

The Labour Liability Ratio: Demographic Ageing, Artificial Intelligence and the Transformation of Labour-Centred Capitalism

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Abstract

For much of the twentieth century, advanced capitalist democracies stabilised economic growth through a labour-mediated accumulation regime linking mass employment, wage-based consumption, and welfare-state finance. The convergence of demographic ageing and artificial intelligence destabilises that historical configuration. Ageing populations, shrinking labour-force growth, and rising dependency burdens coincide with technological systems capable of substituting for cognitive and physical labour.

Existing approaches within demographic economics, automation studies, and labour-market analysis address these developments separately. To integrate them, the article introduces the labour liability ratio (LLR), a heuristic framework that captures the relationship between labour's contribution to output, demand formation, and fiscal capacity and the demographic, infrastructural, and dependency costs required to sustain labour-intensive societies.

The article argues that advanced capitalist economies face compression of this ratio from both directions: labour-related costs rise while labour's relative contribution weakens under advanced automation. It explores the possibility that demographic contraction may partially offset the disruptive effects of AI-driven labour substitution by reducing long-run labour-force growth and increasing capital deepening. This shift reconfigures political economy, raising questions of ownership, distribution, and technological surplus, alongside the global core-periphery divide. The article examines the political-economic implications of these developments for ownership, distribution, and technological sovereignty in increasingly automated economies.

1. Introduction

For much of the twentieth century, the macroeconomic stability of advanced economies rested upon a historically specific institutional arrangement: the integration of mass human labour into the circuits of production, consumption, and state finance. Under the Fordist accumulation regime, labour served not merely as a productive input but as the central mediating mechanism linking industrial output to aggregate demand, fiscal capacity, and social integration. Rising productivity was coupled to rising wages, expanding consumption, and growing tax revenues, enabling the postwar welfare state to institutionalise mass prosperity (Aglietta, 1979; Boyer, 1990; Keynes, 1936; Kalecki, 1943). The durability of this model rested on a foundational assumption: that expanding populations and labour inputs would continue to underpin economic growth, welfare-state finance, and political stability.

That assumption is now increasingly destabilised by the convergence of two structural transformations. First, advanced capitalist economies are experiencing demographic inversion: ageing populations, persistently sub-replacement fertility, shrinking working-age cohorts, and declining aggregate labour hours (Goodhart and Pradhan, 2020; OECD, 2024a). Under low-fertility, zero-net-migration scenarios, the European Union's population could fall below 300 million by 2100, with Italy contracting from roughly 59 million today to below 30 million (United Nations Department of Economic and Social Affairs, 2024).

Old-age dependency ratios across several core economies are projected to approach or exceed 50 retirees per 100 working-age adults (OECD, 2024c).

Second, advances in artificial intelligence, machine learning, and robotics are progressively weakening labour's historical role within production. Unlike earlier mechanisation that primarily substituted for physical strength while expanding demand for cognitive and managerial labour, contemporary AI systems increasingly automate cognitive, coordinative, and analytical functions previously reserved for highly educated workers (Brynjolfsson, Li and Raymond, 2023; Acemoglu and Restrepo, 2020). IMF analysis suggests that roughly 40 per cent of global employment, and substantially higher shares in advanced economies, may be exposed to AI-assisted transformation (Cazzaniga et al., 2024). Robotics is extending automation into logistics, warehousing, manufacturing, retail, and segments of physical services (International Federation of Robotics, 2024). Previous industrial revolutions shifted labour upward along the cognitive ladder; contemporary AI increasingly climbs that ladder simultaneously (Brynjolfsson et al., 2023).

This article adopts a macro-political-economy approach rooted in Regulation School theory and informed by demographic economics, automation studies, and world-systems analysis. It examines how artificial intelligence and demographic inversion jointly undermine the institutional foundations of labour-centred capitalism. More specifically, it asks how advanced capitalist economies are transformed when these forces weaken labour's role as the central mediator between population, production, aggregate demand, and state finance.

Existing frameworks only partially capture this dual transformation. Conventional dependency ratios measure age structures while largely assuming the continuing centrality of labour within production. Mainstream automation studies focus on labour-market adjustment and productivity effects but often pay insufficient attention to the demographic and fiscal architecture of labour-centred welfare states. Aggregate GDP metrics similarly obscure labour's historical role as a mechanism linking production, consumption, taxation, and social integration (Polanyi, 1944; Streeck, 2016; Boyer, 1990). Contemporary political economy, therefore, lacks an integrated framework for analysing the interaction between demographic ageing, labour substitution, fiscal reproduction, and the restructuring of accumulation regimes.

To conceptualise this shift, the article develops the labour liability ratio (LLR): an analytical heuristic that captures the relationship between labour's contribution to output, demand formation, and fiscal capacity on the one hand, and the demographic, infrastructural, and dependency costs required to sustain labour-intensive societies on the other. Rather than functioning as a formal econometric measure, the LLR is intended as a macro-political-economy framework for analysing labour's changing systemic role under conditions of demographic ageing and advanced automation.

The labour liability ratio is situated within the Regulation School tradition (Aglietta, 1979; Boyer, 1990). Rather than treating technological change as an exogenous productivity shock, the framework examines how demographic structures, labour institutions, and technological systems jointly shape regimes of

accumulation and their reproduction over time. In this respect, the article focuses less on technological substitution as an isolated phenomenon than on the institutional conditions under which changing labour requirements reshape broader patterns of production, distribution, and social reproduction.

The article makes three contributions. First, it develops the labour liability ratio (LLR), a novel heuristic framework for analysing labour's evolving systemic role amid demographic ageing and advanced automation. Second, it brings together demographic economics, automation studies, and Regulation School political economy within a common analytical framework, highlighting how demographic and technological transformations interact within regimes of accumulation. Third, it uses this framework to explore the implications of the decline of labour centrality for future forms of accumulation, distribution, and economic governance.

The article proceeds as follows. Section II develops the labour liability ratio. Section III examines demographic inversion and the limits of additive demographic strategies. Section IV analyses the two-wave automation transition encompassing cognitive and physical labour substitution. Section V explores competing institutional futures emerging under conditions of declining labour centrality. Section VI examines the geopolitical implications of post-labour accumulation, while Section VII concludes by considering the broader political-economic challenges posed by demographic contraction and artificial intelligence.

2. Theoretical Framework: The Labour Liability Ratio

2.1 Labour as Macroeconomic Mediator

The stability of twentieth-century capitalist democracies depended not simply on economic growth, but on a historically specific institutional relationship between labour, production, and consumption. Under Fordism, labour functioned as the central mediating mechanism linking industrial production to aggregate demand and fiscal reproduction. The mass worker simultaneously occupied three interconnected macroeconomic roles: producer of output, consumer of commodities, and taxpayer sustaining the welfare state. As Regulation School theorists observed, Fordism partially resolved the structural underconsumption crises of early industrial capitalism by embedding wage growth within productivity growth, thereby aligning mass production with mass consumption (Aglietta, 1979; Lipietz, 1987; Boyer, 1990).

