# The Impact of Minimum Wages on Spot Labor Markets: New Evidence from Monthly Platform Data

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December 29, 2024

**Abstract**

This paper examines the short-term effects of minimum wage increases on employment, labor demand, and supply in spot labor markets using unique data from a Japanese platform. Characterized by low-skilled workers, short-term contracts, and wage-posting environments, spot labor markets offer a unique context to study labor dynamics. Using a Difference-in-Differences (DiD) approach, we find that binding minimum wages decrease employment by 9–15% but increase contract hours by 1.3–3.8%, with significant declines in vacancies (10.1–57.2%) and spot work utilization. These findings highlight labor input reallocation from workforce numbers to working hours, with variations across industries and regions.

**Keywords**: minimum wage, employment, gig worker, spot work

**JEL code**: J21, J23, J38, J88

## 1 Introduction

The gig economy, characterized by temporary, contract-based, and freelance online jobs rather than permanent positions, has witnessed rapid growth in recent years. An increasing share of freelance workers is now matched with customers through online platforms.[1] Despite the growing significance of the gig economy, research on the effects of minimum wage hikes within this context remains limited, with notable exceptions (Glasner 2023). In particular, there is a dearth of studies examining alternative work arrangements (Mas and Pallais 2020), especially spot labor markets for low-skilled jobs and workers. In this paper, we provide new causal evidence on the effects of

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We thank seminar and conference participants at 27th Labor Economics Conference at University of Tokyo. This work was supported by JST ERATO Grant Number JPMJER2301, Japan.

[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.

minimum wage hikes on short-term employment. Using confidential data from a Japanese spot labor market platform, we decompose the impact into establishments' labor demand and workers' labor supply in the short term, offering unique insights into the dynamics of low-skilled spot labor markets.

To study minimum wage impact in the short-term, spot labor markets exhibit three ideal features: limited heterogeneity in labor, short-term employment contracts, and a wage-posting environment. First, limited heterogeneity attracts low-skilled workers who are particularly susceptible to minimum wage changes, matching them to homogeneous spot jobs and making these markets closely resemble homogenous 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). Finally, the wage-posting environment precludes wage bargaining which is a common modelling assumption in the long-term employment contract, allowing us to focus on models grounded in monopsonistic or oligopsonistic labor market structures.

From a macroeconomic perspective, we first report a significant expansion of the private platform in the labor market for part-time spot employment between December 2019 and December 2023. The number of registered users, primarily unemployed individuals 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 dramatic 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 part-time spot employment matching.

Next, we employ a recent Difference-in-Differences (DiD) specification (Callaway and Sant'Anna 2021) to estimate the impact of minimum wage increases on establishment outcomes when their average wages become bound to the minimum wage. With the notable exception of Cengiz *et al.* (2019), most studies on minimum wages and employment focus on identifying the effects of a universal minimum wage by filtering worker and establishment characteristics, without distinguishing which workers are directly impacted. For instance, Manning (2021a) notes that workers classified as minimum wage earners are often teenagers, but their high school attendance rates challenge their alignment with neoclassical labor market models. By leveraging variation in the timing of minimum wage revisions across establishments, we identify the effect of average wages becoming bound to the minimum wage and track spot-level employment dynamics in establishments that

hire minimum wage workers. This allows us to estimate the causal effect on employment for minimum wage workers. Furthermore, we examine the macro-level relationship between the spot labor market and minimum wage increases using the "Own Wage Elasticity" (OWE) framework proposed by Dube and Lindner (2024), Dube and Zipperer (2024). This approach measures the impact of marginal wage changes caused by minimum wage increases on employment.

Our findings reveal that when wages become bound to the minimum wage, wages increase by 1.3% to 2.7%, while employment decreases by 9% to 15%, which are substantially large estimates compared to previous studies. Additionally, contract hours increase by 1.3% to 3.8%. This indicates that employers may adjust labor input by increasing hours for workers in response to higher wage costs, rather than expanding the workforce.

Our analysis reveals that minimum wage increases significantly impact labor demand and supply dynamics in spot labor markets. On the demand side, vacancy counts decline sharply (10.1–57.2%) immediately following the wage increase, with a persistent reduction in job postings over time, as establishments likely respond to higher labor costs by limiting new openings. Similarly, the number of active days per establishment on the platform decreases by 7.1–45.1%, reflecting reduced platform activity among businesses. Spot work utilization rates on the establishment side also decline (5.5–15.5%), suggesting a shift away from reliance on flexible or temporary labor. On the supply side, worker utilization rates decline by 2.2–13.1%, as some non-regular workers, constrained by Japan's tax deduction thresholds, reduce their labor supply to remain below annual income limits. These results suggest that minimum wage binding has negative effects on employment as both establishments and workers reduce their use of spot work platforms.

Finally, we examine the impact of minimum wage changes on employment and vacancies across industries and regions. Analysis across three sectors—restaurants, retail, and estates—reveals that restaurants and retail, as representative minimum wage industries, experience significant declines in employment (11.5–60.9%) and vacancies (14.9–68.9%) following minimum wage increases, with persistent effects over time. In contrast, the estate sector, which is less affected by minimum wage changes, shows no consistent trends, serving as a placebo test.

Regional analysis highlights heterogeneous effects of minimum wage changes on labor market outcomes across Tokyo (urban area), Shizuoka (rural area), and Okinawa (island area). In Tokyo, employment and vacancies exhibit moderate declines (employment: 13.6–55.3%; vacancies: 10.6–63.3%). Shizuoka shows smaller and inconsistent employment effects but a more pronounced decline in vacancies (39.3–63.3%), while Okinawa displays negligible impacts. These patterns underscore the importance of considering sectoral and regional differences in the labor market's response to minimum wage policies, influenced by variations in wage levels, economic structures, and labor demand conditions.

## 1.1 Related literature

Our paper relates to five distinct strands of literature: the employment effects of minimum wage increases, alternative work arrangements in spot labor markets, short-term employer responses to wage hikes, causal identification using individual binding designs, and the causal impact of minimum wages on employment in Japan.

First, it contributes to the extensive and often controversial literature on the employment effects of minimum wage increases. We provide new causal evidence on the impact of minimum wage hikes on minimum wage workers (Neumark and Wascher 2008, Belman and Wolfson 2014, Card and Krueger 2016). While much of the existing literature debates the employment effects of minimum wages (Card 1992a, Card and Krueger 1994, Neumark and Wascher 1992), most studies focus on specific industries, age groups, or educational backgrounds, with notable exceptions (Cengiz *et al.* 2019). However, these studies often fail to capture the overall impact of minimum wages on low-wage workers and low-wage-paying establishments across the broader labor market (Neumark and Wascher 2008, Manning 2021a). Using spot labor market data, we estimate the effects of minimum wage increases on low-wage workers and establishments without conditioning on workers' age, education, or industry.

Second, our paper contributes to the nascent literature on alternative work arrangements (Mas and Pallais 2020), focusing on labor markets with greater frequency and flexibility than classical labor markets. A key distinction between spot labor markets and traditional labor markets is the skill level of minimum wage workers. This study is the first to estimate the effects of minimum wage increases on wages, hours worked, and employment in spot labor markets. Alternative work arrangements facilitated by online platforms have grown significantly in recent years (Katz and Krueger 2019). In spot labor markets, employers post job openings on online platforms specifying the dates and nature of the work, while workers apply for postings based on their availability. These jobs, often low-skill and requiring minimal training, are frequently compensated at minimum wage levels. As such, the majority of workers and establishments in spot labor markets are directly affected by minimum wage policies.

Third, this paper examines the short-term effects of minimum wage increases on establishments using establishment-month panel data. Monthly variations offer two key advantages. First, these enable us to analyze how establishments adjust employment in response to wage increases over a short period. Particularly in the months immediately following a minimum wage hike, establishments face limited options to replace labor with capital, compelling them to adjust employment levels. Second, monthly data provide precise estimates of minimum wage effects (Burkhauser *et al.* 2000b,a, Sabia 2009a,b).

Fourth, we estimate the impact of minimum wage increases on employment using the individual binding design of Kanayama and Miyashita (2024), which leverages hourly wage and employment data from an online spot work platform. Much of the literature on minimum wage hikes and

employment relies on state-based local variation settings (Card and Krueger 1994, 2000, Dube *et al.* 2010, Cengiz *et al.* 2019, Jha *et al.* 2024). However, defining treatment groups as states with increased minimum wages introduces bias, as outcomes in the treatment group include both affected and unaffected employment, depending on the proportions. Our approach isolates the causal effect of minimum wages on employment by focusing on establishments whose wages are bound by the minimum wage, allowing us to infer the average behavior of minimum wage-bound establishments.

