Just After Minimum Wage Hikes: Short-Run Labor-Demand Response and Reallocation

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Abstract

Understanding how labor markets adjust immediately after minimum wage hikes remains an open, policy-relevant question. This paper studies short-run minimum-wage effects in Japan's spot labor market using contract-level data from Timee and a wage-bin difference-in-differences. We find a 2% employment decline in affected bins, driven by reduced vacancy creation, not worker supply. Effects are more negative in prefectures with higher minimum-wage bite and in low-wage occupations. Using job-description and amenity information, we document reallocation across job types: postings shift toward amenity provision and toward experienced-worker-targeted descriptions, while female-targeted descriptions decline, suggesting that short-run adjustments in spot labor demand may foreshadow longer-run reallocation.

Keywords: Minimum wage, Employment, Job amenity, Gig worker, Spot work, Difference-in-differences

JEL code: J21, J23, J38, J88

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1 Introduction

The gig economy—temporary, contract-based, and freelance online work—has expanded rapidly (Boeri *et al.* 2020). An increasing share of freelance workers is now matched with customers through online platforms.[1] Because gigs range from on-demand shifts to project-based contracts, gig work is among the most adjustable forms of labor demand. Yet evidence on minimum-wage effects in this setting remains limited, with a few notable exceptions (Glasner 2023). In particular, for alternative work arrangements (Mas and Pallais 2020)—and especially spot labor markets for jobs requiring minimal skills and the workers who take them—we still know little about how much employment declines, how quickly it happens, and which jobs contract in the short run. Clarifying the magnitude, timing, and composition of short-run employment changes and reallocation is essential for designing timely, well-targeted support and for linking immediate adjustments to longer-run reallocation (Dustmann *et al.* 2022).

We address these questions using confidential, posting- and contract-level data from *Timee*, a leading Japanese spot-work platform. Spot work platforms have expanded worldwide—including Taskmo (India), TROOPERS (Singapore), Geupgu (South Korea), QuikShift (Australia), Coople (Switzerland/UK), and Instawork (United States)—reflecting a broader shift toward flexible, on-demand labor markets. We exploit the platform's data to separate labor demand from employment by studying outcomes for vacancies and matches side by side, and to trace short-run dynamics around minimum-wage changes at daily, weekly, and monthly frequencies. We further use non-wage amenities and job-description content to characterize job types, allowing us to document reallocation across types. These features provide a high-frequency view of how labor demand and job composition adjust in the immediate aftermath of a wage-floor increase.

Spot labor markets exhibit three features that make them ideal for studying short-run minimum wage impacts: limited heterogeneity in labor, short-term employment contracts, and a wage-posting environment. First, limited job heterogeneity attracts workers seeking jobs that require minimal skills, who are particularly susceptible to minimum wage changes. These workers are matched to homogeneous spot jobs, making these markets closely resemble homogeneous labor markets. Second, short-term employment contracts enable labor demand to adjust easily. Employers in the spot labor market are expected to be more elastic with respect to workers' wages than in the general labor market because they do not recruit for full-time jobs but for temporary jobs as needed. Our spot work data captures an extreme case of short-term labor demand adjustment, a phenomenon rarely observed in the empirical literature on the labor supply of taxi and Uber drivers (Angrist *et al.* 2021, Buchholz *et al.* 2023, Kuroda and Onishi 2023). Finally, the wage-posting

[1] For instance, Kässi and Lehdonvirta (2018) report that the demand for online gig work grew by approximately 21% between 2016 and 2018, based on an analysis of open projects and tasks on various platforms.

environment precludes wage bargaining, which is a common modeling assumption in long-term employment contracts, allowing us to focus on models grounded in oligopsonistic or competitive labor market structures. Because this is the setting in which firms can adjust most readily in the very short run, our estimated demand elasticities should be interpreted as an upper bound for standard employment elasticities in traditional labor markets. These short-run responses are complementary to longer-run evidence on minimum wage elasticities, reallocation, and exit, not in conflict with it, and they clarify the earliest and most flexible adjustment margin through which minimum-wage shocks propagate (Dube and Lindner 2024).

Our data have three advantages for studying short-run adjustments in spot labor markets. First, the data are recorded at the daily level with associated click logs and user activity, allowing us to track employers' job-posting activity and workers' application activity immediately before and after the implementation of the new minimum wage. This granularity is substantially finer than the month–state level used in Sabia (2009a,b), Brochu *et al.* (2025), Melo *et al.* (2025) or the quarter–state level in Addison *et al.* (2009) and Cengiz *et al.* (2019), enabling a more detailed view of temporal adjustments. Second, because establishments can readily modify job descriptions at posting and we observe easily adjustable non-wage amenities such as fixed-amount transportation reimbursement and staff-meal provision, we can use both amenity and description information to characterize job types and trace detailed reallocation across types in the short run. Third, since spot labor demand is not tied to long-term employment relationships, it is less affected by reputation concerns or switching costs, making it an ideal setting for identifying immediate behavioral responses to policy changes.

From a macro perspective, the private platform's role in part-time spot employment expanded markedly between December 2019 and December 2023. The number of registered users actively using the platform increases gradually, while the number of vacancies grows sharply, particularly after 2022, leading to a rise in the labor market tightness ratio. Hiring counts show a substantial upward trend beginning in 2020, reflecting a substantial increase in successful job matches. The job-finding rate also steadily surpasses 1.0, indicating that each active worker matches with multiple spot vacancies per month. Meanwhile, the worker-finding rate remains stable at approximately 0.8, suggesting that 80% of spot jobs are successfully filled. These trends highlight the platform's growing role in facilitating spot employment matching.

Using granular spot work platform data, as an illustrative example, we examine how Tokyo's minimum wage adjustment in 2023 reshaped employment patterns at the intensive margin of job characteristics. This uniquely detailed dataset allows us to track daily, weekly, and monthly shifts in employment distribution across wage levels, posted working hours, and transportation reimbursement. Descriptive evidence reveals a clear upward shift in the wage distribution around the new minimum wage threshold, consistent with firms adjusting wages to comply with the

new policy. In contrast, working hours and transportation reimbursement remain largely stable, suggesting limited adjustment along other job attributes. These fine-grained patterns highlight the value of high-frequency, contract-level data in capturing immediate and heterogeneous responses to labor market regulation, and they motivate a causal analysis that isolates the impact of the minimum wage change from broader trends.

Given these patterns, we employ a difference-in-differences (DID) framework inspired by Cengiz *et al.* (2019) and Dustmann *et al.* (2022), which leverages variation in exposure to the minimum wage increase across wage bins. Rather than identifying treated workers based on demographic or job characteristics, we exploit the wage distribution itself, comparing outcomes in bins near the new minimum wage threshold with those in the upper tail of the distribution, which are assumed to be unaffected. We define treatment and control groups based on their relative position to the minimum wage in each prefecture, enabling a consistent bin-level comparison over time. This granular approach is well suited to our setting, as it fully utilizes spot work platform data aggregated at the prefecture-month-wage-bin level. By estimating dynamic effects through interactions of relative time and exposure group indicators, we trace the evolution of treatment effects before and after the policy change. To summarize these effects across the distribution, we implement the "excess-jobs-minus-missing-jobs" decomposition following Cengiz *et al.* (2019) and compute employment elasticities and changes in the average wage for affected workers.

Our findings show that the minimum wage increase reduces employment at the lower end of the wage distribution. The increase yields an approximately 2 percent decline in total employment among wage bins directly affected by the policy, with a 3 percent reduction in jobs below the new minimum wage and a 1 percent increase just above it. Consistent with this pattern, the employment elasticity with respect to the minimum wage computed from Cengiz *et al.* (2019) is -0.388. Given that spot work represents the most flexible adjustment margin, we interpret this estimate as an upper bound for standard employment elasticities, complementing rather than contradicting longer-run evidence. These effects materialize immediately after the policy takes effect and remain stable throughout the post-reform period. Unlike evidence from broader labor markets where excess jobs offset missing jobs (Cengiz *et al.* 2019), our setting shows that missing jobs consistently exceed excess jobs, resulting in a net negative employment effect. These results indicate that the spot labor market adjusts quickly to minimum wage hikes, primarily through employment reductions.

We further show that these employment effects operate primarily through labor demand rather than labor supply. Vacancy postings decline sharply below the new minimum wage, while modest gains appear just above it, indicating that firms adjust mainly by reducing vacancy creation. By contrast, total working hours decline much less than vacancy counts, as missing and excess hours largely offset each other in the months following the reform. Because total hours fall much less than

vacancy counts, hours per vacancy rise modestly: firms post fewer jobs but offer slightly longer shifts. On the worker side, high-frequency platform data reveal no evidence of a contraction in labor supply around the policy change or toward the end of the fiscal year, and employment trends remain similar across gender and worker-status groups. This evidence points to labor demand responses as the primary driver of the observed employment decline.

Finally, we use our distributional DID approach to characterize heterogeneity in minimum-wage effects across locations, occupations, and job attributes. Exploiting prefecture-level variation in minimum-wage bite, we show that employment losses are more negative in prefectures with higher Kaitz indices, indicating stronger contractions where the wage floor is more binding. We then document substantial occupational heterogeneity: the largest reductions in low-wage employment are concentrated in restaurants, retail, and event staffing, while logistics, customer service, and light work display more balanced patterns with partial offsetting gains above the new minimum. Office work is distinctive, exhibiting employment gains in higher wage bins consistent with a shift toward higher-quality postings (a "quality jump").

Beyond occupation, we show that minimum-wage hikes reshape the composition of postings within occupations: jobs without transportation reimbursement contract relative to those offering it, and the mix of job-description targets shifts away from female-targeted postings and toward experienced-worker-targeted postings. Taken together, these results indicate that minimum-wage increases generate not only average employment changes but also systematic reallocation across job types and posting attributes in the short run. Consistent with the long-run reallocation mechanisms emphasized by Dustmann *et al.* (2022), our evidence suggests that such reallocation originates immediately on the most flexible margin—spot labor demand—where adjustments occur first through the entry, exit, and reshaping of postings before propagating to longer-run changes in firm composition and employment structure.

1.1 Related Literature

Our paper speaks to three related literatures: minimum wage effects in platform-mediated spot labor markets, minimum-wage-induced reallocation across job types, and the short-run dynamics of job destruction and creation around the wage floor.

First, we contribute to the emerging literature on alternative work arrangements and online labor markets (Mas and Pallais 2020, Katz and Krueger 2019) by studying the employment effects of minimum wage increases in spot labor markets. Existing studies on platform-mediated work largely focus on off-site gig work involving relatively high-skill tasks, such as programming or design (Glasner 2023). In contrast, we study on-site spot work—short-term, low-skill jobs that require physical presence and are accessible to a broad segment of the workforce—which has expanded

rapidly worldwide as part of a broader shift toward flexible, on-demand labor arrangements.

These features imply that spot labor markets differ fundamentally in their exposure to minimum wage policies. Jobs are frequently posted at or near the minimum wage, and both workers and establishments are directly affected by statutory wage floors, leaving limited scope for spillover effects to higher wages. Using comprehensive platform data, we find clear negative employment effects following minimum wage increases, accompanied by minimal spillovers across the wage distribution.[2] In this respect, our findings contrast with the limited employment effects documented for the broader labor market in Lee (1999), Autor *et al.* (2016), Cengiz *et al.* (2019), and highlight how the nature of work—on-site, low-skill, and short-term—shapes the incidence of minimum wage policies.[3]

Second, our paper contributes to the literature on minimum-wage-induced reallocation by documenting how a wage floor reshapes the composition of jobs within a rapidly adjusting spot labor market (Cengiz *et al.* 2019, Dustmann *et al.* 2022). While much of the minimum-wage literature emphasizes average employment effects, an equally important question is *which* jobs contract, *which* expand, and how employment is reallocated across locations, occupations, and job types. Using a distributional DID design on prefecture–month–wage-bin cells, we quantify missing and excess jobs and decompose these changes by prefecture exposure (Kaitz index), occupation, and description-based job attributes. The results reveal systematic reallocation patterns: employment losses concentrate in heavily exposed regions and low-wage occupations, while the composition of surviving postings shifts toward distinct job types.

In this reallocation perspective, posting characteristics such as transportation reimbursement as a non-wage amenity and description-based targeting (gender and skill) serve as markers of job type rather than merely adjustment margins.[4][5] We show that minimum wage hikes are followed

[2] A large literature studies the employment effects of minimum wages and documents substantial heterogeneity across settings, groups, and sectors. While many studies focus on specific age groups, such as teenagers or young workers (Card 1992, Neumark and Wascher 1992, Allegretto *et al.* 2011, Neumark *et al.* 2014, Allegretto *et al.* 2017), others examine employment effects within particular industries, most notably low-wage sectors such as restaurants (Katz and Krueger 1992, Card and Krueger 1994, Dube *et al.* 2010). More recent work emphasizes cases in which employment effects are small or statistically insignificant (Clemens 2021, Manning 2021, Neumark and Shirley 2022). Methodological debates and evidence on sectoral heterogeneity and spillovers are surveyed in Dube and Lindner (2024).

[3] Related platform-based studies examine minimum wage effects on vacancies rather than employment outcomes, including evidence from online and flexible labor platforms (Adams-Prassl *et al.* 2020, Melo *et al.* 2025).

[4] Recently, a growing body of literature investigates the margins of adjustment for employers, such as price pass-through (Aaronson and French 2007, Harasztosi and Lindner 2019, Leung 2021), reduction in non-wage compensation (Simon and Kaestner 2004, Clemens *et al.* 2018), reduction in firm revenue (Draca *et al.* 2011, Bell and Machin 2018), firm entry/exit (Draca *et al.* 2011, Mayneris *et al.* 2018, Aaronson *et al.* 2018, Harasztosi and Lindner 2019, Luca and Luca 2019, Dustmann *et al.* 2022, Chava *et al.* 2023). See Clemens (2021) and Dube and Lindner (2024) for comprehensive reviews.

[5] Job advertisement content has been shown to shape segmentation and self-selection: titles and descriptions predict wages and applications (Marinescu and Wolthoff 2020) and often carry explicit or implicit gender or skill signals (Brenčič 2010, Kuhn and Shen 2013, Kuhn *et al.* 2020, Helleseter *et al.* 2020).

by compositional shifts away from low-amenity postings and toward postings targeting more experienced workers, indicating that reallocation occurs not only across wage bins but also across economically meaningful job types. This complements reallocation evidence in standard employment settings (Dustmann *et al.* 2022) by highlighting that, in on-site spot markets, reallocation can operate at high frequency through the entry and exit of narrowly defined postings.

Third, we provide evidence on the very short-run *speed* and *composition* of job losses and job creation following minimum wage hikes. Building on the distributional approach of Cengiz *et al.* (2019) and the wage-bin design in Dustmann *et al.* (2022), we track month-by-month (and, in robustness checks, higher-frequency) movements in missing and excess jobs around the new wage floor.[6] This design allows us to identify which postings disappear immediately below the new minimum, which reappear just above it, and how these patterns vary across regions, occupations, and posting attributes.

Studying the short run is policy-relevant because firms may face liquidity constraints and adjustment frictions at the time of implementation, so immediate job destruction can reflect temporary financial stress rather than long-run inefficiency (Doh *et al.* 2024). Despite its importance, there is limited evidence on firm responses at daily, weekly, or monthly frequencies, with only a few exceptions (Sabia 2009a,b, Brochu *et al.* 2025, Melo *et al.* 2025).By revealing the near-immediate sorting of postings around the new wage floor—where compliance is rapid and spillovers to higher wage bins are limited—we clarify how minimum wage policy reshapes the spot job distribution in the months following the reform. This perspective complements the long-run literature on capital–labor substitution, firm exit, and reallocation (Neumark and Wascher 2008, Dustmann *et al.* 2022) by identifying the initial margins and job types through which longer-run adjustments unfold.

The rest of the paper is structured as follows: Section 2 outlines the context of the spot labor market and the Japanese Minimum Wage Act with related studies. Section 3 introduces our data and illustrates motivating data patterns. Section 4 presents our identification strategy. Section 5 reports our empirical findings. Section 6 explores the heterogeneous effects across prefectures and occupations. Section 7 concludes the paper.

2 Background

2.1 Non-regular Work and Spot Work in Japan

The number of non-regular workers and the significance of spot labor markets have grown considerably from 2013 to 2024 in Japan, as shown in Panels (a) and (b) of Figure 1. Panel (a) in Figure 1 shows the increasing popularity of non-regular workers. Using our spot work platform data,

[6]Related applications include Gopalan *et al.* (2021) and Brochu *et al.* (2025).

Panel (b) in Figure 1 shows a diverse range of job categories, with Entertainment, Food Industry, and Office Work occupying significant shares. Other categories like Event Staff, Light Work, and Professional roles also contribute to the platform's job distribution, albeit to a lesser extent. This surge suggests a growing reliance on the spot work platform for flexible employment opportunities, particularly in sectors like Entertainment and Food Industry. The steady rise across multiple categories implies an expanding spot labor market, reflecting a broadening acceptance and utilization of on-demand work arrangements in Japan.

