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Hampered digitalization: Institutional failure and new instability in Japan

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ABSTRACT

This article examines how business, labor, and the state have adapted to digitalization, highlighting the critical role of national institutions in shaping how societies experience this global shift. By drawing on Régulation Theory and considering the case of Japan, this article analyzes the interplay between competition, wage-labor relations, and the state. The paper argues that Japan's response to digitalization has reinforced neoliberal restructuring without establishing a new mode of regulation (which would require the reconciliation of the competing interests of labor, capital, and the state). Digitalization has intensified competition, placing downward pressure on wages and exacerbating skills shortages while also creating a digital divide between large firms and SMEs. The existing low-wage problem has been exacerbated by rising investment in technological upgrades without commensurate wage increases. Finally, the Japanese state's failure to effectively coordinate labor market policies with digitalization efforts has exacerbated existing inequalities and hindered the development of a stable regulatory framework. Consequently, instead of reconciling the competing interests of labor, capital, and the state, current institutional adjustments to digitalization in Japan have generated further instabilities, hindering the realization of any growth potential.

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Introduction

Digitalization and the digital transformation, and their potential benefits, have seen a rapid growth in interest across the business, political and academic communities. Many critical studies have raised concerns over the negative consequences of digitalization as an increasingly prominent feature of the global political economy (Bisht et al. 2023; Couldry and Mejias 2019; Durand 2024; Joyce et al. 2023; Sadowski 2020; Zuboff 2019). While these existing studies provide valuable insights, we also need to examine

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how digitalization has unfolded differently across national economies. While a number of studies rightly emphasize country variance in ongoing processes of digitalization (Dupuis 2025; Haipeter 2020; Krzywdzinski 2021; Ohlert, Giering, and Kirchner 2022; Sawada et al. 2022; Schröder et al. 2024), they nevertheless tend to lack a critical and holistic analysis of how digitalization progresses within specific (national) capitalist models. Drawing on Régulation Theory as an analytical framework, and seeking to address the current lack of critical, yet country-specific, analysis, we examine the research question: how has digitalization been incorporated into the existing socio-economic system of Japan? We argue that institutions, including the state, forms of business competition, and the wage relation, have each adapted, in part, to digitalization, yet have so far failed to address sufficiently the social conflict and distributive struggles that have also arisen as a result of digitalization.

By utilizing Regulation Theory's unit of analysis - institutions that seek to regularize the core process of capitalist socio-economies - our findings from Japan explore how the ongoing process of digitalization is generating novel forms of insecurity and challenges. Japan offers a compelling case study due to its unique set of advanced economic challenges. These include long-term market stagnation, low consumption, labor shortages, and a persistent drive to enhance productivity and profitability. Key actors within Japan have enthusiastically embraced digitalization as a potential solution to these problems. This trend is mirrored, albeit to varying degrees, in other advanced capitalist economies. Japan holds particular significance within East Asia, where many economies have emulated Japan's economic model. Observing how Japan adapts to the digital age therefore provides valuable insights for both global and regional contexts. This paper shows how digital transformation in the case of Japan has emerged in the context of its ongoing neoliberal transformation.

We argue that digitalization has intensified competition between firms and polarized businesses, exacerbated a shortage of skilled workers, and exerted downward pressure on wages. This has created labor market instabilities, including a growing wage divide and skills gap between regular and non-regular workers, increasing conflicts between firms, and between capital and labor. Organized labor has failed to realign its strategies with the new pressures that digitalization is having upon workers. Furthermore, our analysis reveals a lack of coherence in state-led reform efforts, hindering the achievement of a balanced approach that simultaneously addresses the needs of businesses and aligns state policies for digitalization with the protections of workers. This inadequacy has led to insufficient worker upskilling by which we mean enabling people "to acquire or let people acquire the skills they need to enter a new profession or to adapt to a significant change in the skills required in their current profession"

(Ishihara 2021, 6), a continuation of low wages and the weakening of consumer power – all despite stated government intentions to the contrary. Whilst institutions have attempted to adapt to digitalization, in doing so, they have created new tensions and frictions.

The paper begins with a critical evaluation of existing research on digitalization, both in general and in Japan. It then argues that Régulation Theory offers a valuable framework to address some of the shortcomings in the existing literature. Next, the study examines three case studies, looking into how digitalization has impacted competition between firms, the wage-labor relation, and the state.

A critical analysis of digitalization under neoliberalization in Japan

Digitalization is a process whereby digital technologies, data and their interconnection change existing economic activities (OECD 2019). The recently published working paper of the IMF acknowledges various effects, including employment and wage effects, productivity and economic growth associated with the introduction of new technologies (IMF 2024). Many critical studies raise concerns over the process of digitalization, highlighting how technology strengthens employers' control over workers through increased surveillance, a worsening of the work-life balance, the creation of more precarious employment patterns, and producing polarization between different types of jobs (Betancourt 2020; Chamorro-Premuzic 2023; Couldry and Mejias 2019; Pfeiffer 2022). For critics, digitalization creates information for capital that is used to develop new forms of control over workers' behavior (Schröder et al. 2024). Those in business, management and organization studies highlight especially algorithmic management and resistance against such management (De Stefano and Taes 2023; Reid-Musson, MacEachen, and Bartel 2020; Schaupp 2023).

In discussing the consequences associated with digitalization, critics have often overlooked context-specific outcomes – instead referring to consequences *in general*. This reflects a tendency to generalize from particular instances in the West (Qiu and Chan 2025; Shibata 2022). In doing so, there has been a failure to pay sufficient attention to how global capitalism consists of various (national) models which affect how digitalization evolves differently in different national contexts. For instance, different countries face different labor market challenges, a variety of business models, different state-market relations and political systems, different levels of market pressure based on their position within (changing) global value chains, varying productivity, various levels of (in)equality of gender, race and class, and a variety of social conflicts. Capital and the state therefore implement or mediate digitalization differently reflecting the distinct demands of different social groups and in response to different socio-economic pressures.

This is not to deny that some commentators have noted the importance of country variance in understanding how digitalization progresses and how the effects of digitalization vary, often with a focus on the impact on different industries (Krzywdzinski 2021; Prause 2019; Sawada et al.; 2022; Schröder et al. 2024; Whittaker 2024; Wright 2023). These studies nevertheless have tended to focus on national institutions without consideration for how digitalization forms part of a wider process of neoliberal restructuring in transforming capitalism.