Fifth, our study contributes to the literature on the causal relationship between minimum wages and employment in Japan. Instead of relying on prefectural variations in minimum wages, we estimate the causal effect of minimum wages on employment by conducting a difference-in-differences (DiD) analysis based on whether an establishment's posted wages are bound by the minimum wage. This approach enables us to estimate the causal impact of minimum wages on individual establishment employment.

Numerous studies have examined the impact of minimum wages on employment in Japan (Kawaguchi and Yamada 2007, Kawaguchi and Mori 2009, Higuchi 2013, Akesaka *et al.* 2017, Okudaira *et al.* 2019, Haojun *et al.* 2020, Kawaguchi and Mori 2021, Izumi *et al.* 2022, Kanayama and Miyashita 2024). However, few estimate this impact as a "causal effect." For example, Kawaguchi and Mori (2021) examine the employment effects of minimum wages following the 2007 reform of Japan's Minimum Wage Act. 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 saw substantial increases. Using the difference between public assistance levels and monthly minimum wage earnings in 2006 as an instrumental variable, the authors estimate the local average 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, Yamagishi 2021, Mizushima and Noguchi 2021, Izumi *et al.* 2022). However, with the exception of Kanayama and Miyashita (2024), these studies do not capture the impact of recent minimum wage changes on outcomes, and no literature estimates the causal effect of recent increases.

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. Section 3 presents our methods and data. Section 4 reports our empirical findings. Section 5 explores the heterogeneous effects of minimum wage binding by industry. Section 6 concludes the paper.

# 2 Background

## 2.1 Non-regular work and spot work markets in Japan

The number of non-regular workers and the significance of spot work 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 an increasing popularity of non-regular workers. Using our spot work platform data, 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.

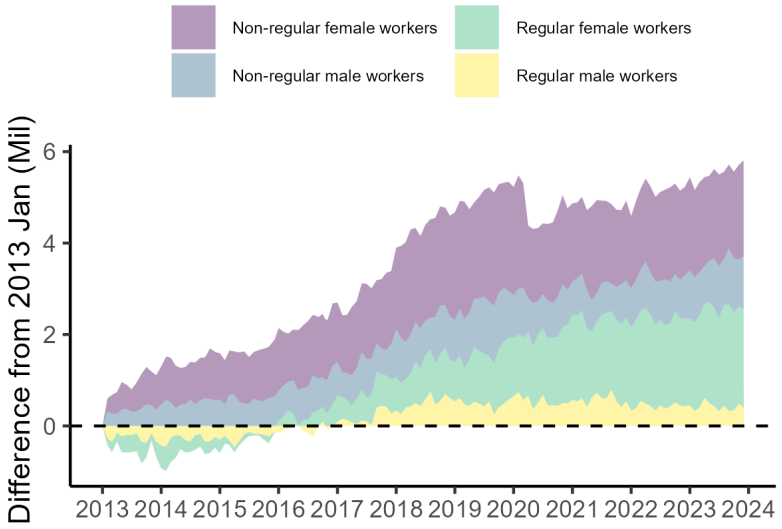
## 2.2 Spot work platform

We use a term "spot work platform" to refer non-regular labor market provided by the huge online platform in Japan. This platform operates as an on-demand staffing platform designed to connect businesses with temporary workers for short-term jobs through the app. The primary users of the platform are individuals seeking flexible, task-based employment rather than long-term positions and establishments seeking for 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 the process of matching workers with available shifts across industries such as food, retail, and logistics.

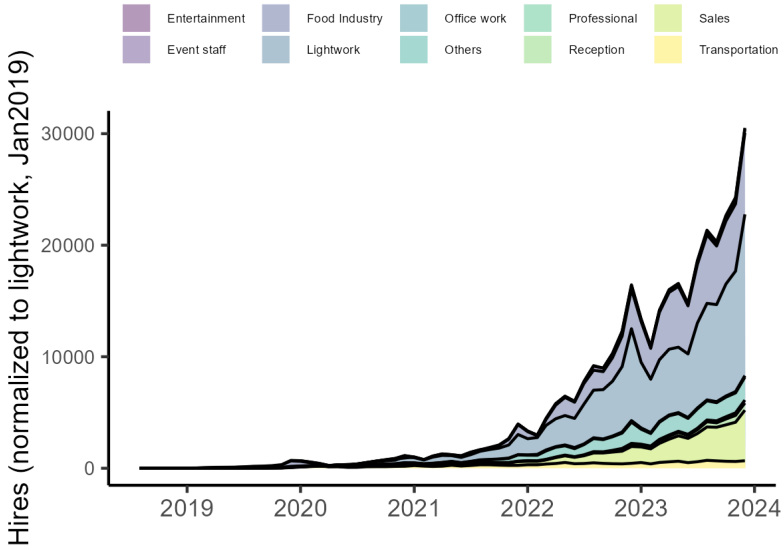
The platform's business model allows workers to browse and accept jobs without the need for a traditional hiring process. Instead of charging a subscription fee, the platform earns revenue through fees paid by the businesses utilizing the service. This arrangement benefits both companies and workers by offering flexible, short-term employment opportunities while avoiding the formalities and commitments of long-term contracts. The platform's simplicity and immediacy are attractive particularly for workers looking to fit employment around their schedules.

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 define that this labor market is less-skilled labor markets.

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-




(a) Hires, Labor force survey

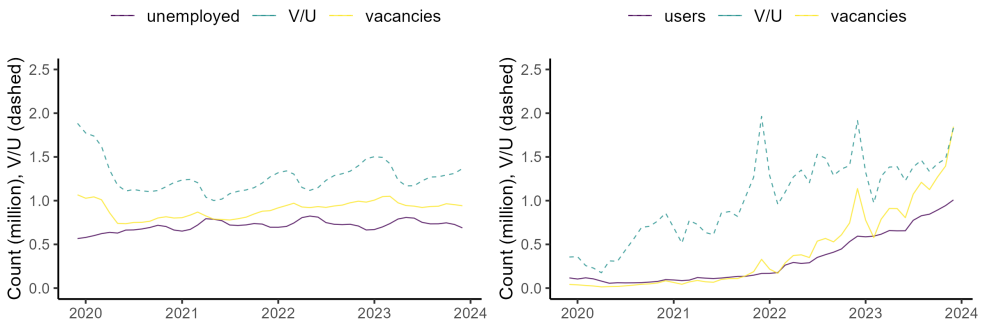



(b) Hires, Spot work platform

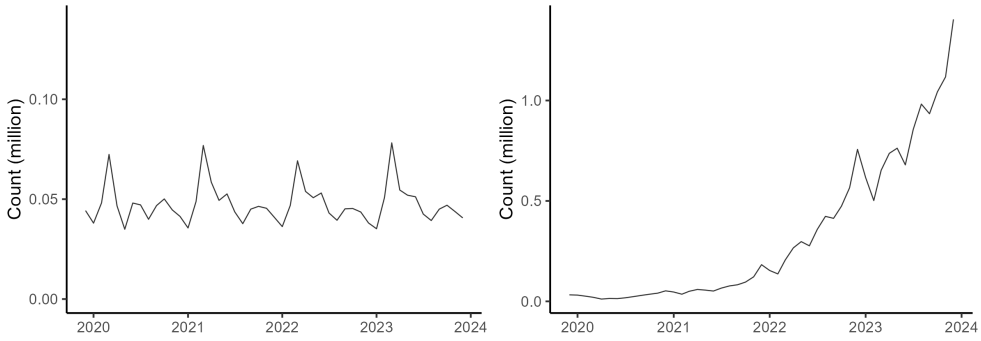
Figure 1: Changes of employment. National vs Spot work platform

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.

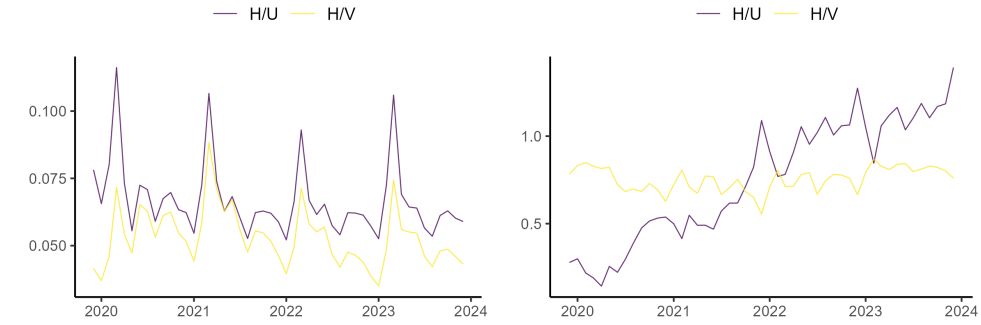
operated institution in Japan as a conventional platform that provides job seekers with part-time and full=time employment counseling, job placement services, and vocational training, playing a




(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 key 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 as 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.

critical role in Japan's labor market (Otani 2024b).