2.2 Spot Work Platform

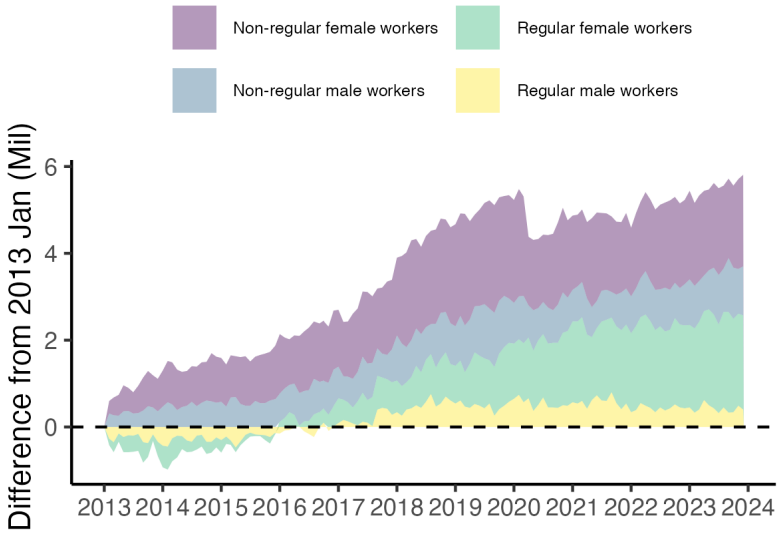
We use the term "spot work platform" to refer to the non-regular labor market provided by Timee.[7] Timee is the representative online platform in Japan's spot-work market, given its leading scale among comparable platforms.[8] As of 2024, more than 7 million workers were registered on the platform—exceeding 10% of Japan's labor force of roughly 70 million—illustrating its significant penetration in the country's labor market. This on-demand staffing platform connects businesses with temporary workers for short-term jobs via the app.

Labor Demand On the labor-demand side, businesses must first undergo a screening and verification process before being allowed to post jobs. Once registered, they can easily create postings through a user-friendly interface by specifying job details such as tasks, wages, and shift times. The platform makes these listings immediately visible to workers and facilitates the matching and contracting process.

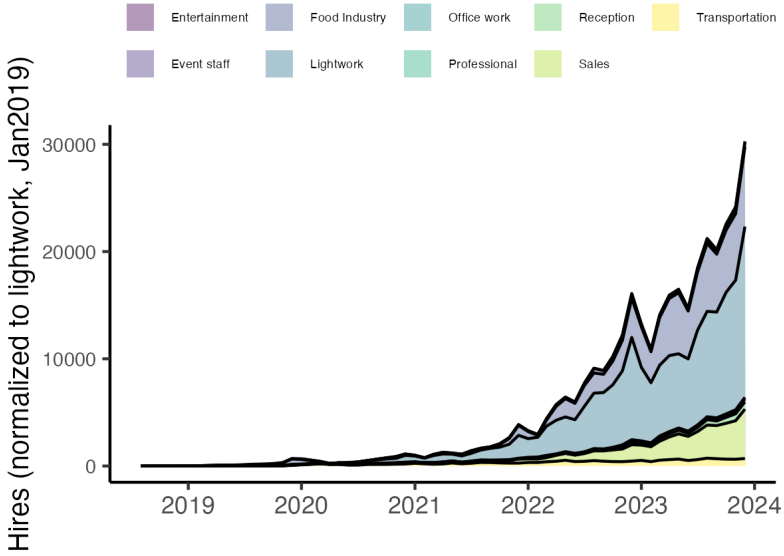
Labor Supply On the labor-supply side, the primary users of the platform are individuals seeking flexible, task-based employment rather than long-term positions, while establishments use the platform to seek short-term workers. Workers can register on the platform for free and immediately gain access to job offers from various companies, with the platform streamlining

[7] According to the Japan Spot Work Association (JASWA), "spot work" refers to employment contracts for short-hour, one-off work engagements that are facilitated through digital platforms. These platforms serve as intermediaries that match job offers with available workers—often on a same-day or near-term basis—and rely on digital technologies to streamline the processes of matching, contracting, and compensation. JASWA plays a central role in promoting sound practices in the sector by issuing guidelines for legal compliance, offering interpretations of labor laws, and supporting proper labor management. In particular, it emphasizes the use of digital infrastructure to reduce the administrative burden traditionally associated with employment, including time tracking, wage calculation, and performance evaluation. This description draws on information provided by the association's official overview and published guidelines (https://www.jaswa.or.jp/about/; https://jaswa.or.jp/pdf/spotwork_gudeline_v2.pdf).

[8] As of 2024, major spot-work platforms exhibit the following scale: Timee (approximately 230,000 registered establishments; PR TIMES https://prtimes.jp/main/html/rd/p/000000222.000036375.html), Sharefull (approximately 55,000 corporate registrations; Sharefull Info https://sharefull.com/information/6602/), and Mercari Hallo (approximately 50,000 registered stores; HRog https://hrog.net/knowledge/122159/).



(a) Hires, Labor force survey



(b) Hires, Spot work platform

Figure 1: Employment Changes: National vs. Spot Work Platform

Note: Panel (a) depicts the time series of job changes in Japan, standardized to January 2013. The colored areas indicate changes within specific worker groups. This graph is based on data from the Economic Survey by the Japanese Cabinet Office (see details at https://www5.cao.go.jp/keizai3/2024/0802wp-keizai/setsumei-e2024.pdf, accessed September 19, 2024). Panel (b) shows the time series of spot workers, standardized to April 2020. The vertical axis indicates the ratio relative to April 2020, and the horizontal axis shows the time (year-month). The filled areas illustrate the number of matched spot workers in each job category defined by the company. See the survey of Miyamoto (2025) for an overview of labor markets in Japan.

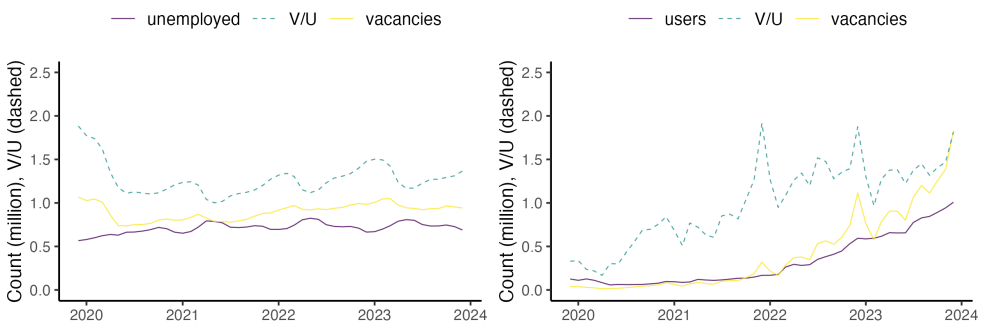
the process of matching workers with available shifts across industries such as food, retail, and logistics, without the need for a traditional hiring process such as formal applications, interviews, or long-term employment contracts.

Certain qualifications (nurses, caregivers, childcare workers, etc.) are required for some jobs, but these jobs are a minority of the total, and most are jobs that any worker can do. Workers in this market can apply for jobs and perform their duties without having any special human capital. Therefore, we treat this labor market as one requiring minimal skills.

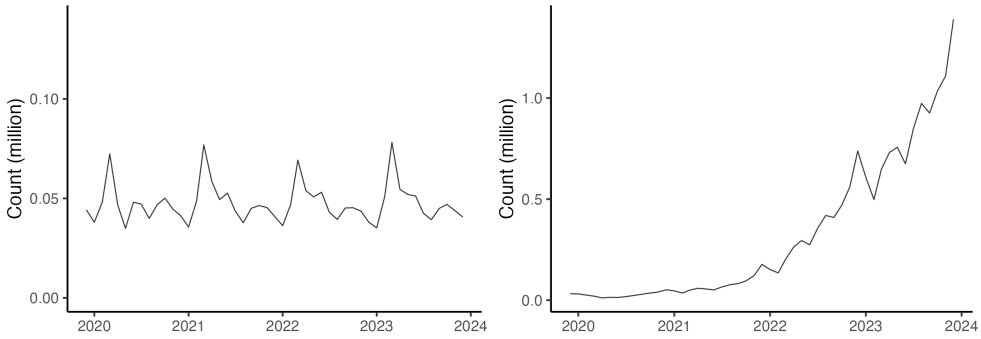
Platform Objective The platform's objective is to maximize revenue from successful matches between workers and businesses. Unlike other digital platforms that rely on advertising, registration fees, or subscription models, this platform does not charge workers or businesses for access. Instead, its revenue is directly tied to transactions: specifically, 30% of each contracted payment between a business and a worker is collected by the platform as commission. The payments from businesses to the platform are triggered only when a contract with a worker is finalized, ensuring that fees are linked to successful matches rather than postings alone. This design aligns the platform's incentives with increasing the volume of completed matches. This arrangement benefits both companies and workers by offering flexible, short-term employment opportunities while avoiding the formalities and commitments of long-term contracts.

At the same time, the platform also allows workers to repeatedly take jobs from the same business establishment, and businesses are permitted to extend longer-term employment offers to workers if they wish. In this way, the platform does not prohibit transitions into regular (part-time) employment, effectively serving as a trial channel for businesses and workers to explore longer-term arrangements. The platform's simplicity and immediacy are attractive particularly for workers looking to fit employment around their schedules.

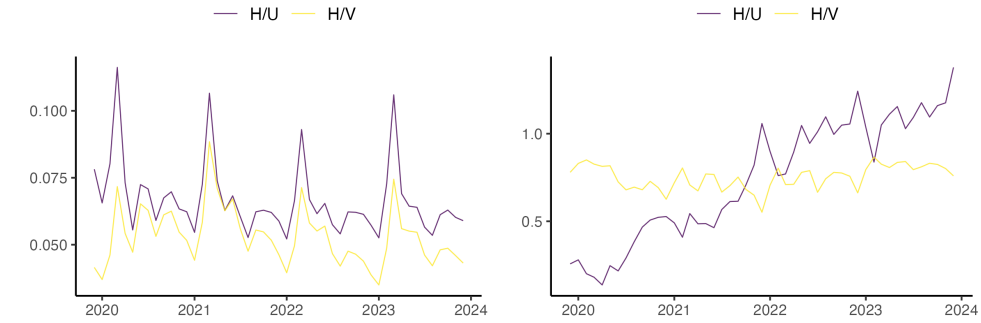
Transfers from Companies to Workers On this platform, workers may receive not only a total income from employment based on hourly wages and working hours but also transportation reimbursement. This reimbursement is intended to cover the cost of traveling to and from the workplace. However, firms are not legally required to provide such transportation reimbursement, and the decision to do so is solely at the discretion of each firm. In addition, because this reimbursement must be determined at the time of posting a job on the platform, firms often lack accurate information about the actual commuting costs incurred by workers. Moreover, workers are not required to report or return any discrepancies between their actual travel costs and the reimbursement they receive. As a result, if an increase in the minimum wage leads to higher employment costs, there is a possibility that firms may choose to offset some of these additional costs by reducing transportation reimbursement, thereby mitigating the overall negative impact



(a) User U, vacancy V, and tightness ($\frac{V}{U}$)



(b) Hire H



(c) Job and worker finding rate ($\frac{H}{U}$,$\frac{H}{V}$)

Figure 2: Trends of Macro Variables: Hello Work Part-time (left) vs. Platform (right), 2019–2023

Note: Details are in Kanayama and Otani (2024). For the left panels, we use the Report on Employment Service (*Shokugyo Antei Gyomu Tokei*) for the month-level aggregate data from December 2019 to December 2023 to capture the trends of matchings between unemployed workers and vacancies via a conventional platform. These datasets include the number of job openings, job seekers, and successful job placements, primarily sourced from the Ministry of Health, Labour and Welfare (MHLW) of Japan, which publishes monthly reports and statistical data on the Public Employment Security Office, commonly known as Hello Work. Hello Work is a government-operated institution in Japan and a conventional platform that provides job seekers with employment counseling, job placement services, and vocational training, playing a critical role in Japan's labor market.

of increased labor costs from minimum wage increases.

2.3 Institutional vs. Platform-Based Matching: Hello Work and Spot Work

Figure 2 from Kanayama and Otani (2024) provides a comparative analysis of labor market dynamics between the Hello Work public employment platform (left panel) and a private spot work platform (right panel) from December 2019 to December 2023. Hello Work is a government-operated institution in Japan as a conventional platform that provides job seekers with part-time and full-time employment counseling, job placement services, and vocational training, playing a critical role in Japan's labor market.

First, we discuss the left panel of Hello Work for part-time workers and jobs.[9] In Panel (a), the number of unemployed individuals remains stable over the observed period, hovering around 0.8 million. Vacancies and tightness (V/U) show stable trends. Panel (b) shows that the hiring count through Hello Work remains low, with a small oscillating pattern throughout the period. This stable but limited hiring activity suggests that the platform may face constraints or inefficiencies in increasing the job match rate for part-time workers. In Panel (c), the job and worker finding rates (H/U and H/V) exhibit a gradual decline over time, suggesting reduced effectiveness in matching job seekers with available vacancies via Hello Work. This decline might reflect a growing preference for alternative job search methods such as the spot-work platform.

In contrast, the right panels reflect the dynamics of the private platform, where a distinctive pattern emerges. Unlike Hello Work's part-time flow from unemployed to employed, workers on this platform do not automatically leave after securing a match, which retains a larger pool of active users. The number of registered users increases gradually, while the number of vacancies rises sharply, especially post-2022, leading to a notable rise in labor market tightness (V/U). This reflects an expanding demand for spot employment opportunities. The hiring count in Panel (b) shows a rapid upward trajectory starting around 2022, underscoring a marked increase in successful matches.

Panel (c) illustrates the job and worker finding rates (H/U and H/V), highlighting significant differences compared to Hello Work. The job finding rate (H/U) continues to rise, reaching values close to 1.3, indicating that each worker matches with multiple vacancies per month. On the other hand, the worker finding rate (H/V) remains stable around 0.8, suggesting that 80% of the available jobs are successfully filled. This pattern demonstrates the platform's increasing efficiency in matching workers to vacancies. It indicates a maturing spot labor market that still exhibits

[9]For full-time jobs on the public and private job matching platforms, Otani (2025) estimates trends of matching efficiency and elasticity between 2014 and 2024. Otani (2024) also provides the long-term trends of full-time and part-time job matchings in Hello Work between 1972 and 2024.

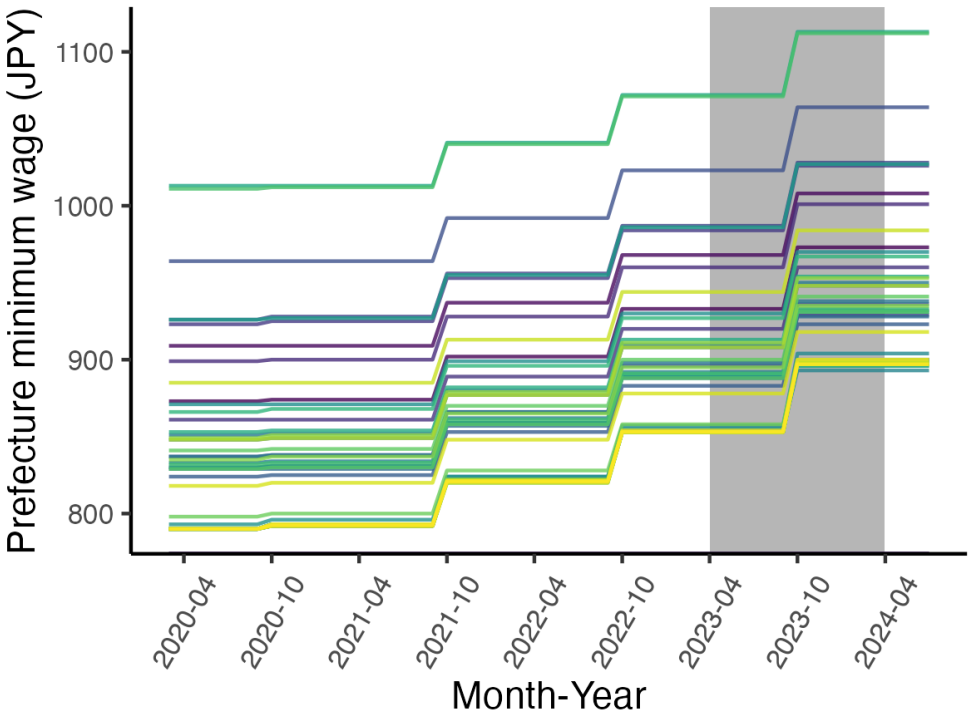


Figure 3: Dynamics of Regional Minimum Wage Changes

Note: This describes the monthly changes in regional minimum wages across prefectures. Until 2022, each prefecture was divided into four categories based on the average income level of its workers, and a minimum wage was assigned to each category as a guideline. Many prefectures set a wage close to this guideline as the regional minimum wage for that prefecture. The shaded period is of our focus.

strong growth.

