Institute for Economic Studies, Keio University

Keio-IES Discussion Paper Series

求人・求職者・最低賃金：職業安定業務統計からのエビデンス

太田聰一、小前和智

2022 年 3 月 9 日
DP2022-004
https://ies.keio.ac.jp/publications/18177/

Institute for Economic Studies, Keio University
2-15-45 Mita, Minato-ku, Tokyo 108-8345, Japan
ies-office@adst.keio.ac.jp
9 March, 2022

求人・求職者・最低賃金：職業安定業務統計からのエビデンス

太田聰一、小前和智

IES Keio DP2022-004
2022 年 3 月 9 日
JEL Classification: J63, J64, J65
キーワード: 最低賃金;求人;求職者;労働市場フロー;サーチとマッチング

【要旨】

本論文は、日本の職業安定業務統計を用いて最低賃金の上昇が求人数と求職者数に与える影響を分析する。分析結果によると、2005年から2019年の期間において、最低賃金の上昇は求人数を減少させていた。一方、最低賃金の上昇は求職者数を増加させており、求人倍率の低下をもたらしていた。求職者数の増加の一部は、離職に伴う失業者の増加によるものであった。最低賃金上昇の影響は、労働市場の需給が緩んでいる時期や、カイツ指標や小企業比率の高い都道府県、さらにはパート労働者において顕著であった。

太田聰一
慶應義塾大学経済学部
〒108-8345
東京都港区三田2-15-45
ohta@econ.keio.ac.jp

小前和智
東京大学大学院経済学研究科
〒113-8654
東京都文京区本郷7-3-1
kkomae@g.ecc.u-tokyo.ac.jp

Vacancies, Job Seekers, and Minimum Wages: Evidence from Public Employment Placement Service Data*

Souichi Ohta†
Faculty of Economics, Keio University

and

Kazutomo Komae‡
Graduate School of Economics, The University of Tokyo
and
The Ministry of Health, Labour, and Welfare

March 9, 2022

Summary

This paper investigates the impact of a minimum wage increase on the number of vacancies and job seekers using data from Japan's public employment placement service. The results show that for 2005-2019, a rise in the minimum wage reduced the number of vacancies. On the other hand, it increased the number of job seekers and then decreased the vacancy-job seeker ratio. Some part of this came from the increased job separation into unemployment. The impact of a minimum wage rise is conspicuous during the period of the slack labor market, for prefectures with high Kaitz indices or with a high proportion of small firms, and for part-time jobs.

JEL: E24, J63, J64, J65

Key Words: Minimum Wages, Vacancies, Job Seekers, Labor Market Flows, Search and Matching

* We are grateful to Yuji Genda, Ryo Kambayashi, Daiji Kawaguchi, Atsushi Kawakami, Masayuki Morikawa, Yoko Takahashi, Atsuhiro Yamada, and seminar participants at the workshop held by the Ministry of Health, Labour, and Welfare for their helpful comments and suggestions. The views expressed herein are those of the authors and do not necessarily reflect the views of the Ministry of Health, Labour, and Welfare, Japan.

† Corresponding author: 2-15-45 Mita, Minato-ku, Tokyo 108-8345 Japan (ohta@econ.keio.ac.jp)

‡ 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8654 Japan (kkomae@g.ecc.u-tokyo.ac.jp)

1. Introduction

This paper estimates the minimum wage elasticities of vacancies and job seekers using monthly prefectural data registered for the public employment placement services in Japan. While numerous previous studies have examined the impact of minimum wages on employment levels, those studied their effect on vacancies and job seekers are relatively scarce. Further analysis is desirable because the number of vacancies and job seekers are the main determinants of the level of employment. Investigating the impact of minimum wages on vacancies and job seekers opens the way for understanding the various routes through which minimum wages affect employment levels.

The concept of labor market flows illustrates the basic idea. Let us consider the labor market as a site where matching takes place between vacancies and job seekers. The number of matched pairs becomes the number of hires, which constitutes the number of flows into employment. On the other hand, the number of separations from firms becomes the number of outflows. The difference between the two flows determines the change in the employment level. The crux here is that the minimum wage can affect these two flows. For example, if a rise in the minimum wage undermines firms' incentives to hire workers, it could bring about fewer vacancies and hence fewer hires. Firms may also lay off their workers to save labor costs, bringing about more separations. This argument suggests that examining the impact of minimum wages on labor market flows is a promising strategy to unravel the nature of the minimum-wage effect on the level of employment. The basic idea of labor market flows accords well with the model of imperfect labor markets where vacancies and job-seekers coexist due to lack of information or search costs. In this model, and the monopsony model of the labor market as well, an increase in the minimum wage does not always lead to employment reduction (Card and Krueger, 1995; Bhaskar et al.,2002; Flinn, 2006), which is in sharp contrast to the simple neoclassical model where an increase in the minimum wage should reduce employment (Stigler, 1946).

Many empirical studies have focused on the effect of minimum wages on the level of employment. The literature, however, has not reached a definite conclusion: Some studies find positive or zero effects (Card and Krueger, 1994), while other studies obtain opposite results (Neumark and Wascher, 2008; Clemens and Wither, 2019). Recent studies show that the minimum wage affects labor market flows while leaving the level of employment unchanged. Dustmann et al. (2021) investigated the effects of the first-time introduction of the nationwide minimum wage in Germany in 2015. According to their results, the minimum wage did not reduce employment even though the wage level had increased. The wage increase took the form of reallocation of low-wage workers from smaller establishments to larger establishments and from lower- to higher-paying (productive) establishments. This observation is consistent with the prediction of search friction models that a higher minimum wage induces the lower productivity jobs to resolve and the dismissed workers move to higher productivity jobs (Mortensen and Pissarides, 1994; Pissarides, 2000).

