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What is the Future of Work in the Generative AI Era? A Marxist and Ricardian Analysis

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Abstract: There is an increasing public discourse of automation for white-collar professional jobs due to improvements in artificial intelligence (AI) capacities, raising the question about the contours of the future of work. Marx and Ricardo's framework of technological labour displacement helps us understand the future of work in the context of AI. Marx's discussion in Capital and Ricardo's discussion in Principles of Political Economy reveal the common thesis that technology-induced worker displacement and precariousness of employment relationships are built into the internal logic of the contemporary digital capitalist economy. There are three important differences in their theoretical framework: (1) Marx did not believe that high technological unemployment is possible within capitalism even with very advanced technologies such as AI, while Ricardo saw technological unemployment as a serious threat while he acknowledges countervailing employment-creating tendencies; (2) While Ricardo's explanation for the falling rate of profit is limited to rising wages, Marx traces the profit decline to the rising organic composition of capital and automation itself; (3) For Marx, a desirable future of work is not found within a capitalist framework but in communism, while Ricardo sees no alternatives to capitalism.

Keywords: artificial intelligence, technological unemployment, Marx, Ricardo, future of work, automation, digital capitalism

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1. Introduction

There is an increasing public perception that white-collar professional jobs will be automated due to improvements in artificial intelligence (AI) capacities. Generative AI is defined as "computational techniques that are capable of generating seemingly new, meaningful content such as text, images, or audio from training data" (Feuerriegel et al. 2024, 111), thus potentially displacing highly educated workers who produce content and manipulate symbols (AbuMusab 2023). There is already empirical evidence that generative AI has displaced internet freelancers and lowered their incomes (Hui et al. 2023). While AI-related automation is fairly recent in origin, worker displacement is as old as the modern capitalist economy. Older forms of automation are focused on replacing mechanical blue-collar tasks in factories and fields while insulating professional service workers, who are protected by administrative requirements and the technological inability to displace cognitive tasks. Large language models (LLM) like ChatGPT can affect roles involving more cognitive tasks as well. The continuity of technological change within modern digital capitalism raises the underexplored question of whether early scholars of capitalism offer useful theories that help contemporary

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scholars explain the technological impact on workers today. Does the rise of AI imply a future without work, according to Karl Marx and David Ricardo? Analyses on labour value and automation have a long research tradition within critical social science research (Dujarier 2023; Sørensen 2024), leaving open the question of how Marxist and Ricardian frameworks can describe the effects of AI on work.

In this article, I argue that Marx's and Ricardo's frameworks of technological labour displacement help us understand the future of work in the context of AI. The motivation for using Marx and Ricardo is that AI is introduced in the context of a capitalist economy, and these two thinkers defined the relationship between labour, technology and the social relations of production in capitalism. Ricardo and Marx have *technically* said nothing about GAI or broader AI. They used the term "machinery" in the context of the industrial textile factory employing textile workers in early to mid-19th century Britain. However, their views on contemporary AI are still applicable because AI is introduced in a capitalist social relations context. After examining the most recent economic and sociological evidence on automation, I review Ricardo's discussion in *Principles of Political Economy* and Marx's discussion in *Capital* to lay out the common thesis that technological-induced worker displacement and precariousness of employment relationships are built into the internal logic of the capitalist economy but Marx and Ricardo had different views on the possibility of technological unemployment within capitalism, the cause of the falling rate of profit and desirable futures of work.

Ricardo theorised that productivity-raising technology could cause technological unemployment if the displaced workers are not reabsorbed into the labour market via additional spending of capitalists in the form of the maintenance of menial servants or wars. This theory opposes Say's Law, which presumes that increased profits and lower consumer prices *automatically* increase labour demand in the economy. Thus, the important contrast in Ricardo's views on automation is that he regards technological unemployment within capitalism as a much more significant threat than Marx, although he also speculated about countervailing tendencies that would generate jobs. Ricardo traces the tendency of the falling rate of profit to rising wages and sees no relationship to automation, unlike Marx. In addition, as a bourgeois economist, Ricardo did not believe that workers would or should seize the means of production or would be able to secure their livelihood if demand for labour-power was replaced by technology, which contrasts with Marx's communist vision.

Marx makes the forceful case that workers produce surplus value that is essential to profit while at the same time seeking an economic advantage over their competitors by introducing labour-saving technology. The flipside of introducing new technologies is to disempower and deskill workers, while high profits in machine-dependent sectors draw in more capital and temporarily expand employment, which lowers profits in the long term, leading to the consolidation and concentration of capital in fewer hands. For instance, Amazon is replacing the retail sector, while OpenAI is replacing online freelancers. The caveat is that by doing so, Amazon has become the second-largest employer via employment expansion *and* automation in transportation and warehouse logistics, and OpenAI has relied on low-paid AI trainers in developing countries to build their LLMs that are extensively used by professional workers (Tubaro et al. 2020). The threat of machine displacement is constantly hanging over these workers. Following Marx's reasoning, high technological unemployment is unlikely to be achieved within the framework of a capitalist system, given that an abundance of displaced workers maintains a large enough reserve army of labour that capital can find ways to exploit. The capitalist economy is unlikely to generate "fully automated luxury communism", i.e. a workless future and broadly shared technological gains (Bastani 2019; Srnicek

and Williams 2015). That is because the technological displacement creates a precarious, underpaid working class that diminishes capitalist incentives to adopt more costly robots (Smith 2020; Benanav 2020). Marx (1863, chapter 18) has shown that the individual displaced workers themselves might not get a new job, but at the macro-level, the valorisation of capital is dependent on wage labour, and up until today, his prediction has been correct. Marx offers an advancement to Ricardo's theory on the declining rate of profit because Marx claims that this tendency is caused by the rising organic composition of capital (capital intensity, automation), while Ricardo thought it was caused by high wages. Unlike Ricardo, who only believed in capitalism, Marx believed in a communist future where the antagonism between man and machine due to capitalist exploitation is dissolved. The commonalities and differences in the Marxist and Ricardian frameworks are presented in Table 1.

	Marx	Ricardo
Common framework	Technological job displacement, precarity of employment relationship in capitalist economy	
Technological unemployment within capitalism	Unlikely	Very likely
Cause of declining rate of profit	Rising organic composition of capital (capital intensity, automation)	Rising wages
Desirable future of work	Communism	Status quo, countervailing employment creation tendencies strong

Table 1: Marxist and Ricardian Framework on Automation and Future of Work

While the exact contours of an AI future are still uncertain and more empirical research should be conducted, the Marxist framework demonstrates that as long as we have capitalism and the valorisation of capital originates from wage labour, labour power will remain an important component, while in the Ricardian framework full employment is entirely reliant on the compensatory mechanism of job creation that could diminish over time, rendering labour redundant. In Marx and Ricardo's theories, there is no contradiction between (1) AI being labour-intensive, especially in the early or middle phase of AI development, and (2) capitalists chasing labour cost savings and pursuing more automation, i.e. labour displacement, via AI. This raises the question of what a desirable future of work will be, which is covered in the conclusion.