This institutional arrangement was subsequently stabilised through the postwar Keynesian welfare state. Expanding labour participation and rising productivity enabled governments to finance pensions, healthcare, education, and infrastructure through taxation of labour income while simultaneously sustaining aggregate demand through wage-based consumption (Keynes, 1936; Kaldor, 1957). Labour, therefore, functioned not merely as a factor of production but as the central institutional mechanism integrating population, demand formation, fiscal capacity, and political inclusion. Economic growth, demographic expansion, and welfare-state stability became mutually reinforcing.

Crucially, the postwar global economy extended this labour-mediated accumulation regime beyond the advanced capitalist core. As industrial production shifted toward export-oriented manufacturing systems in East Asia and parts of the Global South, labour-intensive industrialisation became the principal pathway through which developing economies integrated into global capitalism (Lewis, 1954; Gereffi, 2014). The broader architecture of globalisation, therefore, remained fundamentally dependent on the monetisation of large-scale human labour inputs across both industrial and post-industrial economies.

The contemporary significance of artificial intelligence and demographic ageing lies precisely in their potential to weaken this historically central mediating role of labour. If advanced capitalist economies increasingly generate output through automated systems while simultaneously supporting ageing populations with shrinking labour forces, then the traditional Fordist relationship between labour, production, demand, and fiscal capacity becomes structurally unstable. Under conditions where production increasingly scales computationally rather than demographically, labour may progressively lose its historical role as the primary organising mechanism linking population size to economic output and social integration.

2.2 Defining the Labour Liability Ratio

To conceptualise this transformation, this article introduces the labour liability ratio (LLR). The concept refers to the structural relationship between labour's macroeconomic contribution and the aggregate demographic, fiscal, infrastructural, and biophysical costs required to sustain labour-intensive societies. More specifically, the ratio captures the degree to which labour continues to function as a net stabilising force within the broader political-economic system.

The LLR should not be understood as a precise econometric index or directly measurable statistical variable. Rather, it functions as a heuristic macro-political economy framework designed to analyse the changing systemic relationship between labour, demographic structure, and technological productivity under conditions of advanced automation and demographic ageing.

Heuristically, the relationship can be represented as follows:

$$LLR = \frac{L_o + L_d + L_t}{F_d + B_r + H_c}$$

Where:

L_o refers to labour's contribution to economic output;

L_d refers to labour's role in generating aggregate demand through wages and consumption;

L_t refers to labour-generated fiscal revenues through taxation;

F_d refers to fiscal dependency costs associated with pensions and welfare obligations;

B_r refers to the biophysical and material costs of reproducing labour power;

H_c refers to healthcare and long-term care burdens associated with aging populations.

Figure 1 illustrates the basic compression dynamic of the labour liability ratio under conditions of demographic ageing and advanced automation. On the numerator side, labour hours, labour demand, labour share, and labour-centred tax revenues increasingly weaken. On the denominator side, dependency costs, healthcare burdens, labour-reproduction costs, and pension obligations continue to rise.

Historically, Fordist industrial capitalism operated under conditions of a strongly positive labour liability ratio. Expanding labour participation generated sufficient output, aggregate demand, and fiscal revenue to offset the broader costs of demographic reproduction and social dependency. Rising productivity and wages remained institutionally coupled, allowing labour to function simultaneously as a productive input, a consumer base, and a fiscal foundation of the welfare state.

Under contemporary conditions, however, the ratio faces increasing structural compression. Across advanced capitalist economies, aging populations extend healthcare and dependency burdens, while labour's relative contribution to production increasingly weakens under conditions of advanced automation and declining aggregate labour intensity (OECD, 2024c; World Health Organization, 2024). More broadly, the share of total societal time devoted to directly productive market labour has steadily declined across advanced post-industrial economies as longer education phases, automation, ageing, and extended retirement reduce aggregate labour intensity (Eberstadt, 2016).

This does not imply the disappearance of labour as such. Rather, it suggests that labour may gradually cease to function as the dominant institutional mechanism by which advanced capitalist societies organise production, distribute demand, and reproduce the fiscal order. The concept, therefore, shifts analytical attention away from aggregate population growth alone and toward labour's changing macroeconomic centrality under conditions of demographic inversion and artificial intelligence (Polanyi, 1944; Streeck, 2014).

A shrinking population does not necessarily imply declining prosperity if technological capital increasingly substitutes for labour inputs (Solow, 1956). Conversely, a growing population does not automatically strengthen macroeconomic stability if the fiscal and infrastructural costs associated with labour reproduction rise faster than labour's contribution to output and taxation. Under conditions of advanced automation, demographic contraction may partially offset labour displacement by reducing long-term expansion of labour supply itself.

2.3 Why Existing Metrics Are Insufficient

The labour liability ratio differs from existing demographic and labour-market indicators in several important respects because it incorporates not simply the quantity of labour in an economy, but also labour's changing systemic centrality in production, demand formation, and fiscal reproduction.

Traditional dependency ratios measure the relationship between working-age and non-working-age populations, but generally assume that labour remains the economy's central productive resource. As a result, they insufficiently account for the possibility that advanced automation may weaken the relationship between labour inputs and aggregate output itself. A society may therefore experience worsening demographic dependency ratios while simultaneously becoming less economically dependent upon biological labour inputs.

Similarly, labour-share metrics capture the distribution of income between labour and capital but offer little insight into the demographic, infrastructural, and biophysical costs of sustaining labour-intensive societies (Piketty, 2014). Employment rates and unemployment statistics measure labour-market participation but ignore labour's broader institutional role in demand formation, fiscal reproduction, welfare-state finance, and political integration (Polanyi, 1944; Boyer, 1990).

Productivity measures likewise remain insufficient because they typically evaluate output efficiency within production itself while abstracting from the broader societal costs required to reproduce labour-intensive economies. The LLR instead attempts to integrate labour's productive contribution with the fiscal and demographic structures necessary to sustain labour-centred systems over time.

Much of the contemporary automation literature likewise remains centred on labour-market adjustment rather than on systemic political-economy transformation. Mainstream approaches frequently assume that technological change will ultimately generate compensatory forms of employment, preserving labour's central macroeconomic role even as specific occupations disappear (Autor, 2015). While such dynamics characterised previous industrial revolutions, contemporary artificial intelligence increasingly targets cognition itself, including analytical processing, pattern recognition, software generation, and administrative coordination (Acemoglu and Restrepo, 2020; Eloundou et al., 2023; Brynjolfsson et al., 2023). The historical upward migration of labour along the cognitive ladder may therefore weaken under conditions in which automation simultaneously climbs the ladder.

The labour liability ratio, therefore, attempts to integrate dimensions often analysed separately: demographic ageing, labour substitution, fiscal reproduction, aggregate demand formation, labour-intensive welfare systems, and the biophysical costs of labour reproduction. Its purpose is not to predict a single economic outcome, but to provide a framework for analysing the structural pressures that emerge as advanced capitalist economies transition toward increasingly capital-intensive forms of production.

2.4 Compression of the Ratio

The contemporary compression of the labour liability ratio emerges from two simultaneous pressures.