On the other hand, some studies argue that a rise in the minimum wage reduces labor market flows. Brohu and Green (2013) show that the higher minimum wage did not change the level of employment but reduced separation and hiring rates in Canada between 1979 and 2008. Also, Dube et al. (2016) indicate that the minimum wage change did not affect the employment level of teens and workers who have been in a high-impact industry (restaurants) but reduced the labor market flows in the US between 2000 and 2011. Liu (2021) finds that the rise in minimum wage decreased the occupational mobility of younger and less-educated workers and augmented the mismatch in the US between 2005 and 2016. Both Brochu and Green (2013) and Dube et al. (2016) argue that their extended search friction models can explain why the minimum wage reduces layoffs even under the assumption of search friction.

These are valuable studies that focused on the role of labor market flows such as hires and separations when examining the minimum wage effect on employment. However, these labor market flows derive from the matching process of vacancies and job seekers in the labor market, where the latter two indices more directly represent labor demand and supply, respectively. Therefore, the effect of minimum wages on vacancies and job seekers deserves detailed empirical investigation.

There are, in fact, a few studies that examine the relationship between minimum wage and vacancy posting. Kudlyak et al. (2020) estimated the minimum wage effect on vacancies in "at-risk occupations" (occupations with a high employment share around the prevailing minimum wage) in the US between 2005 and 2018. The results show that a 10% increase in the minimum wage resulted in a 2.4% reduction of vacancies in "at-risk occupations." For Japan, Ariga (2007) is the only study that focuses on the relationship between minimum wage and vacancies and finds a negative correlation between these two variables. However, one should note that this study only examined vacancies of new high school graduates treating the minimum wage as one of the many independent variables. Hence, a more detailed analysis using data on vacancies for general workers is necessary.

This paper is the first study that examines the impact of minimum wage on vacancies for general workers in Japan. We also investigate its effect on job seekers since a higher minimum wage may induce firms to change the number of their employees and affect the labor market participation from out of the labor force[1]. This paper also estimates the minimum wage effect on the number of new recipients of unemployment insurance benefits to gain some insight into the relative importance of separations.

The remainder of this paper is structured as follows. Section 2 briefly introduces the characteristics of the minimum wage system in Japan. Section 3 discusses the data and estimates the effect of minimum wage changes on the number of vacancies and job seekers. Section 4 is devoted to analyzing differences in minimum wage effects between subperiods, regions, vacancy types, and job

[1] Flinn (2006) argues that the minimum wage could encourage people out of the labor force to participate in the job search.

seeker types. Section 5 concludes.

2. Minimum Wage in Japan

This section briefly introduces some characteristics of the minimum wage system in Japan. The Japanese minimum wage system consists of two types of minimum wages: regional and specific minimum wages. The Minimum Wage Act stipulates that "regional minimum wages shall be set in consideration of the living expenses of workers, wages of workers and the ordinary enterprises' ability to pay the wages in the region" (Article 9, Paragraph 2). The Central Minimum Wage Council which consists of members of the public interest representative, worker representative, and employer representative, provides a guideline of the amount to be raised for each prefecture. After that, the Local Minimum Wage Council in each prefecture consisting of members of the public interest representative, worker representative, and employer representative discusses the amount to be raised considering the guideline, then the minimum wage in that prefecture is determined.

Every year, discussions at the Central Minimum Wage Council start in early summer, and regional minimum wages come into effect around October. The regional minimum wage covers all workers except those in particular industries and acts as a safety net. The specific minimum wages are set based on the offer by labor and management, and their levels should be higher than the regional minimum wage. As of March 2020, the number of workers applied is about 2.9 million, about 5% of the number of workers employed in the same year. The specific minimum wages pertain to the industries and occupations where the labor union organizations have strong bargaining power. Though the law stipulates this type of minimum wage, no legal punishment exists because this system has a strong flavor of labor-management autonomy. In other words, the rationale of the regional minimum wage as a compulsory provision lies in the fact that it covers those who cannot negotiate specific minimum wages. Considering this reason and the wide range of workers applied, this paper focuses on the effect of the regional minimum wages.

Some of the characteristics of the Japanese minimum wages are as follows. First, regional minimum wages change every year. There has been no reduction in minimum wages, and even no change (zero increase) has seldom occurred. At the same time, the increase had been modest when the labor market condition was slack. For instance, the rate of change in the national average minimum wage was only 0.17% in 2002, when many prefectures did not raise their minimum wages due to the economic downturn.

Second, although the negotiations at the local level determine the minimum wage change in each region, the guidelines provided by the Central Minimum Wage Committee have a substantial impact on the outcome. The committee divides the whole prefecture into four groups and suggests for each group a guideline amount of increment considering the growth rate of wages, local economic and

labor market conditions, and government policy toward minimum wages. Tamada (2009) shows that the actual minimum wage change in each region follows closely to the guideline to that region with the correlation coefficient of 0.98 for 2001-2009. The committee's taking into account the regional wage growth in determining minimum wage increase brings about a substantial correlation between the national weighted average of minimum wage increase and the nationwide changes in wages. After 2008, however, the government policy to raise minimum wages became pronounced faced with the criticism that minimum wages had been falling behind social welfare, especially in metropolitan areas. In addition, the Abe cabinet announced the target level of average minimum wages (1,000 yen) in 2015 to support low-income families, which the subsequent cabinets have been following since then. For these reasons, since 2007, the national minimum wage increase has surpassed the nationwide wage increase by 1-2 percentage points except for 2020 when the covid-19 hit the world economy.

Third, the ratio of the minimum wage to the median wage rate of full-time workers increased from 32% in 2000 to 45% in 2021 owing to this recent effort by the government to raise minimum wages. Despite this increment, the ratio is ranked 27th among 31 OECD countries in 2021.

