. Documents consumer units, household expenditure and income measurement, and the conceptual basis for using expenditure data to examine household budget allocations.

Limits. Standard spending categories do not isolate a human-origin premium, the labor component of a purchase, or future demand under automation.

Access. Official full documentation page opened 2026-10-02.

[M07] National Center for O*NET Development (n.d.). O*NET OnLine Help: Scales, Ratings, and Standardized Scores

Evidence. Defines task importance, relevance as the proportion of incumbents considering a task relevant, and frequency categories such as daily, weekly, and yearly occurrence.

Limits. Task counts, importance ratings, and occurrence frequency do not automatically yield time shares. Conversion to hours or essential-demand coefficients is an additional analyst assumption.

Access. Official full page opened and scale definitions inspected 2026-10-02.

[M08] Jens Hainmueller; Daniel J. Hopkins; Teppei Yamamoto (2014). Causal Inference in Conjoint Analysis: Understanding Multidimensional Choices via Stated Preference Experiments

Evidence. Develops causal interpretation of randomized attribute effects in conjoint experiments. Supports designing separate tests of human origin, price, performance, identity continuity, and responsibility.

Limits. An established method rather than evidence about essential demand. External validity depends on the population, attribute distribution, plausible profiles, and connection between hypothetical and actual choices.

Access. Author-hosted full 30-page article opened 2026-10-02; journal identity independently verified through publisher and MIT repository search results.

[M09] Richard T. Carson; Theodore Groves (2007). Incentive and informational properties of preference questions

Evidence. Analyzes how preference-question format, strategic incentives, and information shape the interpretation of stated-preference answers.

Limits. Methodological foundation for survey design, not a study of AI or a measured human premium. No numerical human-demand estimate should be attributed to this source.

Access. University author-hosted full 30-page article opened 2026-10-02. DOI independently verified: 10.1007/s10640-007-9124-5.

[M10] Klaus Wertenbroch; Bernd Skiera (2002). Measuring Consumers' Willingness to Pay at the Point of Purchase

Evidence. Publisher abstract reports comparison of WTP elicitation methods, including a BDM procedure, and lower WTP estimates under incentive-compatible elicitation than certain hypothetical approaches.

Limits. Publisher abstract and bibliographic information accessed; full article is restricted. Used only for the abstract-supported claim that incentives affect WTP elicitation, not for detailed protocol or effect sizes.

Access. Official publisher abstract inspected 2026-10-02. Journal of Marketing Research 39(2):228-241.

[M11] U.S. Census Bureau (2025). Business Trends and Outlook Survey Content V4 Cycle 2 with AI Supplement — Questionnaire

Evidence. Questions distinguish task replacement, augmentation, new tasks, changes in total employment, and operational changes such as staff training and workflow redesign.

Limits. An instrument measuring business self-reports, not direct observation of essential demand or causal employment effects. Version and fielding period must be preserved in future comparisons.

Access. Official full 11-page questionnaire opened; questions 25-32 inspected 2026-10-02.

[M12] U.S. Bureau of Labor Statistics (n.d.). Handbook of Methods: Occupational Requirements Survey — Concepts

Evidence. Defines physical, cognitive, mental, and other job requirements, including judgment, interaction, adaptation, and critical job functions.

Limits. Measures requirements of existing jobs, not buyer preferences for human identity under an adequate automated alternative.

Access. Official full documentation page opened 2026-10-02.

[M13] Tyna Eloundou; Sam Manning; Pamela Mishkin; Daniel Rock (2023). [GPTs are GPTs: An Early Look at the Labor Market Impact Potential of Large Language Models](#)

Evidence. Original research constructs task-exposure measures for LLMs and related software. Abstract explicitly states that it does not predict the development or adoption timeline.

Limits. Exposure is not a measured probability of unemployment or a measure of essential demand. The dossier cites only this distinction, not the paper's headline exposure percentages.