First, I discuss the left panel of Hello Work for part-time workers and jobs.[2] 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.

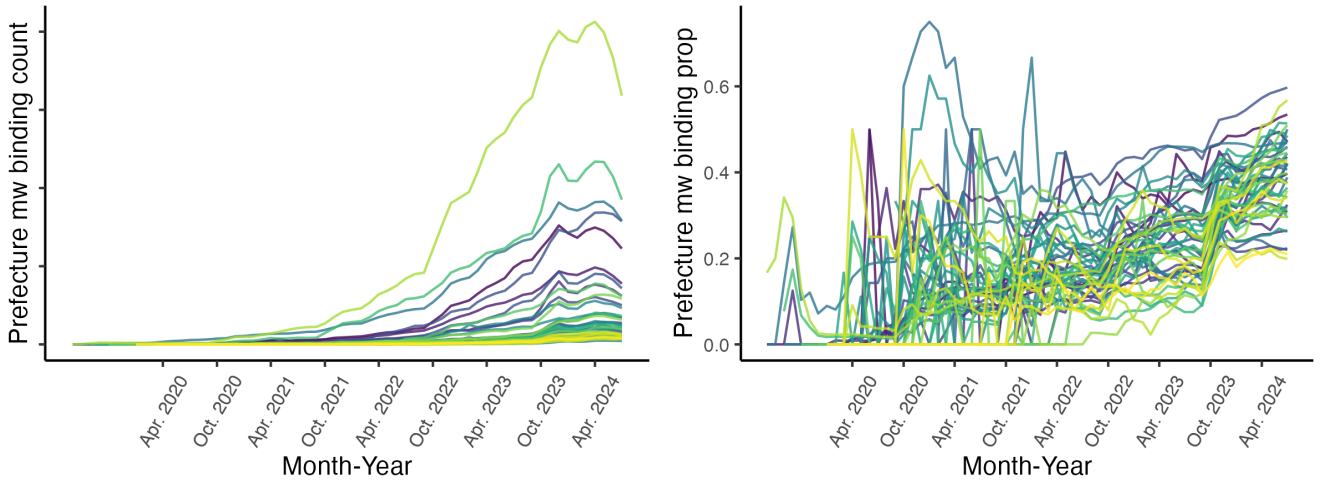
In contrast, the right panels reflect the dynamics of the private platform, where a distinctive pattern emerges. Unlike Hello Work's part-time flow from unemployed to employed, workers on this platform do not automatically leave after securing a match, which keeps a larger pool of active users. The number 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 strong growth.

## 2.3 How many establishments are affected by the change of minimum wage?

The key to our analysis is observing the wages and employment of establishments whose wages are bound to the minimum wage. Specifically, we analyze how the wages and employment of establishments that paid workers above the minimum wage in the previous period are affected when the minimum wage in the current period exceeds the previous period's level. This approach parallels the "Fraction Affected (FA)" methodology used in Card (1992b). However, unlike Card (1992b), our analysis allows us to directly examine the behavior of establishments paying wages

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




(a) Count

(b) Proportion

Figure 3: The prefecture-month level counts and proportions of minimum wage binding establishments

Note: This figure illustrates the monthly changes in the number and rate of establishments bound by the minimum wage in each prefecture (masked for confidentiality reasons) from January 2020 to July 2024. Panel (a) displays the number of establishments in each prefecture where wages are bound by the minimum wage, with the actual numbers masked for confidentiality. Panel (b) shows the corresponding rates of such establishments.

close to the minimum wage, providing insights into the impact of minimum wage changes on these businesses.

Panel (a) of Figure 3 illustrates the number of minimum wage jobs in each prefecture. Regional minimum wages in Japan increase annually in October, often leading to a significant rise in the number of establishments whose wages are bound to the new minimum wage around this time. However, this increase does not follow a stepwise pattern. Many establishments that do not use the spot work platform regularly tend to post new job offers several months after the minimum wage hike. Consequently, the binding effect of the minimum wage on wages increases gradually over time.

Panel (b) of Figure 3 depicts the percentage of establishments with wages bound to the minimum wage in each prefecture. In October, the percentage of such establishments rises notably but gradually declines in the subsequent months leading up to the next October. This decrease occurs as new establishments enter the spot labor market after October, and many of these businesses offer wages that are not bound by the minimum wage.

Notably, our findings show a higher rate of minimum wage binding compared to the national weighted averages reported in the *Fact-finding Survey on Minimum Wages*. According to the survey, the national weighted averages of the FA were 4.7%, 16.2%, 19.2%, and 21.6% from 2020

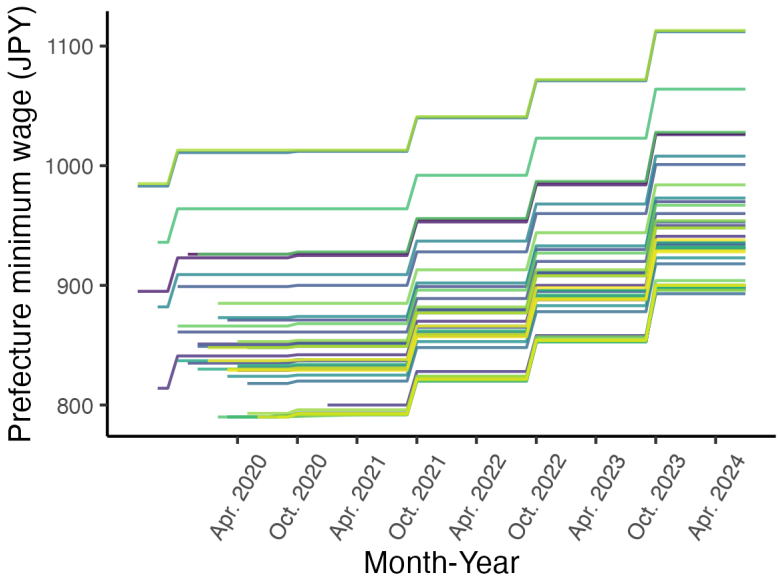



Figure 4: The dynamics of regional minimum wages changes

Note: This Figure describes the monthly changes of the regional minimum wages each 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.

to 2023.[3] The discrepancy between our results and the survey findings arises from differences in sample composition. Our sample includes a substantial number of industries heavily affected by the minimum wage, such as the restaurant sector. In contrast, the *Fact-finding Survey on Minimum Wages* considers a more balanced representation of industries, including those less impacted by the minimum wage. Consequently, our sample reflects a higher proportion of establishments significantly affected by minimum wage increases, resulting in a greater prevalence of wages bound to the minimum wage.

## 2.4 Minimum wages in Japan

This section introduces the regional minimum wages set for 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 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 four regional blocks based on regional welfare levels. It sets guidelines ("Meyasu") for the recommended increase in the hourly minimum wage for each group. These recommendations primarily reference the average annual wage increase rate

[3] https://www.mhlw.go.jp/toukei/list/97-1.html

for workers at workplaces with fewer than 30 regular employees, as reported in the Minimum 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.[4]

Figure 4 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.

# 3 Data and methods

## 3.1 Data source and data construction

We base our analysis on spot work-level records from a Japanese platform operated by a private company that facilitates the matching of spot workers and employers. This dataset allows us to analyze the short-term effects of minimum wage changes on the employment of low-skilled workers.

To investigate the effects of minimum wage policies on the spot labor market platform, we construct an establishment-year-month panel dataset covering the period from January 2020 to July 2024. The dataset includes over 100,000 establishments and more than 10 million spot work records during the sample period. These records provide detailed information about who performed what work, when and where, as well as hourly wages and employment conditions.

We aggregate the data to calculate key metrics at the establishment-month level, including the number of job postings (vacancies), the number of matches (employment), the monthly average wage, the total monthly hours worked per vacancy, and the number of days establishments used the platform.[5] Additionally, we create a dummy variable indicating whether an establishment

[4]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.

