Artificial Intelligence and the Productivity-Pay Gap in the USA: Industrial Insights and the Revival of Heterodox Ideas

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Abstract: This paper aims to offer a heterodox perspective on the productivity-pay gap in the United States in light of the ongoing disruptive changes within leading industries driven by the widespread adoption of artificial intelligence (AI). We present robust arguments that the application of AI-type technologies across various industries and domains is likely to not only exacerbate the existing productivity-pay gap but also change the way this gap is generated. We suggest that deploying decision-making AI algorithms in economic processes could empower capital-technology owners at the expense of the traditional managerial technostructure, potentially re-establishing the possession of capital as the main driver of income inequality. In addressing the potential economic and social costs of the current trajectory of AI technologies, some of the major concepts in heterodox economics may prove useful.

Keywords: Labor Market, Productivity–Pay Gap, Artificial Intelligence, Heterodox Economics.

JEL: B52, J01, O33.

From the end of the Second World War until 1973, the real wages of American workers kept up with labor productivity growth. However, since 1973, a notable shift occurred, with wages beginning to lag behind productivity growth. This diverging trend, referred to as the 'productivity-pay gap' is well documented in both heterodox and orthodox literature (Bakir, Hays, and Knoedler 2021; Bivens and Mishel 2015; Bosworth, Perry, and Shapiro 1994; Carter 2007; Fleck, Glaser, and Sprague 2011; Hornbeck and Moretti 2018; Sprague 2021; Stansbury and Summers 2017), using different datasets, and measures of wages and productivity.

The appearance and rapid spread of AI is expected to redefine the productivity-pay gap. This shift isn't just about widening the gap thanks to the incredible productivity of new technology that exceeds human capabilities in performing a wide range of routine and cognitive tasks. It also includes a series of secondary changes, such as adjustments in institutions, culture, and power dynamics, in response to the emergence of a new society. Heterodox economic thought, viewing the economy as a social provisioning process as opposed to the orthodox view of it as a marketplace, enables a better understanding of the potential costs of AI-based technologies and how they can be prevented.

Conceptual Framework: Productivity-Pay Gap

Labor productivity and wages are crucial in determining the well-being of a typical (production/nonsupervisory) worker. Labor productivity, measured as the ratio of economic output to the number of work hours, implies that increased productivity results in more goods being produced with fewer labor hours (Sprague 2021). A deeper understanding of labor productivity requires consideration of not only supply-side forces, but also demand-side forces that lie behind productivity figures. This shift takes our discussion into the realm of heterodox economics, where we seek answers to questions using concepts of effective demand, countervailing power, institutional change, and predatory pricing. In this vein, Webber and Huaccha (2023) argue that aggregate demand is central to productivity, and that the standard one-dimensional representation of productivity blurs most of the information on how and why productivity figures evolve.

Rising productivity by itself seems beneficial for workers, as it suggests more production with less labor. However, the true benefit for workers lies in how this increased production translates into consumption. This translation depends on wages, which reflect workers' purchasing power and determine their ability to afford the goods produced. Therefore, while labor productivity forms the foundation by increasing the availability of goods, the actual impact on living standards is determined by the wages that workers receive.

In examining the relationship between labor productivity and wages, it is important to note that convergence between these two variables does not necessarily imply causation. Likewise, divergence in this relationship should not be immediately interpreted as a breakdown in their causal link (Stansbury and Summers 2017). Wages reflect the interplay of numerous factors, such as the power balance between workers and employers, institutional structures, customs, and government regulations. Thus, reducing wage determination to merely a measurement of a worker's contribution to production, whether direct or through signals of productivity, as suggested by the neoclassical economic school, is overly simplistic (Drakopoulos and Katselidis 2023; Komlos 2016; Larudee and Koechlin 1999; Turner 1967). The relationship between labor productivity and wages should not be sought in the wage-setting process, but primarily in the factors that simultaneously influence both labor productivity and wages. Among these, technological progress is undoubtedly one of the most significant.