Access. Original research abstract and version metadata opened 2026-10-02; v5 dated August 21, 2023.

[M14] Abdul Latif Jameel Poverty Action Lab (J-PAL) (n.d.). [Trial registration](#)

Evidence. Institutional methodological guidance discusses registration of randomized evaluations and the use of pre-analysis plans to specify intended analyses.

Limits. Methodological guidance only. Registration does not guarantee valid identification, adequate power, representative samples, or external validity.

Access. Official full methodological guidance opened 2026-10-02. AEA registry direct opens failed, so no full-access claim is made for that site.

[M15] Adam Grundy; Cory Breaux; Dhanapati Khatiwoda, U.S. Census Bureau (2026). [Large Firms With at Least 20 Employees Biggest AI Users](#)

Evidence. Census authors document the November 17, 2025 revision from AI use in production of goods or services to AI use in any business function, and expansion of the AI supplement.

Limits. Used to document a measurement discontinuity, not to infer essential demand or use dated adoption percentages as current estimates.

Access. Official Census article dated May 26, 2026 opened and question-change passage inspected 2026-10-02.

Updated economic debate

[N01] Pascual Restrepo (2025). [We Won't Be Missed: Work and Growth in the AGI World](#)

Evidence. Conditional model of replicable work, compute expansion, positive wages, and a vanishing labor income share; propositions 1-6.

Limits. NBER Working Paper 34423; inspected author version dated October 22, 2025. Assumes replicability even of human-touch advantages. Supplementary work is not equivalent to Essential Demand. Does not estimate future employment or inadequate wages.

Access. Full author PDF inspected; printed pages 9-10 also visually checked. NBER DOI 10.3386/w34423.

[N02] Neil Thompson; Danial Lashkari; Omeed Maghzian (2025). [Discussion: 'We Won't be Missed: Work and Growth in the Era of AGI' by Pascual Restrepo](#)

Evidence. Opening page identifies questions about the AGI definition, constant returns, worker welfare, and exogenous compute growth.

Limits. Only the indexed opening page and official Federal Reserve cross-post were accessible; full PDF retrieval failed. No detailed results from later pages are asserted.

Access. Primary discussion opening-page text; official Fed cross-post inspected.

[N03] Daron Acemoglu; David Autor; Simon Johnson (2026). [Building Pro-Worker Artificial Intelligence](#)

Evidence. Five-category technology framework distinguishes new-task creation and expertise leveling; discusses collaborative AI and policy direction.

Limits. February 2026 Hamilton Project paper and NBER Working Paper 34854. Conditional conceptual and policy argument, not an estimated guarantee of full employment after comprehensive automation.

Access. Full official PDF inspected, especially introduction, Table 1, and sections II-IV.

[N04] Graelin Mandel; Alex Imas (2026). Art and the Machine: Why People Devalue AI-Generated Creative Work — author-hosted abstract

Evidence. Author-hosted abstract reports two preregistered incentivized art-print bidding experiments, combined N=351; AI-origin discount decreases as the work becomes less exclusive.

Limits. Working paper. Full SSRN paper 6302659 was inaccessible, so individual-study samples, raw bid means, uncertainty, and exact exclusivity conditions were not verified. No inference to labor concentration or universal exclusivity is warranted.

Access. Original author website abstract inspected, AI and Technology section, item 5.

Historical mechanism cases

[T01] U.S. Department of Agriculture (1945). The Livestock and Wool Situation, 6 December 1945, tables 9–10

Evidence. Tables 9 and 10, printed pp.26-27, report 21.431 million horses and 5.062 million mules on U.S. farms in 1915.

Limits. Farm inventories; counts are not human employment measures or observed derived/essential demand classifications.

Access. Official USDA archival PDF inspected 2026-10-04, including table screenshot.

[T02] U.S. Department of Agriculture, Agricultural Marketing Service, Crop Reporting Board (1961). Livestock and Poultry Inventory, January 1, 1955–60: Number, Value, and Classes, by States, Statistical Bulletin 278

Evidence. Table 5, printed p.5, gives 3.089 million horses and mules combined on farms in January 1960. Cover dated February 1961.