The first concerns the expansion of labour-related costs. Ageing populations dramatically increase pension obligations, healthcare expenditure, and long-term care requirements. These pressures are amplified by Baumol's cost disease in care-intensive sectors such as nursing, eldercare, and healthcare, where productivity growth remains structurally limited relative to technologically scalable industries

(Baumol, 1967; OECD, 2024c). At the same time, the reproduction of highly skilled labour has become increasingly resource-intensive, requiring extensive educational systems, healthcare infrastructures, housing, transportation networks, and energy-intensive digital systems (Smil, 2017).

The second pressure concerns labour's weakening contribution to output, demand formation, and taxation. Average annual labour hours have declined across most advanced economies due to ageing, extended education, falling labour-force participation, and changing work structures. At the same time, artificial intelligence enables firms to expand productive capacity with fewer labour inputs. Cognitive automation reduces demand for information processing, coordination, and administrative work, while robotics extends into previously resistant physical domains (Eberstadt, 2016; International Federation of Robotics, 2024).

The combined result is a growing asymmetry between labour's systemic costs and its systemic contribution. The Fordist accumulation regime required labour to remain structurally central to production, consumption, and fiscal reproduction simultaneously. Under conditions of demographic inversion and advanced automation, centrality is progressively weakening. The following sections examine these dynamics empirically and explore their political-economic implications.

3. Demographic Inversion and the Exhaustion of Additive Solutions

3.1 Demographic Inversion and Declining Labour Intensity

The postwar growth regimes of high-income economies were built upon a historically exceptional demographic configuration: expanding working-age populations, rising labour-force participation, and comparatively limited dependency burdens. Across much of the advanced capitalist world, that structure is now reversing. Fertility rates throughout Europe and East Asia remain persistently below replacement level, while life expectancy continues to rise and labour-force growth slows or contracts (Goodhart and Pradhan, 2020; OECD, 2024a).

Under constant low-fertility, zero-net-migration scenarios, the population of the European Union would decline from roughly 449 million today to approximately 419 million by 2050 and potentially below 300 million by 2100. Italy could contract from roughly 59 million inhabitants today to below 30 million by the century's end (United Nations Department of Economic and Social Affairs, 2024). Although the United States remains demographically younger, its fertility rates have also fallen below replacement level, making long-term population growth increasingly dependent on migration. Table 1 summarises illustrative long-term demographic trajectories under these assumptions.

Table 1
Illustrative Population Projections Under Low-Fertility, Zero-Net-Migration
Scenarios

Region	Population Today	2050	2100
European Union	~ 449 million	~ 419 million	~ 295 million
Italy	~ 59 million	~ 49 million	~ 29 million
United States	~ 340 million	~ 330 million	< 250 million

The result is a profound demographic inversion in which shrinking cohorts of productive labour increasingly support expanding pools of age-related dependency. OECD projections indicate that old-age dependency ratios in countries such as Italy, Germany, Japan, and South Korea may approach or exceed 50 dependents per 100 working-age individuals by mid-century (OECD, 2024a). Healthy life expectancy substantially lags total life expectancy: across the European Union, average life expectancy exceeds 81 years while healthy life expectancy remains around 62–63 years, implying nearly two decades of age-related morbidity and care demand for large segments of the population (World Health Organization, 2024).

This inversion also reflects a long-term decline in aggregate labour intensity. Annual labour hours per worker have fallen steadily due to longer education, earlier retirement, and changing work norms. In Germany, for example, average annual hours declined from more than 2,000 in the postwar decades to roughly 1,331 today (OECD, 2024a). Illustrative calculations suggest that directly productive market labour now accounts for only about 7.8 per cent of total societal time in advanced post-industrial economies, down from roughly 11 per cent in earlier industrial periods (Eberstadt, 2016; OECD, 2024a).

The fiscal implications are intensified by the structure of contemporary welfare states. Healthcare, pensions, and long-term care are highly labour-intensive sectors subject to Baumol's cost disease, limiting technological deflation in precisely the areas where demand is rising fastest (Baumol, 1967). At the same time, reproducing highly productive labour has become more expensive. High-income societies require extensive education, healthcare, housing, and infrastructure systems, with housing costs in major metropolitan regions functioning as a de facto tax on labour reproduction (Aalbers, 2016; Georgescu-Roegen, 1971; Smil, 2017). Labour tax wedges in several advanced European economies now approach or exceed 45 per cent of total labour costs (OECD, 2024b).

From the perspective of the labour liability ratio, demographic inversion therefore intensifies both sides of the compression: labour-related dependency costs continue to rise while labour's relative macroeconomic centrality progressively declines.

3.2 The Limits of Pro-Natalist Expansion

Contemporary policy responses to demographic ageing remain anchored in twentieth-century assumptions that expanding labour supply is essential for sustaining aggregate demand, fiscal stability,

and welfare-state finance (Streeck, 2014; Goodhart and Pradhan, 2020). Governments have therefore pursued additive demographic solutions aimed at increasing the volume of biological labour.

The most direct approach is a pro-natalist policy. Across Europe and East Asia, states have introduced childcare subsidies, parental leave, tax incentives, and direct financial transfers. Yet these interventions have produced only limited results. Fertility rates remain persistently below replacement level despite substantial public expenditure (Lesthaeghe, 2014; OECD, 2024a). South Korea, despite one of the world's most ambitious pro-natalist programmes, still records fertility rates hovering around 0.8 births per woman (United Nations Department of Economic and Social Affairs, 2024). Similar stagnation is evident in Japan, Italy, Spain, and much of Northern Europe.

These trends reflect deeper structural shifts: urbanisation, rising educational attainment, delayed family formation, high housing costs, and the intensive parenting demands of knowledge economies (Lesthaeghe, 2014). Pro-natalist strategies also face a significant temporal asymmetry: even a successful recovery in fertility would take decades before new cohorts enter the labour market, while dependency burdens rise immediately.

Under accelerating automation, the long-term rationale for labour expansion itself becomes uncertain. If AI substitutes for labour across cognitive and physical domains, shrinking working-age populations may partially offset technological displacement rather than exacerbate it. The interaction between demographic contraction, automation, and capital deepening is examined in later sections.

3.3 Migration as an Additive Demographic Fix

Faced with the limits of pro-natalist policy, many advanced economies increasingly turned toward labour migration as a demographic stabilisation mechanism. From a narrow accounting perspective, importing working-age adults appears to improve labour-force ratios immediately by expanding the pool of taxable labour while partially offsetting population ageing. Highly skilled migration continues to generate substantial fiscal, technological, and innovation benefits in many advanced economies, particularly in research-intensive and high-productivity sectors (Borjas, 2015; OECD, 2023).

However, treating migration primarily as a macroeconomic substitute for endogenous demographic reproduction encounters several structural limits.

First, fertility convergence substantially weakens migration's long-term demographic stabilisation effect. Numerous demographic studies demonstrate that fertility rates among immigrant populations tend to converge toward host-country norms across one or two generations (Coleman, 2006). Migration, therefore, does not permanently reverse demographic ageing without continuously expanding inflows over time.

Second, the fiscal contribution of migration varies substantially according to skill composition, wage structure, and welfare-state architecture. Highly skilled migrants employed in high-productivity sectors frequently generate strongly positive net fiscal contributions. By contrast, large-scale low-wage migration

into sectors characterised by low productivity and high public-service utilisation may generate weaker long-term fiscal effects, particularly in expensive welfare states that require substantial expenditure on infrastructure, education, healthcare, and housing (Borjas, 2015; OECD, 2023). The issue is therefore not migration as such, but the structural relationship between labour-market composition and the fiscal requirements of ageing welfare systems.