[5]Unlike Dustmann *et al.* (2022), there is no difference between actual and contractual working hours. This is an advantageous point in our data.

was active and used the platform during a given month. Similarly, on the labor supply side, we aggregate the data at the worker-month level, including a dummy variable indicating whether a worker was active and used the platform in a given month.

The dataset also includes detailed characteristics of employers, such as their industry, occupation, and geographic information (prefecture and municipality). This rich dataset enables a comprehensive analysis of how minimum wage changes impact both the short-term and long-term dynamics of spot labor markets.

## 3.2 Empirical Strategy

### 3.2.1 Difference-in-Differences Approach

Our data allow us to track establishments over time. The key idea of the establishment-year-month panel approach is to compare outcomes, such as average wages, average hours worked, employment, and vacancies, across minimum wage changes between establishments bound by the minimum wage and those that are not. To achieve this, we employ the following regression model:

$$Y_{j,p(j),k,t} = \sum_{\tau \in T} \beta_\tau 1\{mw_{p(j),k-1} \leq w_{j,k-1} < mw_{p(j),k}\} \times 1\{t-k=\tau\} + \mu_j + \gamma_t + \varepsilon_{j,p(j),t}, \quad (1)$$

where $Y_{j,p(j),k,t}$ represents the outcome for establishment $j$ in prefecture $p(j)$, whose treatment timing is $k$, observed in year-month $t$. The indicator function $1\{mw_{p(j),k-1} \leq w_{j,t} < mw_{p(j),k}\}$ equals 1 if, for establishment $j$ in year-month $t$ residing in prefecture $p(j)$, the minimum wage was not binding on the employer's mean wage in the previous year-month $(k-1)$ but becomes binding in year-month $k$. Otherwise, it equals 0. The term $1\{t-k=\tau\}$ represents a set of dummy variables for year-month $\tau$ relative to the treatment timing, and $T$ is the set of relative year-months $\tau$. Fixed effects $\mu_j$ and $\gamma_t$ account for establishment and year-month fixed effects, respectively. The range of $T$ is defined as $\{-11, -10, ..., 10, 11\}$, enabling us to estimate the impact over a one-year period before and after an establishment's average wage becomes binding to the minimum wage.

This model captures the effect of a minimum wage becoming binding on each establishment's outcomes. If the average wage $w_{j,k-1}$ for establishment $j$ in a given year is below the regional minimum wage in the subsequent year, the establishment is defined as bound by the minimum wage.[6]

Our primary interest is the set of coefficients $\beta_\tau$, which represents the average treatment effect of a binding minimum wage on outcomes at time $\tau$, under the assumptions of the Difference-in-Differences (DiD) framework. However, estimating $\beta_\tau$ is challenging due to the staggered timing of treatment assignments across establishments. In such cases, the standard two-way fixed effects

[6]This binding treatment setting based on individual wages follows similar methodologies used in Currie and Fallick (1993), Kawaguchi and Yamada (2007), Clemens and Wither (2019), and Kanayama and Miyashita (2024).

event study approach may fail to identify the true effect of the minimum wage on outcomes, even if the parallel trends assumption holds. To address this issue, we adopt the method proposed by Callaway and Sant'Anna (2021), which is a type of staggered DiD specification.[7]

### 3.2.2 Own wage elasticity

Many previous studies estimate the direct effects of minimum wage increases on wages and employment separately. However, these approaches do not disentangle the extent to which minimum wage increases influence wages and how those wage changes subsequently impact employment. Dube and Zipperer (2024) and Dube and Lindner (2024) address this gap by introducing the concept of "Own Wage Elasticity (OWE)" as a universal measure of the impact of minimum wages. The OWE quantifies how wage increases driven by minimum wage changes translate into employment effects. In essence, the OWE captures the elasticity of employment with respect to wage changes caused by marginal increases in the minimum wage.

The OWE is defined as:

$$\text{OWE} = \frac{\left(\frac{\%\Delta \text{ Employment}}{\%\Delta \text{ MinimumWage}}\right)}{\left(\frac{\%\Delta \text{ Average Wage}}{\%\Delta \text{ MinimumWage}}\right)} = \frac{\epsilon^E}{\epsilon^W}. \tag{2}$$

In Equation (2), the OWE is expressed as the ratio of the elasticity of employment with respect to minimum wages ($\epsilon^E$) to the elasticity of average wages with respect to minimum wages ($\epsilon^W$). This measure enables us to estimate the impact of a marginal change in the minimum wage on employment through its effect on wages.

The OWE is estimated using an instrumental variable (IV) approach, with the minimum wage serving as the instrument for wage changes. This involves the following system of equations:

$$\begin{aligned}
\textbf{First stage:} \quad & \log(wage_{j,c,o,t}) = \epsilon^W \log(MW_{c,t}) + \mu_j + \kappa_c + \Omega_o + \tau_t + \varepsilon_{j,c,o,t}, \\
\textbf{Second stage:} \quad & \log(Employment_{j,c,o,t}) = \beta_{IV} \log(\widehat{wage}_{j,c,o,t}) + \mu_j + \kappa_c + \Omega_o + \tau_t + \varepsilon_{j,c,o,t}, \\
\textbf{Reduced form:} \quad & \log(Employment_{j,c,o,t}) = \epsilon^E \log(MW_{c,t}) + \mu_j + \kappa_c + \Omega_o + \tau_t + \varepsilon_{j,c,o,t}.
\end{aligned} \tag{3}$$

Here, $\log(Employment_{j,c,o,t})$ represents the logarithm of employment for establishment $j$, located in municipality $c$ (at the city or prefecture level), within occupation $o$, and observed in year-month $t$. Similarly, $\log(wage_{j,c,o,t})$ denotes the logarithm of the average wage for establishment $j$ and $\log(\widehat{wage}_{j,c,o,t})$ denotes the predicted ones in the first stage, while $\log(MW_{c,t})$ represents the logarithm of the minimum wage in municipality $c$ at time $t$. The model includes fixed effects to account for unobserved heterogeneity: establishment-specific effects ($\mu_j$), municipality-level effects

[7] The approach of Callaway and Sant'Anna (2021) does not estimate $\beta_\tau$ through ordinary least squares regression. Instead, it relies on a non-parametric framework, but its estimator has the same interpretation as $\beta_\tau$.

($\kappa_c$), occupation-level effects ($\Omega_o$), and year-month effects ($\tau_t$).

The parameter of interest, $\beta_{IV}$, represents the OWE, capturing the elasticity of employment with respect to wage changes due to minimum wage increases. The reduced-form regression coefficient of the minimum wage on employment, $\epsilon^E$, and the first-stage wage elasticity with respect to the minimum wage, $\epsilon^W$, allow us to calculate $\beta_{IV}$ as:

$$\beta_{IV} = \frac{\epsilon^E}{\epsilon^W}.$$

This approach provides a robust framework for understanding how minimum wages indirectly influence employment through their effects on wages.

# 4 Empirical findings

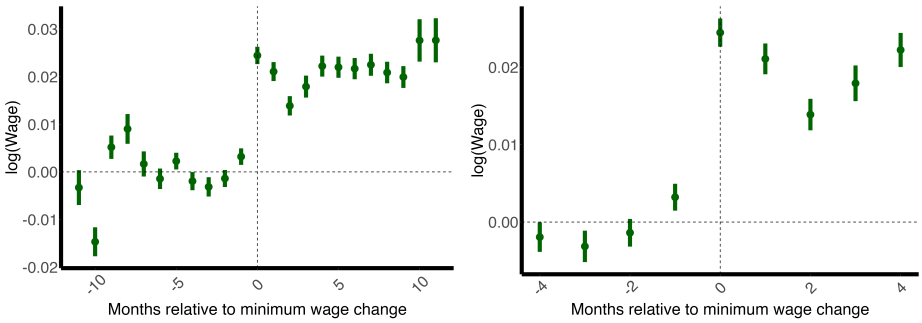
## 4.1 Wage, employment, and contract hours

Figure 5 explores the effects of minimum wage increases on multiple labor market outcomes, including $\log(wages)$, $\log(Employment)$, and $\log(hours)$, focusing on spot labor markets.