The challenge, therefore, is to present an analysis that pays attention both to national particularities, and is able to situate national-specific change within a wider process of global neoliberalization and digitalization. The need to consider nationally specific forms of global process of digitalization as part of neoliberal restructuring is particularly evident in the case of Japan (Lechevalier and Shibata 2024). Here, digital transformation involves adapting business models and operations to meet customer and societal needs, enhance competitiveness, and leverage data and digital technologies (METI 2022, 8-9). This process occurs within the context of Japan's ongoing neoliberal transformation since the 1990s (Lechevalier 2014), which has shifted its national model of capitalism from a coordinated to a more disorganized one (Shibata 2020). The current paper underscores the crucial need to understand digitalization within this specific national context, considering the transformation of Japanese capitalism.

Theoretical framework and methodological approach

In seeking a more nuanced understanding of the interplay between digitalization and institutional change, this paper adopts a Régulation Theory (RT) framework. RT directs our attention to specific institutions (configuration of social relations or observed social and economic patterns) (Boyer and Saillard 2002, 38), how they interact with transformative changes, such as digitalization, and how institutional configurations mediate or exacerbate the impacts of digitalization under on-going neoliberalization. From a RT perspective, the constituent elements and processes of capitalism are in a constant state of flux, driven toward disequilibrium and dealignment between production, distribution and consumption, and suffering from a tendency toward social conflict and crisis. Therefore, RT posits that a series of institutional interventions, which together form a mode of regulation, are necessary to (temporarily) reconcile these inherent contradictions and lead to a temporary growth model (regime of accumulation) (Boyer 2005, 2018). In drawing our attention toward how institutions, including the state, and the regulation of competition and the labor market, adjust to the ongoing restructuring of capitalist production, RT highlights the importance of considering how specific institutional

realignments relating to digitalization take place and whether these lead to a reconciliation or compromise between competing processes and interests, and (therefore) a regime of accumulation - or otherwise generate new frictions and instability. RT defines these institutional frameworks for coordinated activity as a mode of regulation. Economic growth, or a regime of accumulation, becomes feasible when such a mode of regulation is successfully established (Boyer and Saillard 2002). Our paper examines whether a mode of regulation is emerging under digitalization in Japan and if this coordinated digitalization has fostered a regime of accumulation.

Applying this Régulation Theory framework, this paper studies the transformation of Japan's capitalism, its process of neoliberalization, and how digitalization aligns with this process. During the prolonged recession of the 1990s, Japanese capitalism underwent significant institutional shifts in its financial system and labor practices. Scholars like Isogai (2012) and Lechevalier (2014) analyzed this transformation, highlighting the emergence of hybrid corporate governance models like the "new J-type" with pay-for-performance, alongside a "re-segmentation" of the labor market due to firm heterogeneity and the impact of neo-liberal policies. Hirano and Yamada (2018) further examined the breakdown of "companyist" regulation, characterized by the collapse of the manager-worker compromise on job security and the company-bank compromise on management security due to financial liberalization and the weakening of main banks, leading to increased inequality and instability in the Japanese employment system (Uemura, Yamada, and Harada 2016, 137-38). This paper examines how digitalization has been integrated into this institutional breakdown. Régulation Theory distinguishes between five institutional forms (Boyer and Saillard 2002), and in this paper, we focus particularly on three interconnected institutions and their interrelationship since they are posited as the key institutions directly driving and shaping the progress of digitalization within a capitalist economy. These institutions include forms of competition (competition between firms), wage-labor relations, and the state. In referring to 'forms of competition', we consider how competition is organized and regularized within markets. We examine how capitals compete under the current phenomenon of digitalization, which is widely expected to transform productive systems and see changes to patterns of the competition and concentration of capital (Boyer 2018, 5-6). In referring to the 'wage-labor nexus', we focus on the general rules that govern employment and work, including social protection, and the impact this has upon wages, working conditions, and workers' benefits. Finally, the state plays a crucial role in shaping digitalization through industrial policies and regulations (Lechevalier, Debanes, and Shin 2019). Régulation Theory posits that robust capitalist competition hinges on a degree of

labor market stability. This stability encompasses factors like consistent wage growth and secure employment. Without these, consumers lack sufficient income to purchase the goods produced, hindering capitalists' ability to sell their output effectively (Aglietta 1979). We contend that, absent state support for stable employment relationships under digitalization, firms are unlikely to sustain profitability and invest in digitalization. Therefore, we explore the impact of this government intervention, recognizing its significant potential to shape the digital landscape for both businesses and workers in Japan.

In the following section, we consider competition between firms (forms of competition) and show how they transform their production by examining factory automation. This draws on company reports on factory automation collected from ICT/tech firms and consultant firms, business journals, public reports, and interviews with business associations, labor support group and union officials. These data are used to identify how digital tools, AI-enhanced production/human management and digitized information have been used to improve productivity and manage employees. In the subsequent section, we demonstrate how digitalization has changed the nature of wage-labor relations and what new problems are emerging. Here, we also examine unions' engagement with digitalization by examining unions' policies and reports to consider how and/or whether organized labor has managed to regulate (on a temporary basis) the contradictions and conflicts that constitute the wage relation within capitalism. Finally, we explore the role of the Japanese state, specifically the way it has sought to introduce labor market reforms and economic policies, as part of its attempt to oversee the national economy's adaptation to digitalization.

Heightening competition between firms and the new instability

Régulation theorists characterize the business relationship in Japan as a companyist regulation. It is the socio-economic system of coordination among labor, companies and the bank, which supports economic growth by ensuring employment security and stable finance from banks (Boyer et al. 2018, 12; Hirano and Yamada 2018, 431-32; Boyer et al. 2016, 133). This coordination and compromise significantly weakened from the 1990s onwards, leading to long-term stagnation (Boyer et al. 2018). Companies have steadily aligned themselves with a gradual process of neoliberal restructuring, which includes the flexibilization of employment relations, resultant suppression of wages, reduction in workers' training opportunities within companies, liberalization of corporate governance including increased influence of shareholders, decline in companies' networks with their subcontractors through keiretsu, seeking finance beyond the main bank system,

and the weakening of business networks (Shibata 2020, 30-32). Nevertheless, despite these efforts, Japanese companies have suffered from low levels of business competitiveness and productivity and stagnant economic growth. Digitalization, we consider, has emerged as part of neoliberal restructuring to address these ongoing challenges of low growth and a stagnating economy in Japan.

Indeed, there has been considerable focus by state and business elites on Japan's low digital competitiveness (on which, see Figure 1). As we show below, competition between firms reveals how digitalization has led to new instabilities, including intensifying competition between manufacturers, global tech firms and manufacturers, and startups and existing firms. New instabilities also include heightened competition to obtain/train skilled workers, insufficient training opportunities for workers, continuing downward pressure on wage growth, a digital divide between companies, new competition between tech and manufacturing firms and diminishing profits.