Technological progress drives an increase in labor productivity, but technology-led productivity growth does not automatically translate into pay growth for typical workers. In explaining why this happens, heterodox economists offer arguments beyond the market processes and replacement of workers by machines. From the perspective of old institutionalism, corporate capital is seen, by its nature, as predatory towards the incredible productivity of modern technology, and therefore prevents the establishment of a society of abundance.

In a society of abundance, everyone should have access to adequate nutrition, health care, education, transportation, recreation, housing, self-expression, and personal security (Peach and Dugger 2006). However, this does not imply that goods will be free; it suggests instead that 'the common man' will have the means to afford the goods they need. Consequently, the income of 'the common man' should reflect the collective ability to overcome resource and institutional limitations to achieve social progress. In the context of technological change, wages should either be aligned with the growth in labor productivity or this disparity should be compensated through the government's redistributive

role. The concept of a society of abundance stands in stark contrast to a fundamental principle of orthodox economics: the concept of scarcity. This is not to say that resources aren't scarce, rather, technological progress, by enhancing the efficiency of resource use and supported by progressive institutional structures, lays the groundwork to overcome or alleviate the resource limitations that hinder social progress.

According to Thorstein Veblen, corporate capital is oriented towards the accumulation of wealth and characterized by conspicuous consumption. Motivated by pecuniary gains, corporate capital often intentionally restricts output to levels below the potential of the industrial system. This preference for investment aimed at profit rather than efficiency leads to a society where production does not fully utilize the community's 'joint stock of knowledge' and the 'state of the industrial arts' (Josifidis and Supic 2021; Peach and Dugger 2006). Furthermore, such business practices contrast sharply with the instincts of 'idle curiosity' and 'workmanship,' which are defining characteristics of innovators and engineers. A similar idea was also presented in Clarence Ayres's 'Law of Progress,' which suggests that social progress is primarily driven by technological advancements (Ayres 1946). However, technological progress can be ceremonially constrained, leading to a retardation or even a halt in social progress (Adkisson 2004).

In addition to institutional constraints on the transmission of technological progress into social progress, economists belonging to various heterodox schools of thought emphasize the role of the demand side of the economy. The high and rising productivity-pay gap leads to a crisis in a capitalist society, caused by a fall in aggregate demand (Jo, Chester, and D'Ippoliti 2017). Workers and capital owners differ in their contributions to aggregate demand. Workers' consumption, determined by their wages, is not only the largest single component of aggregate demand, but workers are also more inclined to spend their income compared to capital owners (Bunting 2003). In the absence of redistributive measures, growth in labor productivity, accompanied by a decrease in labor's share and an increase in capital's share, does not contribute proportionately to rise in aggregate demand. This

happens because additional money, came from greater productivity, is disproportionately accumulated in the hands of those with a lower marginal propensity to consume and, consequently, a higher marginal propensity to save.

The negative impact of a declining labor share on aggregate demand can be mitigated in the short term through the possibility that workers, faced with stagnant incomes, finance their consumption by borrowing in the credit market. However, in the long run, credit-debt relation adversely affects the labor share, as paying interest entails further redistribution of income from the debtor (workers) to the creditor (capital owners). Capital owners are also losers in the long run, not due to a lack of profit but because of their inability to invest profit in conditions where aggregate demand is stagnating or falling (Foley 2012).

The impact of existing technologies on the productivity-pay gap was manifested through the Schumpeterian process of 'creative destruction' — a process where old technology, associated with routine jobs and low productivity, is replaced by new technology, related to non-routine jobs and high productivity, resulting in higher output growth. The process of 'creative destruction' creates winners and losers, and these are determined mainly in ex-post contests rather than in ex-ante calculations (Yay and Yay 2022). Since automation predominantly depresses the demand and wages of typical workers specializing in blue-collar jobs, the overall impact of new technologies on the labor share tends to be negative.

Stylized Facts from the U.S. Economy

Figure 1 provides a detailed insight into the productivity-wage gap in the U.S. economy from 1948 to 2022. Labor productivity growth is presented both as a total estimate and by its constituent components: the contribution of capital intensity, the contribution of shifts in labor composition, and total factor productivity growth (multifactor productivity growth). Total factor productivity refers to output growth not accounted for by increases in labor and capital and is due to contributions of other inputs, such as such technological advancements, efficiency improvements, economies of scale, or

resource reallocation (Sprague 2021). Given that technological advancements are the primary drivers of total factor productivity, this metric is often used in literature as an indirect estimate of aggregate technological change.