Limits. Combined species and farm coverage. OCR misreads 1960 as 1950 in one extracted row; visual table check and series context confirm 1960.

Access. Official USDA PDF text and table screenshot inspected 2026-10-04.

[T03] American Horse Council (2024). Results from the 2023 National Equine Economic Impact Study Released

Evidence. Release dated January 31, 2024 reports 6.6 million horses in 2023 versus 7.2 million in 2017; economic impact and linked employment increased. Defines direct, indirect, and induced impact scope.

Limits. Issuing industry organization's summary rather than an independent census; modern population coverage differs from historical farm inventories. Economic-impact jobs cannot all be interpreted as protected current human work.

Access. Full official release opened 2026-10-04.

[T04] American Federation of Musicians Local 47 (n.d.). History

Evidence. 1927 entry reports 22,000 theater-musician jobs lost within three years and a few hundred new soundtrack jobs. Later entries describe television opportunities and membership peak of 18,000 in the 1940s-1960s.

Limits. First-party institutional retrospective, approximate job figures; local union membership is not national employment, paid hours, or a matched displaced-worker panel.

Access. Full institutional timeline opened 2026-10-04.

[T05] American Federation of Musicians (n.d.). 125 Years: Musicians Staying Stronger Together

Evidence. Reports roughly 22,000 theater musicians losing jobs and fewer than 200 recording jobs created. Describes residual arrangements beginning in 1944 and funding disbursements in 1947 for free live performances.

Limits. First-party retrospective; figures do not measure economy-wide residual employment or consumers' preference for human origin. Distinguish predecessor arrangements from the independent MPFT established in 1948.

Access. Full AFM institutional history opened 2026-10-04.

[T06] Henry J. Harris; U.S. Bureau of Labor Statistics (1923). National Health Insurance in Great Britain, 1911 to 1921, Bulletin 312

Evidence. Printed p.2 reproduces 1911 Census of England and Wales industry and occupation counts. Domestic indoor service industry total 1,302,438, including 1,260,673 women; corresponding occupation count 1,389,618. Industry counts: agriculture 1,229,555; coal mining 971,236.

Limits. Historical census categories have distinct industry/occupation universes; these counts do not classify motives, task composition, essential demand, or employers' income sources.

Access. Official BLS bulletin archived by Federal Reserve Bank of St. Louis; PDF and searchable transcription inspected 2026-10-04.

[T07] Northumberland Archives (2021). Women in Domestic Service

Evidence. Describes domestic duties and employment conditions using archival examples and oral testimony, including tending fires, carrying water, cleaning, supplies management, long days and limited time off.

Limits. Archival interpretation rather than a representative working-conditions survey. Aggregate 1881 count has unresolved geographic scope and is not reused.

Access. Full archive article opened 2026-10-04.

[T08] Music Performance Trust Fund (n.d.). About: Our Mission and Our Story

Evidence. Dates establishment as independent nonprofit to 1948. Describes royalties from signatory recording companies, co-sponsorship funding, independent trustee, and live admission-free performances supporting musicians' income.

Limits. Institution's own account establishes the mechanism; it does not estimate sufficiency for all musicians or displaced workers.

Access. Full official institutional page opened 2026-10-04.

[T09] Wassily Leontief (1983). National perspective: The definition of problem and opportunity

Evidence. Paper in The Long-Term Impact of Technology on Employment and Unemployment: A National Academy of Engineering Symposium, June 30, 1983. Page 3 compares the declining role of humans as the most important factor of production with the displacement of horses by tractors in agriculture.

Limits. A 1983 projection cited for the origin of the analogy. Wording verified through secondary reproductions of p.3.