2. Automation as an Economic and Sociological Phenomenon

Early concerns about the automation of jobs originated in the early periods of the Industrial Revolution when the steam engine was displacing the guilds producing textiles

by hand. In 1811, the British knitters, the so-called Luddites, protested poor working conditions and were destroying the machines that were threatening to erode their living standards (O'Rourke et al. 2013). Ironically, in the early phase of the Industrial Revolution, the displacement of guilds was associated with a substantial expansion in employment in factories, thus generating new markets as clothes became cheaper. Bessen (2019) documents a complex inverse U-shape time trend of jobs due to automation: in the first period, an increase in technology reduces the cost of production, which lowers output prices, and these cheaper prices increase total output demand. Increasing output demand increases employment. But once markets become saturated, e.g. people stop purchasing new clothes after their closets are full, the output demand falls, while the machines remain in place, so capital moves to other industries and workers in the oversaturated sector are laid off. Automation in the sense of mass displacement of labour is happening, but it takes time.

The rise of labour unions, collective bargaining arrangements and the welfare state, which insure against the social risks of unemployment, old age and ill health, shared some of the gains of technological progress to the working class and further stabilised the political economy in the developed capitalist countries (Frey 2019). But the manufacturing sector is automating many jobs, and shrinking manufacturing employment no longer absorbs the surplus labour. This surplus labour population increased further due to a high birth rate and demographic boom in the first half of the twentieth century (Benanav 2014). Less developed countries intent on copying the developed countries in promoting economic development via mass manufacturing jobs struggle with that model because manufacturing activity is significantly more robot-intensive, so the rich countries find it easier to retain their fully automated factories at home (Rodrik 2016).

The mainstream economics literature documents an ambiguous employment effect of technology, which is captured in the skill-biased technological change (SBTC) argument. SBTC argues that technology benefits high-skilled workers, i.e. those with more education and technical training, because their employment and wages rise, while it hurts low-skilled workers, i.e. those with less education and training, especially in repetitive and manual labour tasks (Berman et al. 1998; Card and DiNardo 2002). A different argument is job polarisation, where machines directly replace middle-wage, middle-skill occupations, especially clerical, administrative and production tasks while swelling the high-tech, high-wage and low-tech, low-wage jobs (Goos et al. 2014).

The weakness of SBTC is that it ignores the power imbalance inherent in the capital-labour relationship because in SBTC, compensation and job security are entirely a function of average marginal productivity represented in skill and level of education rather than capitalist control over the production process and surveillance of labour output (Kristal 2013). Another objection to SBTC is that with AI getting better, even high-skilled workers are subject to automation pressure (Susskind 2020; Ford 2021). The major sociological concern with automation has been the increase in wage inequality associated with new technologies but filtered through capitalist reorganisation such as weakening unions (Western and Rosenfeld 2011), weakening left/ labour parties (Kollmeyer 2017), or strengthening finance (Lin and Tomaskovic-Devey 2013).

But even the sociological debate on technology and inequality overly focuses on the divide between managers/ owners of capital and workers and not so much on the divide between workers and non-workers, the latter being a result of technological unemployment (Wallerstein et al. 2013). Empirical ethnographic accounts of automation are numerous but tend to have a short time horizon and point to the employment enhancing effects of software development (Shestakofsky 2024), robot-controlled

warehouse workers (Munn 2022), algorithmically controlled taxi drivers (Rosenblat 2018) or low-wage algorithmic classification workers (Gray and Suri 2019; Tubaro et al. 2020).

3. Predictions and Perceptions of Automation via AI

More recent advances in computing power and the rise of artificial intelligence have generated new sociological research (Liu 2021) and revealed the trends in the most recent development of digital capitalism, the latest iteration of capitalism. Digital capitalism is characterised by the use of computers and the internet for expanding markets, generating societal inequality and domination by powerful big corporations (Schiller 1999; De Rivera 2020). Digital capitalism is "the part of capitalism that is organised around the production of digital commodities and digital products" (Fuchs 2020, 71). AI is the product of digital capitalism because algorithms are built from the data that is scraped from websites, including many social media websites in which users contribute their data and attention (Wheeler 2024), as well as body-tracking devices and sensors among gig economy workers (Van Doorn 2017; Van Doorn and Badger 2020). AI is advanced by giant internet platforms that control the data and the resources to advance these programs, implying their significant social and political power (Srnicek 2016; Khanal et al. 2024). There are also concerns about AI intensifying algorithmic management, surveillance and insecure employment relationships (Deranty and Corbin 2024).

AI has renewed a political debate around technological unemployment that is traceable at least to the New Deal era of the 1930s (Bix 2000). At one extreme is the Alphabet/Google futurist Ray Kurzweil (2005) predicting a "singularity", where machines and AI exceed human intelligence and where humans even merge with machines. Geoffrey Hinton (formerly Google) claims that AI is a societal risk (Siddiqui 2023). If AI transformed into AGI (Artificial General Intelligence), where AI becomes an autonomous agent not requiring any human labour input, it could make the human species completely redundant (Dyer-Witheford et al. 2019).

Whether AI will be a threat to humanity or jobs is still too early to tell, but even with present capabilities, cognitive jobs that were previously safe from automation are now impacted by displacement. Freelance writers and translators have been losing jobs due to chatbots (Hui et al. 2023). The same fate could await cybersecurity professionals (Nowrozy 2024). Amazon is replacing middle managers by using HR algorithms that automatically fire underperforming delivery workers based on pre-set criteria, e.g. time to delivery (Soper 2021). From the introduction of ChatGPT in late 2022 until the end of 2023, Indeed, an online job board, has registered a 45% decrease in software development job ads, a 39% decline in information design/ documentation and a 32% decline in finance jobs (Bunker 2023). The video game industry cut 10,500 jobs in 2023 due to greater AI use in game development (Merchant 2024). An important qualification is that labour displacement can occur even without an increase in technological unemployment, assuming job creation elsewhere in the economy.

Yann LeCun from Meta is significantly more sceptical and thinks that AI capabilities are still too low to make them a serious threat to humanity (Macaulay 2024). Bender (2023) argues that AI is a meaningless marketing term to make it seem like it is an autonomous thinking entity rather than a useful tool for humans and companies. Some social theorists are also very critical of the narrowly technology-determinist views of labour displacement due to AI, arguing that technological choices are highly political, that AI is derived from the intelligence of human labour, that AI creates new social hierarchies and surveillance of labour, and that social movements must continue to

shape the contours of automation to better serve humanity (Pasquinelli 2023). To integrate AI into warehouses and to train computer algorithms, a lot of workers and electricity are needed (Gray and Suri 2019; Crawford 2021; Delfanti 2021; Tubaro and Casilli 2019) and these workers have to adjust to the gaps and weaknesses in the technology to make the business work smoothly (Munn 2022; Tubaro 2022). So far, AI has been integrated into labour-intensive on-demand platforms (e.g. Uber), micro-work (e.g. Mechanical Turk) and social media (Casilli 2025)[1]. Furthermore, if we accept the expanded definition of work as including users within digital media generating surplus value (Fuchs 2014; Sørensen 2024), then a reduction of regular wage work via AI will simply expand an unpaid digital labour force within advertising-based digital media.