Third, additive demographic strategies increasingly collide with the spatial and infrastructural constraints of advanced urban economies. Major metropolitan regions across Europe and North America face housing shortages, rising rents, strained transportation systems, and growing political conflict over spatial distribution. Rapid population expansion within highly financialised housing systems frequently generates asset inflation, disproportionately benefiting property owners while raising labour reproduction costs for younger and lower-income populations (Aalbers, 2016).

The political consequences of these dynamics are equally significant. High-tax welfare states rely not only on fiscal extraction but also on institutional trust and perceived reciprocity between contributors and beneficiaries. When housing affordability deteriorates, public services become visibly strained, and labour-market competition intensifies, social solidarity may weaken (Putnam, 2007). Across much of the advanced capitalist world, the rise of anti-establishment populism partly reflects the perception that traditional political institutions can no longer reconcile demographic expansion, welfare-state sustainability, and declining living standards for segments of the working and middle classes. In Polanyian terms, the social dislocations generated by the marketisation of labour, housing, and migration increasingly provoke political counter-reactions against the institutional architecture of late globalisation itself (Polanyi, 1944; Streeck, 2016).

From the perspective of the labour liability ratio, additive demographic strategies increasingly appear structurally unstable because they attempt to preserve labour-intensive growth under conditions where labour's systemic centrality is itself weakening. An expanding aggregate population may temporarily enlarge the labour pool, but it also increases the infrastructural, fiscal, and biophysical costs of sustaining labour-intensive societies. Under conditions of accelerating automation and demographic ageing, the problem facing advanced economies is therefore not simply a shortage of labour, but the growing instability of a political-economic system historically organised around labour as its primary mediating mechanism.

4. The Two-Wave Automation Transition

4.1 Cognitive Automation

The demographic inversion of advanced capitalist economies intersects with a second structural transformation: the rapid emergence of artificial intelligence systems capable of substituting for large domains of human cognitive labour. While previous industrial revolutions primarily mechanised physical production and expanded demand for cognitive coordination, administration, and managerial roles,

contemporary AI increasingly targets cognition itself (Autor, 2015; Acemoglu and Restrepo, 2020). This distinction matters because much economic theory assumes technological displacement in one area will generate compensatory absorption in higher-value cognitive tasks. Contemporary AI weakens that assumption.

Large language models, generative AI systems, and foundation models now perform tasks previously reserved for highly educated professionals, including software engineering, legal analysis, financial modelling, translation, administrative coordination, and content generation (Bommasani et al., 2021; Eloundou et al., 2023). IMF analysis indicates that roughly 40 percent of global employment, and close to 60 percent in advanced economies, may be exposed to AI-assisted transformation (Cazzaniga et al., 2024).

These systems do more than accelerate human labour; they enable the scaling of productive and coordinative capacity without proportional increases in employment. Their deeper significance lies in the externalisation and replication of socially accumulated knowledge. In Marx's terms, advanced AI approximates a privatised form of the "general intellect": collective knowledge embedded in technical systems and computational infrastructures (Marx, 1973). Once trained, algorithmic systems reproduce capabilities across digital networks at near-zero marginal cost. Human cognitive labour, by contrast, remains constrained by time in education, biological limits, fatigue, and the high biophysical costs of reproducing skilled workers. Machine cognition, therefore, scales computationally, while biological cognition scales demographically and institutionally.

This shift increasingly affects sectors once considered relatively protected from automation. AI-assisted coding is now widespread in software development, while consulting, accounting, legal services, and administrative functions face growing pressure from improvements in analytical reasoning and document processing (Brynjolfsson et al., 2023; Stanford Institute for Human-Centered Artificial Intelligence, 2025; Noy and Zhang, 2023). Entry-level white-collar roles may be especially vulnerable, as many have historically served as training pathways through routine analytical tasks that are now increasingly automated.

Mainstream debates often assume AI will primarily augment rather than replace labour, replicating the dynamics of previous revolutions in which displacement in one domain generated new opportunities elsewhere. Yet this historical analogy underestimates a key difference: earlier mechanisation substituted for physical labour while increasing demand for human cognitive oversight. Contemporary AI targets cognition itself, including analytical processing, pattern recognition, software generation, and organisational coordination. Recent estimates, including the IMF's, suggest that labour-market effects may be substantially larger than many augmentation scenarios anticipate (Cazzaniga et al., 2024), although these projections remain uncertain.

The macroeconomic significance stems from a structural cost asymmetry. Reproducing a highly educated worker requires decades of investment to generate roughly 1,500 annual labour hours. AI systems, once trained, replicate cognitive functions across networks at extremely low marginal cost.

This divergence creates persistent substitution pressure, particularly in ageing economies with slower demographic and demand growth. Even where AI augments tasks, productivity gains can translate into lower aggregate labour demand if firms need fewer workers to maintain output.

Taken together, these developments weaken labour's historical role as the primary mediator between population growth and productive expansion. Output increasingly scales through computational infrastructure rather than proportional labour inputs, while welfare-state finance and aggregate demand remain tied to labour-centred income systems inherited from Fordism.

4.2 Physical Automation and the Erosion of Labour Arbitrage

The second wave extends automation beyond cognition into the physical economy itself. Historically, advanced robotics remained largely confined to highly structured industrial environments such as automotive manufacturing, where repetitive processes could be tightly controlled. Recent advances in embodied AI, machine vision, sensor fusion, and actuator systems increasingly aim to extend automation into logistics, warehousing, agriculture, construction, retail, and segments of physical service work (International Federation of Robotics, 2024).

The scale of this transition is already becoming visible. According to the International Federation of Robotics, annual global industrial robot installations exceeded 500,000 units in recent years, while robot density in advanced manufacturing economies such as South Korea, Singapore, Germany, and Japan continues to rise rapidly (International Federation of Robotics, 2024). Simultaneously, falling compute costs and growing investment into humanoid robotics increasingly aim to extend automation beyond fixed industrial settings into more flexible physical environments (Stanford Institute for Human-Centered Artificial Intelligence, 2025).

Although embodied robotics continues to face substantial engineering constraints, including battery limitations, maintenance complexity, actuator costs, and the challenge of navigating unstructured environments, the long-term substitution incentive remains powerful. Human labour remains biologically constrained by fatigue, limited working hours, illness, and demographic scarcity, whereas automated systems can potentially operate continuously with only maintenance interruptions. As robotic systems become cheaper, more energy efficient, and increasingly generalisable, even partial substitution may exert persistent downward pressure on labour demand and labour bargaining power across routine physical sectors.

The underlying economic asymmetry is substantial. A worker in advanced manufacturing or logistics in core advanced economies may cost €40–50 per hour once wages, healthcare obligations, pensions, taxes, and social contributions are fully accounted for. By contrast, firms developing autonomous systems increasingly target long-run operational costs measured in only a few dollars per productive machine hour at scale. Even if such targets remain technologically distant, they generate persistent economic pressure toward labour substitution wherever automation becomes technically feasible.