Access. secondary reproduction; volume available from the National Academies Press

[T10] Erik Brynjolfsson; Andrew McAfee (2015). Will Humans Go the Way of Horses? Labor in the Second Machine Age

Evidence. Foreign Affairs 94(4), July/August 2015. Recounts Leontief's comparison and the U.S. equine population of more than 21 million horses and mules by 1900, falling to about 3 million horses by 1960. Identifies human social demand and humans' capacity to own capital as key differences from horses.

Limits. Essay with rounded figures; its policy conclusions are the authors' own.

Access. full text

Autonomous production and current data

[Q01] Heerad Sabeti; Aspen Institute (2009). **The Emerging Fourth Sector**

Evidence. Describes for-benefit organizations combining social missions and business practices as a fourth organizational sector.

Limits. Terminological precedent based on public/private/social organizational categories, distinct from the autonomous-production proposal.

Access. Official publication page opened 2026-10-04; publication date September 9, 2009.

[Q02, U20] OECD (2023). **OECD Handbook on Compiling Digital Supply and Use Tables: Framework for digital SUTs**

Evidence. Adds transaction, product, and producer dimensions to a framework based on conventional supply and use tables.

Limits. The autonomous-production account is an original proposed extension, not an OECD statistical category or an existing autonomy measure.

Access. Official handbook chapter opened and framework text inspected 2026-10-04.

[Q03, U22] U.S. Bureau of Economic Analysis (n.d.). **Guide to the Interactive GDP-by-Industry Accounts Tables**

Evidence. Defines value added and its compensation, net production-tax and gross-operating-surplus components; explains current-price shares and nonadditivity of chained-dollar industry series.

Limits. Does not identify an automated sector; the numerical producer example is invented accounting illustration. Gross surplus and net operating surplus are not automatically household disposable income.

Access. Official guide opened and relevant definitions inspected 2026-10-04.

[Q04, U21] U.S. Bureau of Economic Analysis (n.d.). **What are requirement tables, and how are they formed?**

Evidence. Explains direct and total production requirements linking industries through purchased inputs.

Limits. Combining requirements with human-hour coefficients is a further analyst calculation; current tables do not predict future autonomous technologies or automatically capture a complete life-cycle labor footprint.

Access. Official methodology FAQ opened 2026-10-04.

[Q05] U.S. Bureau of Economic Analysis; Federal Reserve Bank of St. Louis (2026 data vintage; 2025 observation). **Personal consumption expenditures: Services: Housing: Imputed rental of owner-occupied nonfarm housing (DOWNRC1A027NBEA)**

Evidence. Annual nominal 2025 observation is 2,521.870 billion dollars, updated September 30, 2026.

Limits. A gross PCE service imputation, not cash income, net rental income, value added of an autonomous sector, or proof of labor-free housing supply.

Access. FRED official series page opened 2026-10-04; observation, units, vintage and BEA source checked.

[Q06] U.S. Bureau of Economic Analysis (2017). **Housing Services in the National Economic Accounts**

Evidence. Explains owner-occupants treated as landlords renting to themselves, with imputed rental service in PCE and GDP to preserve comparability across tenancy forms.

Limits. The accounting treatment does not establish that housing is autonomous or that its service value all accrues as net owner income.

Access. Official methodology note opened 2026-10-04; page last modified December 4, 2017.

[Q07] Mark Zandi; Scott Hoyt; Shandor Whitcher; Moody's Analytics (2026). Estimates of Personal Savings, Personal Outlays and Excess Savings by Demographic Group

Evidence. March 2026 methodology explains allocation of financial flows and disposable income across demographic groups, computation of outlays as income less saving, inclusion of interest/transfers, and federal-tax adjustment.

Limits. Model-derived personal outlays differ from direct observations of household consumption; no measure of human-essential or luxury spending is provided. The authors' view of relative data quality is not treated as independently established.

Access. Primary eight-page report opened 2026-10-04; methodology pp.1-4 inspected.