AI predictions are still premature: the US labour force has increased by 4 million between the end of 2022 and September 2024, which is the period of when Generative AI hit the market (FRED 2024). Furthermore, there is significant demographic ageing, which is associated with more automation (Acemoglu and Restrepo 2022). Given rapid ageing, AI should displace even more jobs to retain general living standards. It is also not clear whether AI and greater output will reduce the work burden. AI use in higher education in a neoliberal and metric-focused institutional setting generates an increase in scholarly and administrative output but merely shifts up the required output to remain in good standing within the university and profession (Watermeyer et al. 2023).

While contemporary social scientists are investigating the extent of technological job replacement, the early social theorists of capitalism have already contemplated the significance of automation. Marx and Ricardo were theorists of capitalism and explained how new technologies impact worker displacement and technological unemployment. Because AI is introduced in a digital capitalist environment, we still benefit from their insights to grasp the future of work in the context of AI.

4. Ricardo on Machinery, the Potential for Technological Unemployment and Countervailing Tendencies

Ricardo (1817, chapter 31) began with the impression that machinery would have a positive impact on all three major social classes: the landlords, capitalists and workers. The landlords would benefit from the cheaper cost of goods, as it increases the purchasing power of their rental income. The capitalists would generate more profit by selling the increased output at a cheaper price. The workers would also benefit from the cheaper cost of the commodities, as their constant wage income could purchase more goods. The layoff of a small number of workers through automation is easily compensated by reemploying them in other industries. Those industries can thrive because cheaper output prices from the increased use of machinery increases consumer purchasing power for new industries. Ricardo quotes Adam Smith's dictum:

> "[T]he desire for food is limited in every man, by the narrow capacity of the human stomach, but the desire of the conveniences, and ornaments of building, dress, equipage and household furniture, seems to have no limit or certain boundary" (Ricardo 1817, chapter 31).

Assuming that there is no restriction on consumer preferences and desires, there is no reason to believe that automation will reduce aggregate employment.

[1] For classifications of the types of AI data work, see Tubaro et al. (2020) and Muldoon et al. (2024).

However, Ricardo did not assume that consumption has no limits. Ricardo points to the unequal distribution of income and wealth inherent to the capitalist economy, where the economic gains generated by labour-replacing machinery can be absorbed by the capitalists (and to some extent the rentier landlords), none of which needs to be shared with workers. Ricardo distinguished between the gross income and net income of a country (Ricardo 1817, chapter 26). In Ricardian terms, gross income is the part of the product that replaces wages, profits and rent, while net income only replaces profits and rent (Ricardo 1817, chapter 26; Marx 1863, chapter 18). Net income, especially capitalist profits, increases with automation, but gross income including wages might not. Indeed, the neoliberal era is characterised by the ever-growing chasm between stagnant wages and rising labour productivity from machinery (Duménil and Levy 2011; Bivens and Banerjee 2022).

Ricardo (1817, chapter 31) uses a hypothetical example of a capitalist making an automation decision that is harmful to labour interests. The addition of machines increases labour productivity, which lowers the value of goods (exchange-value) produced and the number of workers employed but raises the output volume (use-value) and maintains the rate of profit[2]. Thus, Ricardo argues that the working-class view "that the employment of machinery is frequently detrimental to their interests, is not founded on prejudice and error, but is conformable to the correct principles of political economy" (Ricardo 1817, chapter 31).

Ricardo acknowledges some exceptions, i.e. countervailing tendencies, where labour power could remain relevant. The capitalist uses his revenue to increase capital, i.e. by ordering the production of new consumer products that are sold in the consumer market. This is a restatement of Say's Law: supply creates its own demand (Say 1834), which Ricardo grew sceptical of in the context of generating employment[3]. Shared prosperity under capitalism is possible but is always reliant on the creation of new labour-intensive industries. This form of job creation may be considered a countervailing tendency to technological unemployment. But while Say takes this process for granted, Ricardo does not make this assumption and does not believe that it would be effective[4]. In my reading, the countervailing tendencies do not undermine Ricardo's belief in technological unemployment.

But what are these new industries? According to Ricardo, the new industries are to be found in the desire for menial servants among the capitalists.

> "If a landlord, or a capitalist, expends his revenue in the manner of an ancient baron, in the support of a great number of retainers, or menial servants, he will give employment to much more labour, than if he expended it on fine clothes, or costly furniture; on carriages, on horses, or in the purchase of any other luxuries…As the labourers, then, are interested in the demand for labour, they must naturally desire that as much of the revenue as possible should be diverted from

[2] The use-value and exchange-value framework is derived from Ricardo (1817, chapter 1) and Marx (1867, chapter 1). "Use value" refers to the practical utility or usefulness of a good, based on its physical properties and ability to fulfil a human need, while "exchange value" represents the quantitative value of a good in relation to other goods when exchanged on the market.

[3] Elsewhere, Ricardo (1817, chapter 21) approves of Say's Law in that production will be covered by consumer demand.

[4] Marx argues that Say's belief that demand is determined only by production and that demand and supply are identical is false. The act of selling and buying a commodity are separate operations, thus an increase in supply is not automatically matched with a rise in demand and a commodity glut produces economic crises (Marx 1863, chapter 17).

> expenditure on luxuries, to be expended in the support of menial servants" (Ricardo 1817, chapter 31).

If the capitalists desired to live like "ancient barons", purchasing the services of menial labour and servants, then technological unemployment will not be an issue. Ricardo's ideas are reminiscent of the Dutch philosopher Bernard Mandeville (1970), who praised what the Christians called the "wasteful vices" of the rich landlords such as luxury, gambling and crime that are "public virtues" because they generate the consumer demand that support economic growth. In the "Fable of the Bees" (Mandeville 1970), a thriving bee community greedy for generating honey collapsed after turning to the Christian values of honesty and virtue, i.e. frugality and non-materialism. The bees lived under material deprivation in a hollow tree. Anti-consumerist values would crash the capitalist economy. It should be noted that Ricardo lived before the rise of the Fordist era in the mid-twentieth century and could not imagine a mass consumerist economy where high wages and state-provided welfare income generate most of the additional demand (Ivanova 2011).