Brynjolfsson (2022) describes this broader tendency as the “Turing Trap”: the structural incentive to design AI systems that replicate and replace labour rather than complement it. The issue is therefore not whether automation becomes total, but whether even partial substitution progressively weakens labour’s aggregate bargaining position and macroeconomic centrality over time.

Taken together, cognitive and physical automation progressively weaken labour’s historical role significantly as the central mediator between population and production. Under conditions of advanced automation, output growth increasingly detaches from proportional labour-force expansion, while welfare-state finance and aggregate demand remain heavily dependent upon labour-centred income distribution systems inherited from the Fordist era (Solow, 1956).

The implications for the Global South may prove especially significant. For much of the postwar period, export-oriented industrialisation provided the principal pathway through which developing economies integrated into global capitalism through labour-intensive manufacturing and global value chains (Lewis, 1954; Gereffi, 2014). Artificial intelligence and advanced robotics may weaken this developmental model by reducing the relative importance of labour-cost arbitrage in global production systems. As advanced economies progressively automate and partially reshore production, labour abundance may lose some of the comparative advantage it historically provided during earlier phases of industrialisation.

This dynamic may intensify what Rodrik (2016) describes as premature deindustrialisation: the tendency for developing economies to lose manufacturing potential at substantially lower levels of income and industrial maturity than historically experienced by earlier industrialisers. Countries across Sub-Saharan Africa and parts of South Asia face rapidly expanding youth populations entering a global economy, potentially requiring substantially fewer labour-intensive manufacturing workers than previous industrial eras (United Nations Department of Economic and Social Affairs, 2024). The broader geopolitical implications of this transition are examined further in Section VII.

5. Institutional Futures After Labour

As advanced capitalist economies become increasingly dependent upon automated productive systems rather than biological labour, the institutional foundations of twentieth-century welfare capitalism come under growing strain. Fordist political economy linked wages, taxation, aggregate demand, and social integration through mass employment. If artificial intelligence progressively weakens labour’s role within production, advanced societies confront a fundamental distributive problem: how to sustain income flows, fiscal stability, and political inclusion once labour ceases to function as the central mechanism of economic participation.

Under these conditions, at least three broad institutional trajectories become visible.

5.1 Automated Rentier Accumulation

The first and arguably most path-dependent trajectory involves the consolidation of highly concentrated forms of automated rentier accumulation. In this scenario, ownership of AI infrastructure, hyperscale compute systems, semiconductor ecosystems, data architectures, robotics, and digital platforms remains concentrated among a relatively narrow set of corporations, asset managers, and technological oligopolies. Automation substantially increases productive capacity while reducing dependence upon large segments of human labour, allowing wealth generation to become increasingly detached from broad-based wage distribution.

This trajectory intensifies dynamics already identified by scholars of rentier and platform capitalism (Piketty, 2014; Srnicek, 2017; Christophers, 2020). Under post-labour conditions, returns increasingly flow toward ownership of capital-intensive infrastructures rather than labour participation itself. The result may be a highly unequal political economy characterised by concentrated technological ownership and expanding economic superfluity.

Several theorists describe this emerging configuration as a highly concentrated form of platform-based rent extraction, or digital rentierism, in which economic power derives less from competitive markets than from infrastructural control over computational systems, data flows, and algorithmic coordination (Durand, 2020). In such a system, citizens increasingly depend upon transfers, platform access, or precarious service labour while productive surplus accumulates within highly concentrated technological ecosystems.

Yet this configuration also contains an internal macroeconomic contradiction. Capitalist production ultimately depends not only on efficient production but also on sufficient aggregate demand capable of realising profits through consumption. If automation progressively displaces large segments of labour income while ownership remains narrowly concentrated, the system risks undermining the wage-based demand structures upon which mass-market capitalism historically depended (Keynes, 1936; Kalecki, 1943). The more productive capital becomes detached from labour income, the greater the pressure to redistribute purchasing power back into society through transfers, state spending, debt expansion, or broader ownership mechanisms. Automated rentier accumulation, therefore, risks destabilising the very demand conditions required for its continued profitability.

The political risks associated with this trajectory extend beyond inequality alone. If labour progressively loses its historical integrative role, advanced capitalist states may confront growing tensions between formal political equality and increasingly concentrated control over productive infrastructure. The result may be declining democratic legitimacy, weakening social cohesion, and intensified oligarchic influence over states increasingly dependent on private technological systems.

5.2 Redistribution Without Ownership Transformation

A second institutional trajectory seeks to stabilise the emerging post-labour economy by expanding redistribution mechanisms without fundamentally transforming ownership structures. Universal Basic Income (UBI) proposals represent the most prominent version of this approach (Van Parijs and

Vanderborght, 2017). Under this model, the state redistributes a portion of automated surplus through direct income transfers while leaving ownership of productive technological capital largely private.

UBI can mitigate immediate risks associated with labour displacement, including poverty, demand collapse, and social instability during the transition. In macroeconomic terms, it may help preserve aggregate consumption even as wage-based income weakens. In this sense, UBI functions as a *pharmakon* in the post-labour economy: both remedy and symptom. It may stabilise demand and social cohesion in the short term, yet it risks institutionalising widespread dependence on state transfers detached from direct participation in production.

Redistribution and ownership, however, are not equivalent. Redistribution reallocates surplus only after it has been privately generated and concentrated, whereas ownership determines structural claims on productive assets. Under purely redistributive systems, citizens remain dependent on transfers financed through taxation of concentrated capital. As labour displacement accelerates, UBI increasingly acts less as supplementary welfare and more as a systemic subsidy compensating for the erosion of labour-based income formation.

This creates additional asymmetries. By socialising the costs of technological displacement while privatising productivity gains, UBI may weaken firms' incentives to retain labour-intensive employment and shift the fiscal burden of unemployment onto the public sector. Broader fiscal challenges compound the problem: pension systems, sovereign debt, and welfare-state finance were built for economies with expanding labour-intensive production and growing taxable wage income (Minsky, 1986; Lavoie, 2014). Advanced automation, combined with slower population growth and potential deflationary pressures, risks destabilising these architectures and generating debt-deflation dynamics (Fisher, 1933).

5.3 Socialised Technological Capital

The third trajectory involves a more fundamental restructuring of ownership itself. Under this approach, advanced capitalist democracies progressively shift from labour-centred distribution toward broader social ownership of automated productive capital. Rather than relying primarily upon taxation and redistribution after wealth concentration occurs, societies institutionalise direct civic claims upon technological surplus generation *ex ante*.

This model extends principles already visible in sovereign wealth structures such as Norway's Government Pension Fund Global, which today exceeds US\$1.7 trillion in assets, Singapore's Temasek Holdings, and the Alaska Permanent Fund, which distributes annual citizen dividends financed through collectively owned resource revenues. The core principle is that advanced AI systems likewise depend fundamentally upon collectively generated inputs: publicly funded research, social data production, educational systems, energy infrastructures, legal frameworks, and state-supported technological ecosystems (Mazzucato, 2018). Under such conditions, the productive output of automated capital may increasingly be treated not solely as private property but as partially socialised surplus.