Some studies have analyzed the minimum-wage impact on employment outcomes in Japan. Among them, two recent papers are particularly noteworthy. Using individual data set on wages, Kambayashi et al. (2013) find that the minimum-wage increase resulted in the compression of the lower tail of the wage distribution among women and that it is only partially attributable to the loss of employment. Kawaguchi and Mori (2021) examine the impacts of the minimum wage on employment using the minimum-wage hike induced by the introduction of the indexation of the local minimum wage to the local cost of living. They find that the minimum-wage hike raised the wages of low-wage workers, but reduced the employment of less-educated young men.

Figure 1 shows the minimum wages by prefecture in 2005 (average from February to December) and 2019 (average from January to December). We choose this period because it corresponds to the sample period for our econometric analysis in the later sections. The rise of minimum wages mainly takes place in October. In constructing a monthly dataset, we assume that the minimum wage is raised in October when the actual day of revision is on or before October 15 and in November if the day of revision is after October 15. This assumption applies to all the analyses in the subsequent sections. From Figure 1, it is evident that the minimum wages are higher in core prefectures of metropolitan areas like Tokyo, Aichi, and Osaka and their neighboring prefectures than other prefectures. We can also observe that the minimum wages have increased in all the prefectures from 2005 to 2019, especially those belonging to metropolitan areas. This disparity in the growth rate of minimum wage across regions enables us to identify the minimum-wage impact on the number of vacancies and job seekers.

3. Empirical Analysis

3.1 Administrative Data

This section examines the impact of the minimum wage on the number of vacancies and job seekers registered for public employment services in Japan. The data of these variables come from the "Report on Employment Service" published monthly by the Ministry of Health, Labour, and Welfare (MHLW). Using more than 500 local agencies, the MHLW is offering the service of job placement, employment security, and guidance towards firms to reinforce employment security. The main targets are job applicants who have difficulty finding employment and small and medium-sized firms with a lower probability of filling vacancies than larger firms. As of 2019, firms posted about 920 thousand jobs, and about 400 thousand new job seekers registered per month, making it the most relevant employment service provider in Japan[2].

The number of vacancies at a local agency increases when a firm posts more jobs at the agency. Similarly, a person who started a job search by registering at one of the local agencies becomes a job seeker. The "new" vacancies (job seekers) in the statistics represent these newly registered vacancies (job seekers). The MHLW collects these figures from the local agencies and publicizes the summary statistics every month at national and regional levels. We use this highly reliable administrative data to investigate the impact of the minimum wage on the number of vacancies and job seekers. We use the prefectural level data because the regional minimum wages are determined at the prefectural level, as was stated in the previous section. Note here that there are two types of vacancy data at the prefectural level: one based on the location of an establishment where a worker works, and the other based on that of the local agency registered. It is desirable to use the former in our analysis because the minimum wage of each prefecture is applied based on the place where people work. Since the MHLW publicizes this data from February 2005, our data starts from here to December 2019, when COVID-19 has not affected the Japanese labor market. On the other hand, this kind of distinction does not apply to job seekers: Their number is counted based on the place of the local agency registered.

Thus far, we explained the measurement of the number of new vacancies and new job seekers, both of which are the "flow" variables. However, many firms with unfilled vacancies and unsuccessful job seekers keep searching next month, which we should consider when measuring the "stock" of vacancies and job seekers. Our data also contains the number of "active" vacancies and "active" job seekers, both of which are the sum of new vacancies (job seekers) registered each month and the vacancies (job seekers) that have been brought forward from the previous month. The ratio of the number of active vacancies to job seekers is one of the most frequently cited indicators of the

[2] According to the "Employment Trend Survey" (MHLW), those hired through this public employment service constitute 17.8% of the total hirings in 2019, which is larger than the share of private employment service, 5.1%.

tightness of the labor market in Japan.

Figure 2a plots the relationship between the growth rate of minimum wage and the growth rate of the number of new vacancies in each prefecture for the entire sample period. We obtained these variables by first calculating the year average values of the minimum wage and the number of new vacancies for 2005 and 2019, and then calculating their growth rates using these two end-point values. We can observe from the figure that there seems to be a negative relationship between these variables. In Figure 2b, the vertical axis is now the growth rate of the number of new job seekers. In this case, the relationship seems more obscure. We will check these relationships formally in the next section.

3.2 Empirical Strategy

Having observed several suggestive relationships between the growth rate of minimum wage and vacancies/job seekers, we go on to look into them more closely by using regression analysis. The baseline model is the one that regresses the log of the number of vacancies/job seekers, both "new" and "active," of each prefecture on the log minimum wage in the same region, controlling for prefectural specific effects, time-specific effects, and prefectural-specific trends. We check whether the inclusion of the prefectural-specific trends alters the impacts of minimum wage, considering some studies stressing the importance of state-specific trends in identifying the employment effect of the minimum wage (Allegretto, Dube, and Reich 2011).

Furthermore, we also examine the specification that includes a proxy for demand shock in each prefecture as an independent variable. We believe this specification is preferable because there may be some demand shock that cannot be captured by the prefecture-specific effect and the prefecture-specific trend. The variable used here is the prefectural GDP obtained from the "Report on Prefectural Accounts" published by the Cabinet Office. Since the recent series based on 2008 SNA is only available from CY 2006 till CY 2018, the sample size becomes smaller than the specification without this variable. This variable is also transformed in logs when included in the estimation equation. Note also that the data of this variable are from the yearly statistic tables, and hence possible monthly variations in the regional demand shock cannot be absorbed by this proxy measure.