Another possibility to restore labour demand is for the state to wage wars, which would immediately withdraw capital from the civilian economy and expend it both on the labour of weapons manufacturers and soldiers on the battlefield (Ricardo 1817, chapter 31). Expensive wars are deficit-financed and can be inflationary (Riddell 1989), although even that inflationary effect could be mitigated if the war was funded by the "net produce", i.e. the capitalist profits. There are divergent views about whether capitalism promotes wars. Lenin (1964/1917) argues that the growth of capitalism is linked to imperialist wars of expansion, which also subjugates the resources and populations of the colonised for the benefit of the colonial power. Hirschman (1977) counters that war is a pre-capitalist, feudal human quest for power and domination by the ruling elites, while capitalism creates a non-violent path for ambitious men to pursue, i.e. it's less violent to be a CEO than a military general. On the one hand, most capitalists need peace for their industries to thrive and economic integration reduces the likelihood of war (Friedman 1999), but on the other hand, the military-industrial complex needs war in other countries to remain viable (Hartung 2012). Regardless of who is right, Ricardo's original contention that war is labour-intensive remains accurate so far. The US Army is experimenting with AI-controlled robot soldiers, which raises ethical questions about whether humans will continue to make the final kill decision (Ceder 2024).

Ricardo (1817, chapter 31) argued that horses could substitute for human labour power because horses have more muscle power, which is very useful in agricultural tasks. Laid off agricultural labourers could remain relevant only if they were employed in other sectors of the economy. The history of agricultural horses shows that they were themselves replaced by diesel tractors in the 1920s (Acemoglu and Restrepo 2019, 205). Horse populations declined thereafter, but human population and employment increased, which suggests that human labour power is significantly more versatile than horse labour power and that in a society of humans, horses are kept for the needs of humans.

Why is technological innovation unavoidable? Ricardo (1817, chapter 31) concludes that global competition enforces technology promotion and ultimately technological unemployment. Global competition works in two ways: (1) restricting technology in one country would result in capital flight abroad, as domestic capitalists will seek for jurisdictions to invest their capital and employ machinery for profit. This would result in a loss of economic activity and tax revenue in the restrictive country; and (2) other

countries deploying the technology will have higher productivity, and thereby command higher purchasing power and more favourable terms of trade for the commodities they produce. Both mechanisms work to reduce the standard of living in the technology-restricting countries. Globalisation and the implied spread of capitalism embed a pro-technological bias, so benefiting from economic and technological opportunities in the global marketplace could produce social instability due to technological unemployment. The US and Chinese political leadership view AI innovation as an important realm of geopolitical competition, thus encouraging each side to innovate quicker than the other side (O'Brien 2024).

Ricardo believed in the high probability of automation and technological unemployment even with the qualification of countervailing employment-creating tendencies in the form of unproductive labour hired by capitalists or the state. Nowhere in his writings did he propose an alternative vision for a desirable future of work. The worker in the Ricardian model is a price-taker awaiting the employment and wage offer of the capital owner, not an autonomous political agent advocating for oneself. Thus, it is exclusively the countervailing employment-generating tendency of capitalists themselves that can sustain the working class. Marx offered a different version of a desirable future of work, which is discussed in the conclusion. I next turn to Marx's automation discussion, which contains several advances to Ricardo's.

5. Marx and Automation: Surplus Value, Surplus Labour and Industrial Reserve Army

In Marx's view, the introduction of the steam engine into the production process is the origin of the Industrial Revolution. Social relations are reorganised with different technologies:

> "In acquiring new productive forces men change their mode of production; and in changing their mode of production, in changing the way of earning their living, they change all their social relations. The hand-mill gives you society with the feudal lord; the steam-mill society with the industrial capitalist" (Marx 1847, chapter 2, Part 1).

Historical epochs are correlated with certain technologies and ways of organising productive social relations[5]. In order to mass-produce textiles, the capitalist has to invest in the required technology, but he also has to reorganise labour relations. Workers have to be placed into the factories, where tasks are divided between workers, and both the machines and the workers are organised such that productivity is maximised. The workers regard interactions with machines as highly oppressive, because the capitalists are interested in speed-up, minimising downtime and devaluing worker skill via standardisation of labour tasks. This speed-up and deskilling has been observed among data science workers dependent on AI technology (Steinhoff 2022). Even if working hours were shortened, the capitalists would work the labourers as hard as they could.

[5] Marx was by no means a technological determinist, as there is a combination of the productive forces (technology), state power, pro-capitalist ideology and the "mute" power of capital that reconfigure social relationships (Mau 2023). Fehrle et al. (2024) provide a solid critique of productive-force determinism, and Wood (2009, ch.4) shows that Marxist theory is historically specific, not technology determinist.

> "The shortening of the hours of labour creates, to begin with, the subjective conditions for the condensation of labour, by enabling the workman to exert more strength in a given time. So soon as that shortening becomes compulsory, machinery becomes in the hands of capital the objective means, systematically employed for squeezing out more labour in a given time. This is effected in two ways: by increasing the speed of the machinery, and by giving the workman more machinery to tend" (Marx 1867, chapter 15, section 3).

The "subjective conditions" to "condense labour" refers to the ability of capitalists to extract more effort from workers despite shorter work hours.

While the artisan controls the tools, the design of the product and the process of production, the worker is oppressed by the capitalist, has to submit to the speed and direction of the machine, does not know all the inputs to the end product and does not control the profits generated from labour power (Marx 1867, chapter 15, section 5). The worker is alienated in four senses of the term: he is alienated from the product of labour, the activity of labour, his own humanity and society at large (Marx 1844). Workers and machines become antagonistic because of the capitalist relations of production, where private capital accumulation takes precedence over the needs and interests of workers and the community (Wendling 2020).

Surplus value is extracted from labour power, which Ricardo's belief in the "fair" allocation of resources to capitalists, landlords and workers obscures. To increase market share and increase individual capitalist profits, capitalists can either lengthen the working day (absolute surplus value) or they can introduce more machines to cheapen commodities (relative surplus value, Marx 1867, chapter 15, chapter 16). Machinery lowers the share of surplus value because the labour power component shrinks (Marx 1867, chapter 25, section 2). Labour power is the capacity of workers to produce goods and services. Variable capital is the portion of capital used to pay wages to labour power. It is variable because workers add more value to the output than what they get paid in wages. A worker produces 10 dollars of value but is only paid 4 as wages, generating 6 dollars in surplus value. Machines and other means of production are considered constant capital because once they are purchased, they do not add value to the output. A machine that costs 100 dollars and produces 1000 units of goods before being replaced costs 0.1 dollars per unit produced. The phenomenon of rising capital intensity, i.e. higher constant to variable capital ratio, is called rising organic composition of capital (Marx 1867, chapter 25). The contradiction in capitalism is the capitalist desire for cheaper production via labour-saving technology *and* the need to generate as much surplus value from a large labour force (Ferschli 2024, 147).

The distinction between variable and constant capital is an important advance to Ricardian theory, where labour and machinery are interchangeable factors of production (Marx 1885, chapter 11). Marx criticised Ricardo for the inadequacy of his fixed vs. circulating capital framework. Fixed capital is machinery and buildings that are not consumed in one production cycle. Circulating capital is the capital used up in each production cycle such as raw material, labour/ wages and operating expenses (Ricardo 1817, chapter 1, section 4). Marx's main insight was that the Ricardian framework does not allow for an explanation of the falling rate of profit which derives from his discussion on the rising organic composition of capital, i.e. the rise in the constant capital (machinery) over the variable capital (wages) (Marx 1894, chapter 13). In Ricardo's model, profits only decline with rising wages (Ricardo 1817, chapter 6), not from the capital intensity in the sphere of production. Thus, for Marx it is not the production cycles of

factors of production (machinery, labour) that matter in explaining economic crises but the relationship of these factors to surplus value production.