Several institutional mechanisms become possible within this framework. States may establish sovereign AI wealth funds financed through automated value-added taxes, compute infrastructure levies, digital land value taxation, energy royalties, public semiconductor holdings, or equity stakes in hyperscale AI firms. Rather than distributing purely redistributive welfare transfers, governments could provide citizens with direct claims on automated productivity through universal basic dividends linked to sovereign technological assets.

The broader implication is a transition from labour-mediated inclusion toward ownership-mediated inclusion through civic claims upon automated productive infrastructures. Under such conditions, the political economy of post-labour capitalism depends fundamentally upon whether technological surplus remains narrowly concentrated or becomes socially distributed through institutional redesign.

At the same time, socialised technological capital raises its own governance risks. Sovereign AI funds themselves could become vulnerable to bureaucratic capture, technocratic insulation, corruption, or oligarchic influence if democratic oversight mechanisms remain weak. The institutional challenge, therefore, concerns not merely public ownership, but how to prevent socially owned technological infrastructures from reproducing concentrated power under new institutional forms.

This transition also carries important implications for monetary and fiscal governance. Modern Monetary Theory scholars argue that sovereign monetary systems ultimately depend upon state capacity rather than purely private labour-market dynamics (Kelton, 2020; Lavoie, 2014). Extending this logic into the post-labour context suggests that future fiscal stability may increasingly rely upon public claims over automated productive capacity rather than taxation of biological labour alone.

The central institutional question, therefore, becomes whether advanced economies can redesign ownership, fiscal systems, and sovereign monetary architectures rapidly enough to adapt to a progressively post-labour economy without collapsing into concentrated technological oligarchy.

6. Shrinking Rich: Capital Deepening and Post-Labour Prosperity

6.1 Capital Deepening and Demographic Contraction

If demographic ageing and artificial intelligence progressively weaken labour's historical role within production, the central macroeconomic challenge facing advanced capitalist democracies is no longer simply how to maximise labour supply. It becomes a matter of how to sustain prosperity, fiscal stability, and social integration under conditions in which productive capacity increasingly derives from automated capital rather than from expanding biological labour inputs. From this perspective, demographic contraction need not necessarily imply economic decline. Under specific technological conditions, shrinking populations may coexist with rising per-capita prosperity through extreme capital deepening.

This possibility can be understood through the logic of the Solow-Swan growth framework, in which output per worker depends fundamentally upon the ratio of productive capital to labour inputs (Solow, 1956). Historically, rapid population growth often diluted capital intensity by spreading infrastructure, housing, and productive assets across expanding populations. Under conditions of advanced automation, however, demographic contraction combined with accelerating investment in AI systems, robotics, compute infrastructure, and energy capacity may generate the opposite dynamic: sharply rising concentrations of productive capital relative to labour.

In such a scenario, shrinking labour forces do not necessarily produce collapsing output if technological systems increasingly substitute for routine cognitive and physical work. Aggregate GDP growth may slow as the population contracts, yet GDP per capita, productivity, and material living standards could continue to rise through capital deepening and AI-driven efficiency gains. The relevant macroeconomic variable, therefore, shifts from aggregate demographic scale toward productive capital intensity and technological efficiency.

Under low-fertility, zero-net-migration scenarios, several advanced economies may experience substantial demographic contraction over the twenty-first century. United Nations projections suggest that both the European Union and the United States could ultimately experience population declines exceeding 30 per cent relative to current levels by 2100 under sustained sub-replacement fertility conditions, while countries such as Italy, Japan, and South Korea may contract substantially more sharply (United Nations Department of Economic and Social Affairs, 2024). Under labour-intensive industrial conditions, such demographic contraction would historically have implied severe economic decline. Under conditions of advanced automation, however, shrinking populations may partially offset AI-driven labour displacement while simultaneously increasing capital intensity per worker.

Figure 2 illustrates the core logic of the shrinking rich thesis. Under conditions of advanced automation, demographic contraction may coincide with rising productive capital intensity, allowing smaller populations potentially to sustain or increase per-capita prosperity even as aggregate demographic scale declines.

This possibility challenges longstanding assumptions within both neoclassical growth theory and conventional demographic economics. Much twentieth-century economic thought implicitly treated population growth as necessary to sustain innovation, consumption, and fiscal solvency. Contemporary fears surrounding demographic decline frequently derive from historical experiences in which ageing societies encountered stagnating productivity within still largely labour-dependent economies. Japan is often presented as the paradigmatic example of this dynamic (Goodhart and Pradhan, 2020).

Yet the Japanese experience may not provide a fully adequate model for the emerging AI transition. Japan experienced demographic ageing primarily before the emergence of large-scale generative AI, advanced foundation models, and increasingly generalisable robotics. Its economy, therefore, confronted rising dependency burdens while remaining heavily dependent upon human labour across large sectors of production and services. Contemporary AI increasingly enables substitution across domains

previously resistant to automation, including cognitive coordination, software production, logistics, and segments of service work. The interaction between demographic contraction and advanced automation may therefore produce substantially different macroeconomic outcomes from earlier ageing episodes.

6.2 Innovation Beyond Demographic Scale

Critics of demographic contraction frequently invoke endogenous growth theory, particularly the argument that innovation depends fundamentally upon the number of human researchers and inventors within a society (Romer, 1990; Jones, 2022). From this perspective, shrinking populations risk long-term technological stagnation because fewer people generate fewer ideas. Historically, this relationship held considerable explanatory power because scientific and technological progress depended overwhelmingly on human biological cognition and the scale of research communities.

Artificial intelligence potentially alters this relationship by partially decoupling innovation capacity from demographic scale. Advanced machine-learning systems increasingly assist scientific research, pharmaceutical discovery, protein modelling, materials science, and software development (Brynjolfsson et al., 2023; Stanford Institute for Human-Centered Artificial Intelligence, 2025). Systems such as DeepMind's AlphaFold demonstrate how AI can accelerate scientific analysis in domains previously constrained by human research capacity alone.

Innovation, therefore, increasingly depends not solely upon population size, but upon access to computing infrastructure, energy systems, advanced semiconductor capacity, research institutions, and capital-intensive technological ecosystems. Smaller but highly capitalised societies may therefore maintain high rates of productivity and technological development despite demographic contraction. Under such conditions, the strategic foundations of prosperity shift away from aggregate labour abundance toward ownership of automated productive infrastructures and high-productivity technological ecosystems.

6.3 Ecological Limits and Post-Labour Prosperity

The ecological implications of this transition are equally significant. Much contemporary economic growth remains tied to aggregate material throughput, urban expansion, energy consumption, and ecological extraction associated with continuously expanding populations. Degrowth theorists correctly argue that infinite material expansion on a finite planet remains biophysically unsustainable (Kallis, 2018; Hickel, 2020). Yet many degrowth frameworks remain sceptical of technological acceleration and continue to associate ecological stabilisation with lower prosperity or reduced consumption.

The shrinking rich thesis points toward a different possibility: ecological stabilisation through demographic contraction combined with extreme technological efficiency. If advanced economies gradually reduce aggregate population while increasing productive efficiency through automation, AI optimisation, advanced energy systems, and capital deepening, ecological pressure may decline even while per-capita prosperity rises. A smaller but wealthier population utilising highly productive technological systems may place lower aggregate stress on housing, transportation, land use,

agriculture, and carbon-intensive supply chains than continuously expanding labour-intensive economies.