[Q08] Jeff Horwich; Federal Reserve Bank of Minneapolis (2026). Have U.S. consumers gone "K-shaped"? A review of the data

Evidence. Compares Moody's top-decile outlays estimate above 45% with 23% in 2024 CE spending and 25.7% in 2023 prototype PCE distribution, explaining differing coverage and methods.

Limits. Periods, concepts, survey/model methods and coverage differ; these figures cannot be treated as one interchangeable series or used to measure essential-human spending.

Access. Official review opened and methodological comparison inspected 2026-10-04; exact publication day not exposed in retrieved page.

[Q09, U16] U.S. Bureau of Economic Analysis (n.d.). Intellectual property products

Evidence. Defines intangible fixed assets and includes entertainment, literary and artistic originals.

Limits. Supports treating some past human creations as productive assets; does not classify every royalty or creator receipt as pure capital income, nor measure future demand.

Access. Official glossary opened 2026-10-04.

[Q10] Economic Policy Institute (n.d.). Employment multipliers for all private industries in the BLS employment requirements matrix, Table A1

Evidence. Reports direct jobs per \$1 million of final demand by industry, including about 1.0 in electric power generation, transmission, and distribution, 1.3 in oil and gas extraction, and 0.7 in natural gas distribution.

Limits. Tabulation of an earlier BLS matrix vintage. Direct employment omits upstream, maintenance, and capital-replacement labor.

Access. table

[Q11] U.S. Bureau of Labor Statistics (n.d.). Employment and Total Requirements Matrix

Evidence. Each column shows the direct and indirect employment across industries generated by \$1 million of an industry's primary product. BLS withdrew the tables on 6 February 2026 to correct an error and stated that corrected tables would accompany the next Employment Projections release; the 2025-35 projections were released on 27 August 2026.

Limits. Coefficients describe the observed production system and are not by themselves a measure of autonomy. Republished tables were not inspected for this edition.

Access. program page

[Q12] U.S. Bureau of Economic Analysis (2017). Imputing Rents to Owner-Occupied Housing by Directly Modelling Their Distribution, Working Paper WP2017-7

Evidence. States that imputed rent on owner-occupied housing accounts for about 8 percent of GDP.

Limits. Share stated for the period the paper studies; the 2025 level is taken from Q05.

Access. full text

Quantitative evidence and accounting

[U08] Daron Acemoglu, David Autor, and Simon Johnson (2023). *Can We Have Pro-Worker AI?*

Evidence. MIT policy memo, September 2023. Explicitly identifies wage pressure from displaced higher-paid workers entering lower-paid work. Its proposed technological direction differs from assuming complete automation.

Limits. Current observations and illustrative calculations are distinguished in the text; these data do not measure the counterfactual essential-demand share.

Access. Primary source inspected in the 4 October 2026 review.

[U10] U.S. Bureau of Labor Statistics (2025). *Consumer Expenditures—2024*

Evidence. Release dated 19 December 2025. Establishes the release period and expenditure concepts. CE spending differs from PCE and GDP; averages are per consumer unit. Major-component shares in 2024: housing 33.4%, transportation 17.0%, food 12.9%, personal insurance and pensions 12.5%, and healthcare 7.9%.

Limits. Current observations and illustrative calculations are distinguished in the text; these data do not measure the counterfactual essential-demand share.

Access. Primary source inspected in the 4 October 2026 review.

[U11] U.S. Bureau of Labor Statistics (2025). *Table 1101: Quintiles of Income Before Taxes, 2024*

Evidence. Official XLSX downloaded and cells inspected. Includes 135.760 million consumer units, entertainment and fees/admissions means and budget shares. The current-scale arithmetic multiplies rounded published means by units; entertainment and its subcategory must not be added. The source's standard errors were not propagated into scenario outputs.

Limits. Current observations and illustrative calculations are distinguished in the text; these data do not measure the counterfactual essential-demand share.

Access. Primary source inspected in the 4 October 2026 review.