Digital production is marked by intensifying competition between manufacturing and tech firms. In the auto industry, Tesla, Google, Uber/Lyft, Amazon, a resurgent GM and Ford, Chinese auto-driving tech, and semiconductor industries all vie for dominance (Tanaka 2018, 3-6). Japanese automakers like Honda, Toyota, and Nissan face this increased competition (Tanaka 2018, 3-6). Tech giants like Google and Tesla, and semiconductor firms like Intel, have entered the electric vehicle market, posing a threat to established car manufacturers. China's Baidu has also joined the race with AI-led projects (Tanaka 2018, 11, 19). This has led to an integration of auto, digital (IT, AI, IoT, Big Data), electronics, and renewable energy industries, further intensifying competition (Calvo, Kenney, and Zysman 2025; Tanaka 2018, 78). Japan's return of investment (ROI), a key efficiency

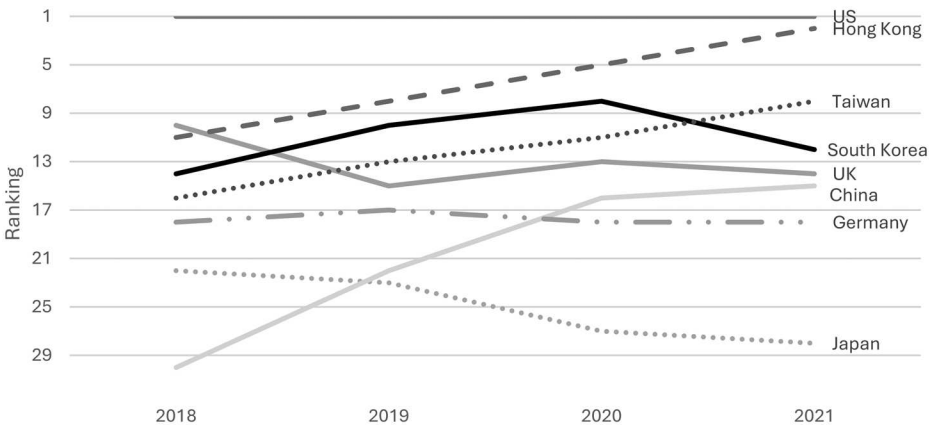

Figure 1. Digital Competitiveness Ranking.
Source: IMD World Competitive Center (n.d). World Competitiveness Ranking

metric for assessing a manufacturing company's efficiency in generating profits from its capital, has lagged behind China, the US, and Europe from 2009 to 2021 (METI 2024, 26). This intensifying competition creates new challenges for Japanese manufacturers, potentially destabilizing business-to-business and capital-labor relations.

Japanese firms have sought to adapt to this competitive environment. In doing so, some firms have introduced factory automation (digitalization in production) to address challenges in production, including lagging productivity, labor shortages, poor quality assurance and weak management of production status and inventory. Firms have reported widespread adoption of new technologies in development, design, prototyping, experimentation, production management, order/inventory management and manufacturing – all in an attempt to address the challenges in production they have faced (Arakawa and Tanaka 2022, 3-4). These new technologies include the Internet of Things (IoT), artificial intelligence (AI), image and voice recognition technologies and robotic process automation (RPA) (AI Market 2024; METI 2017, 2019; UPR n.d). For instance, Hitachi's AI system to analyze worker postures and movements to ensure procedural adherence and triggers corrective alerts, improving product quality and reducing reliance on specialized equipment (Hitachi 2022). These trends suggest that the primary goals of factory automation include the improvement of field operations and quality of products, reducing lead times, costs, and workload while boosting product quality, efficiency, and productivity (Arakawa and Tanaka 2022, 5).

Despite concerns reported elsewhere about the surveillance and control that new technologies impose on workers, some technologies have nevertheless been accepted by workers in Japan, who perceive a number of tangible benefits. For instance, a data-driven system that optimizes production line assignments is viewed by some workers as reducing excessive workloads and effectively placing workers where they're most needed on the production line (Labour Support Group in Electronics 2025). This acceptance of technological change is in keeping with the historical tradition of Japanese production lines, where workers have become accustomed to close efficiency monitoring and are more open to beneficial new surveillance methods.

Nevertheless, factory automation, while offering significant advancements, comes with some disadvantages. Firstly, it entails high costs, beginning with a substantial initial investment. This includes purchasing equipment and covering design expenses, which for a single robot setup can range from ¥10 million to ¥15 million (approximately $65,000 to $97,000 USD) (Robot-Meister 2024). Beyond the initial outlay, there are also ongoing running costs for the regular maintenance essential to keep automated systems operating smoothly. Secondly, businesses need to

cultivate in-house technical knowledge. This is crucial for basic trouble-shooting and handling minor issues, as constantly relying on manufacturers for every small problem can lead to continuous and often avoidable expenses (Robot-Meister 2024). Third, some workers worry about their employment security due to the promise of factory automation's efficiency improvements and the resulting reduction in the number of workers (SMS Data Tech 2025). Finally, the high costs associated with factory automation also disadvantage labor's share within the company. This could further exacerbate existing low-wage problems in the Japanese labor market.

Firms in Japan have sought to digitalize to be competitive, whilst at the same time failing to sufficiently train workers and attract skilled workers. Many firms have not sufficiently trained their employees to reskill them, which is itself a prerequisite for successful digitalization, thereby undermining their own competitiveness. Japanese companies have mainly provided firm-specific skills and training for digitalization with permanent employees (Schröder et al. 2024, 22) but have not been willing to set remuneration rates at a sufficient level to lure skilled workers (Katz 2024, 166) or address skill mismatches (Lechevalier and Mofakhami 2025). This is not surprising, however, because Japanese firms have increased the proportion of more flexible and cheaper non-regular workers. Japanese firms are also lagging in reskilling in comparison to other developed countries. In the US, the UK, and some Asian countries such as Singapore, private and public sectors collaborate to retrain workers and provide free online courses. In Germany, the government leads reskilling and training programmes for workers (Reskilling.com 2024). In contrast, the Japanese education system has not adapted to digital transformation and lacks sufficient curricula for teaching knowledge of AI, Big Data, and IoT (Reskilling.com 2024). As such, Japanese firms face new dilemmas in their attempts to improve digital competitiveness.

Japan's leading auto manufacturers have started to face more competition from their peers and rival startups, destabilizing the business environment. The more companies intensified production in the digital era, the more mergers and acquisitions (M&A) started emerging in the manufacturing industry, intensifying competition between capitals. Nissan Motor, for instance, has sought to find a potential merger with another auto company due to increased competition in the electric vehicle sector. Toyota has also cultivated a partnership with BMW (Nikkei Asia, 18 December 2024). These Japanese manufacturers have faced the global trend of M&A and, as a result, have turned to new partnerships to survive. This represents an attempt to improve international competitiveness by Japanese manufacturers in the face of intensified competition in the digital age. Moreover, those new startups which have adopted new digital technologies have themselves started challenging the old business model, threatening to

out-compete those companies that fail to make the digital transition (Katz 2024; Qiu and Chan 2025).