At the same time, relative decoupling between productivity growth and ecological extraction is not guaranteed. Advanced AI systems themselves require substantial energy inputs, compute infrastructure, semiconductor production, and critical mineral extraction. The ecological sustainability of post-labour prosperity, therefore, depends heavily upon energy transition pathways, technological efficiency gains, and resource governance (Hickel, 2020).

Demographic contraction may also alter the political economy of housing and urban financialisation. Across many advanced capitalist economies, housing inflation has been driven partly by persistent demographic expansion colliding with constrained urban supply and highly financialised property markets (Aalbers, 2016). Slower population growth may weaken some of these pressures over time, reducing rent extraction and reallocating disposable income away from housing costs toward consumption, savings, or technological investment.

However, shrinking rich is not an automatic outcome of demographic decline and automation. Without institutional restructuring, capital deepening may generate extreme wealth concentration rather than broad prosperity. The critical question is therefore not simply whether advanced economies can produce abundance with fewer workers, but who owns the automated systems generating that abundance and how their surplus is distributed across society.

7. The Global South, Fortress Politics, and the Need for a Planetary Transition Regime

The transition toward increasingly automated, capital-intensive economies does not merely transform the internal structure of advanced capitalist states. It also alters the global political economy of development. For much of the postwar period, industrial globalisation rested upon a relatively stable international division of labour: the advanced capitalist core supplied capital, technology, and consumer markets, while labour-abundant regions of the Global South supplied low-cost manufacturing labour integrated into global value chains (Wallerstein, 1974; Amin, 1976; Gereffi, 2014). If artificial intelligence and robotics progressively reduce the strategic importance of labour-intensive production, then the postwar developmental architecture of globalisation itself may enter a structural crisis.

7.1 The Erosion of the Industrial Convergence Model

Historically, the dominant pathway from agrarian poverty to middle-income industrialisation depended upon labour absorption through manufacturing. The Lewis model of development assumed the transfer of surplus labour from low-productivity agriculture into higher-productivity industrial sectors (Lewis, 1954). Later development-state and global-value-chain literatures showed how East Asian economies converted this labour transfer into export-led industrial upgrading through state coordination, industrial

policy, and integration into global markets (Amsden, 1989; Wade, 1990; Evans, 1995; Gereffi, 2014; Chang, 2002). The demographic scale constituted a developmental asset because an expanding labour force could be absorbed into manufacturing systems serving advanced consumer markets.

The maturation of artificial intelligence and advanced robotics potentially weakens this pathway. If advanced economies progressively reshore production through automated systems operating close to domestic markets, labour-cost arbitrage loses part of its historical centrality. Under such conditions, the comparative advantage historically possessed by labour-abundant developing economies may erode precisely as many regions of the Global South experience rapid demographic expansion. United Nations projections suggest that the population of Sub-Saharan Africa could rise from roughly 1.2 billion people today to approximately 2.1 billion by 2050 (United Nations Department of Economic and Social Affairs, 2024). This is not simply a technological issue. It alters the developmental bargain through which peripheral and semi-peripheral economies entered the world economy by monetising abundant labour.

This dynamic is particularly significant for Sub-Saharan Africa and parts of South Asia, where industrial absorption capacity remains limited relative to demographic expansion. Rodrik's account of premature deindustrialisation already shows that many developing economies have begun to lose manufacturing potential at significantly lower income levels than those of earlier industrialisers (Rodrik, 2016). AI-driven reshoring may intensify this tendency by reducing long-term demand for labour-intensive offshore manufacturing. In world-systems terms, the risk is not merely continued dependency, but a shift from exploitation through cheap labour toward exclusion from labour-intensive industrialisation itself (Wallerstein, 1974; Arrighi, 2007).

The consequences extend beyond trade balances or factory employment. Much of the legitimacy of postwar globalisation rested upon the implicit promise of eventual convergence through industrial integration. Even where development remained uneven, export-oriented manufacturing offered a historically plausible route toward urbanisation, middle-class formation, rising productivity, and state consolidation. If that pathway narrows substantially with advanced automation, the developmental compact underpinning late-twentieth-century globalisation weakens structurally.

At the same time, deterministic collapse narratives should be avoided. The Global South retains adaptive capacities. South-South trade networks continue to expand, regional manufacturing systems may partially absorb labour displaced from Northern value chains, and some developing economies may use AI technologies to improve productivity in agriculture, logistics, finance, education, and public administration (World Bank, 2024). Digital services, remittances, regional markets, and AI-enabled leapfrogging may offer partial alternatives to classical industrialisation. Nevertheless, these pathways are unlikely to replicate the scale of labour absorption once provided by manufacturing-led development. The structural problem remains: a labour-abundant world economy is moving toward technologies that progressively reduce the value of labour abundance itself.

7.2 Fortress Politics and Technological Core-Periphery Formation

One likely response within the advanced capitalist core is increasingly restrictive fortress politics. As advanced economies become less dependent upon low-cost labour while confronting fiscal pressure, demographic anxiety, and political polarisation, incentives for restrictive migration regimes intensify. Under highly automated conditions, advanced economies may prioritise the selective extraction of elite cognitive talent while reducing dependence upon large-scale low-skill migration. This would deepen a familiar dependency dynamic in which the core extracts scarce, skilled labour while excluding surplus labour populations from meaningful economic integration (Bhagwati and Hamada, 1974; Amin, 1976).

Border regimes may therefore shift from labour integration toward population management and territorial containment. AI-assisted surveillance, biometric identification, predictive migration analytics, and automated border systems increasingly expand the technological capacity for such control. In world-systems terms, the intelligence economy risks producing a new core-periphery hierarchy organised less around ownership of factories than around ownership of compute infrastructure, energy systems, semiconductor capacity, data assets, and advanced automation platforms (Wallerstein, 1974; Srnicek, 2017; Mazzucato, 2018).

Yet fortress strategies alone are unlikely to provide durable geopolitical stability. Even highly automated economies remain dependent upon global ecological systems, critical minerals, maritime trade routes, and energy infrastructures tied to the Global South. A world divided between automated prosperity in the core and structural underemployment in the periphery would likely intensify migration pressure, climate displacement, political instability, and regional conflict.

This is the central contradiction of fortress automation: advanced economies may reduce dependence on Southern labour, but they cannot detach themselves from Southern resources, ecologies, and geopolitical instability. Post-labour capitalism, therefore, cannot be stabilised through technological self-sufficiency alone.

7.3 Toward a Planetary Transition Regime

The transition toward post-labour capitalism, therefore, raises a problem not only of domestic distribution but of planetary redistribution. If AI-driven automation weakens the labour-intensive development ladder that underpinned twentieth-century convergence, stabilising the global order may require a new international transition regime capable of redistributing technological productivity gains beyond the advanced capitalist core.

This should not be framed primarily as humanitarian charity, but as geopolitical stabilisation. If the North automates production while the South loses labour-intensive development pathways, the result is unlikely to be stable prosperity in the core but increasing geopolitical disorder. In this sense, a twenty-first-century “Marshall Plan for the South” becomes less an ethical aspiration than a strategic requirement.