The estimation equation is

$$\ln Y_{it} = \alpha \ln MW_{it} + \beta \ln GDP_{ij} + \gamma_i + \delta_t + \theta_i * trend + \varepsilon_{it} \quad . \qquad (1)$$

The subscripts i and t denote a prefecture and time (month), respectively. Y_{it} is the number of vacancies/job seekers in each prefecture (both fulltime and parttime), MW_{it} is the prefectural minimum wage, and GDP_{ij} is the prefectural GDP (million yen). γ_i is a prefectural fixed effect, δ_t is a month fixed effect, and $\theta_i * trend$ is a prefectural specific trend. ε_{it} is an error term. We will report cases with or without the prefectural GDP in the regression equation. When Y_{it} is the number of

vacancies, the coefficient of the log of the minimum wage, α, would become negative if a rise in the minimum wage in a prefecture leads to a decrease in labor demand through reduced hiring of workers of the firms in the region. In the same vein, the coefficient would become positive when the dependent variable is the number of job seekers if a higher minimum wage leads to the increased separation of workers or participation from the out of labor force[3]. The estimation method is the OLS using clustered standard errors at the level of the prefecture[4]. See Table A-1 for some of the summary statistics.

3.3 Results

Panel A of Table 1 presents the estimation results for new vacancies. Columns (1)-(4) show the estimated coefficients when we do not include the prefectural GDP as an independent variable, while (5)-(6) are the cases with that variable. We can observe the strong negative impact of the regional minimum wage variable irrespective of the specification. The results show that a 1% increase in the minimum wage leads to a 1.2-2.4% decrease in new vacancies. Controlling for the prefectural specific trends strengthens the impact of the minimum wage, while the addition of the prefectural GDP reduces the impact only marginally. The prefectural GDP has a significantly positive coefficient, which accords with our prediction stated earlier. Our preferred specifications with prefectural specific trends show that a 1% increase in the minimum wage results in a 2.1-2.4% decrease in the number of new vacancies, which seems large in magnitude. Panel B shows the cases where the dependent variable is the number of new job seekers. We find positive estimated coefficients of the minimum wage variable, while the absolute values of the estimated minimum wage effect are smaller than those of Panel A within the corresponding specification. Again, the coefficients become larger when controlling for the prefectural-specific trends. The estimated coefficient of the prefectural GDP is negative, which is consistent with our prediction. The estimated coefficients of the log minimum wage show that a 1% increase in the minimum wage brings about a 1.8-2.2% increase in job seekers, which may be due to the higher separations resulting from decreased labor demand. Panels C and D are for active vacancies and job seekers, respectively. These panels show that the estimated coefficients of the minimum wage for the active vacancies (job seekers) tend to be larger than those for the new vacancies (job seekers) in absolute value when the prefectural specific trends are absent. The estimated coefficients of the minimum wage of the active vacancies/job seekers are similar to those of the new vacancies/job seekers for the specifications with the prefectural specific trends. In the next section, we will concentrate on new vacancies/job seekers.

---

[3] We will return to this issue in section 4.4, where we examine the impact of the prefectural minimum wage on the number of new recipients of the unemployment insurance benefit in the same prefecture.

[4] Note here that using the OLS could bias the estimates of the impact of minimum wages if the labor market tightness is a factor to be considered when setting the minimum wage. We do not pursue this issue here because it is hard to cope with this endogeneity problem. However, the direction of the bias is likely toward underestimation, meaning that the OLS coefficient becomes the lower bound of the minimum wage effect.

4. Further Investigation

4.1 Differences in Minimum Wage Effects between Subperiods

Here we investigate whether the impact of the minimum wage differs across different subperiods. It seems reasonable to conjecture that an increase in the minimum wage during a recession is more detrimental to labor demand because firms tend to be more vulnerable to the exogenous increase in labor costs when consumer demand for their products/services is weaker. This conjecture leads to the hypothesis that a rise in the minimum wage decreases labor demand more in the slacker labor market resulting from a recession. We divide the entire sample period into two subperiods, February 2005 to December 2013 and January 2014 to December 2019, and consider the former (latter) as the slack (tight) labor market period. This choice of threshold is natural because average active job openings rates[5] in 2014 and after are higher than any year between 2005 and 2013. Moreover, the unemployment rate in 2014 fell below an annual average of 4% for the first time in 17 years since 1997.

Figure 3a shows the relationship between the minimum wage growth rates and the new vacancy growth rates during the period of the slack labor market. It seems that a negative relationship exists between these variables. The relationship between minimum wage growth rates and the new job seeker growth rates shown in Figure 3b is unclear. Figures 4a and 4b are similar figures for the tight labor market period. The dots in the figures are more scattered for this period, and there are no apparent relationships.

Now we estimate new vacancies/job seekers equations for each subperiod and look at the changes in the estimated impact of the minimum wage. The estimation model is the same as the one used in the previous section. The results are in Table 2. Panel A shows the results for the slack labor market period, and Panel B shows those for the tight labor market period. The difference between the panels is conspicuous. We find a substantial impact of the minimum wage both on new vacancies and job seekers during the first half period, while we find no such effect on those variables during the latter half period except for the cases of new job seekers without prefectural specific trends. For the first subperiod, the estimated minimum wage elasticity is about -4 for vacancies and about 3.5 for job seekers, which are more pronounced than found for the entire sample period in Table 1. The results are consistent with the hypothesis that the negative impact of the minimum wage on labor demand becomes severer when the labor market is loose. One can also see that the minimum wage effects on vacancies/job seekers found in the previous section come almost entirely from the inclusion of this slack labor market period. In addition, Panel A shows that the estimated minimum wage effects during the first half become larger in absolute value when we exclude the data for 2005 from the sample,

[5] This index is the ratio of the number of active vacancies to that of active job seekers.

which happened to be caused by the availability of the prefectural GDP data. One possible interpretation is that since the labor market condition in 2005 is comparatively better than the subsequent years in the same subperiod, the property of the slackness of this subperiod was reinforced by dropping the observations that belong to this year. This observation leads to a question: Which part of the first subperiod is responsible for the substantial negative minimum wage effect on labor demand?