One outcome of the industrial production system where improving machinery raises output is the periodic crisis of overproduction, whose corollary is the lack of aggregate demand (Marx 1894, chapter 15)[6]. The increase in industrial output is not covered by a corresponding increase in consumption which lowers prices and ultimately profit, investment and jobs (Heinrich 2004, 169). Marx normatively critiqued Ricardo's sole concern with maintaining the rate of profit instead of the negative social implications of economic crisis such as lower wages and unemployment (Marx 1894, ch.15).[7]

Industrial capitalism by improving labour productivity via machinery and by concentrating more and more capital in fewer hands generates technological displacement, i.e. to release more and more humans from the production system (Marx 1867, chapter 25, section 2). Productivity-induced layoffs create a relative surplus population or industrial reserve army that is competing for other jobs. The more workers are competing for the same jobs, the lower the wages and the easier it will be for capitalists to extract profits from their workers (Marx 1867, chapter 25, section 3). Rising productivity displaces small capitalist producers, who join the ranks of the working class (Marx 1863, chapter 4, section 9). The creation of the industrial reserve army makes machinery a tool to undermine working class strikes and organisation (Marx 186, chapter 15, section 5). It should be noted that Marx conducted his studies before the rise of labour unions and labour laws that limited the extent to which capital could exploit workers. However, the contemporary weakness of labour unions, the neoliberal turn of the state and the rise of AI push the pendulum back to growing precarity for the workers (Kalleberg 2011; Standing 2011; Lewchuk 2018; Benenav 2020).

In the aggregate, automation may eventually increase employment but it doesn't have to benefit the same displaced workers, who themselves risk being unemployed long-term. Marx notes:

> "It is true that in the long run the labour that has been released together with the portion of revenue or capital that has been released, will find an opening in a new sphere of production or in the expansion of the old one, but this is of more benefit to *those who succeed the displaced men* than to the displaced men themselves" (Marx 1863, chapter 18, section B).

Thus, there is a disconnect between the fate of individual labourers whose displacement may be existentially grave for them versus the average/total labour force that could be accommodated in future employment.

[6] Rising organic composition of capital does not necessarily cause a decline in the profit rate. The profit rate is the rate of surplus value (s/v) divided by the organic composition of capital (c/v). Rising organic composition of capital (higher capital intensity) can be offset by an increase in the rate of surplus value arising from that same increase in capital intensity, see Heinrich (2013).

[7] The capitalist countries did not properly address the problem of overproduction until the Great Depression of the 1930s, when states adopted a Keynesian state interventionist framework to support the capitalist class in generating new markets to accumulate more capital. The state also increased spending to generate public-sector employment, to keep less productive industries alive and to provide welfare services for the economically displaced. While this spending may be considered a fiscal burden for the state, it is a socially necessary expenditure to maintain public support for the capitalist order (O'Connor 1973). State intervention prevents capital destruction and generates debt bubbles that prolong the economic slump (Kliman 2009).

There is an apparent disagreement between Marx and Ricardo. Marx argues that Ricardo believed that the increased profits coming from labour-saving technology are used to hire the displaced workers (Marx 1863, chapter 18, section B)[8]. Marx's depiction of Ricardo's views on automation is based on Ricardo's (1817) initial statement in chapter 31 that he originally believed that automation would be universally beneficial to all social classes, including workers. I think Marx's critique misrepresents Ricardo's position, who was open in the middle section of chapter 31 to the notion that displaced workers do not get reemployed. A much fairer charge against Ricardo is that his approval of hiring menial servants (unproductive labour) to keep displaced labourers employed unfairly makes these labourers best economic interest to support labour-displacing innovation (Marx 1863, chapter 18, section B)[9]. Secondly, Marx is critical in imposing all adjustment costs on labourers instead of capitalists even if full employment is restored at a later date (Marx 1863, chapter 18, section B). On the point of the possibility of technological unemployment, Ricardo believed that industrial efficiency will permanently displace workers, while Marx believed that the industrial reserve army will on average be accommodated in other sectors, though some workers will fall through the cracks.

There is an important cleavage in Marx's ruminations on automation and technological unemployment. Within the capitalist framework, as long as there are hungry people who had previously been displaced by technology, they will seek to sell their labour power as cheaply as possible, so a high employment rate is still possible even as AI encroaches on more and more labour tasks. This injustice reflects the inherent alienation arising from technological innovation under capitalism (Wendling 2020). But, on the other hand, Marx (1845) could envision a communist future where workers decide on their own if, what and how long they want to work. This position is an important advancement to Ricardo's conservatism and is presented in more detail in the conclusion.

6. Conclusion and Desirable Futures

The era of AI portends to be a dramatic game changer implying a decline in the available pool of jobs within the knowledge economy that was regarded as a safe option for individuals in capitalist countries to preserve middle class status. "Learning to code" became the modern buzzword that should assuage the general public about fears of technological displacement while blaming them for their lack of employability, but rings hollow if algorithms potentially code much more efficiently than humans. There are justifiable critiques that AI work remains very labour-intensive, e.g. the recursive process of using low-wage labour to train LLMs (Gray and Suri 2019; Tubaro et al. 2020; Tubaro 2022).[10] On the other hand, past automation has reduced agricultural and

[8] Marx (1863, chapter 18, section B) summarised Ricardo's (1817, chapter 31) quote as follows: "The means of subsistence which were previously consumed by the workers now discharged [by machinery], remain after all in existence and are still on the market. The workers, on the other hand, are also available on the market. Thus, there are, on the one hand, means of subsistence (and therefore means of payment) for workers, i.e., potential variable capital, and on the other, unemployed workers. Hence the fund is there to set them in motion. Consequently, they will find employment. Is it possible that even such an economist as Ricardo can babble such hair-raising nonsense?".

[9] Marx and Ricardo are both in agreement that technological displacement increases the number of unproductive jobs (contemporary discussion in Graeber 2018).

[10] Data activists attempt to improve the labour rights of AI digital workers, see https://data-workers.org/#Inquiries

manufacturing employment and AI is the most recent form of automation. While the contours of the contemporary push toward automation are still uncertain, the Marxist and Ricardian framework of automation technology provide valuable angles on how we can understand the contemporary AI revolution and they temper and qualify the AI job threat narrative.

Both the Marxist and Ricardian frameworks maintain that technology-induced worker displacement and precariousness of employment relationships, i.e. the ease of workers to lose their jobs to technology, are built into the internal logic of the capitalist economy. There are also differences in views regarding technological unemployment and a desirable future of work.