Digitalization also contributes to a notable digital divide among companies. Within Japan's electronics sector, Hitachi has significantly benefited from digitalization (Figure 2). The company reported a strong fiscal year ending March 2025, with a 23% profit increase to 930 billion yen, exceeding its 550 billion yen forecast. This success was primarily driven by its electricity business, supported by global power grid expansion, rising electricity demand from AI and data centers, and renewable energy growth (Hitachicon News, 24 February 2025). The process of neoliberal restructuring has therefore benefited some firms over others, in this case creating a divide between Hitachi and other (less competitive) firms in the electronics sector.

Japan's traditional keiretsu business networks, characterized by long-term relationships and hierarchical structures, are widely considered to have hindered the process of digital transformation. While these networks earlier fostered stability, they now tend to impede rapid innovation, limit data sharing crucial for AI adoption, and are incompatible with the standardized interfaces required for digitalization (Matsunobe 2019, 5). Furthermore, Japanese management's emphasis on obedience and rule-following is widely considered to have stifled employee innovation and creativity (Katz 2024, 135). These ingrained business practices and management mindsets pose a significant challenge to improving Japan's digital competitiveness,

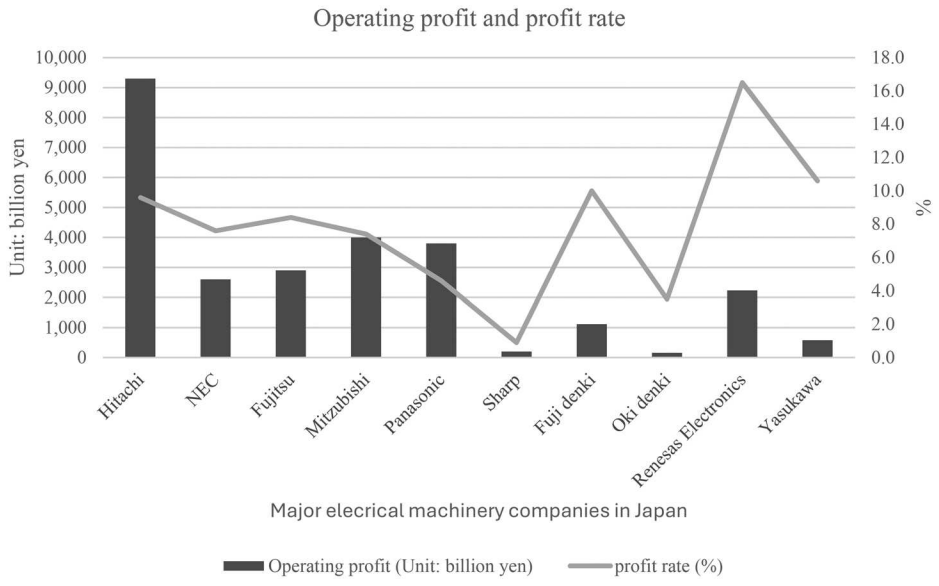

Figure 2. 2024-25 Full-year forecasts of major electrical machinery companies (Based on the third quarter announcement).
Source: Electronic Labour and Industry Correspondence (2025)

requiring a fundamental shift in business models beyond mere technological advancements. This presents a dilemma for Japanese companies seeking to thrive in the evolving digital landscape.

The process of digitalization, as it has been introduced in the Japanese manufacturing sector, has therefore contributed to, and been part of, an overall process of neoliberal restructuring. This has produced a number of inter-connected problems that have each compounded each other, resulting in an ongoing economic malaise within Japan's economy. The introduction of digital technologies has intensified an already-existing downward pressure on wages. This has further contributed to the erosion of the manager-worker compromise that has historically been founded in Japan on the basis of job security and wage growth. As Figure 3 shows, there has been a sustained decline in Japanese manufacturing wages over the past twenty years. This itself is partly due to declining productivity arising from the difficulties faced by Japanese firms in seeking to introduce and adopt new digital technologies. As a result, there has been a failure to secure the changes required by both capital and labor in order for both to achieve the kind of mutually beneficial compromise that was earlier secured under the companyist mode of regulation. Ultimately, this amounts to an absence of the kind of mutually-beneficial class compromise which characterized the earlier phase of companyist regulation.

One example of these tensions could be seen in January 2025 when Renesas Electronics announced 1,000 redundancies (around 5% of the workforce), at the same time as it introduced profit-enhancing production methods as a result of productivity gains achieved through the introduction of factory automation (Electrical Labor and Industry Correspondence, 2025, 2; Denki Joho Union 2025a:1, see also Figure 2). Similarly, since April 2024, NEC has increased the use of contract workers in an attempt to reduce labor costs, despite at the same time achieving an increase in

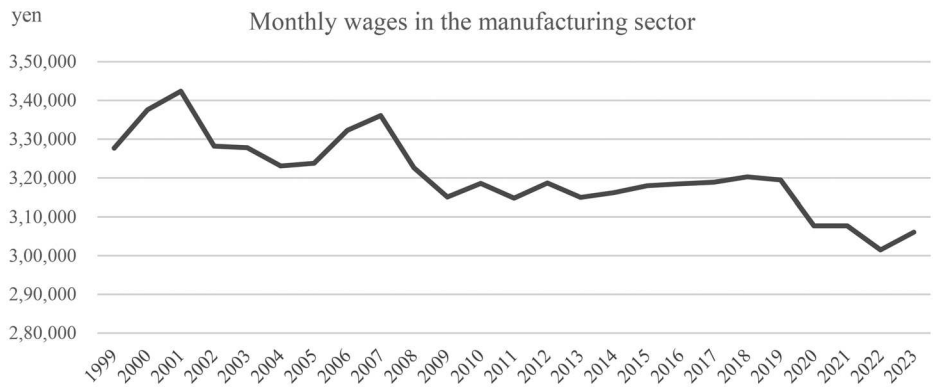

Figure 3. Changes in monthly wages in the manufacturing sector, 1999-2023.
Source: MHLW (n.d.a) Basic Statistical Survey on Wage Structure

company profits, prompting considerable opposition from NEC employees (ELIC, 2025b; ELICNEC 2025).

In sum, Japan's economy, after a period of stable "companyist regulation," between the 1970s and 1980s, has faced prolonged stagnation and embraced neoliberal restructuring since the early 1990s and digitalization in an attempt to regain competitiveness amidst intensifying global competition. Despite tangible advantages, this digital transformation has generated new instabilities, including increased competition within industries, a widening digital divide, inadequate worker training, particularly among SMEs, and declining wages (Figure 3). Furthermore, while offering advancements, factory automation presents disadvantages including high initial and ongoing costs, the necessity for businesses to develop in-house technical expertise, and potential negative impacts on worker employment security and labor's share in wages, which could worsen existing low-wage issues in Japan. Compounding these issues, traditional Japanese business practices and management's resistance to change are hindering the necessary innovation for successful digital adaptation.