[U12] U.S. Bureau of Labor Statistics (2026). *Occupational Outlook Handbook: Childcare Workers*

Evidence. May 2025 wage data, page revised September 2026. Median \$16.82 per hour versus \$24.51 across occupations. Wage coverage differs from employment projections and excludes self-employment. Ratio calculated here.

Limits. Current observations and illustrative calculations are distinguished in the text; these data do not measure the counterfactual essential-demand share.

Access. Primary source inspected in the 4 October 2026 review.

[U13] U.S. Bureau of Labor Statistics (2026). *Occupational Outlook Handbook: Home Health and Personal Care Aides*

Evidence. May 2025 wage data and 2025-2035 projections. Median \$35,800 versus \$50,980 across occupations; projected employment growth 18%. These are baseline projections, not estimates of essential human demand.

Limits. Current observations and illustrative calculations are distinguished in the text; these data do not measure the counterfactual essential-demand share.

Access. Primary source inspected in the 4 October 2026 review.

[U14] U.S. Bureau of Labor Statistics (2026). *American Time Use Survey—2025, Table 11A*

Evidence. 2025 annual averages, release June 2026. Leisure 5.16, television 2.61, and socializing/communicating 0.58 hours per day, civilian population age 15 and over. Time use is not willingness to pay or a future constraint estimate.

Limits. Current observations and illustrative calculations are distinguished in the text; these data do not measure the counterfactual essential-demand share. ATUS operations were suspended from 1 October to 12 November 2025 during the federal government shutdown, so 2025 annual estimates omit that period.

Access. Primary source inspected in the 4 October 2026 review.

[U15] U.S. Bureau of Economic Analysis (2025). Arts and Cultural Production Satellite Account, U.S. and States, 2023

Evidence. Release 2 April 2025. \$1.17 trillion, 4.2% of GDP, 5.4 million jobs; real value added growth 6.6%, jobs growth 0.3%. Broad scope includes supporting activity. The program landing page carries a February 2026 notice ending regular production.

Limits. Current observations and illustrative calculations are distinguished in the text; these data do not measure the counterfactual essential-demand share.

Access. Primary source inspected in the 4 October 2026 review.

[U17] U.S. Bureau of Economic Analysis (2025). The 2025 Annual Update of the National Economic Accounts

Evidence. Survey of Current Business, November 2025, Table 7. 2024 employee compensation \$15,027.1 billion and wages/salaries \$12,387.9 billion. A named historical vintage used only for scale, not a latest-vintage essential-demand estimate.

Limits. Current observations and illustrative calculations are distinguished in the text; these data do not measure the counterfactual essential-demand share.

Access. Primary source inspected in the 4 October 2026 review.

[U23] U.S. Bureau of Labor Statistics (2026). Labor share at its lowest level, 52.8 percent, in second quarter 2026

Evidence. The Economics Daily reports a nonfarm business labor share of 52.8% in the second quarter of 2026, the lowest since the series began in 1947, compared with a postwar range generally between 60% and 66%.

Limits. Nonfarm business sector only. It differs from total-economy and net measures and describes a mixed economy, not the autonomous endpoint.

Access. full text

[U24] Epoch AI (2025). LLM inference price trends

Evidence. Prices for reaching fixed performance thresholds fell between 9x and 900x per year depending on the threshold, with a median of about 50x per year; the fastest declines occurred recently.

Limits. List prices for model access, not full delivery costs. Trends may not persist and vary by task.

Access. full text

[U25] U.S. Bureau of Labor Statistics (2026). Housing and transportation accounted for 50 percent of household spending in 2024

Evidence. The Economics Daily reports 2024 CE shares of 33.4% for housing, 17.0% for transportation, and 12.9% for food out of \$78,535 in average annual expenditures; food at home averaged \$6,224 and food away from home \$3,945.

Limits. Shares of CE total expenditure, not national-accounts consumption. Healthcare covers only household-paid premiums and expenses.

Access. full text