Unlike the original Marshall Plan, however, the objective would not simply be to rebuild industrial capacity in already industrialising societies. It would be to create viable development pathways for labour-

abundant regions in a global economy progressively less dependent upon mass labour itself.

Such a transition regime would likely require large-scale infrastructure investment in energy, water, transportation, climate adaptation, and digital connectivity; debt restructuring for economies facing weakening export-led growth; and broader access to computing infrastructure, AI systems, technical education, and public digital capacity. Without wider technological diffusion, the intelligence economy risks concentrating productivity gains within a small number of technologically dominant regions.

South-South trade, regional industrial policy, and AI-enabled productivity gains may partially offset these pressures, but they are unlikely to fully replace the labour absorption once provided by manufacturing-led industrialisation. The central issue is whether labour-abundant societies can achieve sufficient economic integration once labour itself loses its strategic centrality in global production.

The broader political-economic point is therefore clear: the erosion of labour-intensive globalisation risks transforming inequality from a primarily domestic distributive issue into a systemic geopolitical fault line between automated, capital-intensive regions and labour-abundant societies confronting narrowing industrial pathways.

The central question is not simply whether advanced economies can become “shrinking rich” domestically. It is a question of whether the post-labour transition can occur without producing a fragmented global order characterised by automated abundance in the core and structural superfluity across large parts of the periphery.

8. Conclusion: Political Economy Beyond Labour

For more than two centuries, modern political economy has been organised around the assumption that human labour constitutes the central productive and distributive mechanism of economic life. The Fordist accumulation regime represented the most successful institutionalisation of this principle, linking mass labour, mass consumption, and welfare-state finance within a relatively stable framework of industrial capitalism (Aglietta, 1979; Boyer, 1990). The postwar global economy subsequently extended this labour-mediated model internationally through export-oriented industrialisation and labour-intensive globalisation.

This article has argued that the convergence of demographic inversion and artificial intelligence increasingly destabilises that historical configuration. Advanced economies simultaneously confront ageing populations, shrinking labour-force growth, rising dependency burdens, and technological systems capable of substituting for expanding domains of cognitive and physical labour. Existing frameworks within demographic economics, labour-market analysis, and automation studies often address these transformations separately. By contrast, the labour liability ratio developed here integrates them within a broader macro-political economy framework centred on labour’s changing systemic role.

Advanced capitalist economies increasingly face structural compression of this ratio from both directions simultaneously. On the cost side, ageing populations, healthcare burdens, labour-reproduction costs, and Baumol-afflicted care systems intensify the fiscal and biophysical demands of sustaining labour-centred welfare states (Baumol, 1967; OECD, 2024c). On the contribution side, artificial intelligence and automation progressively weaken labour's role in output generation, demand formation, and taxation (Acemoglu and Restrepo, 2020; Brynjolfsson et al., 2023). The result is growing instability within political-economic systems historically organised around labour as the mediator between population, production, and fiscal reproduction.

Under these conditions, additive demographic strategies aimed at preserving labour-intensive growth through pro-natalism or large-scale migration increasingly encounter structural limits. At the same time, the intelligence economy potentially enables a different macroeconomic trajectory: demographic contraction combined with extreme capital deepening. The shrinking rich thesis developed here suggests that smaller but highly capitalised societies may maintain or increase per-capita prosperity through AI-driven productivity growth and automated production systems. Yet this outcome is neither automatic nor politically neutral.

The critical institutional question concerns ownership. Without structural transformation, post-labour capitalism risks consolidating highly concentrated forms of technological rentierism in which automated surplus accrues primarily to owners of compute infrastructure, robotics, data systems, and platform monopolies (Piketty, 2014; Srnicek, 2017; Christophers, 2020). Redistribution alone may prove insufficient if citizens become progressively detached from meaningful forms of economic participation. The long-term viability of post-labour prosperity may therefore depend on institutional architectures capable of socialising claims on automated productive capital through sovereign technological funds, universal dividends, and fiscal frameworks less dependent on labour-intensive taxation.

The article has also argued that the implications of this transition extend beyond the advanced capitalist core. AI-driven reshoring and automation potentially weaken the labour-intensive developmental model through which much of the Global South historically pursued industrial convergence (Rodrik, 2016). As labour arbitrage loses strategic importance, the developmental compact underpinning industrial globalisation begins to fracture, intensifying geopolitical fragmentation between highly automated regions and labour-abundant societies confronting narrowing industrial pathways.

For this reason, the post-labour transition increasingly raises a planetary political-economic problem rather than a purely domestic one. Stabilising the intelligence economy may require new international institutional arrangements capable of redistributing technological productivity gains beyond the advanced capitalist core through infrastructure investment, debt restructuring, compute access, educational expansion, and broader technological diffusion.

At the same time, important uncertainties remain. The pace and distribution of AI-driven automation remain contingent upon regulation, energy constraints, technological bottlenecks, political resistance, and organisational adoption dynamics (Cazzaniga et al., 2024; Stanford Institute for Human-Centered

Artificial Intelligence, 2025). Historical precedents also caution against deterministic assumptions about technological displacement, since previous industrial revolutions frequently generated new forms of labour demand even as they transformed production systems (Autor, 2015; Acemoglu and Restrepo, 2020). The labour liability ratio should therefore be understood not as a predictive model that claims inevitable outcomes, but as a heuristic framework for analysing structural pressures that emerge under conditions of demographic ageing and advanced automation.

The political economy of the industrial era was organised around the allocation, discipline, and monetisation of human labour. The political economy emerging under demographic contraction and artificial intelligence increasingly concerns the ownership, governance, and distribution of automated productive capacity. How societies negotiate that transition remains an open empirical and political question rather than a technologically predetermined outcome.

The purpose of the labour liability ratio is not to predict the disappearance of labour, nor to prescribe a particular institutional outcome. Rather, it provides a framework for analysing how demographic ageing and advanced automation may alter labour's historical role within regimes of accumulation. Whether these transformations result in intensified inequality, new forms of collective ownership, or alternative modes of economic coordination remains a fundamentally political question.

Declarations

Declarations Disclosure Statement

The author declares no conflict of interest.

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Author Contribution

P.H. conceived the study, developed the theoretical framework, conducted the research, performed the analysis, and wrote the manuscript.

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Figures

Declining Numerator Factors

Labour hours

Labour demand

Labour share of income

Labour-centred tax revenues

Wage-mediated demand formation

Rising Denominator Factors

Pension obligations

Healthcare expenditure

Long-term care burdens

Labour reproduction costs

Dependency ratios

Figure 1

Compression of the Labour Liability Ratio

Demographic Trend	Economic Effect Under Advanced Automation
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Shrinking labour force	Reduced labour oversupply
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Demographic contraction	Offsets AI labour displacement by aligning labour supply reduction with technological substitution
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Rising automation intensity	Higher capital productivity
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Expanding AI infrastructure	Increased output per worker
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Slower population growth	Reduced infrastructure dilution
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Capital deepening	Rising GDP per capita despite slower aggregate GDP growth
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Figure 2

Demographic Contraction and Capital Deepening