Wage-labor nexus and unresolved frictions between capital and labor

Japanese manufacturers have historically transformed their production system through the introduction of new technologies and innovations in the 1970s and 1980s, gradually undermining workers' status and security. Toyotism, as described by Odagiri (1992) and Boyer, Uemura, and Isogai (2012), emphasizes the importance of companies investing in worker training and the resulting loyalty it creates. Lifetime employment, internal competition, and long working hours all contributed to increased productivity without layoffs (Odagiri 1992, 312). Nevertheless, globalization, the bursting of the bubble economy, and neoliberalization have each impacted the business environment, leading Japanese firms to seek cheaper labor overseas from the 1990s onwards (METI 2019, 4). The current digitalization of the manufacturing sector has further generated negative changes to workers' wages, skills and working conditions, exacerbating conflict between employers and employees, failing to solve the existing problems and furthering instabilities.

Factory automation has significantly affected the wage-labor nexus. While technology has enabled the effective transfer of skills, it has also led to the down-skilling of workers, as new production methods render existing workers' skills redundant. This development has compounded the problem of a lack of skilled workers, as workers do not have the new skills required for these updated production process (Neffke, Nedelkoska, and Wiederhold 2024, 3).

In the context of a shortage of skilled workers, the ability to easily share know-how becomes crucial for boosting productivity and quality (Knock 2021). Digitalized information, therefore, has gained immense importance. Digital manufacturing - defined as the incorporation of digital technology in the manufacturing process and an initiative to improve the productivity of the entire organization by collecting and analyzing various data from each manufacturing process - has become important under a shortage of skilled workers. It often replaces tasks once done by skilled workers with machines (Knock 2021). Digital manufacturing, therefore, simultaneously drives an increase in productivity and contributes to the down-skilling of some workers.

Japanese manufacturing workers have expressed concerns about insufficient re-skilling opportunities during digital transformation. The 2023 White Paper on the Employment Needs of the Manufacturing Sector reveals employee dissatisfaction, primarily due to claims that the "salary level is low/not increasing." Secondly, employees feel "unable to improve their skills and unable to shake off fears about the future" (Nikken Total Sourcing 2024). This echoes broader labor market trends, including stagnant wage growth (see Figure 3). This perceived lack of reskilling opportunities has also increased manufacturing sector turnover, worsening the labor shortage. Importantly, digitalization has not been able to solve this existing workers' discontent.

Factory automation has led to diminishing workers' opportunities to be trained in the workplace. For instance, firms face a dilemma in terms of how to provide skills for workers who work highly flexibly or work with reduced working hours, where number has increased (Takahashi 2024, 301). Firms tend to provide training opportunities for regular workers (Schröder et al. 2024), whereas flexibly employed workers have been deprived of opportunities to be trained. This has added new frictions to the existing disparity between regular and non-regular workers in the digitalizing workplace.

The digitalization of production processes has led to both the replacement of human workers and the intensification of work. A notable example is the NEC DX Factory, where AI analyzes real-time video footage of assembly tasks to detect defectives. Robot arms now perform functions such as placing baseboards and capturing images of circuit boards, tasks that were preciously handled by human workers. In the process of component placement, component information is visualized on the IoT board, enabling traceability, such as enhanced component management (Wada 2022). Workers who are evaluated as underperforming tend to be targeted for redundancy (Labour Support Group in Electronics 2025). While companies have officially reduced working hours (see Figure 9), but the volume

of work does not disappear, resulting in unpaid work being pushed into weekends (Labour Support Group in Electronics 2025). The increased speed, surveillance, and performance evaluation made possible by AI have significantly intensified the demands placed on workers.

Despite benefiting from digitalization, employers have failed to increase wages, a crucial factor for a mode of regulation and sustained accumulation. This stagnation in wages has likely contributed to weak market demand, hindering the development of a stable accumulation regime. Technological advancements, such as Hitachi's IoT platform for streamlining data analysis (Hitachi n.d) and Yasukawa Electronics' AI-driven efficiency gains (Saito, 2020), have increased productivity without corresponding wage increases (Figure 3). Factory automation, while optimizing production, often reduces the demand for human labor or renders it undervalued, further suppressing wage growth in manufacturing. This sector also faces stagnant profits despite cost-cutting efforts (Figure 4), exerting downward pressure on wages. This instability in the wage-labor nexus is evident in the rising number of contentious labor conflicts over the past five years, including strikes (MHLW 2024a, 5). These disputes, primarily centred on wages, dismissals, and workplace conditions (MHLW 2024a, 8), underscore rising worker discontent.

The issue of workers' discontent can be witnessed in a number of instances. The Denki Joho Union, which is a trade union of unorganized regular workers (including managers) and non-regular workers (dispatched, contracted and part-time) in electrical and information-related industries, including Toshiba, NEC, Hitachi, Renesas, and Panasonic, has sought to challenge the fact that employers have recently increased profits but are implementing large-scale compulsory redundancies (Denki Joho Union 2025b). Zenroren, and Denki Joho Union held their 11th joint action to request ministries and agencies to conduct publicity in front of the Ministry of Economy, Trade and Industry in March and April 2025, and to ask the Ministry of Health, Labor and Welfare, the Ministry of Economy, Trade and Industry (METI), the Ministry of Foreign Affairs, and the Ministry of Justice to create industrial policies that are friendly to the people and workers (Denki Joho Union 2025b). Despite profits increasing over the recent years (Figure 4), labor organizations representing employees in these companies claim that the companies have not done enough to increase monthly salaries. Collective wage negotiations in spring 2025 saw a series of actions, including demonstrations in front of the building of the electrical manufacturing employers' organization, METI, and factories of Oki Denki and Renesas, as well as collective negotiations with employers and state officials, and leafleting. These actions indicate a high level of worker discontent within the electrical manufacturing sector (ELIC, 2025a 2025b). This discontent has also been compounded by the steady rise in retained earnings (Figure 5).