To avoid data distortion from treating the very high incomes of top earners as labor income, the compensation data is limited to compensation (wages and benefits) of production and non-supervisory workers in nonfarm business sector. This group constitutes about four-fifths of the employees and three-fourths of the United States' economic output (Giandrea and Sprague 2017; Mendieta-Muñoz, Rada, and von Arnim 2021), making it a reliable proxy for the 'typical' American worker.

Insert Figure 1 Here

From figure 1 we can clearly see that, since 1973, the growth in labor productivity has exceeded that of the typical worker's compensation, and that this soaring productivity growth is primarily attributed to the technological change.

A general description of the relationship between wage and technology-led labor productivity over time can be captured by using a simple elasticity measure, as proposed by (Carter 2007) in a similar context:

$$e_{W,LP} = \frac{\partial \ln W_t}{\partial \ln LP_t}$$

where: $\partial \ln W$ is percent change in (log) compensation; $\partial \ln LP$ is percent change in (log) technology-led labor productivity; t refers to time. In terms of the productivity-pay gap, a productivity-elastic compensation ($e_{W,LP} > 1$) implies that increases in compensation outpace the rise in labor productivity. Conversely, a productivity-inelastic compensation ($e_{W,LP} < 1$) suggests that labor productivity, influenced by technological changes, contributes more significantly to the growth of capital than to the labor share.

Insert Table 1 Here

Table 1 shows that the link between compensation for the typical American worker and technology-led labor productivity underwent an essential transformation in the neoliberal era compared to the period that Joan Robinson (2013) called the 'golden age' of the U.S. economy. Although the neoliberal era is not homogeneous, consisting of at least three distinct subperiods, the common denominator among them is the systematic lag in the growth rate of compensation behind that of labor productivity. Considering that the Great Inflation (the 1970s and early 1980s), the Great Moderation (mid-1980s to mid-2000s), and the Great Recession and its aftermath (late 2007 to mid-2010s) are each characterized by distinct macroeconomic environments, the cause of the broken productivity-pay link should be sought in systemic factors, not cyclical ones.

Insert Figure 2 Here

The impact of technological progress on labor productivity and wages varies across different industries and among various categories of workers. As evident from Figure 2, from 1987 to 2022, labor productivity exceeded inflation-adjusted compensation for typical American workers in all sectors with significant industry coverage, except for the educational and health services. The highest growth in labor productivity was recorded in the sectors where technological progress, as measured by total factor productivity, was most pronounced. However, wage growth for typical workers lagged behind the increase in labor productivity. This gap was especially noticeable in labor-intensive industries, like the manufacturing and retail trade sectors, where automation of routine tasks of clerical and factory workers is most prevalent. Thus, the recent research by Acemoglu and Restrepo (2022) shows that between 50% and 70% of the changes in the U.S. wage structure from 1980 to 2016 can be attributed to the relative wage declines of workers specializing in routine tasks in industries that have experienced rapid automation.

Artificial Intelligence and the New Context of the Productivity-Pay Gap

The appearance and application of AI-type technologies across various industries and domains are likely to exacerbate the existing productivity-pay gap in the U.S. economy, but it might also change the

way this gap is generated. AI introduces two key innovations in economic processes compared to previous technological advances. The first is the automation of cognitive tasks, such as decision-making and problem-solving, which contrasts with earlier wave of automation, which predominantly affected middle-skilled jobs. The second is the capacity of AI technologies to self-learn and adapt over time, including the ability to make predictions using unstructured data sets (Acemoglu 2021; Russell 2019). As a result, AI can be utilized to develop new technologies that not only complement but also replace humans in more than just routine tasks[i].