Ricardo takes the threat of technological unemployment as a serious issue and a real possibility. As technologies replace human workers capitalists do not share most of these productivity gains with their workers. But he added the qualification that the rise in net profits from automation could fund additional expenditures on unnecessary bureaucracy and personal services for the wealthy or wars and these trends are documented (Hartung 2012; Graeber 2018; Smith 2020). AI-induced automation could further inflate unproductive work, where the owners of AI companies could subsidise people's existence for their entertainment or pleasure. In the case of employment-creating tendencies being weak, indicators of social disorder, e.g. larceny or drug abuse, could exacerbate.

There are differences between the two frameworks in what causes the decline in the rate of profit. Ricardo blames falling profit on a rise in wages, while Marx traces it to the rising organic composition of capital in the form of automation, which is an important theoretical advancement by Marx. A further difference between the two frameworks is the normative case for how labour should respond to advancing automation and what a desirable future of work is. As a bourgeois economist, Ricardo did not believe that workers would seize the means of production or would be able to secure their livelihood if demand for labour-power is replaced by technology, while Marx formulated a communist vision where technologies would be appropriated for social use value rather than private exchange value for the capitalist.

Within the context of a capitalist economy and the Marxist framework, we can expect that machinery is designed to raise productivity and generate a surplus labour force that bids down aggregate wages. This could, ironically, slow down the pace of further innovation, which suggests that liberation from wage work is not feasible in digital capitalism. The flourishing AI data work is an indication of the continuing labour dependence (Tubaro et al. 2020; Muldoon et al. 2024). Rising capital intensity implies a heightened risk of a crisis of overproduction, considering that surplus value (as exchange-value) is derived from labour, even while machinery-induced labour productivity increases generate more use-value (see Harvey 2003).

The antagonism between technological progress and barriers to human flourishing is focused on the preservation of private property, which Ricardo considers the natural rule of modern social organisation and Marx considers a form of alienation that must be overcome. Communism, which is distinct from "primitive communism" that was characterised by tribal ownership and was the pre-historic social form, is the final movement of human evolution. The economic system returns to the values of humanism and overcomes the contradiction between material existence in capitalism (the need to make a living in the alienated capitalist form) and essence (the state of material freedom to change one's surroundings and lack of exploitation of man by man and nature by man) (Heller 1976: 46). In his own words:

> "Communism is the positive supersession of private property as human self-estrangement, and hence the true appropriation of the human essence through and for man; it is the complete restoration of man to himself as a social – i.e., human – being, a restoration which has become conscious, and which takes place within the entire wealth of previous periods of development. This communism, as fully developed naturalism, equals humanism, and as fully developed humanism equals naturalism; it is the genuine resolution of the conflict between man and nature, and between man and man, the true resolution of the conflict between existence and being, between objectification and self-affirmation, between freedom and necessity, between individual and species. It is the solution of the riddle of history and knows itself to be the solution" (Marx 1844, Third Manuscript, "Private Property and Labour").

If the robots/AI were, indeed, owned by the state or the community at-large, then we would have technological abundance and concerns about the inability to retain wage work would diminish (Srnicek and Williams 2015; Bastani 2019). Communism resolves the capitalist limitation of creating ever more relative surplus value and economic output through technological development without reducing labour time. Marx is not fundamentally opposed to working, but this should happen at a self-determined pace and without the constrictions of formal employment.[11] People should be able to hunt, fish, herd and criticise "without ever becoming hunter, fisherman, shepherd or critic" (Marx 1845). The internet itself offers a potential path for social organisation that could advance human liberation from the constrictions of digital capitalism (Fuchs 2009). This liberation would require a revolutionary consciousness and overcoming alienated labour (Starosta 2013). What we gain from Marx's normative case for communism is that the technical tools for human freedom already exist and these tools are expanding further with AI.[12] However, the problem is that the present social/political configuration does not permit a reduction of wage labour. The present order could increase inequality further if Ricardo's countervailing employment-creating tendencies weaken due to the rise of AI. If AI remains under capitalist control, Luddite resistance is a perfectly rational response for workers (Mueller 2021). Whatever the future of work in the world of generative AI will be, it will not be desirable in a capitalist framework.

References

AbuMusab, Syed. 2023. Generative AI and Human Labour: Who Is Replaceable?. *AI & Society*: 1-3.

Acemoglu, Daron and Pascual Restrepo. 2019. Artificial intelligence, Automation, and Work. In *The Economics of Artificial Intelligence*, edited by Ajay Agrawal, Joshua Gans and Avi Goldfarb, 197-236. Chicago: University of Chicago Press.

Acemoglu, Daron and Pascual Restrepo. 2022. Demographics and Automation. *The Review of Economic Studies 89* (1): 1-44. https://doi.org/10.1093/restud/rdab031

Benanav, Aaron. 2014. *A Global History of Unemployment: Surplus Populations in the World Economy, 1949-2010*. Doctoral dissertation, University of California, Los Angeles.

Bastani, Aaron. 2019. *Fully Automated Luxury Communism*. New York: Verso Books.

Benanav, Aaron. 2020. *Automation and the Future of Work*. New York: Verso.

[11] For a critique of the productivist definition of species-essence, see Vitale (2020).

[12] Universal basic income has been advanced by progressive scholars (Srnicek and Williams 2015) but also has critics (Pitts 2018).

Bender, Emily M. 2023. Opening Remarks on “AI in the Workplace: New Crisis or Longstanding Challenge”. *Medium*, 2 October 2023. https://medium.com/@emilymenonbender/opening-remarks-on-ai-in-the-workplace-new-crisis-or-longstanding-challenge-eb81d1bee9f

Berman, Eli, John Bound and Stephen Machin. 1998. Implications of Skill-Biased Technological Change: International Evidence. *The Quarterly Journal of Economics 113* (4): 1245-1279.

Bessen, James. 2019. Automation and Jobs: When Technology Boosts Employment. *Economic Policy 34* (100): 589-626.

Bivens, Josh, and Asha Banerjee. 2022. Inequality’s Drag on Aggregate Demand. *Economic Policy Institute*, 24 May 2022.

Bix, Amy Sue. 2000. *Inventing Ourselves Out of Jobs? America’s Debate over Technological Unemployment, 1929-1981*. Baltimore: Johns Hopkins University Press.

Bunker, Nick. 2023. Indeed’s 2024 US Jobs & Hiring Trends Report: Reasons for Cautious Optimism. *Indeed*, 15 November 2023.

Casilli, Antonio A. 2025. *Waiting for Robots: The Hired Hands of Automation*. Chicago: Chicago University Press.

Card, David and John E. DiNardo. 2002. Skill-Biased Technological Change and Rising Wage Inequality: Some Problems and Puzzles. *Journal of Labour Economics 20* (4): 733-783.

Ceder, Riley. 2024. One-Third of US Military Could be Robotic by 2039: Milley. *Military Times,* 14 July 2024.

Crawford, Kate. 2021. *Atlas of AI*. New Haven: Yale University Press.