To answer this question, we perform a rolling regression. Specifically, we repeatedly run a regression while sliding the sample period by one month, keeping constant the length of the sample period (this length is called the "window"). Choosing a window entails a tradeoff. A wide window does not help identify the relevant part within the subperiod. On the other hand, a narrow window can bring about the problem of a small sample size. After some experimental trials, we chose 62 months (6 years) as the window width. The specification of the model is that of (2) and (4) in Tables 1 and 2.

Figures 5a and 5b show the results of the rolling regression for new vacancies and job seekers, respectively. The horizontal axis is the stating period of the sample, and the solid line denotes the estimated coefficients of the log minimum wage. The estimated minimum wage elasticity of the new vacancies is positive during the sample periods that start in 2005 but forms a fairly sharp trough in the late 2000s with a bottom figure around -5. Then the estimated elasticity quickly returns to zero for the sample periods starting from 2011 and becomes stable after that (Figure 5a). On the other hand, the estimated minimum wage elasticity of new job seekers is about two at the starting periods and makes a sharp peak near 5 in the late 2000s. After that, the level drops to near zero in 2010 and then slightly moves upward, exceeding 1 in 2013 (Figure 5b). The concurrence of the sharp peak and trough seems to support the view that there is a particular period when the minimum wage affected the labor market. We can now figure out the intersection of the sample periods that bring about substantial estimates in absolute value. If we choose 4 for this threshold, the intersection period is from April or May 2008 to April or May 2012. During this period, the Japanese economy was seriously damaged by the Great Recession of 2008 and the Great East Japan Earthquake of 2011, resulting in the highest unemployment rates among the entire sample period 2005-2019. This finding also supports the hypothesis that the negative impact of minimum wages on labor demand becomes strongest during a slack labor market.

4.2 Differences in Minimum Wage Effects between Regions

The effect of minimum wage could vary across regions. The reason is that each has its distinct economic environment such as industry or firm size composition, wage level, labor force composition. Among the various economic variables that characterize regional differences, we focus on two variables: the Kaitz index and the share of small establishments. We examine these in turn below.

The Kaitz index is a frequently used measure of the wage distribution in the literature of minimum wages. Its definition is the ratio of a regional minimum wage of a particular region to the average wage rate of that region multiplied by 100. Figure 6 shows the average Kaitz index calculated using the "Monthly Labor Survey" (MHLW). The prefecture with the highest index is Okinawa, while Tokyo is the prefecture with the lowest index. If this index is high, it suggests the minimum wage is relatively higher than the local wage rate in that region, which may bring about a more detrimental effect of a minimum wage increase on labor demand in that region. To test this hypothesis, we divide the 47 prefectures into two groups: the group with low Kaitz indices and the other with high Kaitz indices. The threshold value of the index is set to 45 so that the number of prefectures is roughly equal across the two groups. We then run regressions explaining the log of new job vacancies and new job seekers for each group using the entire sample period and compare the estimated coefficients of the minimum wage. The specifications used here are those using prefectural specific trends, with and without the regional GDP.

Table 3 shows the estimation results. Panel A shows that the estimated coefficients of the minimum wage are negative for all the groups and the specifications. It is interesting to observe that the negative impact of the minimum wage on the number of new vacancies is higher in absolute value for the group with high Kaitz indices than for that with low Kaitz indices. The difference is stark, that is, nearly twice in elasticity. This result is consistent with our hypothesis that the impact of minimum wage is more pronounced in the regions with minimum wage. Panel B of the table shows the estimation results for the number of job seekers. We can see that the coefficients of the minimum wage are positive for both groups irrespective of the specifications. Again, the estimated elasticities for the group with high Kaitz indices are higher than that with low Kaitz indices, supporting our hypothesis.

Let us now turn to the case when we group the prefectures according to the size of establishments. It is reasonable to conjecture that small firms are more vulnerable to the rise in the minimum wage. A plausible reason is that since such small firms do not usually have competitiveness of their products like large firms, they face difficulty adding the burden of the minimum wage rise to their product prices. Considering that the minimum wage applies to the establishments in each prefecture, we divide them into two groups according to the share of small establishments. The data source of establishment size is "Economic Census of Business Activities" (Ministry of Internal Affairs and Communications). We use the share of establishments that are less than 30 employees averaged over the survey years 2009, 2011, 2013, and 2016 as a benchmark of establishment size distribution. We calculate this value for each prefecture and divide them into two groups. The threshold value is 54.8% to make the number of regions in each group roughly the same. See Table A-2 for the prefectures included in each group.

Table 4 shows the estimation results. We can observe that the minimum wage elasticity of new vacancies in absolute value is substantially higher for the group of the higher share of small

establishments (Panel A). The difference is even more conspicuous than when we group the prefectures according to the Kaitz index. The estimated elasticities are not statistically significant for the group with a lower share, while they are smaller than -4 and statistically significant for the group with a higher composition of small firms. We can also see that the impact of the minimum wage on the number of job seekers is higher in the group with a higher share of small firms. The difference is again more conspicuous than when we group the prefectures according to the Kaitz index.

In sum, the results in this section show that the minimum wage effect on the number of vacancies and job seekers in a region varies according to the minimum wage level relative to the average wage in that region (Kaitz index) and the share of small establishments: The minimum wage effects is higher in prefectures with higher Kaitz index or higher composition of small establishments.