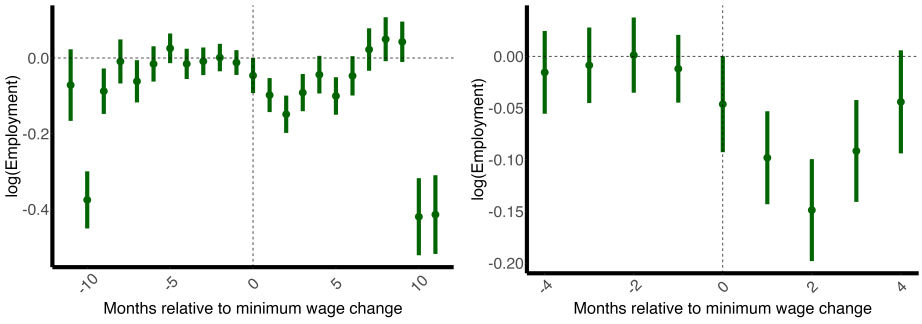
**Log Wage** To confirm whether minimum wages increase the wages of workers in spot labor markets, Panel (a) in Figure 5 shows the results of the impact of binding minimum wages on the logarithm of average hourly wages. The figure supports the identification assumption of parallel trends, as the pre-treatment trajectory, though slightly bumpy, exhibits pre-trend point estimates close to zero. Following the implementation of binding minimum wages, monthly average wages at establishments increase by approximately 1.3–2.7%.[8] This result indicates that employers comply with minimum wage regulations, effectively raising wages in the spot labor market as intended by the policy.

**Log Employment** Panel (b) in Figure 5 illustrates the impact of minimum wages on the monthly logarithm of employment, measured as the logarithm of matching counts across all industries in the spot labor market. While the pre-treatment trends appear bumpy and are significantly different from zero at several points up to seven months prior, there is no consistent or clear pattern, suggesting no significant violation of the parallel trends assumption. After the binding minimum wage, matching counts tend to decrease by 9–15% within the first 1–6 months, indicating a potential short-term decline in job matches in response to the wage policy. A larger decrease, exceeding 40%, is observed after 10–11 months (August to September of the year following the binding). However,

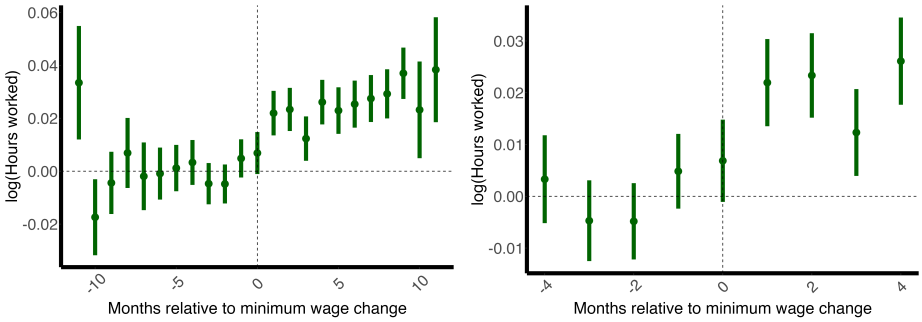
[8] If $\beta_\tau$ is sufficiently close to 0, the increase is calculated as $\beta_\tau \times 100\%$. However, if $\beta_\tau$ is not close to 0, the increase is given by $(\exp(\beta_\tau) - 1) \times 100\%$.




(a) Log wage (12 periods vs 4 periods)




(b) Log employment (12 periods vs 4 periods)




(c) Contract hours (12 periods vs 4 periods)

Figure 5: Impact of minimum wages on wage, employment, and contract hours

*Note*: The figure presents the main results from our event study analysis (see equation (1)), which exploits establishment-level binding minimum wage changes between January 2020 and July 2024. The figure illustrates the effect of a minimum wage becoming binding on establishment-level outcomes, specifically $\log(Wages)$, $\log(Employment)$, and $\log(Contract\ hours)$, over time. The left column displays the results of the long-term estimation, covering the period from 11 months before binding ($\tau \in -11, ..., -1$) to 12 months after binding ($\tau \in 0, ..., 11$). The right column shows the results of a shorter-term estimation, spanning 5 months before binding ($\tau \in -4, ..., -1$) to 5 months after binding ($\tau \in 0, ..., 4$). Additionally, 95% confidence intervals are provided, based on standard errors clustered at the establishment level.

these results may be influenced by the increase in the minimum wage in the subsequent year, warranting caution in their interpretation.

The magnitude of these estimates is notably large compared to previous studies. Considering that the regional minimum wage increased by an average of 4.7% from 2022 to 2023, the elasticity

of the 15% decrease in employment ($\tau = 2$) is calculated as $-15/4.7 = -3.19$. This value is significantly larger than the elasticity of $-0.49$ reported by Okudaira *et al.* (2019), which used the Census of Manufacture, and the $-1.2$ estimated by Kawaguchi and Mori (2021), which exploited the Labor Force Survey. These results suggest that employment at establishments most affected by the minimum wage in the spot labor market decreases substantially following an increase in the minimum wage.

**Log Contract Hours** Panel (c) in Figure 5 presents the effect of binding minimum wages on the logarithm of average hours worked per match. Although the pre-treatment estimates are somewhat noisy, the parallel trends assumption appears valid, as the deviations are statistically insignificant and relatively small. Following the policy change, establishments affected by the minimum wage tend to increase working hours per job by 1.3–3.8% within 1–11 months. This indicates that employers may adjust labor input by increasing hours for workers in response to higher wage costs, rather than expanding the workforce.

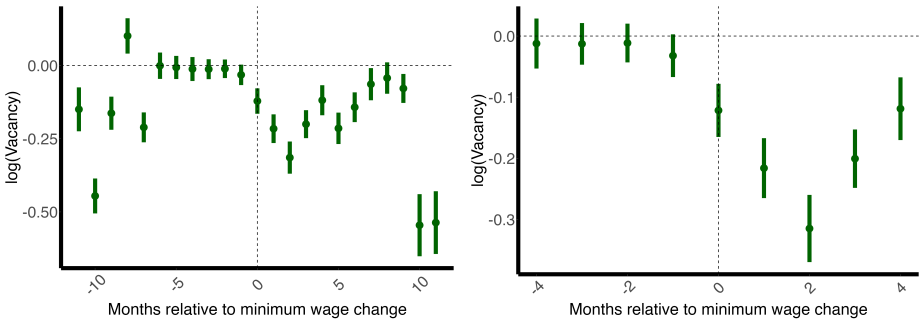
The magnitude of these estimates is notably large and differs significantly from those reported in previous studies. Considering that the regional minimum wage increased by an average of 4.7% from 2022 to 2023, the elasticity of the 3.8% decrease in contract hours ($\tau = 11$) is calculated as $3.8/4.7 = 0.81$. This value is substantially larger than the elasticity of 0.01 reported by Kawaguchi and Mori (2021), which utilized the Labor Force Survey. Furthermore, our findings diverge from those of Sabia (2009a), who estimated a minimum wage elasticity of $-0.38$ to $-0.42$ in the retail sector.

In summary, these results indicate that employment at establishments most affected by the minimum wage in the spot labor market decreases considerably following a minimum wage increase. The discrepancies between our findings and those of previous studies can be attributed to the unique characteristics of the spot labor market. Unlike traditional settings, the platform facilitates adjustments to both the number of employees and their working hours. It appears that establishments primarily respond to wage increases by slightly increasing working hours rather than reducing the number of employees, thereby adjusting the total amount of work more flexibly.

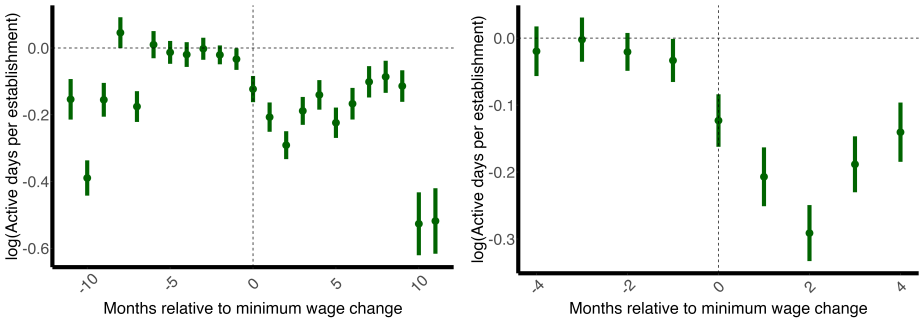
## 4.2 Spot work labor demand

Figure 6 examines the impact of minimum wage changes on various labor demand outcomes, including vacancy counts, the number of active days per establishment on app, and spot work utilization on the establishment side.