2.4 Minimum Wages in Japan

This section introduces the regional minimum wages set in each of the 47 prefectures in Japan, which we define as "regional minimum wages." The introduction of regional minimum wages follows the framework described by Tamada (2009) and Kawaguchi and Mori (2021). The Ministry of Health, Labor and Welfare established the Central Minimum Wage Council, which operates under the tripartite principle and consists of representatives from labor, management, and public interest groups.

The Council divides the 47 prefectures into three regional blocks based on regional welfare levels. It sets guidelines ("Meyasu") for the recommended increase in the hourly minimum wage for each group.[10] These recommendations primarily reference the average annual wage increase rate for workers at workplaces with fewer than 30 regular employees, as reported in the Minimum

[10]The Council had divided the 47 prefectures into four regional blocks before 2022.

Wage Survey. The Council typically holds its first meeting in June and finalizes the guidelines by the end of July. Based on these guidelines, the Local Minimum Wage Councils in each prefecture determine the specific minimum wage increases in August, with the revised wages coming into effect during the first week of October. This two-stage process has been implemented annually since 1978, with a few exceptions, ensuring regular increases in the local minimum wage.

The Regional Minimum Wage Act applies to nearly all workers in Japan, regardless of industry, age, or gender. However, exceptions exist where the director of the labor bureau in each prefecture deems it appropriate to pay less than the regional minimum wage.[11]

Figure 3 illustrates the changes in regional minimum wages over time. This analysis uses minimum wage variations across prefectures from 2020 to 2023. In October 2020, due to the negative employment shock caused by COVID-19, the minimum wage increased only slightly, by an average of 0.2%. However, from 2021 onwards, the minimum wage increased consistently each year, with an average increase of 4.7% in 2023. Notably, except for the period of economic stagnation during the COVID-19 pandemic, substantial minimum wage increases have occurred in October across all prefectures.

While minimum wage hikes in Japan are effective at raising wages (Aoyagi *et al.* 2016), they are also associated with negative employment effects. Numerous studies have examined the impact of minimum wage policies on employment in Japan (Yugami 2005, Tachibanaki and Urakawa 2006, Kawaguchi and Mori 2009, Higuchi 2013, Kambayashi *et al.* 2013, Akesaka *et al.* 2017, Okudaira *et al.* 2019, Izumi *et al.* 2020, Kawaguchi and Mori 2021, Izumi *et al.* 2022). Many of these studies report negative employment effects for certain demographic groups (Kawaguchi and Yamada 2007, Kawaguchi and Mori 2009, Kambayashi *et al.* 2013, Akesaka *et al.* 2017, Okudaira *et al.* 2019, Kawaguchi and Mori 2021, Izumi *et al.* 2022, Mori and Okudaira 2025). For example, Kawaguchi and Mori (2021) examines the employment effects of minimum wages by leveraging the 2007 reform of Japan's Minimum Wage Act.[12] They find that the employment elasticity of the minimum wage for less-educated young men is -1.2. This implies that although the minimum wage in Japan affects only certain demographic groups, the magnitude of its impact can be larger than what is observed in other countries.

[11] Examples where it is considered appropriate to pay less than the minimum wage include: 1) individuals with significant mental or physical disabilities, 2) employees on trial periods, 3) participants in certified basic vocational training programs, 4) workers engaged in light work, and 5) those performing intermittent work.

[12] This reform mandated that monthly minimum wage earnings must meet or exceed monthly public assistance levels. Prefectures where minimum wages fell below public assistance thresholds experienced substantial increases. Using the difference between public assistance levels and monthly minimum wage earnings in 2006 as an instrumental variable, they estimate the causal effect of the minimum wage on employment during the years following the reform. This approach has since been applied in several studies (Okudaira *et al.* 2019, Mizushima and Noguchi 2021, Yamagishi 2021, Izumi *et al.* 2022, Mori and Okudaira 2025, Yamanouchi *et al.* 2025).

3 Data

3.1 Data Source and Construction

We base our analysis on spot work–level records from Timee, a privately operated Japanese platform that facilitates the matching of spot workers and employers and, as the oldest and largest player in Japan's spot labor market, provides highly representative data. This dataset allows us to analyze the short-term effects of minimum wage changes on the employment of workers with minimal skills. We focus on the period from April 2023 through March 2024 to study the October 2023 minimum wage increase, the most recent revision for which our data analysis is feasible.

We aggregate the contract-level data to calculate key metrics at the prefecture-month-wage-bin and prefecture-month level, including the number of job postings (vacancies) and matches (employment). Unlike Dustmann *et al.* (2022), there is no difference between actual and contractual working hours, which is an advantage of our data. The dataset also includes not only detailed employer characteristics (industry, occupation, and location—prefecture, municipality, longitude, latitude) but also precise timestamps for vacancy posting and filling (and shift start), as well as the full job-description text. Measuring vacancy duration as the elapsed time a posting remains advertised—from appearance on the platform until it is filled, rather than until work begins—has the advantage of focusing on the time to find candidates, as in Bassier *et al.* (2025). Job descriptions set by employers provide rich textual signals—implicitly conveying skill requirements (e.g., "experience required," heavy-lifting, certification cues), task intensity and shift constraints, and preferred worker attributes. These signals influence applicant self-selection, as shown in Kuhn *et al.* (2020), even when they are not binding screening criteria. This rich dataset enables comprehensive heterogeneity analysis of how minimum wage changes impact the short-term dynamics of spot labor markets.

Table 1 reports summary statistics at the contract, prefecture–month–wage-bin, and prefecture–month levels. At the contract level, hourly pay averages 1,086 JPY (median 1,100), with typical shifts of 4.79 hours. Employers commonly offer transportation reimbursement (mean 405 JPY; median 500), but the wide range underscores substantial heterogeneity by location and policy. About 81% of contracts include any reimbursement and 4% include staff meals. For timing, vacancy duration is measured as the elapsed time from posting availability to fill; the posting-to-start lag (start lead time) is the elapsed time from posting availability to the shift start. Among fully filled vacancies, the mean duration is 3.28 days and the mean posting-to-start lag is 9.07 days. Job-description targeting flags indicate that beginner-targeted, experienced-worker-targeted, female-targeted, and male-targeted postings account for roughly 1%, 30%, 3%, and 3% of contracts, respectively.

At the prefecture–month–wage-bin level, employment and vacancies average 191.50 and 235.06 per bin, respectively; the mean transportation reimbursement is 111.72 JPY per contract in the cell,

Table 1: Summary Statistics

(a) Contract Level

	N	mean	median	sd	min	max
Hourly wage	8673942	1086.01	1100.00	123.12	853.00	2000.00
Working hour	8673942	4.79	4.50	1.84	1.00	16.00
Num of positions	8673942	1.67	1.00	4.60	1.00	8961.00
Transportation reimbursement (JPY)	8673942	404.65	500.00	255.19	0.00	1500.00
Transportation reimbursement dummy	8673942	0.81	1.00	0.39	0.00	1.00
Staff-meal provision dummy	8673942	0.04	0.00	0.19	0.00	1.00
Vacancy duration (Day)	6710362	3.26	0.25	6.73	0.00	99.34
Posting-to-start lag (Day)	6710362	9.04	5.85	9.69	0.00	99.99
Beginer-targeted job	8673942	0.01	0.00	0.10	0.00	1.00
Experienced-targeted job	8673942	0.30	0.00	0.46	0.00	1.00
Female-targeted job	8673942	0.03	0.00	0.17	0.00	1.00
Male-targeted job	8673942	0.03	0.00	0.17	0.00	1.00

(b) Prefecture-month-wage-bin Level

	N	mean	median	sd	min	max
Employment	61584	191.45	0.00	1789.29	0.00	83124.00
Vacancy	61584	234.98	0.00	2171.39	0.00	111887.00
Mean transportation reimbursement (JPY)	61584	111.73	0.00	222.09	0.00	1500.00
Mean transportation reimbursement dummy	61584	0.21	0.00	0.38	0.00	1.00
Mean Staff-meal provision dummy	61584	0.01	0.00	0.06	0.00	1.00

(c) Prefecture-month Level

	N	mean	median	sd	min	max
Employment	564	20904.55	7150.00	34822.35	505.00	262937.00
Vacancy	564	25657.84	9240.50	42700.28	633.00	350673.00

Note: This table reports the mean, median, standard deviation, and minimum and maximum values of each outcome variable during the period of analysis, April 2023 through March 2024. 150 JPY is about 1 USD at the current exchange rate. Vacancy duration and posting-to-start lag are defined only for vacancies that are filled.

with a 21% reimbursement incidence and about 1% staff-meal incidence. At the prefecture–month level, spot employment averages 20,910 and vacancies 25,666, revealing substantial time-series and cross-prefecture variation and a persistent gap consistent with unfilled positions.

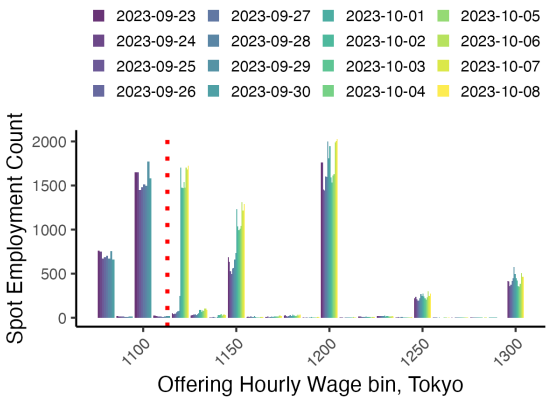
3.2 Preliminary Evidence Before and After the Minimum Wage Change

Leveraging the strengths of granular spot work platform data, we focus on Tokyo to illustrate how the minimum wage adjustment reshaped employment patterns, allowing for a detailed examination of wage shifts while revealing the stability of working hours and transportation reimbursement.

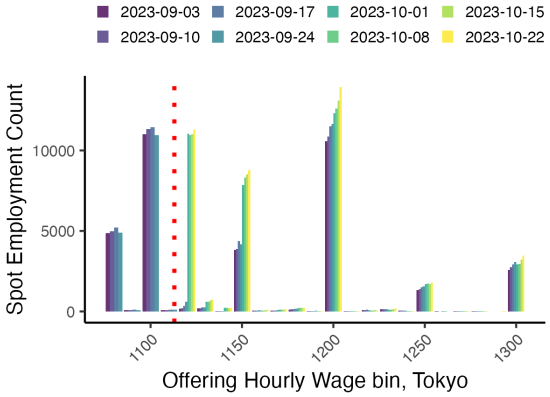
The Hourly Wage Distribution Figure 4 illustrates the transition in employment distribution across hourly wage bins at both the daily and weekly levels before and after the minimum wage adjustment. The ability to observe such granular, high-frequency adjustments is a unique strength of our spot labor platform data, enabling us to capture firms' real-time responses to policy changes with day-to-day resolution. Panel (a) shows the daily evolution of the employment distribution in Tokyo, revealing a sharp and immediate decline in employment below the new minimum wage threshold (1,113 JPY) just one day after the policy took effect. Jobs previously offered at lower wages either disappeared or were adjusted upward, with a clear clustering of employment around the new minimum wage floor. Complementarily, Panel (b) aggregates these patterns at the weekly level, confirming the persistence of this shift over the course of a month. Panel (c) shows that the effect persists over a six-month period.

Adjustments in Working Hours and Transportation Reimbursement Panel (a) in Figure 5 reveals that employment distribution across working hour bins remains relatively stable, though some shifts suggest firms' strategic adjustments to optimize labor costs. Employment at common working hour intervals, such as four and eight hours, remains prominent, while shorter-hour categories show slight declines, possibly due to increased hourly labor costs. Panel (b) examines transportation reimbursement, showing a stable yet slightly shifting distribution, with a concentration in the 500 JPY reimbursement bin, indicating standardized employer practices. While wage structures have adapted, transportation reimbursements largely remain unchanged, though some redistribution in higher reimbursement categories suggests firms may be adjusting overall compensation structures in response to rising labor costs. These patterns underscore the interconnected nature of wage adjustments and broader employer strategies in response to policy changes.

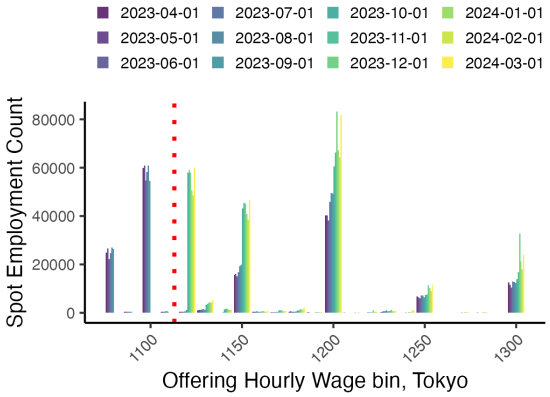
A natural question is whether the wage increase resulting from the minimum wage adjustment led to adjustments in working hours and transportation reimbursement, or whether firms primarily confined their response to wage adjustments. Figure 6 demonstrates that the minimum wage adjustment primarily impacted the distribution of employment across wage bins, while working hours



(a) Daily



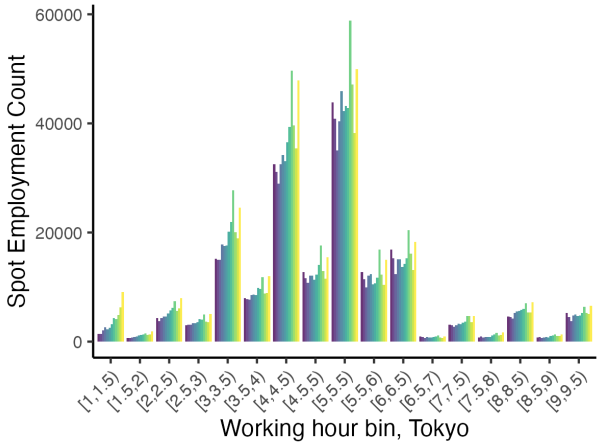
(b) Weekly



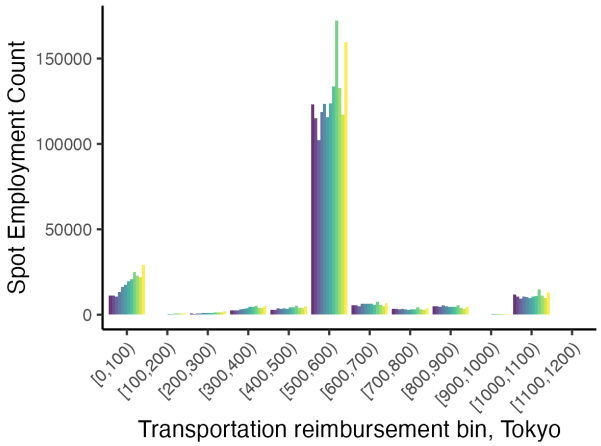
(c) Monthly

Figure 4: Transition of Employment Distribution by Week and Day Before and After the Minimum Wage Change

Note: The x-axis represents the wage bins, while the y-axis indicates the total count of spot employment. The colored bars represent different months, allowing for a clear comparison of employment pattern shifts over time. The red dashed line denotes Tokyo's 2023 October minimum wage, i.e., 1,113 JPY.



(a) Posted Working Hour



(b) Transportation Reimbursement

Figure 5: Transition of Employment Distribution Before and After the Minimum Wage Change

Note: The x-axis represents the wage bins, while the y-axis indicates the total count of spot employment. The colored bars represent different months, allowing for a clear comparison of employment pattern shifts over time. The red dashed line denotes Tokyo's 2023 October minimum wage, i.e., 1,113 JPY.

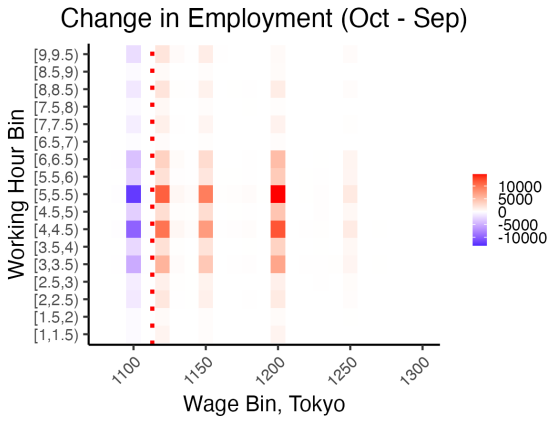
and transportation reimbursement remained largely unaffected. In Panel (a), employment previously concentrated in wage bins below the new minimum wage threshold shifted upward, clustering around the new minimum wage level, indicating compliance-driven wage adjustments. However, changes in the distribution of working hours are minimal, suggesting that firms maintained their established job structures despite increased labor costs. Similarly, transportation reimbursement patterns in Panel (b) exhibit stability, with no significant redistribution, reinforcing the notion that firms adjusted wages in response to the policy change without altering other compensation components. This pattern is further supported by Panel (c), which shows that even among jobs with short working hours—where transportation costs make up a larger share of compensation—

there was little adjustment in reimbursement levels. These patterns highlight that the primary response to the minimum wage hike was wage compliance, rather than broader changes in job design or additional benefits.