4.3 Differences in Minimum Wage Effects between Vacancy Types

The effect of a rise in minimum wage can be different according to the type of vacancies. Among many possible aspects of them, the distinction between full-time and part-time jobs seems to be intriguing. One can conjecture that the absolute value of minimum wage elasticity of posted vacancies is higher for part-time jobs for two reasons. First, wage rates of part-time jobs are generally lower than those of full-time jobs, resulting in a higher impact of the minimum wage rise on the number of vacancies of part-time jobs. That is because the proportion of vacancies needed to adjust their posted wage rates to the minimum wage increase is likely to be higher for part-time jobs. Second, the elasticity of labor demand for part-time workers tends to be higher than for full-time workers because the former is usually an atypical type of labor with high own wage elasticity of labor demand (Lichter, Peichl, and Siegloch 2015).

The full-time and part-time vacancies data are available only for the posted location, rather than the work location as in the previous sections. Therefore, we should first check the extent to which the difference in location treatment brings about the difference in the estimated coefficients by comparing the results for total vacancies in both cases. The estimation specifications are those with the prefecture-specific trend terms with and without the prefectural GDP variable. Table 5 shows the estimation results of the new vacancies. From Panel A columns (1) and (2), we can observe that the estimated minimum wage elasticities for the entire sample period are significantly negative, and contrary to our intuition, their absolute values are higher than those using new vacancies classified by the location of work (cf. Table 1). The results in columns (3)-(6) indicate that the estimated coefficients of the minimum wage are higher for part-time than for full-time jobs. Panels B and C show the estimation results for the two subperiods introduced in Section 4.1. The results for the period of slack labor market do not give us conclusive evidence. On the other hand, we can observe some marginally significant effects only for part-time vacancies during the tight labor market period, contributing to the higher minimum wage elasticities for the entire sample period.

4.4 Job-to-Unemployment Separation

The estimation results obtained up to this point show that a rise in the minimum wage increased the number of job seekers during the slack labor market period. This phenomenon could be due to the increased separation of workers (dismissals, for example) or participation from out of the labor force. Since our data contains information on the number of new recipients of the unemployment insurance benefit, we can examine whether or not the number of job-to-unemployment separations increases with a rise in the minimum wage. Testing this effect is valuable because confirmation of this point becomes another evidence showing that the labor demand decreases with a minimum wage rise. In addition to analysis on the entire sample period, we conduct estimation for two subsample periods defined earlier.

Table 6 provides estimation results. We can see from Panel A that all the estimated coefficients of the minimum wage for the entire sample period are significantly positive, showing that the job-to-unemployment separation increases with a minimum wage rise. The results for the slack labor market period exhibit a starker minimum wage effect (Panel B). Interestingly, we observe some significant estimated coefficients even for the tight labor market period (Panel C). These results are consistent with the view that a rise in the minimum wage leads to decreased labor demand via increased job separations.

5. Conclusion

The results obtained in this paper show that for 2005-2019, a rise in the minimum wage reduced the number of vacancies. On the other hand, it increased the number of job seekers and then decreased the vacancy-job seeker ratio. Some part of this came from the increased job separation into unemployment. The impact of a minimum wage rise is conspicuous during the period of the slack labor market, for prefectures with high Kaitz indices or with a high proportion of small firms, and for part-time jobs.

One should note that the vacancies and job seekers analyzed in this paper are not necessarily representative of those in the Japanese labor market as a whole. Since the main targets of the employment service are job applicants who have difficulty finding employment and small and medium-sized firms with a lower probability of filling vacancies than larger firms, the impact of a minimum wage rise obtained in this paper is likely to be higher than the national average. Also, since we did not have access to the raw data of vacancies and job seekers due to its administrative nature, we could not identify the detailed mechanisms of the impact of a minimum wage rise on the number of vacancies and job seekers. Richer data on vacancies are necessary to examine these issues.

References

Allegretto, S. A., A. Dube, and M. Reich (2011) “Do Minimum Wages Really Reduce Teen Employment? Accounting for Heterogeneity and Selectivity in State Panel Data,” *Industrial Relations*, 50(2): 205-240.

Ariga, K. (2006)"Labor Markets for New Senior High School Graduates," in Fumio Hayashi (ed.), *Empirical Analysis and Design of Economic Systems Vol. 1*, Keiso Shobo Publishing (in Japanese).

Bhaskar, V., A. Manning, and T. To (2002) “Oligopsony and Monopsonistic Competition in Labor Markets,” *Journal of Economic Perspectives*, 16(2): 155-174.

Brochu, P. and D. A. Green, (2013) “The Impact of Minimum Wages on Labor Market Transitions,” *Economic Journal*, 123(12): 1203–35.

Card, D. and A. Krueger (1994) “Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania,” *American Economic Review*, 84(4): 772-93.

Card, D. and A. Krueger (1995) *Myth and measurement: The New Economics of the Minimum Wage*, Princeton University Press.

Clemens, J. and M. Wither (2019) “The Minimum Wage and the Great Recession: Evidence of Effects on the Employment and Income Trajectories of Low-Skilled Workers,” *Journal of Public Economics*, 170(C): 53-67.

Dube, A., T. W. Lester, and M. Reich (2016) “Minimum Wage Shocks, Employment Flows, and Labor Market Frictions,” *Journal of Labor Economics*, 34(3): 663-704.

Dustmann, C., A. Lindner, U. Schonberg, M. Umkehrer, and P. V. Berge (2022) “Reallocation Effect of The Minimum Wage” *Quarterly Journal of Economics*, 137(1): 267–328.

Flinn, C. J. (2006) “Minimum Wage Effects on Labor Market Outcomes under Search, Matching, and Endogenous Contact Rates,” *Econometrica*, 74(4): 1013-1062.

Kambayashi, R., D. Kawaguchi, and K. Yamada “Minimum Wage in a Deflationary Economy: The Japanese experience, 1994–2003,” *Labour Economics*, 24(C): 264-276.