In the given context, it is arguable that AI will, in the foreseeable future, lead to changes in the power hierarchy within corporations, affecting the balance between what John Kenneth Galbraith's termed a 'managerial technostructure' (Galbraith and Galbraith 2007) and capital owners. Making decisions will be simplified by using AI algorithms, such as ChatGPT, capable of collecting and processing a massive amount of data and drawing conclusions that surpass human capabilities. This is not to say that AI will be given decision rights, nor will capital owners replace the managerial technostructure. However, it is possible to envisage that AI will routinize the execution of complex cognitive tasks, and the outcomes in performing such tasks will depend more on technological knowledge about utilizing algorithms to extract the right information from the digitized real world, rather than on managerial skills. Empowering capital-technology owners at the expense of the managerial technostructure will create a new environment, not only in business but also in society. In the anticipated environment, the possession of capital is expected to re-emerge as the primary driver of income inequality and social stratification.

In seeking an answer to the question of what human society can do to alleviate the negative impacts of AI on the labor market and income distribution, particularly for typical workers, heterodox economics offers a fruitful way for thinking. From heterodox perspective, technology develops and responds in a social and historical context (Jo, Chester, and D'Ippoliti 2017). Drawing on Robert Owen and Clarence Ayres recognition of human-technology relationship, Hayden (2019) moves a step

beyond this and put forward the idea that humans are technology. Accordingly, technological assessment should be socially generated, involving the establishment of social criteria for judging technology. Society should not passively accept new technology; instead, it should critically assess its alignment with established social criteria.

In the future society, where technology will make human labor redundant for a large number of tasks across various industries, wages will no longer be determined by measuring work performance or by the bargaining power of workers and employers. The disconnection of workers from the outcomes of economic processes has the potential for self-destruction, as automation may replace humans as workers but not as consumers. In response to increased insecurity and uncertainty, the government will need to regulate not only the use of new technologies but also redefine work and income distribution rules, aiming to achieve what Figart (2021) described as 'institutionalizing good work'. Some of these changes actually represent a revitalization of heterodox ideas: the government acting as an 'employer of last resort,' providing public service employment for those unable to adjust to labor market changes; shorter work weeks to address the issue of underemployment in the private sector; expanding the social safety net with a universal basic income funded by taxes on AI-related technology; or providing a social wage through public goods and services.

Conclusion

In this paper, we explored the impact of AI technologies on productivity-pay gap in the USA. Analysis of the empirical data revealed that the impact of technological progress on labor productivity and wages varies across industries, and it indicated that the broken productivity-pay link should be attributed to systemic factors rather than cyclical ones. Although the transformative potential of AI on the labor market is challenging to predict, it is plausible to argue that its adverse effects, including job redesign, wage stagnation, and unemployment, would disproportionately impact high-skilled workers in the leading sectors of the U.S. economy, unlike previous waves of automation. We suggested that one of the most controversial consequences of deploying decision-making AI algorithms, which far

exceed all human capabilities, in economic processes will be changes in the managerial technostructure as we know it today, and the empowerment of capital-technology owners. Accordingly, if AI continues on its current trajectory and remains unregulated, the possession of capital may re-emerge as the primary driver of income inequality and social stratification.

Addressing these challenges requires explanations and societal choices that extend beyond neoclassical models of labor markets with self-correcting mechanisms and policy prescriptions based on increasing competition. Hence, the heterodox perspective, which emphasizes the unique characteristics of the labor market as a social institution and the need for worker welfare-promoting regulations, represents a fruitful framework for not only understanding but also addressing the issues of the proliferation of unstable jobs and wage stagnation in the primary labor market.