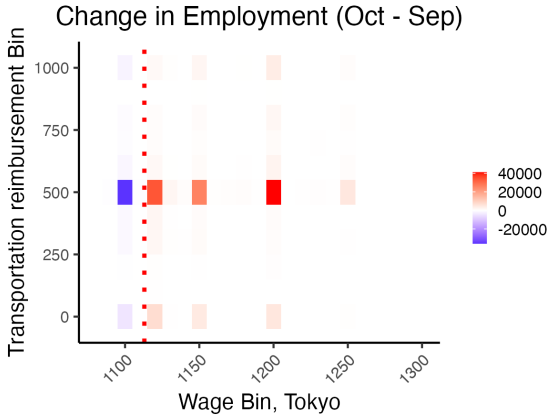
Inflow and Outflow Patterns Across Wage Bins The granular nature of our data also allows us to trace how individual job postings move across wage bins before and after the minimum wage increase in Tokyo in October 2023. Figure 7 illustrates how job offerings shifted across wage bins in response to the minimum wage hike in Tokyo in October 2023. First, focusing on the outflow from sub-minimum wage bins, we observe a strong compliance effect. For instance, 92% of offerings originally in the 1080 JPY bin moved up exactly to the new minimum wage bin (1120 JPY), indicating a direct policy-driven adjustment. In contrast, offerings in the 1100 JPY bin—just above the old minimum wage—display a different pattern: only a small share moves to the new minimum, while 37% jump to 1150 JPY and 13% to 1200 JPY. This upward shift to round numbers is also seen above the threshold; for example, 37% of offerings in the 1160 JPY bin move to 1200 JPY. These patterns suggest a behavioral tendency toward posting wages at salient round numbers, beyond strict compliance, which is consistent with Dube *et al.* (2025).

Turning to the inflow into the new minimum wage bin, the figure shows that most of this increase is driven by postings previously below the new threshold. There is little evidence of firms with previously higher wages lowering them to match the new minimum: fewer than 4% of inflows into the 1120 JPY bin come from wage bins above that level. However, beyond the minimum wage bin itself, around 20% of offerings shift slightly downward to nearby higher bins (e.g., 1150 or 1180), suggesting some firms may make modest downward adjustments while still staying above the mandated minimum. This indicates that the primary effect of the policy was upward adjustment among low-paying jobs, with only limited strategic downward shifts from higher-paying firms.

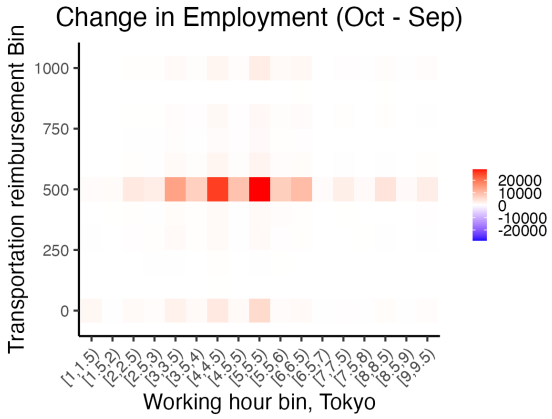
Summary These illustrative data patterns motivate us to move beyond descriptive analysis and investigate the causal impact of the minimum wage adjustment on employment outcomes. While the observed shifts in wage distribution suggest strong compliance effects and limited adjustment on other job attributes, such as working hours and transportation reimbursement, these patterns alone do not establish causality. In particular, they cannot account for concurrent platform growth or heterogeneous trends across prefectures, which may confound observed changes. To rigorously evaluate whether and to what extent the policy change affected employment dynamics—particularly in terms of spot hiring behavior—we turn to a difference-in-differences (DID) framework. This approach allows us to isolate the effect of the minimum wage hike by comparing changes in outcomes between treated and control groups over time, accounting for underlying trends and potential confounders.



(a) Working Hour and Wage



(b) Transportation Reimbursement and Wage



(c) Transportation Reimbursement and Working Hour

Figure 6: Change in Employment Distribution Before and After the Minimum Wage Change

Note: The color intensity reflects the change in spot employment between September and October, with red indicating an increase and blue indicating a decrease. The red dashed line denotes Tokyo's 2023 October minimum wage, i.e., 1,113 JPY.

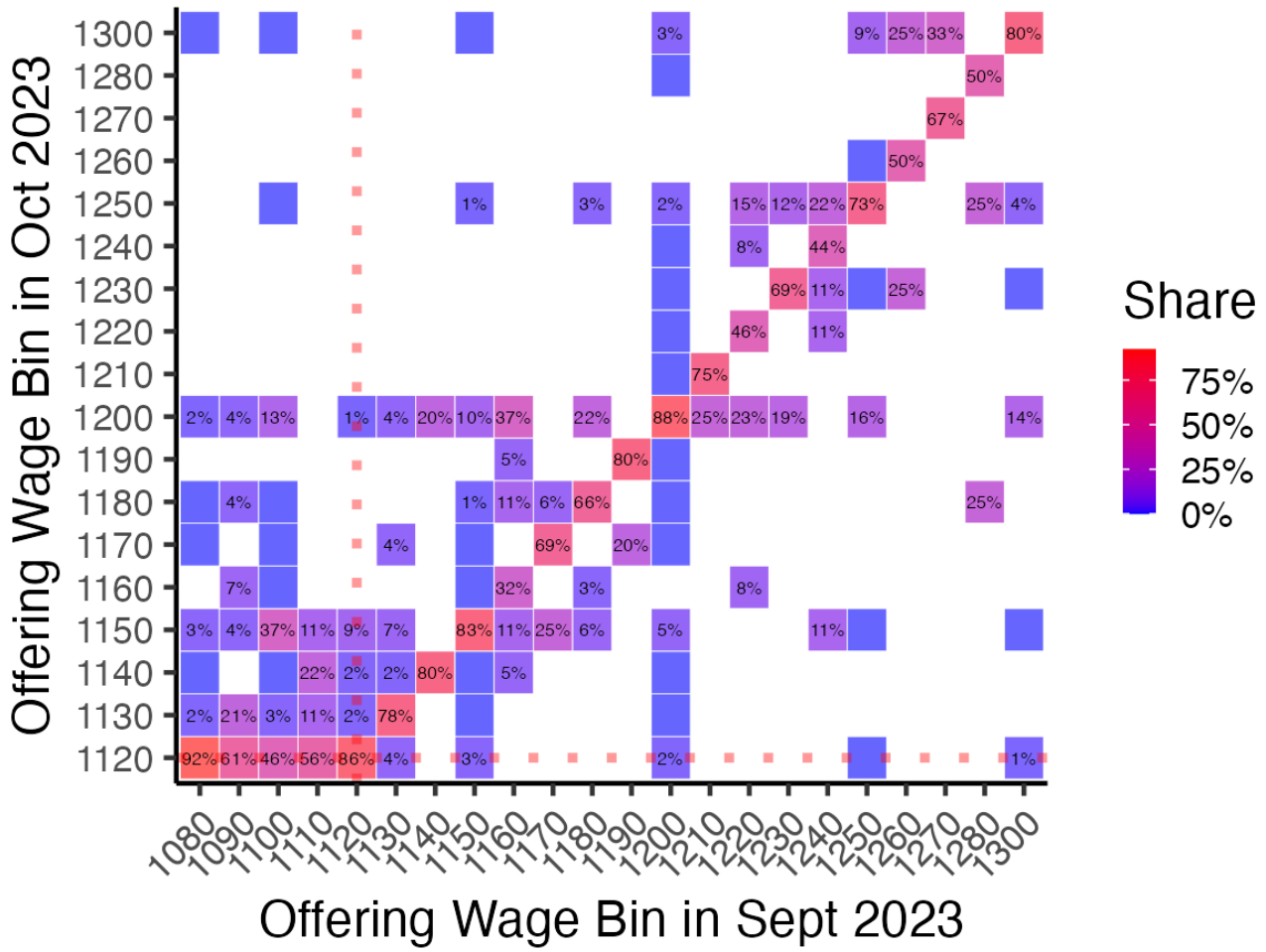


Figure 7: Distributional Shift in Wage Bins (Share of Active Establishments, Sept–Oct 2023)

Note: The red dashed line denotes Tokyo's 2023 October minimum wage, i.e., 1,113 JPY. Blank colored cells mean less than 1% shares.

4 Empirical Strategy

4.1 Prefecture-month–wage-bin DID Estimates

The key challenge in estimating the effect of a minimum wage increase on the outcome is that we cannot observe the counterfactual wage distribution in the absence of the policy shock. To address this issue, following Dustmann *et al.* (2022), we employ a difference-in-differences identification strategy, comparing the outcome before and after the minimum wage increase between observations near the minimum wage threshold and those in the upper part of the wage distribution, which are unlikely to be affected by the policy change.

Specifically, we first decompose the wage distribution in each prefecture into wage bins, where each bin j has a width of 10 yen. We then partition each wage bin j in prefecture p into a mutually exclusive group $E_j(p) = e$ for $e \in \{-1, \ldots, 3, \infty\}$, based on its relative distance from the increased minimum wage MW_p. Specifically, if wage bin j in prefecture p falls within the interval $[MW_p + e \times 100, MW_p + e \times 100 + 99]$, it is assigned to group e. We define the threshold $\bar{W}_p = MW_p + 400$, and assign $E_{j(p)} = \infty$ if wage bin j falls within $[\bar{W}_p, \infty]$. We assume that wage bins in group ∞ are unaffected by the minimum wage increase, an assumption we refer to as the limited spillover effect assumption. Under this assumption, we refer to group ∞ as the control group. Finally, for each group e, we compare the evolution of the outcome between group e and group ∞ before and after the minimum wage increase.

We implement this DID identification strategy by running the following regression:

$$\frac{Y_{j(p),t}}{N_{p,t}} = \sum_{l \neq -1} \sum_{e \neq \infty} \mu_{l,e} \mathbf{1}\{t - 7 = l\} \mathbf{1}\{E_{j(p)} = e\} + \alpha_e + \lambda_t + \epsilon_{j,t}, \tag{1}$$

where $t \in \{1, \ldots, 12\}$ denotes the calendar month, and $l \in \{-6, \ldots, 5\}$ denotes the relative time period before or after the minimum wage increase at time $t = 7$.[13] $Y_{j(p),t}$ is employment for each bin j in prefecture p at time t, $N_{p,t}$ is employment in prefecture p at time t, α_e is the group fixed effect, and λ_t is the time fixed effect.[14] In additional analyses, we replace the left-hand-side outcome with corresponding measures such as vacancies or total hours. Note that this regression is saturated and each coefficient $\mu_{l,e}$ is the difference-in-differences estimand:

$$\mu_{l,e} = E\left[\frac{Y_{j(p),7+l}}{N_{p,7+l}} - \frac{Y_{j(p),6}}{N_{p,6}} | E_{j(p)} = e\right] - E\left[\frac{Y_{j(p),7+l}}{N_{p,7+l}} - \frac{Y_{j(p),6}}{N_{p,6}} | E_{j(p)} = \infty\right],$$

where the pre-treatment period is $t = 6$ and the control group is group ∞.

[13] $t = 1$ corresponds to April 2023, and $t = 12$ corresponds to March 2024.

[14] The notation $j(p)$ indicates that the wage bin j belongs to prefecture p. We adopt this notation because the regression in (1) exploits variation only at the group e and time t levels.

Under the DID identification strategy, each coefficient $\mu_{l,e}$ captures the dynamic effect of the minimum wage increase on the outcome in group e at a given relative period l. Formally, we assume the three identifying assumptions below:

Limited Spillover Effect Assumption This assumption requires that the effect of the minimum wage increase on the outcome vanishes at a certain point $\bar{W}_p$ in the wage distribution in each prefecture p. It ensures that group ∞ (the upper part of the wage distribution) serves as a valid control group. We will assess the validity of this assumption by examining the impact of the minimum wage increase on groups near $\bar{W}_p$ such as $e = 2, 3$.

No Anticipation Assumption This assumption rules out the anticipation effect of the minimum wage increase on the outcome at a given period $l = -1$, i.e., before exposure to the policy shock. While this assumption is not directly testable, we will conduct a robustness check by using the pre-treatment period that is further from the policy shock, such as $l = -2$ or $l = -3$.

Parallel Trends Assumption This assumption requires that for each group e, the outcome evolves similarly over time between group e and the control group ∞. This assumption is also not directly testable, but we assess the plausibility of this assumption by checking the pre-trend differences for the outcome.[15]

4.2 Excess Jobs–Missing Jobs Approach

Next, following Cengiz *et al.* (2019), we estimate the effect of the minimum wage increase on the outcome throughout the wage distribution by aggregating each $\mu_{l,e}$ from the prefecture-month-wage-bin DID estimates. Let $\Delta a_l = \sum_{e=0}^{3} \mu_{l,e}$ and $\Delta b_l = \mu_{l,-1}$ denote the excess jobs and the missing jobs at a given relative period l, respectively. Let $\Delta a = \frac{1}{6}\sum_{l=0}^{5} \Delta a_l$ and $\Delta b = \frac{1}{6}\sum_{l=0}^{5} \Delta b_l$ denote the total excess jobs and missing jobs after the minimum wage increase, respectively. Also, let $\Delta a_e = \frac{1}{6}\sum_{l=0}^{5} \mu_{l,e}$ and $\Delta b_{-1} = \frac{1}{6}\sum_{l=0}^{5} \mu_{l,-1}$ define the excess jobs and the missing jobs at a given relative group e, respectively. We compute the overall employment effect at a given relative period l, denoted as Δe_l, by summing the excess and missing jobs at that period: $\Delta e_l = \Delta a_l + \Delta b_l$.[16] Furthermore, we calculate the total employment effect after the minimum wage increase, denoted as Δe, by summing Δe_l over all relevant periods: $\Delta e = \sum_{l=0}^{5} \Delta e_l$.

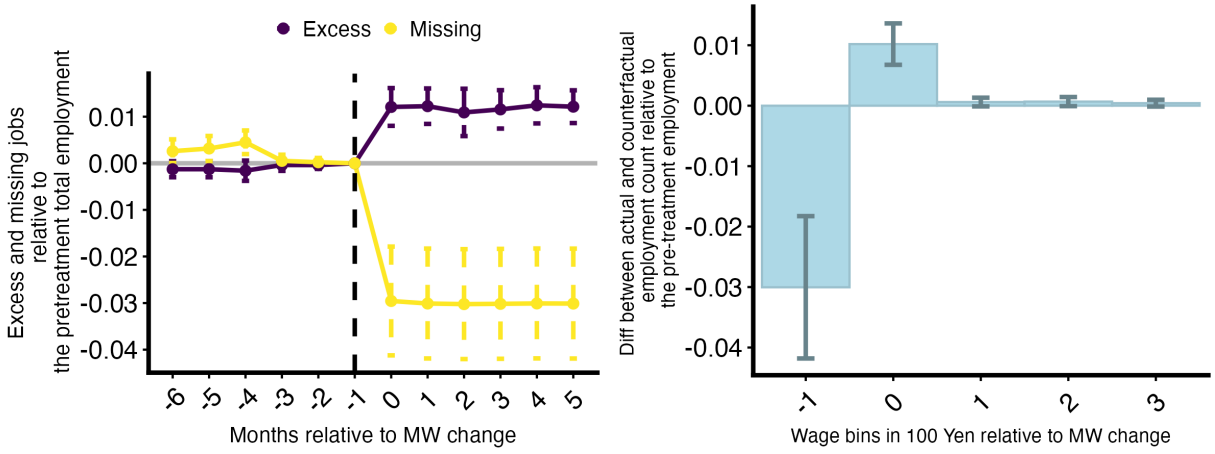
[15] We estimate Difference-in-Difference-in-Difference method to eliminate wage-bin specific trend. See Appendix A.5.

[16] Following Cengiz *et al.* (2019), we normalize the excess and missing jobs by the pretreatment total employment.

5 Results

5.1 Prefecture-month–wage-bin DID Estimates on Employment

We begin by presenting the impact of minimum wage increases on wage bins below and above the minimum wage in the wage distribution. Panel (a) in Figure 8 presents the estimated excess jobs and missing jobs for each month before and after the minimum wage increase. Panel (b) in Figure 8 presents the estimated impact of the minimum wage increase on employment for each group e in the wage distribution, reflecting the cumulative effect across all months following the increase.