Delfanti, Alessandro. 2021. *The Warehouse: Workers and Robots at Amazon.* New York: Pluto Press.

Deranty, Jean-Philippe, and Thomas Corbin. 2024. Artificial Intelligence and Work: A Critical Review of Recent Research From the Social Sciences. *AI & Society* 39 (2): 675-691.

De Rivera, Javier. 2020. A Guide to Understanding and Combatting Digital Capitalism. *tripleC* 18 (2): 725-743.

Dujarier, Marie-Anne. 2023. How Work as a Category of Thought Has Been Disrupted in Neoliberal Capitalist Societies. *tripleC* 21(2): 107-121.

Duménil, Gérard and Dominique Levy. 2011. *The Crisis of Neoliberalism*. Cambridge: Harvard University Press.

Dyer-Witheford, Nick, Atle Mikkola Kjøsen and James Steinhoff. 2019. *Inhuman Power: Artificial Intelligence and the Future of Capitalism*. London: Pluto Press.

Fehrle, Johannes, Marlon Lieber and J. Jesse Ramirez, eds. 2024. Introduction: Marxism and the Technology Debate. In *(De)Automating the Future*, edited by Johannes Fehrle, Marlon Lieber and J. Jesse Ramirez, 1-53. Leiden: Brill.

Ferschli, Benjamin. 2024. Capitalism Without Workers: On the Impossibility of Automation and Its Relation to the Question of Value. In *De-Automating the Future*, edited by Johannes Fehrle, Marlon Lieber and J. Jesse Ramirez, 135-157. Leiden: Brill.

Feuerriegel, Stefan, Jochen Hartmann, Christian Janiesch, and Patrick Zschech. 2024. Generative AI. *Business & Information Systems Engineering 66* (1): 111-126.

Ford, Martin. 2021. *Rule of the Robots: How Artificial Intelligence Will Transform Everything*. New York: Basic Books.

FRED. 2024. Civilian Labour Force Level. https://fred.stlouisfed.org/series/CLF16OV

Frey, Carl Benedikt. 2019. *The Technology Trap: Capital, Labour, and Power in the Age of Automation*. Princeton: Princeton University Press.

Friedman, Thomas L. 1999. *The Lexus and the Olive Tree*. New York: Farrar, Straus and Giroux.

Fuchs, Christian. 2009. Information and Communication Technologies and Society. A Contribution to the Critique of the Political Economy of the Internet. *European Journal of Communication* 24 (1): 69-87.

Fuchs, Christian. 2014. Digital Prosumption Labour on Social Media in the Context of the Capitalist Regime of Time. *Time & Society* 23 (1): 97-123.
Fuchs, Christian. 2020. *Marxism: Karl Marx's Fifteen Key Concepts for Cultural and Communication Studies.* New York: Routledge.
Goos, Maarten, Alan Manning, and Anna Salomons. 2014. Explaining Job Polarization: Routine-Biased Technological Change and Offshoring. *The American Economic Review 104* (8): 2509-2526.
Graeber, David. 2018. *Bullshit Jobs: A Theory*. London: Penguin Random House UK.
Gray, Mary L. and Siddarth Suri. 2019. *Ghost Work: How to Stop Silicon Valley from Building a New Global Underclass*. Boston: Houghton Mifflin Harcourt.
Hartung, William D. 2012. *Prophets of War: Lockheed Martin and the Making of the Military-Industrial Complex*. New York: Bold Type Books.
Harvey, David. 2003. The Fetish of Technology: Causes and Consequences. *Macalester International 13* (7): 3-30.
Heinrich, Michael. 2004. *Introduction to the Three Volumes of Capital.* New York: Monthly Review Press.
Heinrich, Michael. 2013. Crisis Theory, the Law of the Tendency of the Profit Rate to Fall, and Marx's Studies in the 1870s. *Monthly Review* 64 (11): 15-31.
Heller, Agnes. 1976. *The Theory of Need in Marx*. London: Allison & Busby.
Hirschman, Albert. O. 1977. *The Passions and the Interests: Political Arguments for Capitalism Before Its Triumph*. Princeton: Princeton University Press.
Hui, Xiang, Oren Reshef and Luofeng Zhou. 2023. The Short-Term Effects of Generative Artificial Intelligence on Employment: Evidence From an Online Labour Market. *SSRN*. https://doi.org/10.2139/ssrn.4527336
Ivanova, Maria N. 2011. Consumerism and the crisis: Wither 'the American dream'?. *Critical Sociology 37* (3): 329-350.
Kalleberg, Arne 2011. *Good Jobs, Bad Jobs*. New York: Russell Sage.
Khanal, Shaleen, Hongzhou Zhang and Araz Taeihagh. 2024. Why and How Is the Power of Big Tech Increasing in The Policy Process? The Case of Generative AI. *Policy and Society*: puae012 (online).
Kliman, Andreas. 2009. Roots of the Current Economic Crisis: The Falling-Rate-of-Profit Tendency, Insufficient Destruction of Capital, and Bubbles. Association of Heterodox Economics conference, London. https://www.hetecon.net/wp-content/uploads/2019/11/Kliman.pdf
Kollmeyer, Christopher. 2017. Market Forces and Workers' Power Resources: A Sociological Account of Real Wage Growth In Advanced Capitalism. *International Journal of Comparative Sociology 58* (2): 99-119.
Kristal, Tali. 2013. The Capitalist Machine: Computerization, Workers' Power, and the Decline in Labour's Share within US Industries. *American Sociological Review 78* (3): 361-389.
Kurzweil, Ray. 2005. *The Singularity Is Near: When Humans Transcend Biology*. New York: Viking.
Lenin, Vladimir. 1964/1917. "War and Revolution." In *Lenin Collected Works,* Vol. 24. 398-421. Moscow: Progress Publishers.
Lewchuk, Wayne. 2018. The Political Economy of Precariousness in an Era of Artificial Intelligence: Precarious Work, or None at All. *Canadian Labour and Employment Law Journal 21*: 239.
Lin, Ken-Hou, and Donald Tomaskovic-Devey. 2013. Financialization and US Income Inequality, 1970-2008. *American Journal of Sociology 118* (5): 1284-1329.
Liu, Zheng. 2021. Sociological Perspectives on Artificial Intelligence: A Typological Reading. *Sociology Compass* 15, no. 3: e12851.
Macaulay, Thomas. 2024. Meta's AI Chief: LLMs Will Never Reach Human-Level Intelligence. *The Next Web*, 10 April 2024.