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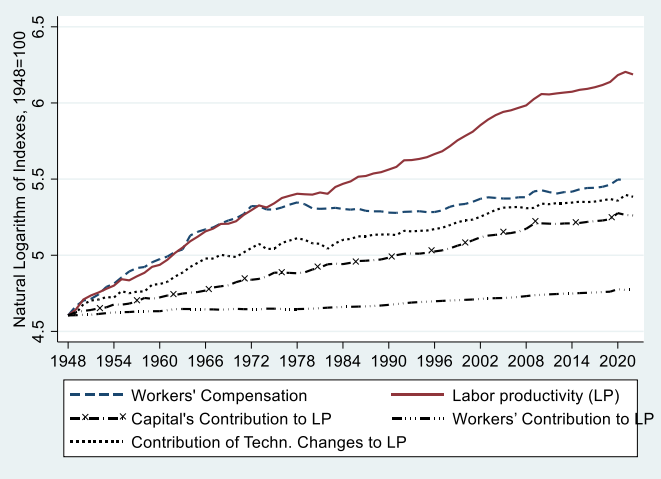
Tables and Figures

Figure 1 Components of Labor Productivity Growth and the Productivity-Pay Divergence in the United States, Private Nonfarm Business Sector, 1948-2022.



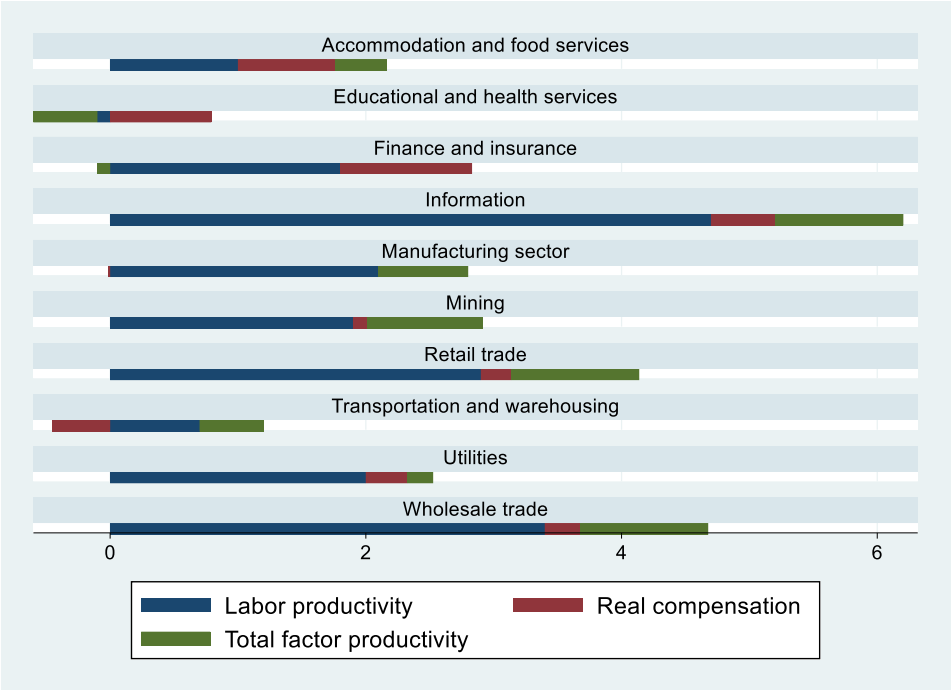
Source: Authors' calculations from the Bureau of Labor Statistics and Economic Policy Institute data, 2023.

Table 1: Average Growth Rates in Compensation of Production and Non-Supervisory Workers, Technology-Led Labor Productivity, and the Corresponding Wage-Productivity Elasticity, United States, Private Nonfarm Business Sector, 1948-2022

	Golden Age	**Neoliberal era**		
	1948-1973	1974-1984	1985-2007	2008-2022
Compensation growth (percent)	3.03	-0.15	0.47	0.56
Productivity growth (percent)	2.09	0.28	1.03	0.65
Elasticity	1.45	-0.52	0.46	0.87

Source: Authors' calculations from the Bureau of Labor Statistics and Economic Policy Institute data, 2023.

Figure 2: Compound Annual Growth Rate in Labor Productivity, Real Compensation of Production and Non-Supervisory Workers, and Technology-Led Labor Productivity for Major Industries, United States, 1987-2022.



Source: Authors' calculations from the Bureau of Labor Statistics data, 2023. Note: Workers' compensation figures have been adjusted for inflation with the Consumer Price Index; all Items in U.S. city average, Index 1987=100.

[i] A clear illustration of this trend is evident in stock markets, where high-speed computer trading has substituted much of human decision making (West 2018).