(a) Missing and Excess Jobs over Time (b) Wage Distribution

Figure 8: Impact of Minimum Wages on Employment

Note: Panel (a) shows the estimated excess jobs and missing jobs for each month before and after the minimum wage increase. Panel (b) shows the estimated impact of the minimum wage increase on employment for each group e in the wage distribution.

Three key findings emerge from Panel (a) and Panel (b). First, immediately after the minimum wage increase, there are clear job losses (missing jobs) below the minimum wage and job creation (excess jobs) above the minimum wage in the wage distribution. Second, the estimated excess jobs and missing jobs remain stable across months following the minimum wage increase. Cengiz *et al.* (2019) shows that the impact of minimum wage increases persists for about five years at the annual level. Considering our results as well, the effects of minimum wage hikes on the wage distribution appear to be permanent. This suggests that dynamic effects, such as labor substitution for capital, are minimal as the impact shifts from the very short term to the medium term.[17] Finally, while Cengiz *et al.* (2019), which examines the entire labor market in the U.S., finds that the estimated

[17] In Appendix A.4, we examine the daily and weekly dynamics of changes in excess and missing jobs as a robustness check. Even when we estimate the effects at daily or weekly frequencies, the point estimates remain stable.

number of excess jobs and missing jobs are approximately equal, our analysis of the spot labor market reveals that the number of missing jobs (−3.0%) exceeds that of excess jobs (1.2%).[18] Employers can reduce employment more flexibly in response to wage increases than in traditional employment because spot hiring is used to address local labor shortages.

Note that Panel (a) and Panel (b) also confirm the validity of the assumptions underlying our identification strategy. From Panel (a), we observe that the estimated excess jobs and missing jobs are close to zero in the period before the minimum wage increase. This supports the plausibility of the parallel trends assumption. From Panel (b), we observe that excess jobs are hardly generated in the upper distribution, far from the minimum wage. This supports the plausibility of the limited spillover effect assumption.[19]

5.2 Impact on Spot Labor Demand: Vacancy Counts and Total Working Hours

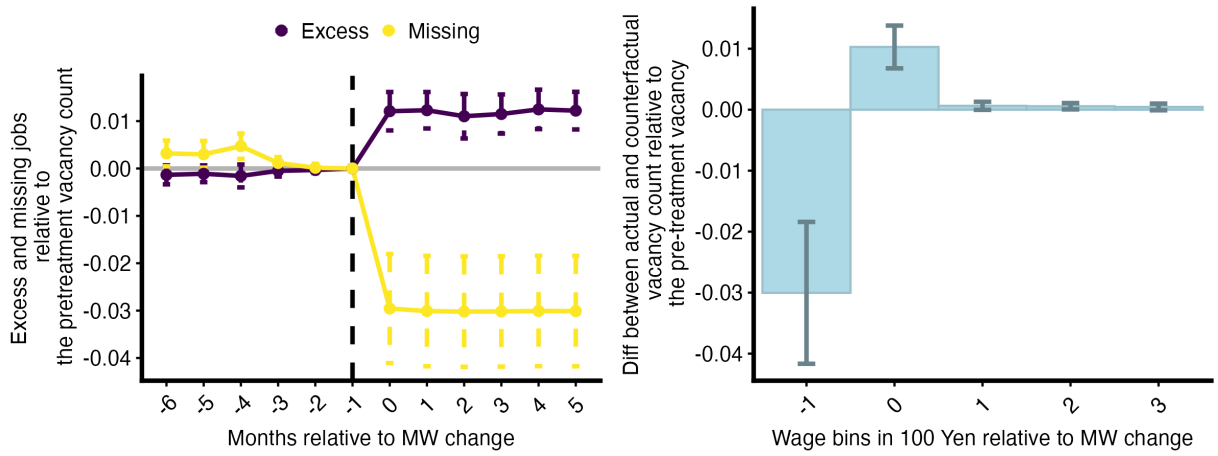
The employment effects documented above naturally raise the question of whether adjustments to minimum wage increases operate primarily through labor demand or labor supply in spot labor markets. Unlike standard employment settings, spot work allows firms to adjust hiring margins flexibly along multiple dimensions, including the number of vacancies posted and the total hours offered. To disentangle these channels, we separately examine the responses of vacancy counts and total working hours using the same DID framework.

Figure 9 shows that employment changes are largely driven by adjustments in vacancy postings, that is, spot labor demand. Panel (a) documents clear missing posted vacancies below the minimum wage and excess vacancies just above it, with effects that persist over time. Panel (b) confirms that these changes are concentrated around the minimum wage threshold, with little evidence of spillovers to higher wage bins. These patterns indicate that the decline in employment below the minimum wage primarily reflects reduced vacancy creation rather than increased job-filling frictions, while modest gains above the threshold arise from expanded postings at slightly higher wages. Vacancy creation thus emerges as the central margin of adjustment on the demand side.

Figure 10 examines adjustments in total working hours following the minimum wage increase. Panels (a) and (b) show that, unlike vacancy counts, the net change in total working hours is relatively small, as excess and missing hours largely offset each other in the months after the reform. This pattern implies that while the number of posted vacancies declines, the reduction in aggregate working hours is limited. Taken together with the vacancy results, these findings

[18] The elasticity with respect to minimum wages computed from the formula of Cengiz *et al.* (2019) is −0.388(0.132) where the bracket number is the standard error. See the detail in Appendix A.1.

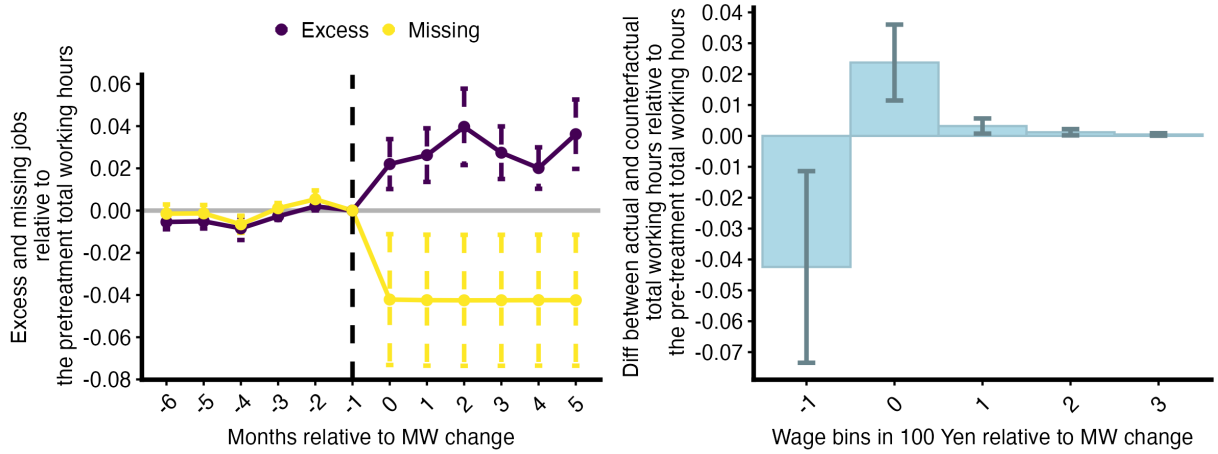
[19] Similar to our findings, Autor *et al.* (2016) and Cengiz *et al.* (2019) also show that the spillover effects of the minimum wage on higher wages are limited.



(a) Missing and Excess Jobs over Time (b) Wage Distribution

Figure 9: Impact of Minimum Wages on Vacancy

Note: Panel (a) shows the estimated excess posting jobs and missing posting jobs for each month before and after the minimum wage increase. Panel (b) shows the estimated impact of the minimum wage increase on vacancy for each group e in the wage distribution.



(a) Missing and Excess Jobs over Time (b) Wage Distribution

Figure 10: Impact of Minimum Wages on Total Working Hours

Note: Panel (a) shows the estimated excess jobs and missing jobs for each month before and after the minimum wage increase. Panel (b) shows the estimated impact of the minimum wage increase on total working hours for each group e in the wage distribution.

suggest a modest increase in hours per vacancy: firms post fewer jobs but offer slightly longer hours per posting. Thus, minimum wage increases primarily affect spot labor demand through the extensive margin of vacancy creation, accompanied by a limited compensating adjustment along the intensive margin.[20]

[20]In Appendix A.3, we examine the platform revenue.

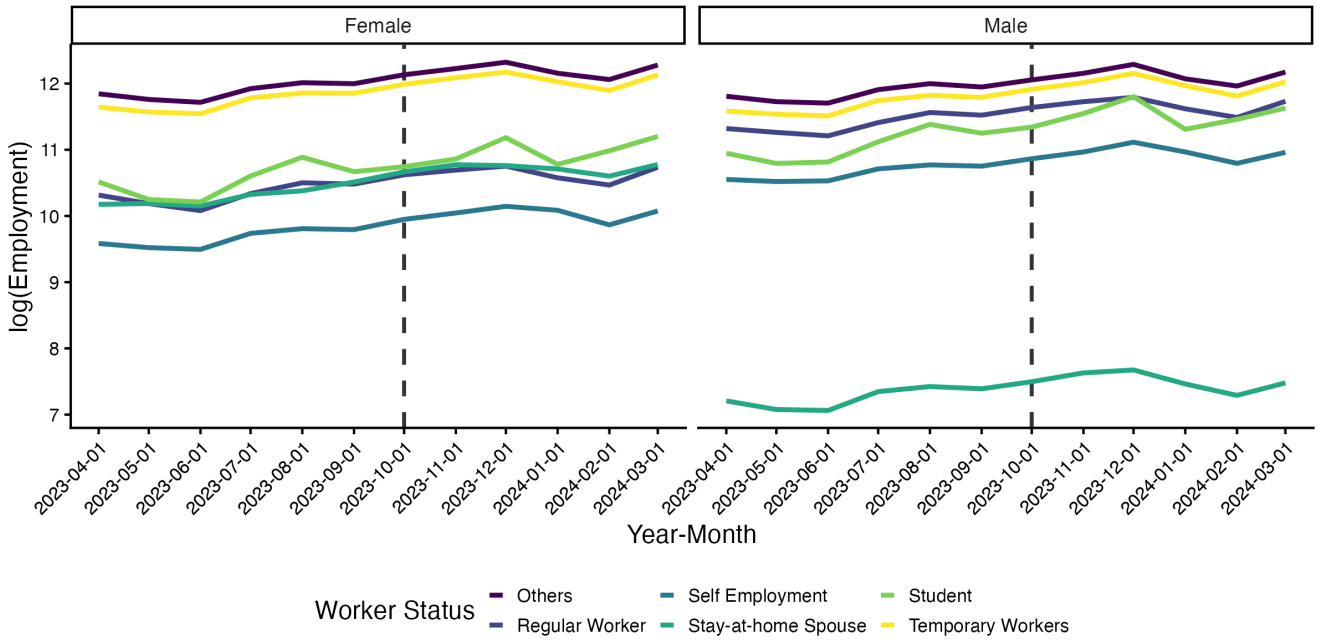


Figure 11: Employment Dynamics by Worker Status

Note: This describes the temporal dynamics of the logarithm of worker counts by worker status.

5.3 Discussion of the Impact on Spot Labor Supply

A natural concern is whether minimum wage increases affect spot labor supply (Godøy *et al.* 2024), particularly in the Japanese context where labor supply often exhibits seasonal adjustment toward the end of the fiscal year (Akabayashi 2006, Takahashi *et al.* 2009, Bessho and Hayashi 2014, Yokoyama and Kodama 2016, Yokoyama 2018). In principle, workers may respond to higher minimum wages by reducing participation or reallocating effort across jobs (Kodama and Momota 2024, Mori and Okudaira 2025). In standard employment relationships, however, tracking short-run labor supply adjustments at daily or weekly frequencies is challenging, as hours and participation are typically observed only at coarse intervals. In contrast, while spot work platforms capture worker behavior only within the platform, they offer a unique advantage: high-frequency observation of worker-side actions throughout the fiscal year. This allows us to examine whether workers reduce engagement with spot work as the year-end approaches.

The left panel of Figure 11 reports the log number of employed female workers by worker status, while the right panel reports the corresponding series for males. Across all gender–status groups, employment displays a similar upward trend, with no evidence of a differential slowdown for groups that are more likely to face tax-related work disincentives toward the end of the fiscal year. Although temporary female workers and stay-at-home spouses are more likely to qualify for spousal tax deductions in Japan, employment continues to rise through November and December

2023 for both women and men. The absence of gender- or status-specific divergence indirectly suggests that the observed decline in spot employment following the minimum wage increase is unlikely to be driven by labor supply adjustments. Instead, the evidence points to labor demand responses by firms as the primary driver. Moreover, the steady growth in spot employment toward year-end indicates that spot work contributes to income gains outside the immediate vicinity of institutional thresholds such as the spousal tax deduction, highlighting its role in expanding earning opportunities rather than amplifying year-end labor supply constraints.

6 Heterogeneous Job-Posting Responses to the Minimum Wage

This section investigates heterogeneity in firms' responses to minimum wage increases, motivated by the idea that adjustment costs and bindingness vary systematically across locations, occupations, and job attributes, leading employers to reallocate employment and modify postings along margins that are cheapest to adjust in the short run.[21]

6.1 Prefecture-month and Occupation-month Level DID Estimates

In Section 5.1, we estimate the effect of the minimum wage increase on the outcome by aggregating the events of the minimum wage increase across prefectures. However, the minimum wage bite varies across prefectures, and the relationship between the employment effect and the Kaitz index (the ratio between the median wage and the minimum wage) is intrinsically interesting. We implement the DID identification strategy separately for each prefecture p, and show that the estimated employment effects are more negative in prefectures with a higher Kaitz index.

Specifically, we first construct a separate dataset for each prefecture p and wage bin j and run the following regression within each dataset:

$$Y_{j,t}^{p} = \sum_{l \neq -1} \sum_{e \neq \infty} \mu_{l,e}^{p} \mathbf{1}\{t - 7 = l\} \mathbf{1}\{E_{j}^{p} = e\} + \alpha_{e}^{p} + \lambda_{t}^{p} + \epsilon_{j,t}^{p}. \tag{2}$$

Here, the superscript p indicates that this regression is estimated separately for each prefecture p. As in Equation (1), each coefficient $\mu_{l,e}^{p}$ is the DID estimand, capturing the dynamic effect of the minimum wage increase on the outcome at a given period l in prefecture p under the DID

[21] Additional heterogeneity analysis is shown in Appendix B.

identifying assumptions:

$$\mu_{l,e}^{p} = E[Y_{j,7+l}^{p} - Y_{j,6}^{p} | E_{j}^{p} = e] - E[Y_{j,7+l}^{p} - Y_{j,6}^{p} | E_{j}^{p} = \infty],$$

where the pre-treatment period is $l = -1$ and the control group is group ∞ in prefecture p.

Next, as in Section 4.2, we compute the missing jobs, excess jobs, and the overall employment effect for each prefecture p by aggregating $\mu_{l,e}^{p}$ in the first step:

$$\Delta a^{p} = \sum_{l=0}^{5} \Delta a_{l}^{p}, \quad \Delta b^{p} = \sum_{l=0}^{5} \Delta b_{l}^{p}, \quad \Delta e^{p} = \sum_{l=0}^{5} \Delta e_{l}^{p},$$

where the superscript p indicates that each quantity is defined within prefecture p.

6.2 Prefecture-month Level Results

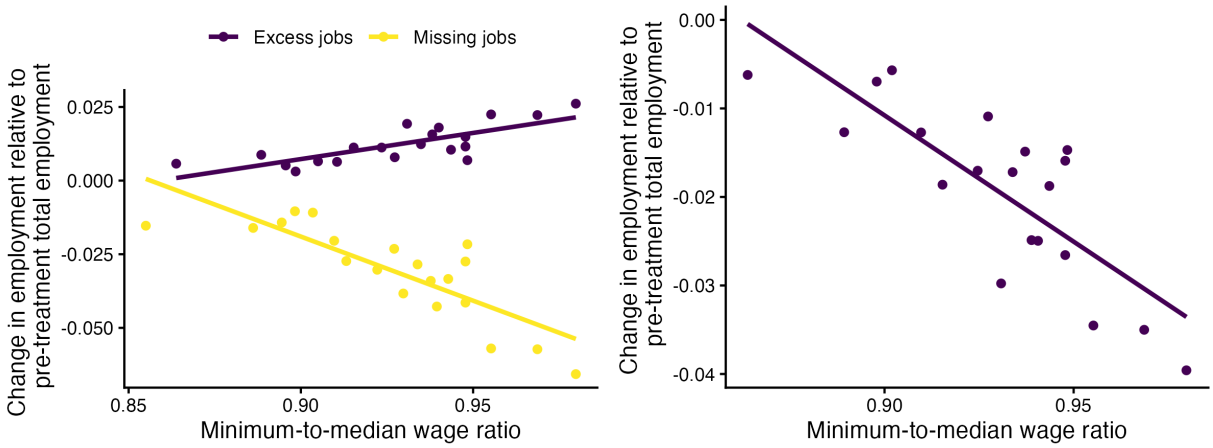
Figure 12 illustrates the relationship between the Kaitz index and employment outcomes across prefectures. The Kaitz index is calculated for each prefecture as the ratio of the October 2023 median wage to the increased minimum wage. Panel (a) plots the estimated numbers of missing and excess jobs against the Kaitz index. It shows a positive association between the Kaitz index and excess jobs, and a negative association with missing jobs. When the minimum wage is high relative to the median wage, minimum wage hikes tend to have a stronger impact. Panel (b) presents the relationship between the Kaitz index and the overall employment effect, revealing a negative correlation. These findings suggest that, in Japan's spot work market, minimum wage increases have already begun to produce modest negative employment effects, in contrast to the United States, where such effects remain limited (Cengiz *et al.* 2019).