Figure 4. Operating profit margin in the manufacturing sector, 1960-2022.
Source: *Financial Statements Statistics of Corporations by Industry* (e-Stat, n.d.a)

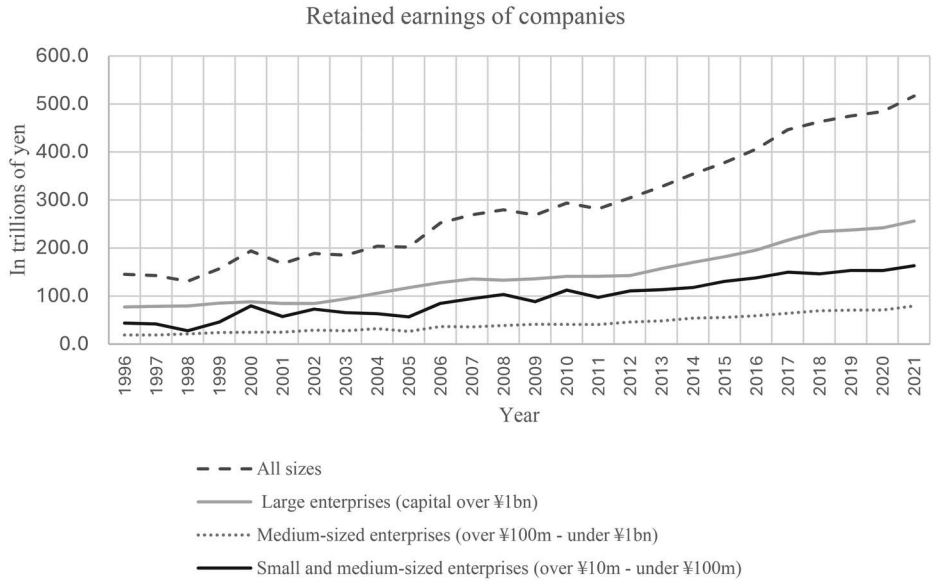

Figure 5. Retained earnings of companies (stock).
Source: MHLW (2023b) Retained earnings in enterprises. Fig. 2-(1)-15

More established trade unions that make up the majority of organized labor in Japan have struggled to adapt to the ongoing process of workplace digitalization. Rengo, the largest industrial union association, has highlighted the potential risks of AI and IoT for human rights and worker privacy (Rengo 2021, 17-19). Unions like Denki Rengo have raised concerns about the mental and financial strain of job reassignments due to digitalization and job losses from offshoring (Jinbo 2022, 6). However, union officials interviewed claimed that on the whole there are few

recognized negative consequences of digitalization, reporting a broadly positive view among workers and unions (Union Association 2022; Industrial Union A in the Electronics Manufacturing Sector, 2022; Industrial Union B in the Auto Manufacturing, 2022; and Industrial Union C in the Auto Manufacturing, 2022). Even when unions have sought to target some of the more detrimental effects of digitalization, their efforts have been relatively muted. For example, while Denki Rengo has identified a number of challenges created by digitalization (Jinbo 2022, 4-6), their focus has been largely on firms' implementation capacity rather than the impact on workers. This lack of attention specifically to workers' interests has tended to weaken workers' positions within firms.

These more mainstream Japanese industrial unions have primarily focused on the challenges of digital transformation, such as a lack of skilled workers, tending to align their goals with management's prioritization of business competitiveness as the goal of digitalization (Industrial Union B in the Auto Manufacturing, 2022; Industrial Union C in the Auto Manufacturing, 2022). Consequently, manufacturing sector trade unions have tended to share firms' aims of utilizing digitalization for productivity gains. As a result, union officials in the manufacturing sector have generally downplayed detrimental changes that digitalization has had upon workers and workplace grievances (Industrial Union A in the Electronics Manufacturing Sector, 2022). This stance contrasts with the struggles of company-based unions to promote workers' rights during digitalization, evidenced by opposition to minimal wage increases and a lack of benefits for non-regular workers in recent wage negotiations. This discontent reflects low wage rises and an absence of trade union representation for many. For instance, the spring wage collective bargaining process (Shunto) of 2024 saw an average wage increase of 4%, yet 56 companies (40%) out of 134 which took part in the negotiations did not implement the pay rise. This is in a context where Shunto anyway only covers 16% of Japan's workforce (Tokyo Shinbun 2025).

To sum up, insufficient wage growth and a lack of reskilling opportunities, alongside an increase in work intensification and workers' dissatisfaction, and insufficient union action, are each contributing to produce new instabilities in the wage-labor relations of Japan's digital era. The state has also largely failed to coordinate these labor market challenges, to which we now turn.

Declining state capacity to coordinate digitalization and labor market challenges

The state plays an important role in guiding wage societies and formulating regulatory principles to ensure the accumulation of capital (Aglietta 1998, 60). Some observers consider state activism in coordinating the process of digitalization as a crucial component to fostering economic

transformation (Calvo 2021; Calvo, Kenney, and Zysman 2025; Collington 2022). The Japanese government has promoted digitalization since the 2010s as a solution for labor market challenges, including stagnating wage growth, labor shortages, long working hours, low productivity, and the gap between regular and non-regular workers. Nevertheless, we argue that the Japanese state has largely failed to legitimate the process of digital transformation in Japan, contributing to a rise in social friction. State policies to improve training opportunities, wages and working environment in the digital era remain limited, failing to stabilize the labor market or to generate a mode of regulation.

The government has largely failed to improve low wages and wage disparity between regular and non-regular workers, and indeed on occasion has rather exacerbated those problems. A Japanese government report compiled by the Study Group on Working Styles in the New Era in 2023 recommended updating labor laws to better suit modern work styles (MHLW 2023a). The report sets out the direction for organizing and reviewing the Labor Standards Law and the state of labor standards administration. However, Zenroren (the second largest industrial union association in Japan) believes current laws already fail to prevent exploitation and overwork and criticizes the report, arguing that it fails to provide enough protection for workers' basic employee rights, which are often disregarded (Zenroren 2023).

The government has not sufficiently acted to improve non-regular workers' wages (Figure 6). Not surprisingly, we have therefore witnessed stagnating wage growth over the last two decades (Figure 7). This failure to address non-regular workers' problems of insecure employment, low wages and a lack of training has partly contributed to the weakening of consumer purchasing capability (MHLW 2024b) (Figure 8). There has been no visible improvement in the consumer attitude index (Cabinet Office 2024) since 2008, reinforcing the unresolved problem of weak consumer power.

Further, digitalization has reinforced the existence of precarious jobs with lower wages and higher stress for workers in Japan (Zenroren 2023) and largely failed to mitigate such negative effects. The Ministry of Health, Labor and Welfare (MHLW) has recognized that it has not adequately addressed these negative impacts, for instance, in its report on technological innovation's impact on employment management (MHLW 2021b). Yet in doing so, the MHLW also concluded that once employers explain the benefits of digitalization, workers would generally accept new technologies, despite this new emphasis on data-driven human measurement being likely to increase the surveillance of workers and intensify work (MHLW 2021b).