Kawaguchi, D. and Y. Mori (2021) “Estimating the Effects of the Minimum Wage Using the Introduction of Indexation,” *Journal of Economic Behavior & Organization*, 184(C): 388-408.

Kudlyak, M., M. Tasci, and D. Tüzemen (2019) “Minimum Wage Increases and Vacancies,” Federal Reserve Bank of Cleveland DP, RWP20-22.

Lichter, A., A. Peichl, and S. Siegloch. (2015) “The Own-Wage Elasticity of Labor Demand: A Meta-Regression Analysis,” *European Economic Review,* 80(C): 94-119.

Liu, A. Y. (2021) “The Minimum Wage and Occupational Mobility” *International Economic Review*, in Press.

Mortensen, D. and C. Pissarides (1994) “Job Creation and Job Destruction in the Theory of Unemployment,” *Review of Economic Studies*, 61(3): 397-415.

Neumark, D. and W. L. Wascher (2008) *Minimum Wages*, The MIT Press.

Pissarides, C. (2004) *Equilibrium Unemployment Theory*, 2nd Edition: The MIT Press, Cambridge MA.

Stigler, G. (1946) “The Economics of Minimum Wage Legislation,” *American Economic Review*, 36(3): 358-365.

Tamada, K. (2009) “The Determinants of the Minimum Wages in Japan,” *Japanese Journal of Labour Studies*, No.593: 16-28 (in Japanese).

Table 1 Minimum Wage Effects on Vacancies and Job Seekers (2005-2019)

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Period	Feb. 2005 - Dec. 2019		Apr. 2006 - Mar. 2018			
A. New vacancies (log)						
Log of minimum wage	-1.772***	-2.176***	-1.251***	-2.483***	-1.344***	-2.442***
	(0.374)	(0.728)	(0.373)	(0.787)	(0.391)	(0.749)
Log of GDP					0.815***	0.529**
					(0.303)	(0.226)
R-squared	0.984	0.989	0.985	0.990	0.986	0.990
B. New job seekers (log)						
Log of minimum wage	0.709*	1.808***	0.657*	2.209***	0.676*	2.180***
	(0.371)	(0.437)	(0.337)	(0.522)	(0.338)	(0.515)
Log of GDP					-0.165	-0.374**
					(0.136)	(0.140)
R-squared	0.986	0.989	0.987	0.989	0.987	0.989
C. Active vacancies (log)						
Log of minimum wage	-2.014***	-2.053***	-1.540***	-2.459***	-1.654***	-2.402***
	(0.450)	(0.751)	(0.455)	(0.810)	(0.473)	(0.757)
Log of GDP					0.996***	0.737***
					(0.352)	(0.224)
R-squared	0.985	0.991	0.985	0.992	0.987	0.992
D. Active job seekers (log)						
Log of minimum wage	1.116***	1.752***	1.160***	2.256***	1.195***	2.201***
	(0.384)	(0.427)	(0.365)	(0.535)	(0.376)	(0.522)
Log of GDP					-0.303*	-0.717***
					(0.153)	(0.131)
R-squared	0.992	0.995	0.993	0.995	0.993	0.995
Number of observations	8,413	8,413	6,768	6,768	6,768	6,768
Prefectural specific time trends	NO	YES	NO	YES	NO	YES

Notes: New vacancies (job seekers) stand for those that appear in a particular month, while active vacancies (job seekers) are the ones that exist that month. The prefecture of vacancies pertains to the location of work.
The sample period for (3)-(6) is shorter than (1) and (2) due to the availability of regional GDP data.
All specifications include prefecture fixed effects and time fixed effects.
Clustered standard errors at the level of the prefecture in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2 Minimum Wage Effects by Subperiod

Specification	(1)	(2)	(3)	(4)	(5)	(6)
A. Period of slack labor market						
Period	Feb. 2005 - Dec. 2013		Apr. 2006 - Dec. 2013			
New vacancies (log)						
Log of minimum wage	-2.557***	-2.239	-1.963***	-4.411***	-1.999***	-4.019***
	(0.522)	(1.406)	(0.512)	(1.364)	(0.500)	(1.317)
Log of GDP					0.746*	0.697***
					(0.379)	(0.216)
R-squared	0.982	0.989	0.983	0.990	0.984	0.990
New job seekers (log)						
Log of minimum wage	1.407***	2.703***	1.328***	3.827***	1.340***	3.502***
	(0.434)	(0.762)	(0.419)	(0.862)	(0.420)	(0.797)
Log of GDP					-0.241	-0.577***
					(0.194)	(0.130)
R-squared	0.984	0.987	0.985	0.988	0.985	0.988
Number of observations	5,029	5,029	4,371	4,371	4,371	4,371
B. Period of tight labor market						
Period	Jan. 2014 - Dec. 2019		Jan. 2014 - Mar. 2018			
New vacancies (log)						
Log of minimum wage	0.915	-0.365	0.540	0.0444	0.469	0.0446
	(1.011)	(0.556)	(0.816)	(0.444)	(0.776)	(0.445)
Log of GDP					0.688***	0.0524
					(0.234)	(0.166)
R-squared	0.994	0.996	0.995	0.997	0.995	0.997
New job seekers (log)						
Log of minimum wage	1.756**	1.523	1.890*	1.808	1.902*	1.807
	(0.761)	(1.167)	(0.964)	(1.145)	(0.949)	(1.139)
Log of GDP					-0.120	-0.136
					(0.136)	(0.144)
R-squared	0.992	0.993	0.992	0.993	0.992	0.993
Number of observations	3,384	3,384	2,397	2,397	2,397	2,397
Prefectural specific time trends	NO	YES	NO	YES	NO	YES