6.3 Occupation-month Level Results

While prior studies have often concentrated on sectors like restaurants—where the minimum wage is most binding and effects are more easily detected—we adopt a distributional approach that captures wage and employment responses even in industries with limited direct exposure. This enables a more comprehensive evaluation of the policy's impact across a broader range of occupations.[22]

Figure 13 illustrates heterogeneous occupation-level responses to minimum wage hikes, revealing distinct patterns across job categories. The most pronounced employment losses below the

[22] Lordan and Neumark (2018) and Aaronson and Phelan (2019) find that the minimum wage reduces the employment of the lowest-wage workers in routine automatable occupations. Dustmann *et al.* (2022) find that minimum wages could also affect productivity by improving the composition of jobs in the economy; in response to minimum wage increases, small, inefficient firms exited the market, and workers at these firms found employment at more productive firms. Also, Forsythe (2023) finds that there is no heterogeneity across occupations.



(a) Missing and Excess Jobs

(b) Employment Change

Figure 12: Relationship between Excess Jobs, Missing Jobs, Employment Change, and the Kaitz Index (Minimum-to-Median Wage Ratio) across Prefectures

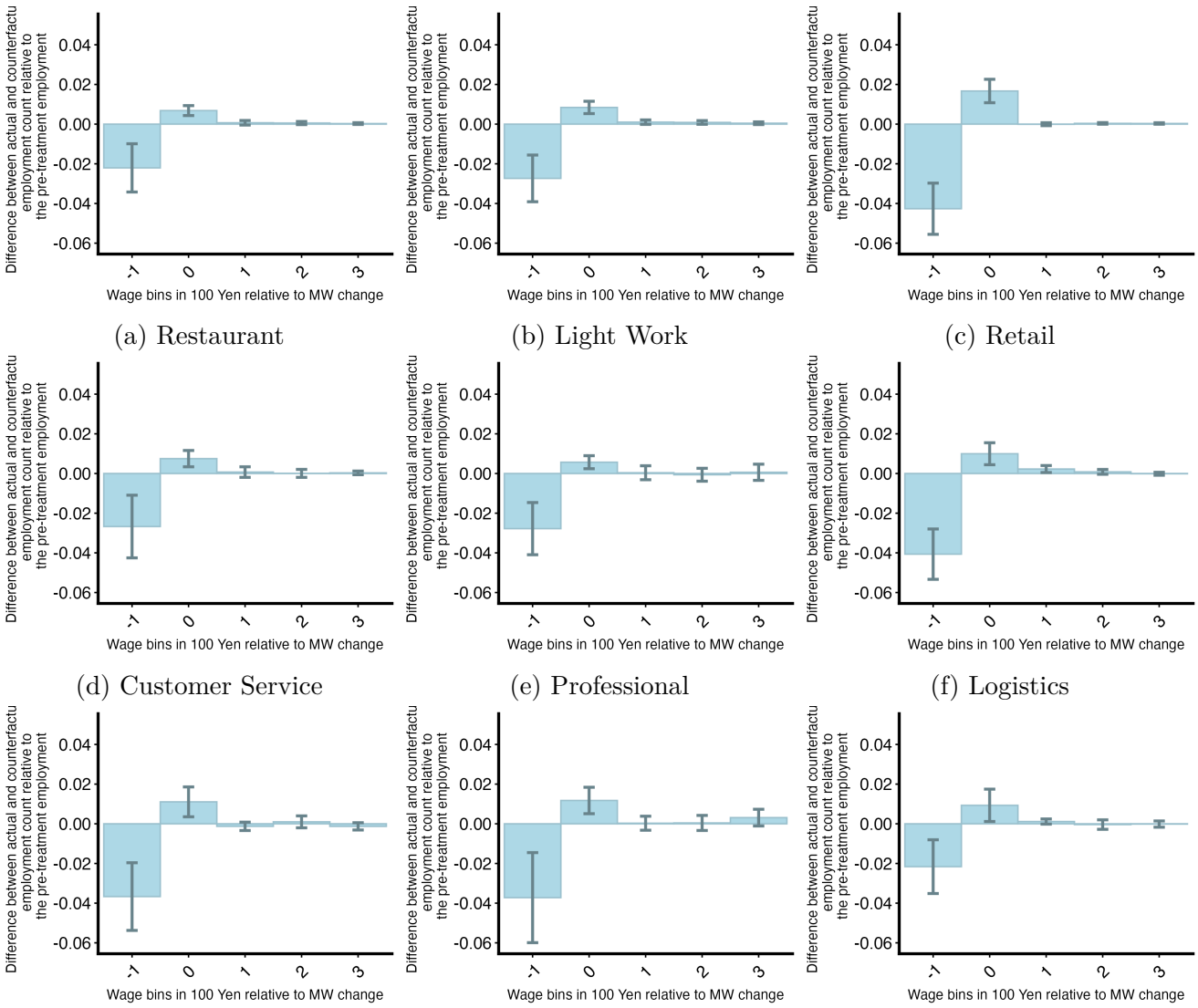
Note: Figure 12 shows the binned scatter plots for missing and excess jobs in Panel (a), and total employment changes in Panel (b) by the value of the minimum-to-median wage ratio (Kaitz index) for the 47 prefecture-specific estimates. The Kaitz index is calculated for each prefecture as the ratio of the October 2023 median wage to the increased minimum wage.

new minimum wage occur in Restaurant, Retail, and Event Staff, where a substantial number of low-wage jobs disappear. In contrast, occupations such as Logistics, Customer Service, and Light Work exhibit relatively balanced patterns, with moderate excess job creation at or just above the new minimum that partially offsets missing jobs. Professional and Entertainment roles show smaller overall impacts, suggesting limited exposure to the minimum wage threshold.

Notably, Office Work stands out as the only occupation with significant employment gains concentrated in the higher wage bins, implying that employers may be attempting to upgrade their workforce quality by attracting more capable workers—what appears to be a "quality jump" in response to rising labor costs. A potential reason is that, unlike other spot work, office positions may carry stronger incentives for firms to shorten vacancy duration and fill jobs quickly, prompting them to post higher wages to attract suitable workers. Overall, these findings suggest that minimum wage increases lead not only to occupational reallocation but also to qualitative adjustments in hiring, especially in tasks related to office work.

6.4 Heterogeneity Across Job Attributes

Beyond aggregate employment and vacancy responses, minimum wage increases may alter the composition of jobs posted on the platform. We therefore examine heterogeneity across job attributes inferred from posting descriptions, which capture salient characteristics such as amenity provision



(a) Restaurant (b) Light Work (c) Retail

(d) Customer Service (e) Professional (f) Logistics

(g) Entertainment (h) Office Work (i) Event Staff

Figure 13: Impact of Minimum Wages on Employment and Wages by Occupation

Note: Figure 13 shows the estimated impact of the minimum wage increase on employment for each group e in the wage distribution for each occupation in the platform.

and gender or skill targeting. These attributes allow us to classify postings into economically meaningful groups and to assess which types of jobs expand or contract following the minimum wage increase. By tracking changes in employment across these description-based categories, we study how the composition of spot jobs adjusts in the short run, complementing evidence on longer-run reallocation documented in Dustmann *et al.* (2022).

Transportation Reimbursement Provision Figure 14 examines how minimum wage increases affect employment dynamics by whether a job posting offers transportation reimbursement.

We find that postings that do not offer transportation reimbursement experience a modest but systematic decline after the reform, indicating that these jobs are more likely to disappear when labor costs rise. In contrast, postings that provide transportation reimbursement are relatively more resilient, with a small increase in excess employment.

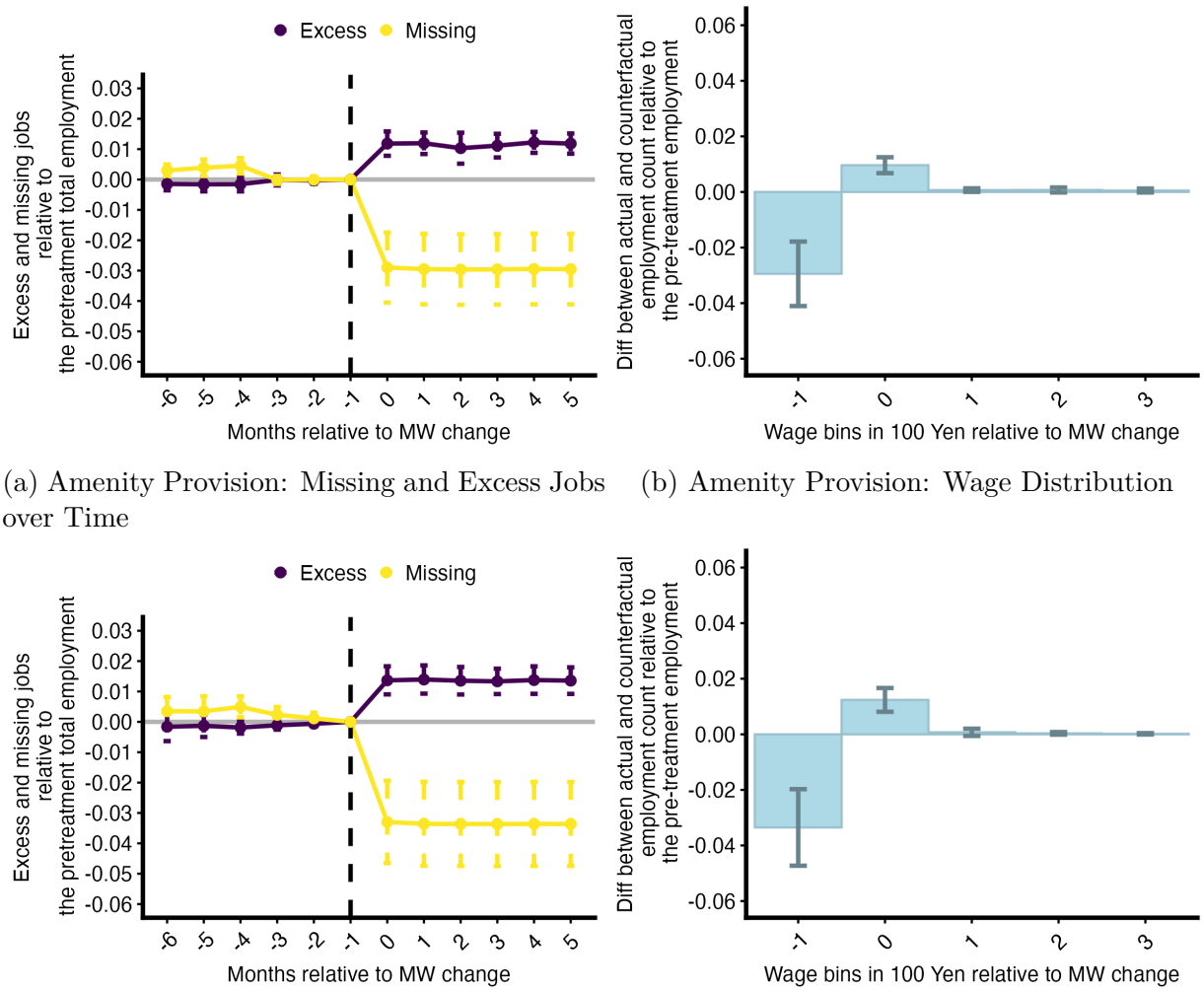
This pattern should be interpreted as a compositional change rather than as evidence that firms actively raise reimbursement levels in response to the policy.[23] Jobs lacking transportation benefits are more likely to exit, mechanically increasing the average amenity level among remaining postings. Overall, these results suggest that minimum wage increases are accompanied by a reallocation of spot jobs toward positions offering higher non-wage amenities.

Job Description and Composition: Gender and Skill Targeting We next examine how the composition of job postings changes along dimensions related to worker targeting, as revealed by job descriptions. Although firms cannot screen or reject applicants on this platform, descriptions convey information about desired worker attributes and task requirements, shaping which workers are more likely to apply (Kuhn *et al.* 2020). We therefore interpret changes across description-based categories as reflecting shifts in the types of jobs being posted, rather than changes in hiring standards per se.

Figure 15 shows that postings explicitly targeting female applicants decline more sharply after the minimum wage increase than those targeting male applicants. This asymmetric contraction leads to a post-hike reweighting of employment toward male-targeted postings, indicating a change in the composition of jobs along the gender-targeting dimension. We interpret this as a task-fit reallocation: given that demand on the platform is concentrated in physically intensive, on-site tasks, postings targeting worker groups less aligned with those task requirements contract relative to others, rather than reflecting any intrinsic differences in worker productivity.

Figure 16 documents a similar compositional shift along the skill-targeting dimension. While the volume of missing jobs is comparable across beginner- and experienced-worker-targeted postings, excess job creation is concentrated among experienced-targeted postings and remains positive after the minimum wage increase. As a result, the composition of posted jobs tilts toward positions targeting more experienced workers. Taken together, these findings indicate that minimum wage increases are associated with systematic changes in job composition, favoring postings that target worker attributes more closely matched to task-specific productivity.

[23] Conditioning on surviving postings, average transportation reimbursement increases slightly after the reform, shown in Figure 17 in Appendix A.2.



(a) Amenity Provision: Missing and Excess Jobs over Time

(b) Amenity Provision: Wage Distribution

(c) No Amenity Provision: Missing and Excess Jobs over Time

(d) No Amenity Provision: Wage Distribution

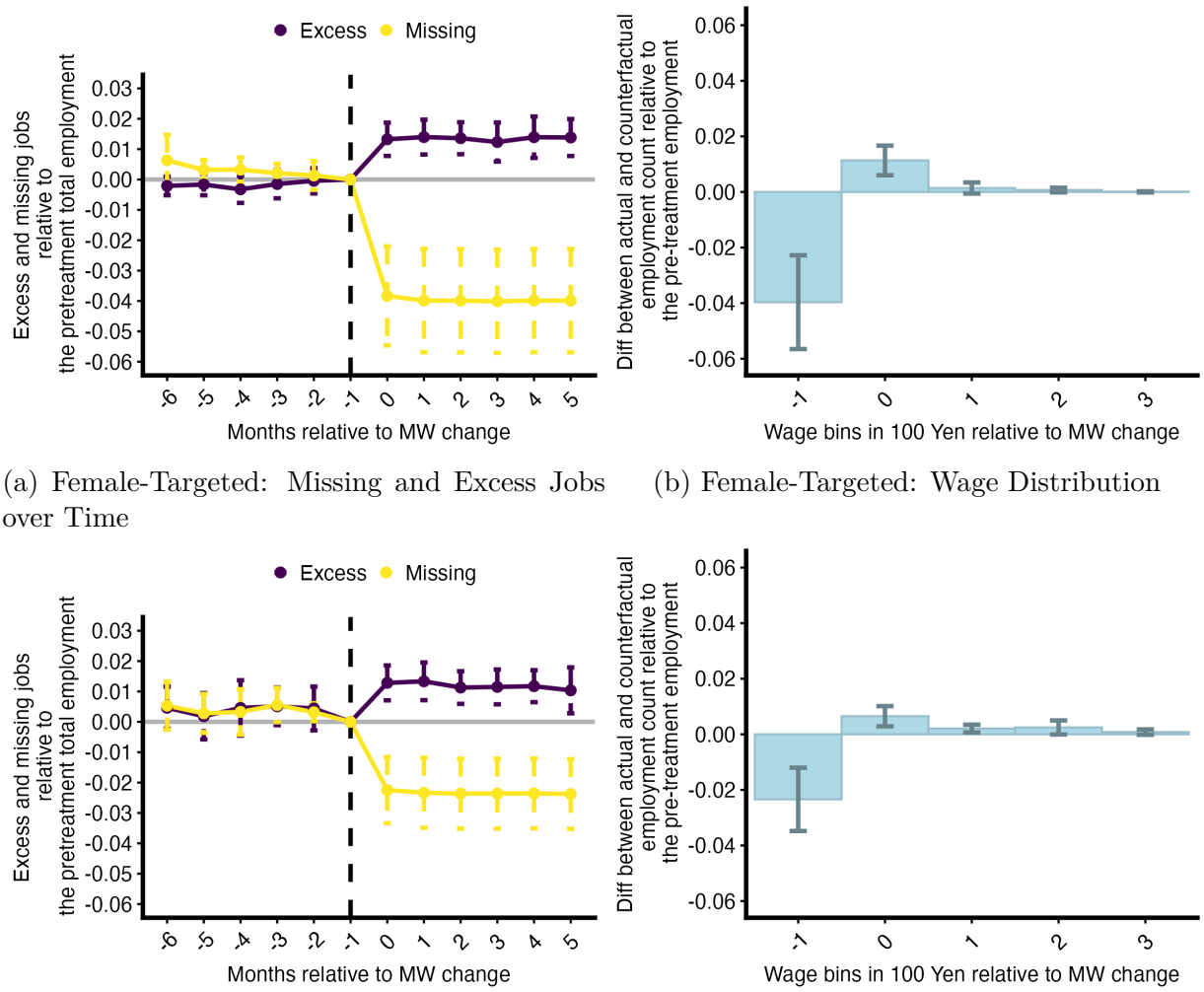
Figure 14: Impact of Minimum Wages on Employment Separated by Transportation Reimbursement Provision

Note: Panel (a) shows the estimated excess jobs and missing jobs for each month before and after the minimum wage increase. Panel (b) shows the estimated impact of the minimum wage increase on the corresponding jobs for each group e in the wage distribution.