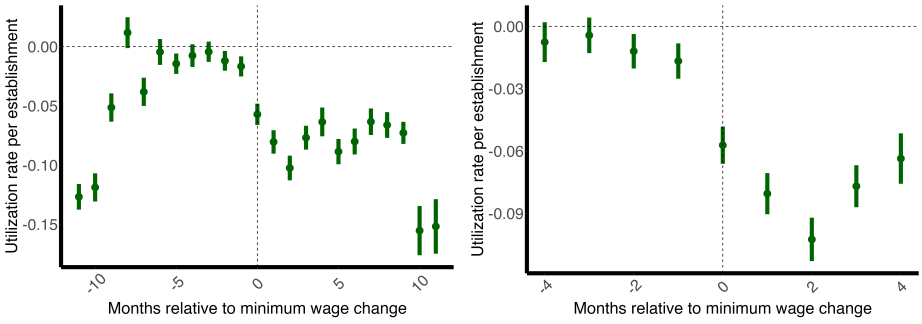
**Log Vacancy** Panel (a) in Figure 6 illustrates the effects of minimum wage changes on log vacancy counts over time. The left graph, spanning 12 periods, reveals a significant decline in the logarithm of vacancy counts immediately following the binding minimum wage (a reduction




(a) Vacancy counts (12 periods)




(b) The number of active days per establishment




(c) Spot work utilization rate per establishment

Figure 6: Impact of minimum wages on labor demand

*Note*: The figure presents the main results from our event study analysis (see equation (1)), which exploits establishment-level binding minimum wage changes between January 2020 and July 2024. The figure illustrates the effect of a minimum wage becoming binding on establishment-level outcomes, specifically $\log(Vacancy)$, *Active establishment*, and *Utilization*, over time. The left column displays the results of the long-term estimation, covering the period from 11 months before binding ($\tau \in -11, ..., -1$) to 12 months after binding ($\tau \in 0, ..., 11$). The right column shows the results of a shorter-term estimation, spanning 5 months before binding ($\tau \in -4, ..., -1$) to 5 months after binding ($\tau \in 0, ..., 4$). Additionally, 95% confidence intervals are presented, based on standard errors clustered at the establishment level.

of 10.1–57.2%), with the negative effects intensifying over time The shorter-term view in the right graph confirms this pattern, showing a persistent and substantial reduction in vacancy postings after the policy implementation. These trends suggest that higher labor costs induced by minimum wage increases may discourage businesses from creating new job openings, particularly in sectors

reliant on low-wage labor.

The magnitude of these estimates is notably large and differs significantly from those reported in the limited existing literature. Considering that the regional minimum wage increased by an average of 4.7% from 2022 to 2023, the elasticity of the 31.6% decrease in contract hours ($\tau = 2$) is calculated as $-31.6/4.7 = -6.72$. This value is substantially larger than the elasticity of $-0.24$ reported by Kudlyak *et al.* (2022), who utilized unique job openings data from the Conference Board's Help Wanted OnLine (HWOL) data series in the United States. These findings indicate that vacancies at establishments most affected by the minimum wage in the spot labor market decrease significantly following an increase in the minimum wage.

**Log Number of Active Days per Establishment** Panel (b) in Figure 6 examines the log of active days per establishment on the platform, representing the intensity of job postings by each registered business. The left graph displays a pronounced downward trend following the minimum wage increase, with active days decreasing by 7.1–45.1%. This effect suggests that some establishments may reduce their activity on the platform as they adjust to higher wage costs. The shorter-term view on the right further underscores this declining trend, demonstrating a sustained reduction in active posting days.

**Utilization Rate per Establishment** Panel (c) in Figure 6 depicts the spot work utilization rate, capturing exit dynamics from the platform. The results show a steady decline of 5.5–15.5% in utilization rates following the minimum wage increase, observed across both longer and shorter timeframes. This pattern suggests a reduced reliance on flexible or temporary labor as businesses adapt to higher wage costs, possibly reallocating resources toward permanent staffing, automation, or other labor adjustments.

In summary, these findings highlight complex labor demand dynamics, with reductions in vacancies and spot work utilization offset by changes in the intensity of platform activity, as establishments respond to the increased wage floor.

## 4.3 Spot work labor supply

**Utilization Rate per Worker** Figure 7 examines the impact of minimum wage changes on spot work utilization from the worker's perspective. The results indicate a consistent decline in utilization rates, ranging from 2.2% to 13.1%, following the minimum wage increase. This decrease is observed steadily across both longer and shorter timeframes. These findings are consistent with economic behavior observed in Japan, where the budget constraints of non-regular workers, who are often not the primary earners in their households, are influenced by tax deduction thresholds. As discussed in some previous studies (Akabayashi 2006, Bessho and Hayashi 2014, Yokoyama and Kodama 2016, Yokoyama 2018, Kanayama and Miyashita 2024), some workers adjust their labor

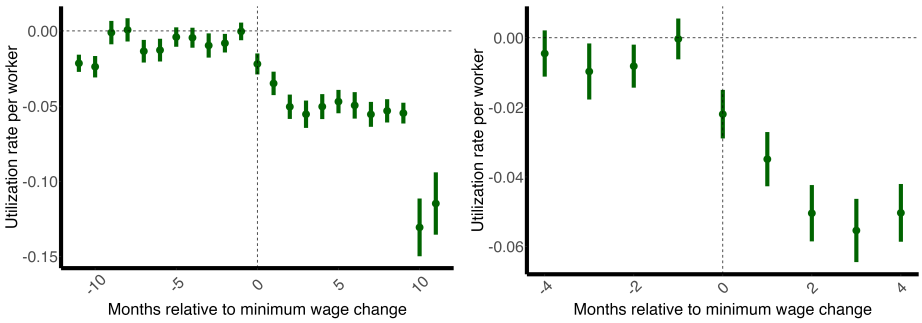



Figure 7: Impact of minimum wages on labor supply

*Note*: The figure presents the worker's utilization from our event study analysis (see equation (1)), which exploits worker-level binding minimum wage changes between January 2020 and July 2024. The left column displays the results of the long-term estimation, covering the period from 11 months before binding ($\tau \in -11, ..., -1$) to 12 months after binding ($\tau \in 0, ..., 11$). The right column shows the results of a shorter-term estimation, spanning 4 months before binding ($\tau \in -4, ..., -1$) to 5 months after binding ($\tau \in 0, ..., 4$). Additionally, 95% confidence intervals are presented, based on standard errors clustered at the establishment level.

supply to remain below a certain annual income threshold to maximize tax benefits. As a result, an increase in the minimum wage, while raising their hourly wages, may simultaneously reduce their labor supply, contributing to the observed decline in utilization rates.

## 4.4 Own Wage Elasticities

Table 1 presents estimates of the own-wage elasticity of employment using various regression specifications, focusing on the relationship between log employment and log wages.

In Panel (a), the first column employs Ordinary Least Squares (OLS) and estimates the elasticity of employment with respect to wages as -1.476, indicating that a 1% increase in wages is associated with a 1.476% decrease in employment. This negative and significant relationship is consistent with standard economic theory, where higher wages are expected to reduce labor demand. The Instrumental Variable (IV) results, reported in the second and third columns, address potential endogeneity in wage determination and produce slightly different results. The IV first-stage estimate of 0.519 for log(minimum wage) indicates a positive and significant relationship between minimum wages and wages, while the second-stage IV elasticity estimate of -1.495 aligns closely with the OLS findings but exhibits larger standard errors due to the two-stage estimation approach.