Government workstyle reforms that were introduced in the mid-2010s to improve working conditions and wages have inadequately addressed

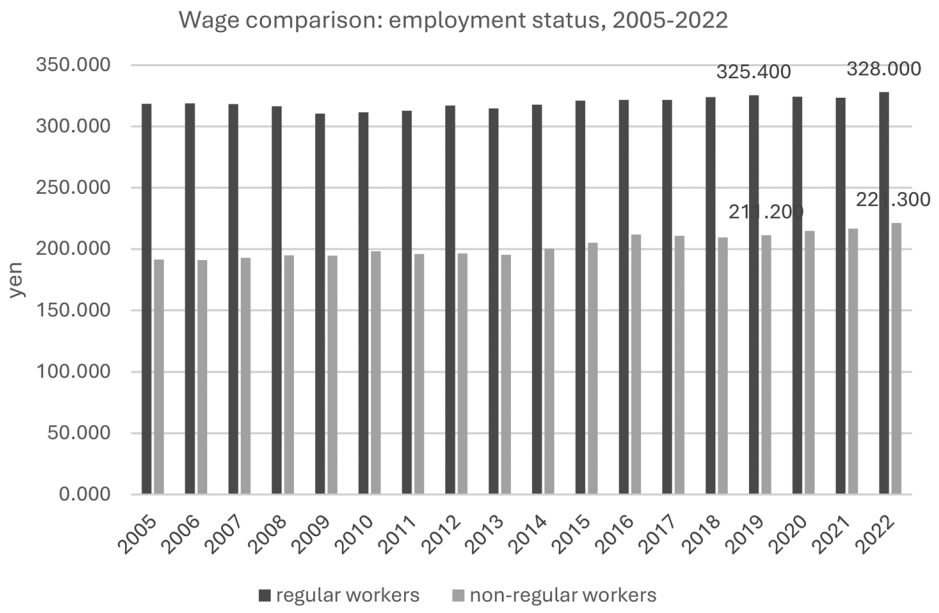

Figure 6. Wage comparison by employment status, 2005-2022.
Source: *Wage Structure Basic Survey* (e-Stat, n.d.b)

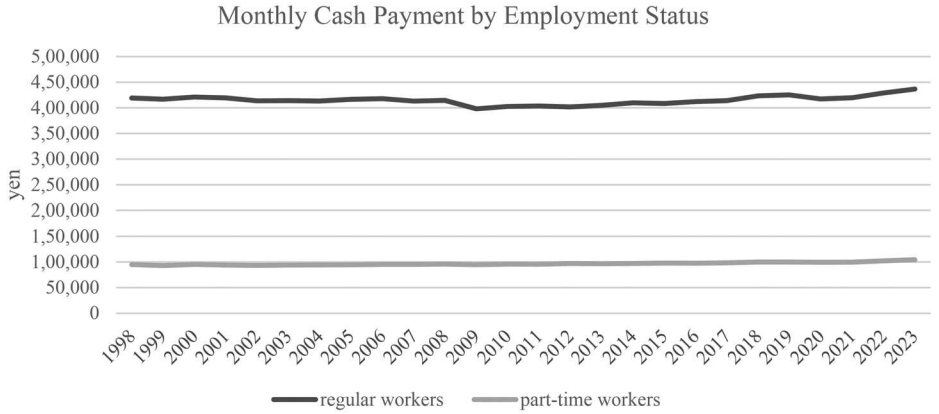

Figure 7. Monthly cash payment by employment status, 1998-2023.
Source: MHLW (n.d.b) *Monthly Labor Statistics Survey* https://www.mhlw.go.jp/toukei/list/30-1a.html

non-regular workers' needs, particularly regarding reskilling (Nikkei Reskilling 2024). The decline in overtime under the Abe government partly stemmed from reduced part-time hours (Figure 9), while unpaid overtime seems to have increased since 2018 (Labour Support Group in Electronics 2025; Kitatsu 2019; Saito T. 2020), suppressing wages and consumer power. Without effective state intervention, digitalization is unable to guarantee improved capital-labor relations. This attempt at policy coordination has failed to resolve distributive conflicts. Without wage increases and stable

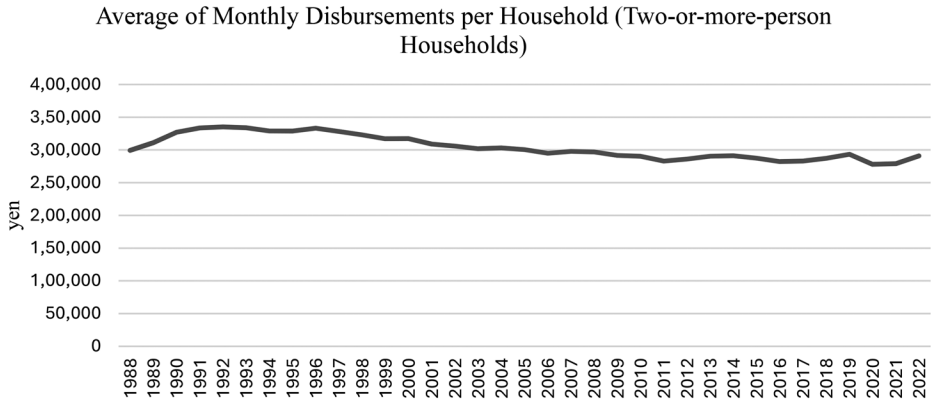

Figure 8. Average of Monthly Disbursements per Household.
Source: Household surveys (e-Stat, n.d.c)

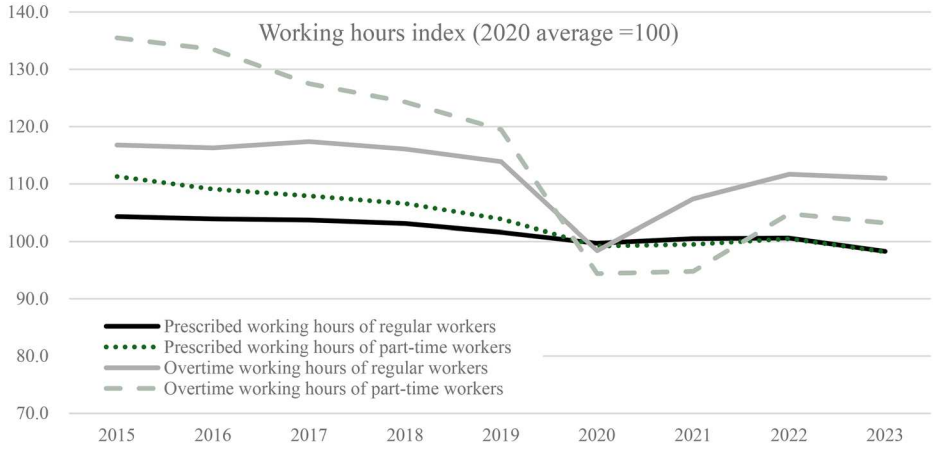

Figure 9. Average overtime hours per month, 2014-2023 (2015 = 100).
Source: Monthly Survey of Labor Statistics (MHLW 2021a)

capital-labor relations – that is, without a coherent and functional mode of regulation - a successful regime of accumulation is unlikely to emerge.