6.5 Limitations

While our contract-level data allow us to examine the immediate responses of employers to minimum wage hikes in spot labor markets, several limitations remain. First, our data are limited to labor demand and supply within a single job-matching platform, which restricts the external validity of our findings. This limitation is shared by many studies relying on platform data (Horton 2025, Melo *et al.* 2025, Stanton and Thomas 2021).

Second, although we observe high-frequency adjustments in wages and transportation reim-



(a) Female-Targeted: Missing and Excess Jobs over Time

(b) Female-Targeted: Wage Distribution

(c) Male-Targeted: Missing and Excess Jobs over Time

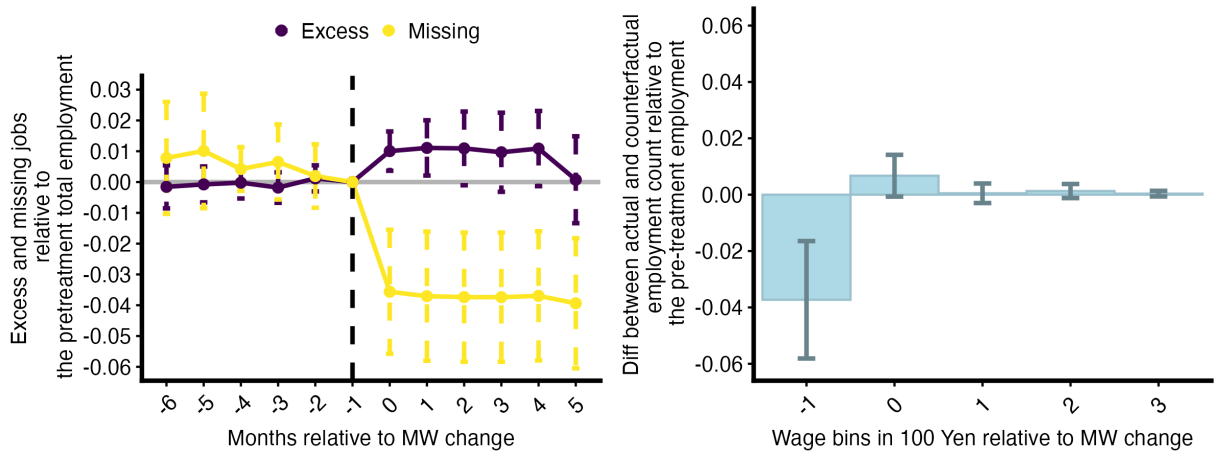
(d) Male-Targeted: Wage Distribution

Figure 15: Impact of Minimum Wages on Employment Separated by Gender

Note: Panel (a) plots the changes in female-targeted jobs before and after the minimum wage increase. Panel (b) plots the estimated effects of minimum wage increases on female-targeted jobs for each group $e \in \{0, \ldots, 3\}$. Panels (c) and (d) provide the corresponding results for male-targeted jobs.

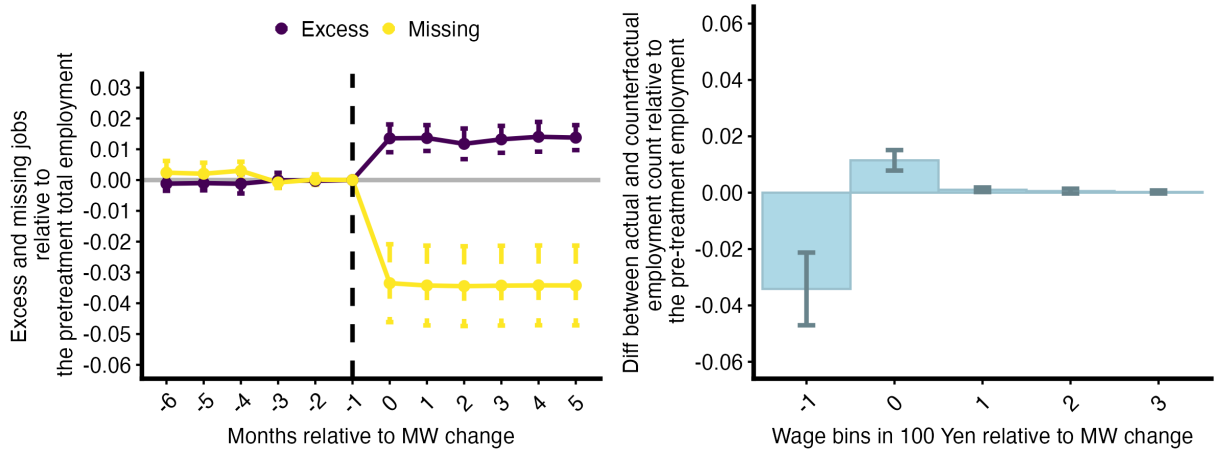
bursement, we cannot analyze employer responses along other production margins. In particular, we are unable to examine substitution between spot workers and other inputs, such as capital or long-term contract workers. For instance, Harasztosi and Lindner (2019) find that firms exposed to minimum wage increases raise capital investment relative to unexposed firms. However, such capital-labor substitution is likely to be limited in the short run, as investment decisions typically unfold over longer horizons.

Labor-labor substitution, by contrast, may operate on shorter time scales. Establishments may stop posting on the platform or reallocate tasks to existing long-term workers. Clemens *et al.* (2021)



(a) Beginner-Targeted: Missing and Excess Jobs over Time

(b) Beginner-Targeted: Wage Distribution



(c) Experienced-Worker-Targeted: Missing and Excess Jobs over Time

(d) Experienced-Worker-Targeted: Wage Distribution

Figure 16: Impact of Minimum Wages on Employment Separated by Skill Requirement

Note: Panel (a) plots the changes in beginner-targeted jobs before and after the minimum wage increase. Panel (b) plots the estimated effects of minimum wage increases on beginner-targeted jobs for each group $e \in \{0, \ldots, 3\}$. Panels (c) and (d) provide the corresponding results for experienced-worker-targeted jobs.

show that skill requirements increased in low-wage jobs after minimum wage hikes, suggesting one channel through which employers adjust labor composition. As Dube and Lindner (2024) discuss, reallocating existing long-term workers may act as a form of wage retrenchment. Unfortunately, our data do not allow us to observe establishment-level staffing decisions that include both spot and non-spot workers.

Taken together, our findings provide valuable insights into short-term adjustments in response to minimum wage hikes, but a fuller understanding of firm behavior would require richer data linking spot and long-term employment as well as broader measures of job quality.

7 Conclusion

This paper studies short-run minimum-wage effects in a spot labor market using high-frequency, posting- and contract-level data from Timee. Using a wage-bin DID design, we find that missing jobs below the new minimum wage exceed excess jobs just above it, yielding a net employment decline of about 2 % in affected bins and an elasticity around −0.39. These effects appear immediately after implementation and remain stable over the post-reform window. By comparing vacancies and matches, we show that the employment decline is driven primarily by reductions in vacancy creation—i.e., labor demand—rather than by changes in worker supply or hours per vacancy. Because spot work is the most flexible adjustment margin, these short-run elasticities should be interpreted as upper bounds for standard employment elasticities in traditional labor markets, complementing rather than contradicting longer-run evidence on reallocation and exit.

We also document systematic reallocation across job types and locations. Employment losses are larger in prefectures with higher minimum-wage bite and in low-wage occupations such as restaurants and retail, while some higher-wage postings expand. Using job-description and amenity information, we show that the composition of postings shifts across economically meaningful types, indicating short-run reallocation within the spot market.[24] Taken together, our results provide a high-frequency picture of how minimum-wage hikes reshape employment and vacancy distributions in the short run, and they offer a foundation for linking immediate adjustments to longer-run reallocation dynamics.

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A Additional Analysis

A.1 Elasticities Related to Minimum Wages

Following the method of Cengiz *et al.* (2019), we estimate (i) the elasticity of employment with respect to minimum wages and (ii) the employment elasticity with respect to the affected wages.

Table 2: Impact of Minimum Wages on Employment and Wages

	Estimate (SE)
Missing jobs below new MW	-0.03
	(0.006)
Excess jobs above new MW	0.012
	(0.002)
Affected wages	0.366
	(0.171)
Affected employment	-0.268
	(0.091)
Employment elasticity w.r.t MW	-0.388
	(0.132)
Emp. elasticity w.r.t affected wage	-0.732
	(0.091)
Job below new MW	0.068
% MW changes	0.047

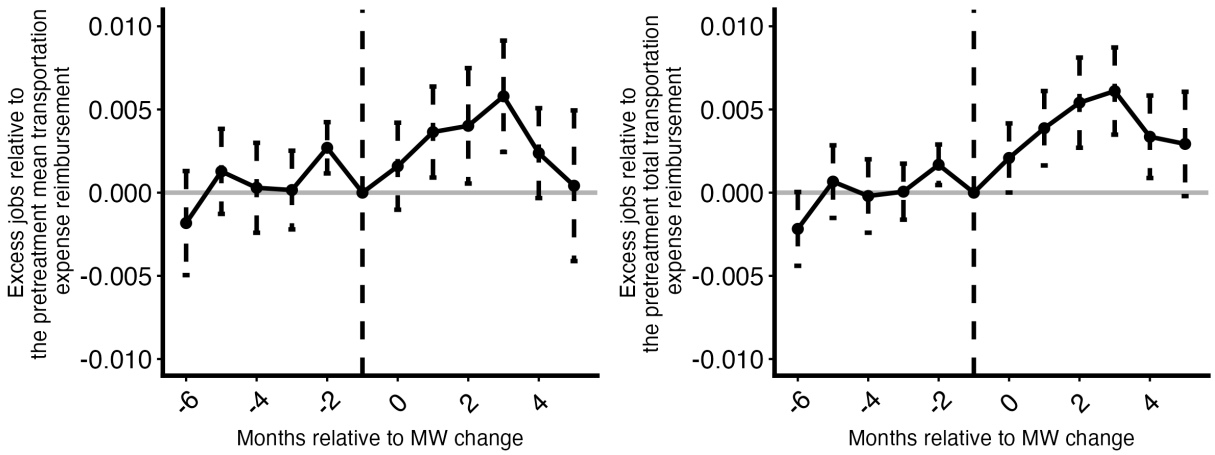
Note: The table reports the effects of a minimum wage increase based on the event study analysis exploiting 47 prefecture-level minimum wage changes in 2023 (i.e., about 4% minimum wage increase). The table reports six-month averaged post-treatment estimates on missing jobs up to 100 JPY below the new minimum wage, excess jobs at and up to 300 JPY above it, employment, and wages. Robust standard errors in parentheses are clustered by wage bins separated by 10 JPY.

Table 2 reports six-month–averaged post-treatment effects for the baseline specification depicted in the Figure 8. The magnitude of missing jobs below new minimum wages exceeds the magnitude of excess jobs above new minimum wages in the six-month window. The estimated employment elasticity with respect to the minimum wage is -0.388, which is consistent with Figure 8. Unlike the findings of Cengiz *et al.* (2019) and Dube and Zipperer (2024), our own-wage elasticity is -0.732, indicating that wages are relatively elastic to minimum-wage changes compared with the median estimate (-0.13) reported by Dube and Lindner (2024).

A.2 Other Measured Outcome

Amenity as Outcome We estimate the impact of minimum wage increases on transportation reimbursement offered by firms as an amenity. The estimation method follows that of Section 4,

with the outcome variable being transportation reimbursement linked to employment (set to zero if no allowance is provided) and the probability of providing any transportation allowance. Since employment in group $e = -1$ disappears after the minimum wage revision, we focus on estimating and aggregating the effects on transportation reimbursement for groups with $e \geq 0$.



(a) Amenity Amount over Time (b) Amenity Provision Probability over Time

Figure 17: Impact of Minimum Wages on Transportation Reimbursement and Staff Meals as Amenities

Note: Panel (a) plots the excess wage bin's changes in transportation reimbursement before and after the minimum wage increase. Panel (b) provides the corresponding probabilities of providing transportation reimbursement.

Panel (a) in Figure 17 displays the estimated changes in transportation reimbursement, measured relative to the timing of the minimum wage increase. The estimates fluctuate around zero in the pre-treatment period and show no systematic trend following the policy change, suggesting that transportation reimbursement as an amenity remained largely stable over time. While some estimates are statistically significant at conventional levels—peaking around a 0.6% increase—they are economically negligible in the post-treatment period. This indicates that the minimum-wage impact via the intensive margin did not meaningfully extend to changes in transportation reimbursement practices.

Panel (b) in Figure 17 presents the dynamic effects of the minimum wage increase on the provision probability of transportation reimbursement. The estimates gradually increase in the post-treatment period, peaking around 0.7%, suggesting a statistically significant but economically modest increase in the likelihood that firms offer this amenity. This pattern suggests that although there is some statistically detectable response at the extensive margin—whether or not the amenity is offered—the degree of adjustment remains limited. Thus, even when considering the amenity provision decision itself, the minimum-wage effect on amenities appears minimal.

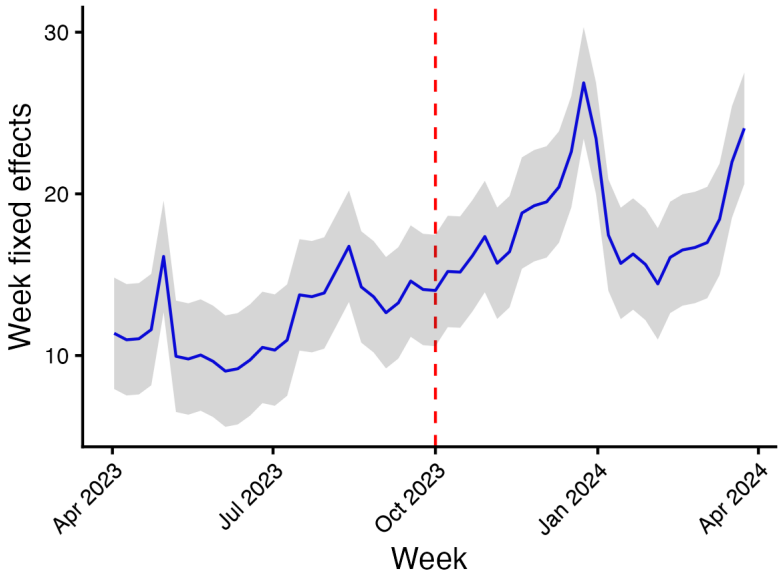


Figure 18: Estimated Week Fixed Effects in Contracted Total Earnings

Note: This describes the week fixed effects with confidence intervals from a regression of total earnings at the prefecture-week level on prefecture and week dummy variables. Total earnings is calculated as hourly wages multiplied by working hours.