Additional specifications include fixed effects (FE) for cities to control for granular unobserved heterogeneity. Across models, the inclusion of fixed effects does not substantially alter the elasticity estimates, indicating the robustness of the negative relationship between wages and employment. Overall, the findings confirm a significant and substantial negative elasticity of employment with respect to wages, suggesting that wage increases—whether driven by market forces or minimum

Table 1: Own wage elasticity

(a) Without establishment fixed effects

| | log(E) | log(w) | log(E) | log(E) | log(E) | log(w) | log(E) | log(E) |
|---|---|---|---|---|---|---|---|---|
| Method | OLS | IV (1st) | IV (2nd) | OLS | OLS | IV (1st) | IV (2nd) | OLS |
| log(mw) | | 0.555 | | 0.331 | | -0.952 | | 2.138 |
| | | (0.067) | | (0.362) | | (0.238) | | (3.057) |
| log wage | -1.506 | | 0.596 | | -1.426 | | -2.246 | |
| | (0.076) | | (0.694) | | (0.116) | | (3.207) | |
| FE (pref x month) | X | X | X | X | | | | |
| FE (city x month) | | | | | X | X | X | X |
| FE (occupation) | X | X | X | X | X | X | X | X |
| Num.Obs. | 798204 | 798204 | 798204 | 798204 | 798570 | 798570 | 798570 | 798570 |
| R2 | 0.099 | 0.443 | 0.083 | 0.091 | 0.075 | 0.421 | 0.072 | 0.067 |
| R2 Adj. | 0.097 | 0.442 | 0.081 | 0.089 | 0.075 | 0.421 | 0.072 | 0.067 |

(b) With establishment fixed effects

| | log(E) | log(w) | log(E) | log(E) | log(E) | log(w) | log(E) | log(E) |
|---|---|---|---|---|---|---|---|---|
| Method | OLS | IV (1st) | IV (2nd) | OLS | OLS | IV (1st) | IV (2nd) | OLS |
| log(mw) | | -0.828 | | 8.410 | | -0.830 | | 8.402 |
| | | (0.097) | | (1.986) | | (0.122) | | (1.888) |
| log wage | -0.343 | | -10.153 | | -0.341 | | -10.127 | |
| | (0.063) | | (2.749) | | (0.088) | | (2.491) | |
| FE (pref x month) | X | X | X | X | | | | |
| FE (city x month) | | | | | X | X | X | X |
| FE (establishment) | X | X | X | X | X | X | X | X |
| Num.Obs. | 798204 | 798204 | 798204 | 798204 | 798570 | 798570 | 798570 | 798570 |
| R2 | 0.657 | 0.885 | 0.584 | 0.657 | 0.657 | 0.885 | 0.584 | 0.657 |
| R2 Adj. | 0.596 | 0.864 | 0.510 | 0.596 | 0.596 | 0.864 | 0.510 | 0.596 |

*Note*: $\log(E) = \log(Employment), \log(w) = \log(wage), \log(mw) = \log(minimum \quad wage)$. Standard errors in parentheses are clustered at the level of prefecture-month and city-month for Panel (a) and establishment for Panel (b). The first and fifth columns present the regression results of the logarithm of employment on the logarithm of wages without using wage instruments. The second, third, sixth, and seventh columns correspond to the first-stage and second-stage regressions specified in Equation (3). Finally, the fourth and eighth columns represent the reduced-form regression results from Equation (3).

wage policies—can reduce employment levels within the studied context.

In Panel (b) of Table 1, the inclusion of establishment fixed effects significantly changes the elasticity estimates. For instance, the OLS estimate of the elasticity of employment with respect to wages decreases to -0.374, indicating a less pronounced but still negative relationship. Conversely, the IV second-stage estimate of wage elasticity becomes more negative, reaching -11.713, though the standard errors are notably larger. By controlling for unobserved factors specific to each establishment, the results suggest that establishments are likely to significantly reduce employment in response to wage increases driven by minimum wage changes. The R-squared values for models with establishment fixed effects are considerably higher (e.g., 0.656 for log(E)) compared to models without them, reflecting improved explanatory power. These findings underscore the importance of accounting for establishment-specific factors to better understand the nuanced effects of wage changes on employment. While the overall negative relationship between wages and employment persists, the results highlight that the magnitude of these effects may vary significantly across firms or industries due to heterogeneity in establishment-level characteristics.

# 5 Heterogeneous Effect

## 5.1 Across Job Categories

Figure 8 illustrates the impact of minimum wage changes on log employment and log vacancy rates across three sectors—restaurants, retails, and estates—using a difference-in-differences methodology. Restaurants are a major job category affected by minimum wage policies (Katz and Krueger 1992, Card and Krueger 1994, Dube *et al.* 2010). Similarly, retail jobs are representative of minimum wage employment (Partridge and Partridge 1999, Orazem and Mattila 2002, Addison *et al.* 2009, Sabia 2009a). The estate category is unlikely to be significantly affected by minimum wage changes, making the results for this sector a type of placebo test.

In the restaurant sector (Panel (a)), the log of employment shows a clear downward trend (a decrease of 11.8–60.9%) following the minimum wage change, indicating that employment decreases as the minimum wage rises. This effect becomes more pronounced in the months immediately after the policy change and persists over time, with confidence intervals suggesting statistical significance. Similarly, the log of vacancy rates in the restaurant sector declines (a decrease of 16.5–68.4%) post-change, with the magnitude of the effect being more pronounced than for employment. These patterns highlight a potentially adverse effect of minimum wage increases on labor demand in the restaurant industry, impacting both filled positions and job openings.

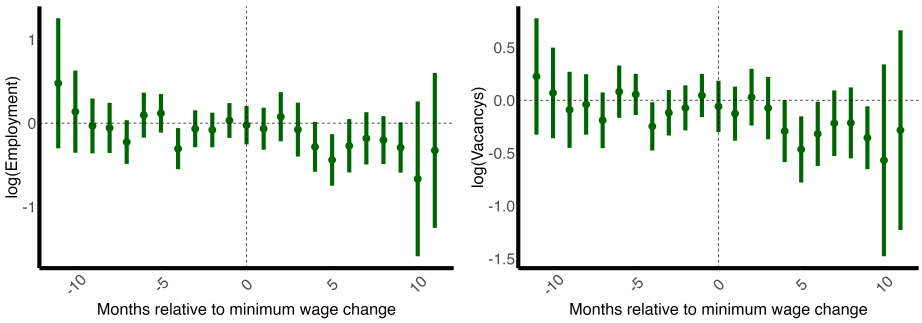
In the retail sector (Panel (b)), the log of employment also displays a clear downward trend (a decrease of 11.5–58.1%) following the minimum wage change, mirroring the pattern observed in the restaurant sector. The effect becomes more pronounced in the months immediately following the

Figure 8: Heterogeneity across sectors

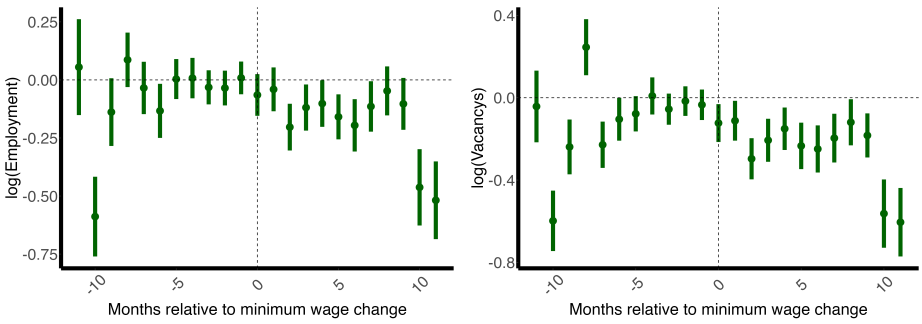
(a) Restaurant sectors: log(Employment) and log(Vacancy)




(b) Retail sectors: log(Employment) and log(Vacancy)




(c) Estate sectors: log(Employment) and log(Vacancy)




*Note*: The figure shows the heterogeneous results across industries (the Restaurant sector and the Estate sector) from our event study analysis exploiting establishment-level binding minimum wage between Jan 2020 and July 2024. The figure shows the effect of becoming binding a minimum wage on establishment outcome ($\log(Employment)$, $\log(Vacancy)$) over time. The left column shows the results of long-term estimation of $\log(Employment)$ and the right column shows the results of long-term estimation of $\log(Vacancy)$. We also show the 95% confidence interval based on standard errors that are clustered at the establishment level.

policy change and remains persistent over time, with statistically significant confidence intervals. Similarly, the log of vacancy rates in the retail sector declines (a decrease of 14.9–68.9%) post-change, with the effect on vacancies being more pronounced than on employment. These results suggest that minimum wage increases negatively affect labor demand in the retail sector, similar to their impact on the restaurant industry.

In the estate sector (Panel (c)), the results are more varied. While the log of employment initially shows a slight decline around the time of the minimum wage change, it stabilizes and even trends slightly upward in later months, although the confidence intervals indicate less precision in the estimates. The log of vacancy rates in the estate sector exhibits a more volatile pattern, with no clear long-term trend emerging after the policy change. This variability may reflect differences in the responsiveness of labor market outcomes to minimum wage changes across sectors, potentially driven by variations in labor intensity, wage structures, or labor demand elasticity in these industries.