Initiatives that have sought to address these issues have largely failed to do so. Japan's "new capitalism" initiative was adopted in 2021 by the Kishida government (2021-2024) as its vision for Japan's economic system with a human focus. Some explain that the government's intention behind the new capitalism approach was to increase wages, invest in human capital through vocational education and training, promote science, technology, and innovation, alongside digital and green transformations and return to a moral economy that prioritizes social purpose and balanced growth (Whittaker 2024, 184; Whittaker and Nakata 2024). We, however, consider that new capitalism has so far resulted in lacking the clear and consistent policies needed to adapt to the digital age (Takeda 2023). New capitalism

has held inherent flaws, a lack of broader stakeholder participation and the declining capabilities of the state (see Lechevalier 2024; Lechevalier, Debanes, and Shin 2019), largely failing to generate a compromise between labor-friendly policies and digitalization, and unable to achieve growth. Workers have shown considerable dissatisfaction with the job training that they have had, and the level of satisfaction at the workplace remains extremely low among workers, particularly among non-regular workers (MHLW 2020). However, it is unclear who will retrain workers for the digital age, as employers have traditionally provided this training (Iwamoto 2023) and are now less likely to do so due to the more flexible labor market.

New capitalism has been continued by the Ishiba administration (2024 onwards), representing a failure to reconcile labor market challenges with digital transformation. While it claims to support skills development, better wages, and worker mobility (Cabinet Office 2023, 1, 5; Prime Minister's Office of Japan (n.d)), it lacks clear implementation measures (Takeda 2023). For example, its reskilling goal is limited to permanent employees, excluding most non-regular workers. The recurrent education guideline encourages "autonomous and independent learning" (Cabinet Secretariat 2024, 11; MHLW 2022), placing the burden of reskilling on individual workers rather than providing systematic support and coordination with firms.

Other challenges associated with reskilling include time and costs for training, difficulties in keeping employees motivated, workers being too busy to reskill, and a low level of trust in people's skills within Japanese companies (Ishihara 2021; Plaza Create 2023). The government has expanded benefits for the unemployed and training in IT qualifications (Nihonkeizai Shinbun 2023). However, funding for these benefits has been limited, especially after COVID-19. Additionally, a lack of support for worker mobility has made it difficult for reskilled workers to find new jobs (Iwamoto 2023).

Government funding for business digitalization has largely been insufficient. Despite calls for a major digitalization campaign, support for businesses, especially SMEs, has been limited (Katz 2024, 174). Ishiba's strategies have not drastically changed how digital transformation is coordinated with labor market challenges. Compared to the EU and China, Japanese government support for business is insignificant (Katz 2024, 174), leading to declining business competitiveness, particularly against Chinese firms, which receive substantial state funding for tech/digital upgrades (Industrial Union C in the Auto Manufacturing 2022). Furthermore, 90% of R&D funds go to large companies, exacerbating SMEs funding problems (Katz 2024, 175-177). This unbalanced funding has polarized businesses, worsened the SMEs environment, and contributed to downward pressure on SMEs wages.

To summarize, Japan's digitalization efforts, whilst they were intended ostensibly to solve labor market issues, have instead worsened wage stagnation and disparity, particularly for non-regular workers. The government's

"new capitalism" initiative has failed to effectively coordinate digital transformation with labor market needs, hindering economic growth and creating social friction.

Conclusion

This paper has explored how institutions' adjustment to digitalization in the case of Japan has led to further instabilities, failing to produce an institutional reconfiguration that can take full advantage of the opportunities presented by the global process of digitalization and achieve growth. The changing institutions of the Japanese model of capitalism, including competition between firms, wage-labor relations, and the state, have each sustained neoliberal restructuring as part of digitalization and have not generated a new coordination mechanism (a mode of regulation), leading to further instabilities.

In more detail, we turned first to the changing nature of competition between firms by examining digitalization in the manufacturing sector. This showed that digitalization has increasingly required capital to be more competitive domestically and internationally, putting further downward wage pressures and exacerbating a shortage of skilled workers. Insufficient attention to wages and workers' skills which are crucial for stable employment relations implies a lack of a mode of regulation. Digital transformation has prompted a rise in mergers and acquisitions, requiring firms to consider strategic mergers with domestic or international partners to take advantage of digitalization, creating uncertainty. On the other hand, there is a new digital divide between large companies and SMEs in reskilling/training workers and capital investment in digitalization. Japanese traditional business practices, based on hierarchy and close business networks, have not facilitated a smooth process of digitalization, instead hindering rapid innovation, workers' innovative projects, data sharing and the use of AI.

Second, the wage-labor relations remain unstable in Japan's labor market. The flexible workforce has not received sufficient reskilling opportunities and is still suffering from low wages. Businesses have benefited from efficiency gains by utilizing digital technologies and AI-enhanced data to the detriment of workers. We have pointed out some disadvantages for workers stemming from factory automation. They include the threat to their employment security due to efficiency improvements leading to reduced labor needs, and the potential for high automation costs to diminish labor's share within the company, thereby worsening existing low-wage issues, whilst sustaining low wages and down-skilling sections of the workforce. Digitalization generated advantages for capital in its contribution to efficiency and agility, but capital has not distributed wages appropriately,

which is important for economic growth (a regime of accumulation). Such non-distributive digitalization has created new frictions and instability. Reflecting the unresolved labor market problems, we have also witnessed an increase in the number of more confrontational labor disputes, destabilizing the wage-labor nexus.

Finally, we have considered how the Japanese state has failed to coordinate its labor market policies and digitalization, to influence businesses and to increase wages or provide skill training for employees. The Japanese government's efforts to promote digitalization as a solution to labor market challenges have failed to address fundamental issues like wage stagnation and the disparity between regular and non-regular workers, often exacerbating these problems. Furthermore, the government's "new capitalism" initiative and associated policies have not effectively coordinated digital transformation with labor market needs, resulting in increased social friction and hindering the establishment of a stable regulatory framework.

The ongoing adjustment of these three key institutions to the process of digitalization in Japan is producing negative outcomes rather than a beneficial cycle of institutional change and sustained economic growth. Specifically, the absence of robust state-led initiatives and weak coordination between capital and labor, are together ensuring that digitalization is reinforcing neoliberal restructuring within manufacturing, leading to intensified work and downward wage pressures. Insufficient reskilling efforts exacerbate these negative consequences. Consequently, Japan's digitalization process has not yet generated a stable regime of accumulation.

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Ethical approval

This research was subject to full ethical reviews by the University of Sheffield's Ethics approval system (application 047457 and application 066232).

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