A.3 Platform Revenue

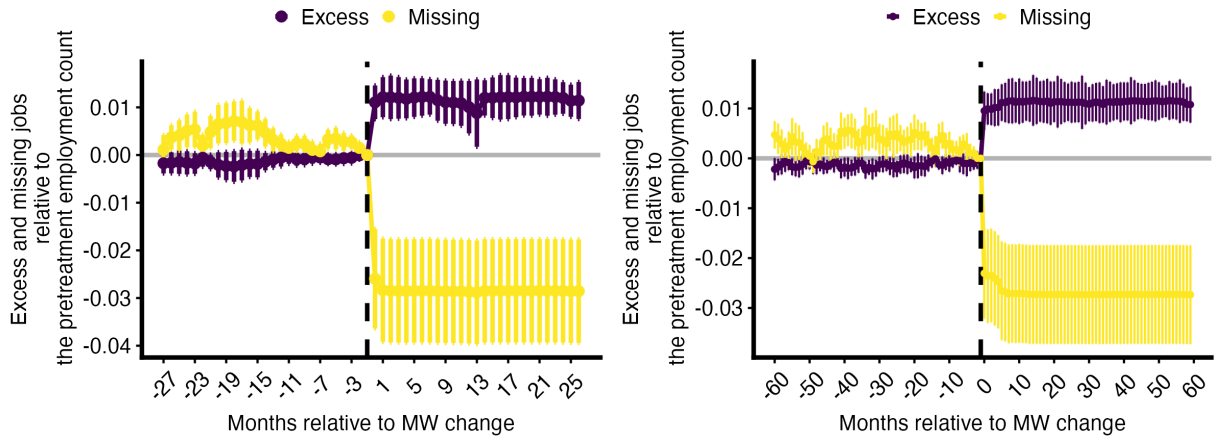
A key advantage of using platform data is the ability to observe not only posted wages but also actual matching outcomes—namely, the contracted payments—on a daily basis. Even if employment volume declined as shown above, rising wages due to the minimum wage hike would still raise total earnings. Since 30% of contracted payments are paid by businesses to the platform as revenue, this indicator is directly linked to platform earnings.

Figure 18 illustrates the temporal dynamics of weekly fixed effects from a regression of total earnings at the prefecture-week level on prefecture and week dummy variables. The observed post-October increase in total earnings indicates that the minimum wage revision had a limited impact on platform revenue. The stability in total earnings before and after the revision suggests that the policy primarily altered the composition of contracted payments, reflecting a shift toward higher hourly wages, with working hours remaining stable and a slight decline in the number of matched workers, rather than a change in total transaction volume.

A.4 Time Window

In this section, we discuss the robustness of the time-window specification used in Section 4. Section 4 conducts the analysis at the monthly level. However, because gig work can adjust flexibly to

fluctuations in the labor market, analyses at the weekly or daily frequency may reveal more flexible patterns of employment adjustment. Therefore, we consider two alternative units of analysis: wage bin-prefecture-week and wage bin-prefecture-day.



(a) Missing and Excess Jobs over Time per week (b) Missing and Excess Jobs over Time per day

Figure 19: Impact of Minimum Wages on Employment

Note: Panel (a) shows the estimated excess jobs and missing jobs for each week before and after the minimum wage increase. Panel (b) shows the estimated excess jobs and missing jobs for each day before and after the minimum wage increase. In Panel (b), we restrict the analysis to the period from 60 days before to 60 days after the treatment in order to focus on changes around the treatment, and report the results.

Panel (a) in Figure 19 shows weekly changes in missing and excess jobs. Although the pre-trend estimates fluctuate, they remain close to zero. After the minimum wage revision, the dynamics of excess and missing jobs are stable, and the magnitude of the point estimates is similar to that in Figure 8. Panel (b) in Figure 19 shows daily changes in missing and excess jobs. To focus on changes around the treatment, we restrict the analysis to the period from 60 days before to 60 days after the treatment and report the results. As in Panel (a), the pre-trend estimates fluctuate but remain close to zero. After the minimum wage increase, changes in missing and excess jobs are stable, and the point estimates are similar to those in Figure 8.

In summary, these results indicate that, even at the weekly or daily frequency, fluctuations in missing and excess jobs are stable, implying that the minimum wage has a consistent effect on the gig work market.

A.5 Difference-in-Difference-in-Differences Approach

In this section, we introduce a difference-in-difference-in-differences (DDD) approach as a sensitivity check for our identification strategy. Our baseline difference-in-differences (DiD) specification relies on the assumption that, absent the policy change, the treated and control wage bins would

have followed parallel trends. However, in practice, it is plausible that employment proportion in wage bins close to the minimum wage threshold and those in higher-wage bins exhibit different underlying trends even before the policy change. Such wage-bin-specific trends may arise from differential demand conditions, compositional changes, or other factors that are correlated with wage levels.

To mitigate concerns about differential wage-bin trends, we propose a DDD specification based on year-over-year (YoY) differences. The key idea is to difference out wage-bin-specific seasonal or persistent components by comparing each month's outcome to the same month in the previous year, and then applying the DiD structure to these YoY changes. Our DDD regression is:

$$\frac{Y_{j(p),t}}{N_{p,t}} - \frac{Y_{j(p),t-12}}{N_{p,t-12}} = \sum_{l \neq -1} \sum_{e \neq \infty} \widetilde{\mu}_{l,e} \mathbf{1}\{t-7=l\}\mathbf{1}\{E_{j(p)}=e\} + \alpha_e + \lambda_t + \epsilon_{j,t}, \tag{3}$$

This specification is identical to our main event-study DiD regression except for our outcome variable. The outcome captures the year-over-year change in the employment rate in wage bin j of prefecture p, i.e., the difference between the rate in month t and the corresponding month one year earlier.

The parameters of interest are the set of $\widetilde{\mu}_{l,e}$. These parameters are defined as:

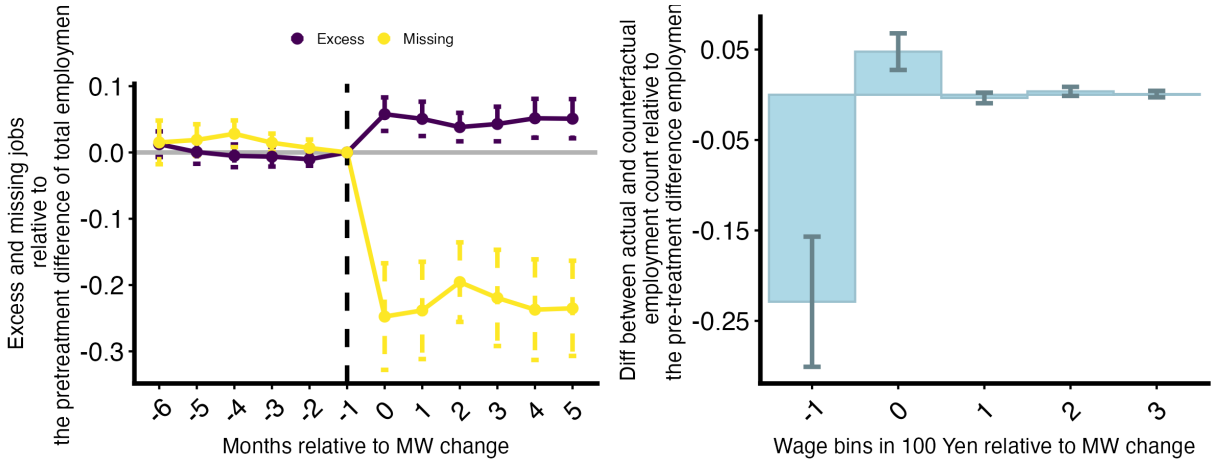
$$\begin{aligned}
\widetilde{\mu}_{l,e} =& E\left[\left(\frac{Y_{j(p),7+l}}{N_{p,7+l}} - \frac{Y_{j(p),7+l-12}}{N_{p,7+l-12}}\right) - \left(\frac{Y_{j(p),6}}{N_{p,6}} - \frac{Y_{j(p),6-12}}{N_{p,6-12}}\right) \middle| E_{j(p)} = e\right] \\
& - E\left[\left(\frac{Y_{j(p),7+l}}{N_{p,7+l}} - \frac{Y_{j(p),7+l-12}}{N_{p,7+l-12}}\right) - \left(\frac{Y_{j(p),6}}{N_{p,6}} - \frac{Y_{j(p),6-12}}{N_{p,6-12}}\right) \middle| E_{j(p)} = \infty\right] \\
=& \mu_{l,e} - \mu^F_{l,e},
\end{aligned}$$

where $\mu^F_{l,e}$ is defined as $E\left[\frac{Y_{j(p),7+l-12}}{N_{p,7+l-12}} - \frac{Y_{j(p),6-12}}{N_{p,6-12}} \middle| E_{j(p)} = e\right] - E\left[\frac{Y_{j(p),7+l-12}}{N_{p,7+l-12}} - \frac{Y_{j(p),6-12}}{N_{p,6-12}} \middle| E_{j(p)} = \infty\right]$. The term $\mu^F_{l,e}$ can be interpreted as a placebo DiD parameter evaluated one year earlier: it captures the treated–control differential change between months 612 and $7 + l - 12$, i.e., in the pre-policy year (e.g., in 2022 when the policy change of interest occurs in 2023). In an ideal setting with no anticipation and no spurious differential dynamics, this placebo effect should be close to zero. More importantly, if treated and control groups are subject to different seasonal patterns, $\mu^F_{l,e}$ may be non-zero even in the absence of the policy. In that case, subtracting this placebo component from the baseline DiD estimand yields $\widetilde{\mu_{l,e}} = \mu_{l,e} - \mu^F_{l,e}$, which removes differential seasonality and provides a more robust estimate of the event-time treatment effect.

Note that this identification strategy implicitly requires that the 2022 minimum-wage revision does not affect postings that fall into wage bin j. In practice, however, this assumption may

not be satisfied. In our data, wage bins j are constructed based on the wage distribution of postings (or realized matches) observed between April 2023 and March 2024. Consequently, over the period April 2023–September 2023, postings can mechanically fall into the wage range above the 2022 minimum wage but below the higher minimum wage introduced in 2023. Therefore, if the 2022 minimum-wage increase affected postings in this wage range, the parameter identified by our DDD specification, $\widetilde{\mu}^F_{l,e}$, should be interpreted as removing not a "clean" placebo effect but a contaminated placebo term, $\mu^F_{l,e}$, which captures the impact of the 2022 minimum-wage revision.

This contamination matters for our interpretation. In our framework, this wage range corresponds to "missing jobs" in 2023, but to "excess jobs" in 2022. If the 2022 minimum-wage hike generated excess postings in that range, the DDD procedure would net out those excess jobs when forming the placebo difference, thereby mechanically boosting the estimated missing-job effect. As a result, the coefficient estimates for missing jobs may be biased toward more negative, even under an otherwise valid DDD design.



(a) Missing and Excess Jobs over Time

(b) Wage Distribution

Figure 20: Impact of Minimum Wages on Employment

Note: Panel (a) shows the estimated excess jobs and missing jobs for each week before and after the minimum wage increase. Panel (b) shows the estimated impact of the minimum wage increase on employment for each group e in the wage distribution.

Panel (a) in Figure 20 shows the estimated excess jobs and missing jobs for each month before and after the minimum wage increase in our DDD specification. Panel (b) presents the estimated impact of the minimum wage increase on employment for each group e in the wage distribution.

Three important findings emerge from Panels (a) and (b) of Figure 20. First, the estimated excess and missing jobs are close to zero in the pre-treatment period, prior to the minimum-wage increase. Second, although the magnitude of the estimates is larger than in our baseline DID specification (Equation 1), the time patterns of the point estimates are similar. Finally, we find no

evidence of spillover effects to higher wage tiers for $e \geq 1$. Taken together, these findings suggest that our baseline results are potentially robust to allowing for heterogeneous time trends across wage bins.

A.6 Firm-level Exposure Approach

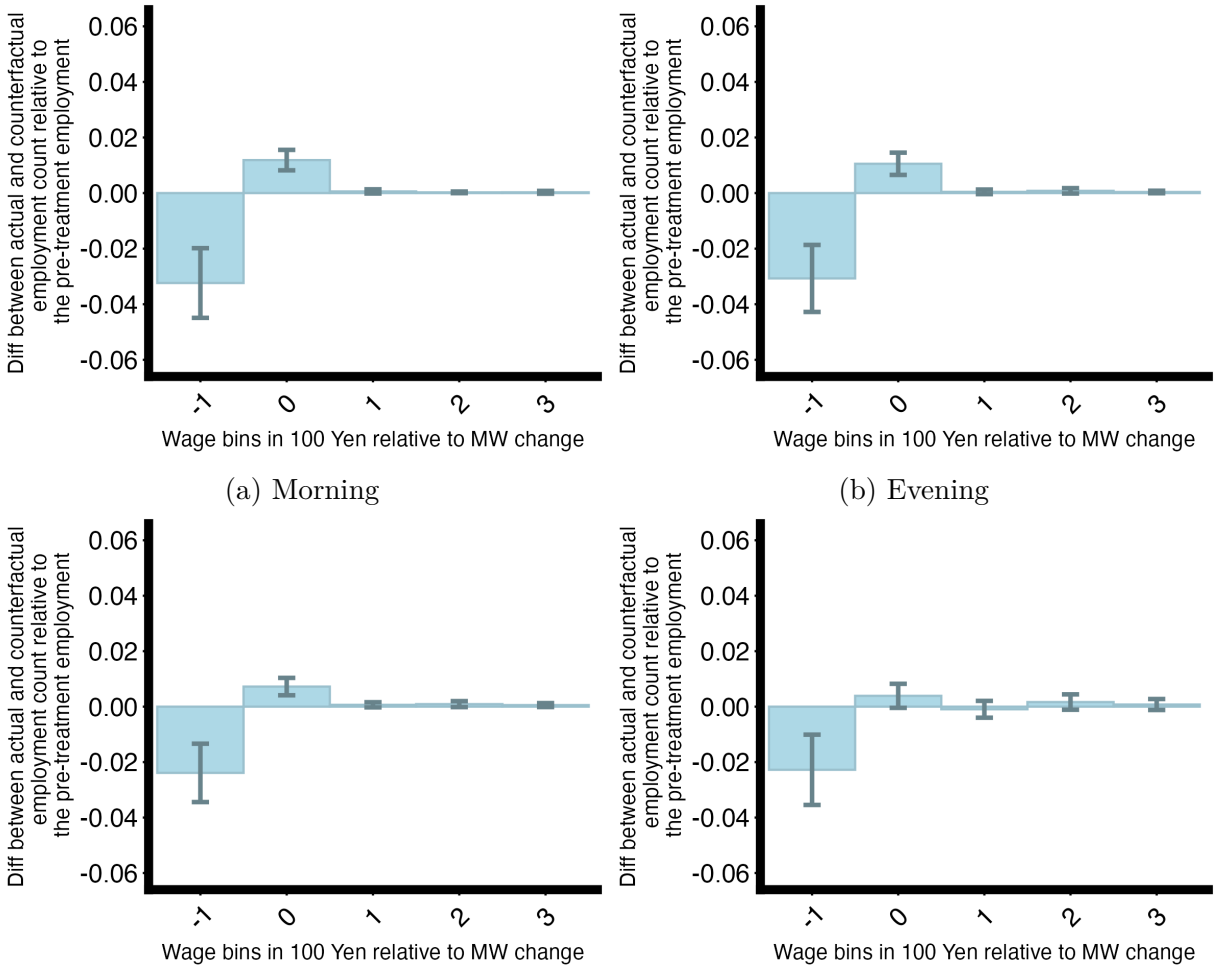
Recent studies on minimum wages and employment, such as Card and Krueger (1994), Machin *et al.* (2003), Draca *et al.* (2011), and Harasztosi and Lindner (2019), adopt a firm-level exposure approach to examine how firms respond to minimum wage increases. Firm-level analyses are useful for understanding firms' margins of adjustment, including changes in amenities and firm entry and exit. Such analyses are appropriate when the set of firms affected by minimum wage hikes can be clearly identified and when their employment records are observed consistently over time (Dube and Lindner 2024).

In contrast, firms on the platform typically recruit workers in a manner that reflects the seasonality of their respective industries, and only a small fraction of firms hire continuously throughout the year. Moreover, it is not possible to distinguish between firms that have permanently exited the platform and those that simply did not use it during a given period because of their seasonality. Consequently, even if firm-month–level data are constructed from contract-level records by restricting attention to firms that keep job postings continuously, the resulting sample is likely to differ substantially from the overall population of firms on the platform. This difference makes firm-level analysis based on such data difficult to interpret.

B Heterogeneity Analysis

B.1 Across Working-Hour Categories

Time Slot Reallocation Next, we estimate the impact of minimum wage increases on employment across different time slots, which may play a role as a non-wage amenity. Specifically, we divide the 24-hour day into four periods—morning (6:00–12:00), afternoon (12:00–18:00), evening/night (18:00–24:00), and late night (24:00–6:00)—and estimate the effect of minimum wage increases on employment within each time slot. This time-of-day granularity allows us to observe potential reallocation of spot labor within a day—for example, whether firms shift demand toward late-night hours in response to higher wage costs. Figure 21 presents the estimated effects of minimum wage increases on employment across different time periods. The figure shows that the impact of minimum wage hikes on employment is largely uniform across time slots, suggesting that there is no meaningful substitution of employment across time periods.



(a) Morning

(b) Evening

(c) Night

(d) Midnight

Figure 21: Impact of Minimum Wages on Employment by Working-Hour Category

Note: We divide the 24-hour day into four periods—morning (6:00–12:00), afternoon (12:00–18:00), evening/night (18:00–24:00), and late night (24:00–6:00).