Mandeville, Bernard de. 1970. *The Fable of The Bees*. London: Penguin Classics.
Marx, Karl. 1844. Economic and Philosophic Manuscripts of 1844. In *Marx & Engels Collected Works (MECW) Volume 3*, 229-346. London: Lawrence & Wishart.
Marx, Karl. 1845. *The German Ideology*. Moscow: Progress Publishers.
Marx, Karl. 1847. *The Poverty of Philosophy*. Moscow: Progress Publishers.
Marx, Karl. 1863. *Theories of Surplus Value*. Moscow: Progress Publishers.
Marx, Karl. 1867. *Capital, Volume 1*. Moscow: Progress Publishers.
Marx, Karl. 1885. *Capital, Volume 2*. Moscow: Progress Publishers.
Marx, Karl. 1894. *Capital, Volume 3*. New York: International Publishers.
Mau, Søren. 2023. *Mute Compulsion: A Marxist Theory of the Economic Power of Capital.* London: Verso.
Merchant, Brian. 2024. AI is Already Taking Jobs in the Video Game Industry. *Wired*, 23 July 2024.
Mueller, Gavin. 2021. *Breaking Things at Work – The Luddites are Right About Why You Hate Your Job.* London: Verso
Muldoon, James, Callum Cant, Boxi Wu and Mark Graham. 2024. A Typology of Artificial Intelligence Data Work. *Big Data & Society* 11 (1): https://doi.org/10.1177/20539517241232632.
Munn, Luke. 2022. *Automation is a Myth*. Palo Alto: Stanford University Press.
Nowrozy, Raza. 2024. GPTs or Grim Position Threats? The Potential Impacts of Large Language Models on Non-Managerial Jobs and Certifications in Cybersecurity. *Informatics* 11(3): 45. https://doi.org/10.20944/preprints202404.1600.v1
O'Brien, Matt. 2024. US Ahead in AI Innovation, Easily Surpassing China in Stanford's new Ranking. *AP News*, November 21.
O'Connor, James. 1973. *The Fiscal Crisis of The State*. New Brunswick: Transaction Publishers.
O'Rourke, Kevin Hjortshøj, Ahmed S. Rahman and Alan M. Taylor. 2013. Luddites, the Industrial Revolution, and the Demographic Transition. *Journal of Economic Growth 18*: 373-409.
Pasquinelli, Matteo. 2023. *The Eye of The Master: A Social History of Artificial Intelligence*. New York: Verso.
Pitts, Frederick Harry. 2018. A Crisis of Measurability? Critiquing Post-Operaismo on Labour, Value and the Basic Income. *Capital & Class* 42, no. 1: 3-21.
Ricardo, David. 1817. *On The Principles of Political Economy and Taxation*. In Rod Hay's Archive for the History of Economic Thought. Hamilton, ON: McMaster University.
Riddell, Tom. 1989. Inflationary Impact of the Vietnam War. *Vietnam Generation 1* (1): 4.
Rodrik, Dani. 2016. Premature Deindustrialization. *Journal of Economic Growth 21*: 1-3.
Rosenblat, Alex. 2018. *Uberland: How Algorithms are Rewriting the Rules of Work*. Berkeley: University of California Press.
Say, Jean-Baptiste. 1834. *A Treatise on Political Economy*. Philadelphia: Grigg & Elliott. 6th American Edition.
Schiller, Dan. 1999. *Digital Capitalism. Networking the Global Market System*. Cambridge, MA: MIT Press.
Shestakofsky, Benjamin. 2024. *Behind the Startup: How Venture Capital Shapes Work, Innovation, and Inequality*. Berkeley: University of California Press.
Siddiqui, Tabassum. 2023. Risks of Artificial Intelligence Must be Considered as the Technology Evolves: Geoffrey Hinton. *University of Toronto,* 29 June 2023. https://www.utoronto.ca/news/risks-artificial-intelligence-must-be-considered-technology-evolves-geoffrey-hinton
Smith, Jason. E. 2020. *Smart Machines and Service Work: Automation in an Age of Stagnation*. London: Reaktion Books.
Soper, Spencer. 2021. Fired by Bot at Amazon: 'It's You Against the Machine'. *Bloomberg*, 28 June 2021.

Sørensen, Søren Bøgh. 2024. Value and Productive Labour in the Era of Digital Technologies. *tripleC* 22 (2): 498-517.
Srnicek, Nick. 2016. *Platform Capitalism.* London: Wiley.
Srnicek, Nick and Alex Williams. 2015. *Inventing the Future: Postcapitalism and a World Without Work*. New York: Verso Books.
Standing, Guy. 2011. *The Precariat: The New Dangerous Class*. London: Bloomsbury.
Starosta, Guido. 2013. The System of Machinery and Determinations of Revolutionary Subjectivity in the Grundrisse and Capital. In *In Marx's Laboratory: Critical Interpretations of the Grundrisse*, edited by Ricardo Bellofiore, Guido Starosta and Peter D. Thomas, 233-263. Leiden, The Netherlands: Brill.
Steinhoff, James. 2022. The Proletarianization of Data Science. In *Digital Work in the Planetary Market*, edited by Mark Graham and Fabian Ferrari, 191-206. Cambridge: MIT Press.
Susskind, Daniel. 2020. *A World Without Work: Technology, Automation, and How We Should Respond*. London: Penguin.
Tubaro, Paola. 2022. Learners in the Loop: Hidden Human Skills in Machine Intelligence. *Sociologia del Lavoro* 163: 110-129.
Tubaro, Paola and Antonio A. Casilli. 2019. Micro-Work, Artificial Intelligence and the Automotive Industry. *Journal of Industrial and Business Economics* 46 (3): 333-345.
Tubaro, Paola, Antonio A. Casilli and Marion Coville. 2020. The Trainer, the Verifier, the Imitator: Three Ways in Which Human Platform Workers Support Artificial Intelligence. *Big Data & Society* 7 (1): https://doi.org/10.1177/20539517209197.
Van Doorn, Niels. 2017. Platform Labour: On the Gendered and Racialized Exploitation of Low-Income Service Work in the 'On-Demand' Economy. *Information, Communication & Society* 20 (6): 898-914.
Van Doorn, Niels and Adam Badger. 2020. Platform Capitalism's Hidden Abode: Producing Data Assets in the Gig Economy. *Antipode* 52 (5): 1475-1495.
Vitale, Sarah. 2020. Beyond "Homo Labourans": Marx's Dialectical Account of Human Essence. *Social Theory and Practice* 46 (3): 633-655.
Wallerstein, Immanuel, Randall Collins, Michael Mann, Georgi Derluguian and Craig Calhoun. 2013. *Does Capitalism Have a Future?* New York: Oxford University Press.
Watermeyer, Richard, Lawrie Phipps, Donna Lanclos, and Cathryn Knight. 2024. Generative AI and the Automating of Academia. *Postdigital Science and Education 6* (2): 446-466.
Wendling, Amy E. 2020. Technology and Science*.* In *The Marx Revival*, edited by Marcello Musto, 363-375. Cambridge: Cambridge University Press.
Western, Bruce and Jake Rosenfeld. 2011. Unions, Norms, and the Rise in US Wage Inequality. *American Sociological Review 76* (4): 513-537.
Wheeler, Tom. 2024. Connecting the Dots: AI Is Eating the Web That Enabled It. *Brookings*, 24 June 2024.
Wood, Ellen Meiksins. 2009. *Democracy Against Capitalism.* Cambridge: Cambridge University Press.

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