## 5.2 Across Prefectures

Figure 9 explores the heterogeneous effects of minimum wage changes on log employment and log vacancy rates across three prefectures—Tokyo, Shizuoka, and Okinawa. Two key reasons necessitate considering regional heterogeneity. First, the levels and fluctuations of minimum wages differ by region. Larger cities typically have higher minimum wages, which may lead to varying employment impacts when wages become bound by the minimum wage. Second, the effect of minimum wage changes on the wage distribution varies across prefectures, making it essential to assess regional differences in the impact of minimum wages (Kambayashi *et al.* 2013).

In Tokyo (Panel (a)), both employment and vacancy rates show a moderate decline following minimum wage changes, with employment decreasing by 13.6–55.3% and vacancy rates decreasing by 10.6–63.3%. In Shizuoka (Panel (b)), the impact on employment appears smaller and less consistent, with estimates fluctuating around zero. However, vacancy rates in Shizuoka exhibit a more pronounced decline (a decrease of 39.3–63.3%), becoming clearer after the policy change. In Okinawa (Panel (c)), the impacts on both employment and vacancy rates are less evident across all periods.

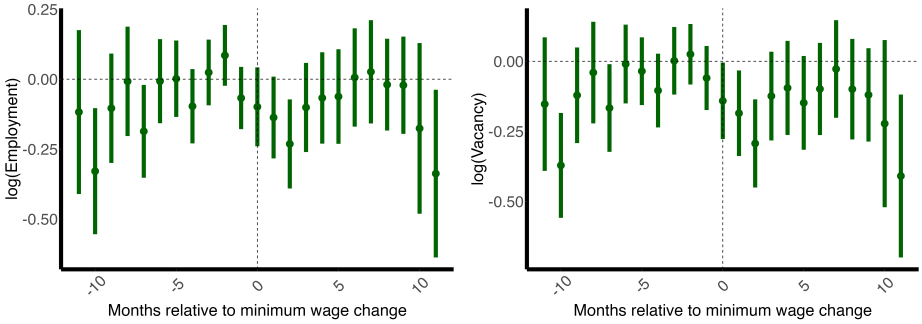
The confidence intervals across all panels reveal varying levels of statistical precision, with more distinct effects observed in some prefectures than in others. These findings highlight the geographic heterogeneity in labor market responses to minimum wage increases, likely influenced by differences in economic structures, wage levels, and labor market conditions across regions.

## 5.3 Future Directions

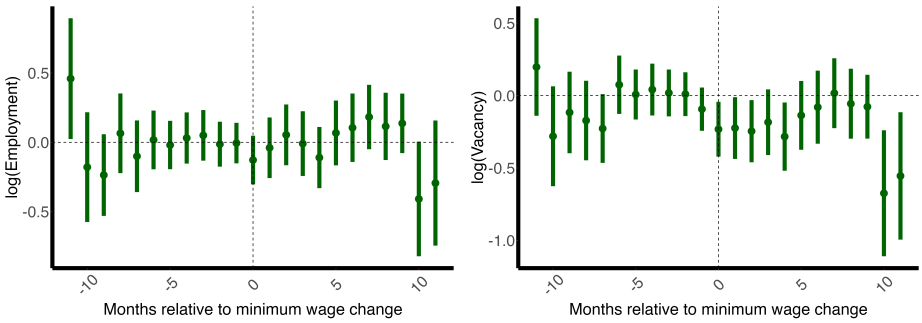
We study the effects of minimum wage changes on contract wages, employment, and labor demand and supply in spot labor markets, leveraging rich exogenous variations in minimum wage changes within a reduced-form framework. As a future direction, we aim to explore these effects further by utilizing worker-job-date matching-level data, including contract hours and wages. By leveraging the unique characteristics of a short-term contract, homogeneous labor supply and demand, and wage-posting environment, we plan to investigate labor market power (or wage markdowns) and

Figure 9: Heterogeneity across prefectures

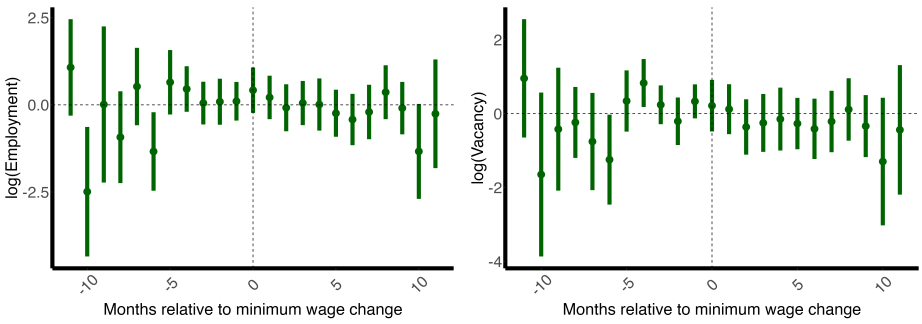
(a) Tokyo: log(Employment) and log(Vacancy)




(b) Shizuoka: log(Employment) and log(Vacancy)




(c) Okinawa: log(Employment) and log(Vacancy)




*Note*: The figure presents the heterogeneous results across prefectures (Tokyo, Shizuoka, and Okinawa) from our event study analysis, which exploits establishment-level binding minimum wage changes between January 2020 and July 2024. The figure illustrates the effect of a minimum wage becoming binding on establishment-level outcomes, specifically $\log(Employment)$ and $\log(Vacancy)$, over time. The left column displays the long-term estimation results for $\log(Employment)$, while the right column shows the long-term estimation results for $\log(Vacancy)$. Additionally, the figure includes 95% confidence intervals, calculated using standard errors clustered at the establishment level.

their interaction with minimum wage changes, as discussed in recent surveys (Card 2022, Manning 2021b, Azar and Marinescu 2024), in a more structural manner.

There are several structural approaches to examining these dynamics depending on the data and market environment. For example, using a production function approach with plant-level data, Okudaira *et al.* (2019) measure the level of monopsony power across labor markets in Japan.

They find that the employment effect of the minimum wage is negative when wages are close to the marginal product of labor but observe no significant employment effects in markets with high monopsony power. Using a differentiated job model and survey experiment data, Dube *et al.* (2022) show that workers exhibit a willingness to pay for "dignity at work" and find no evidence that non-wage amenities decline following a minimum wage increase. Additionally, employing a general equilibrium oligopsony model with calibration, Berger *et al.* (2022) demonstrate that minimum wages can enhance welfare through efficiency gains and redistribution.

In contrast to these approaches, a conduct parameter estimation framework for homogeneous labor markets, as developed by Bresnahan (1982) and further justified by Matsumura and Otani (2023b,a), holds potential for application in our context. The short-term and homogeneous nature of spot labor markets makes this setting particularly well-suited for such an approach. The closest related study is by Roussille and Scuderi (2023), which uses high-wage worker data and assumes differentiated labor markets. While their focus is on testing firm conduct, they stop short of estimating conduct parameters directly. Similarly, Azar *et al.* (2024) assume homogeneous labor markets and numerically solve a simple oligopsony model with Cournot competition among employers. However, their analysis relies on simulation-based predictions of the relationship between market concentration indices and employment, applied to U.S. job postings data in a reduced-form manner.

Building on these foundations, we aim to estimate and test conduct parameters in a structural way, providing direct evidence of market-level wage markdowns. This approach will contribute novel insights into the interaction between minimum wages and labor market power in spot labor markets.

# 6 Conclusion

This study provides new evidence on the effects of minimum wage increases in spot labor markets, offering insights into labor demand and supply adjustments in a short-term context. Using confidential data from a Japanese platform, we reveal that minimum wage binding has significant and immediate impacts on employment dynamics. Employment decreases by 9–15%, and vacancies decline sharply (10.1–57.2%) following the wage increase. Spot work utilization rates also drop for both establishments (5.5–15.5%) and workers (2.2–13.1%), indicating reduced reliance on the platform for flexible labor arrangements. Interestingly, employers appear to adjust to higher labor costs by increasing contract hours (1.3–3.8%) rather than expanding their workforce.

Our findings also highlight heterogeneous effects across industries and regions. Restaurants and retail sectors, as representative minimum wage industries, show substantial declines in employment and vacancies, while the estate sector remains relatively unaffected, serving as a placebo test. Regional analysis demonstrates varying impacts, with urban areas like Tokyo experiencing

moderate declines in employment and vacancies, rural areas like Shizuoka showing inconsistent effects, and island regions like Okinawa displaying negligible impacts.

These results emphasize the complex dynamics of minimum wage policies in spot labor markets, highlighting the need for tailored approaches that account for industry- and region-specific characteristics. This study contributes to the broader literature by focusing on an often-overlooked segment of the labor market and providing policy-relevant insights.

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