Notes: New vacancies (job seekers) stand for those that appear in a particular month.
The prefecture of vacancies pertains to the location of work.
The sample period for (3)-(6) is shorter than (1) and (2) due to the availability of regional GDP data.
All specifications include prefecture fixed effects and time fixed effects.
Clustered standard errors at the level of the prefecture in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3 Minimum Wage Effects by Regional Group (Kaitz Index)

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Region	All		Kaitz <45		Kaitz ≥ 45	
A. New vacancies (log)						
Log of minimum wage	-2.176***	-2.442***	-1.541*	-1.752**	-3.223*	-3.529**
	(0.728)	(0.749)	(0.780)	(0.778)	(1.591)	(1.607)
Log of GDP		0.529**		0.569		0.393*
		(0.226)		(0.344)		(0.198)
R-squared	0.989	0.990	0.991	0.992	0.986	0.987
B. New job seekers (log)						
Log of minimum wage	1.808***	2.180***	1.683***	1.953***	2.049**	2.448**
	(0.437)	(0.515)	(0.544)	(0.601)	(0.799)	(1.026)
Log of GDP		-0.374**		-0.480***		-0.135
		(0.140)		(0.169)		(0.182)
R-squared	0.989	0.989	0.995	0.995	0.979	0.979
Number of observations	8,413	6,768	4,296	3,456	4,117	3,312
Prefectural specific time trends	YES	YES	YES	YES	YES	YES

Notes: New vacancies (job seekers) stand for those that appear in a particular month.
The prefecture of vacancies pertains to the location of work.
All specifications include prefecture fixed effects and time fixed effects.
Clustered standard errors at the level of the prefecture in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4 Minimum Wage Effects by Regional Group (Establishment Size)

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Region	All		Share of small establishments: low		Share of small establishments: high	
A. New vacancies (log)						
Log of minimum wage	-2.176***	-2.442***	-0.491	-0.729	-4.240***	-4.571***
	(0.728)	(0.749)	(0.628)	(0.635)	(1.379)	(1.194)
Log of GDP		0.529**		0.183		0.557***
		(0.226)		(0.370)		(0.178)
R-squared	0.989	0.990	0.987	0.988	0.977	0.977
B. New job seekers (log)						
Log of minimum wage	1.808***	2.180***	0.856**	1.007***	2.794*	3.656**
	(0.437)	(0.515)	(0.334)	(0.336)	(1.455)	(1.409)
Log of GDP		-0.374**		-0.322		-0.208
		(0.140)		(0.198)		(0.159)
R-squared	0.989	0.989	0.988	0.989	0.977	0.976
Number of observations	8,413	6,768	4,296	3,456	4,117	3,312
Prefectural specific time trends	YES	YES	YES	YES	YES	YES

Notes: New vacancies (job seekers) stand for those that appear in a particular month.
The prefecture of vacancies pertains to the location of work.
All specifications include prefecture fixed effects and time fixed effects.
Clustered standard errors at the level of the prefecture in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5 Minimum Wage Effects by Vacancy Type

Dependent variable: log of the number of new vacancies

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Type of job	All		Full-time job		Part-time job	
A. Entire period						
Log of minimum wage	-2.697***	-3.157***	-2.304**	-2.901***	-3.090***	-3.406***
	(0.918)	(0.857)	(0.912)	(0.901)	(1.029)	(0.900)
Log of GDP		0.545**		0.641**		0.334
		(0.226)		(0.240)		(0.223)
R-squared	0.989	0.990	0.987	0.987	0.986	0.986
Number of observations	8,413	6,768	8,413	6,768	8,413	6,768
B. Period of slack labor market						
Log of minimum wage	-2.154	-4.193***	-2.170	-4.942***	-2.638***	-3.153***
	(1.444)	(1.313)	(1.747)	(1.588)	(0.838)	(0.873)
Log of GDP		0.728***		0.830***		0.482***
		(0.228)		(0.270)		(0.168)
R-squared	0.988	0.989	0.985	0.987	0.986	0.986
Number of observations	5,029	4,371	5,029	4,371	5,029	4,371
C. Period of tight labor market						
Log of minimum wage	-0.241	-0.118	0.198	0.461	-0.813	-0.896*
	(0.615)	(0.449)	(0.822)	(0.564)	(0.558)	(0.512)
Log of GDP		-0.0343		-0.0101		-0.0478
		(0.171)		(0.183)		(0.204)
R-squared	0.996	0.996	0.995	0.996	0.991	0.992
	3,384	2,397	3,384	2,397	3,384	2,397
Prefectural specific time trends	YES	YES	YES	YES	YES	YES

Notes: New vacancies (job seekers) stand for those that appear in a particular month.
The prefecture of vacancies pertains to the posted location.
Entire period: Feb. 2005 - Dec. 2019 for (1),(3), and (5), Apr. 2006 - Mar. 2018 for (2),(4), and (6)
Period of slack labor market: Feb. 2005 - Dec. 2013 for (1),(3), and (5), Apr. 2006 - Mar. 2013 for (2),(4), and (6)
Period of tight labor makert: Apr. 2014 - Dec. 2019 for (1),(3), and (5), Apr. 2014 - Mar. 2018 for (2),(4), and (6)
All specifications include prefecture fixed effects and time fixed effects.
Clustered standard errors at the level of the prefecture in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6 Minimum Wage Effects on Job-to-Unemployment Separations

Dependent variable: log of the number of new recipients of UI benefit

Specification	(1)	(2)	(3)	(4)	(5)	(6)
A. Entire period						
Period	Feb. 2005 - Dec. 2019		Apr. 2006 - Mar. 2018			
Log of minimum wage	0.682**	2.262***	0.699**	2.936***	0.727**	2.889***
	(0.266)	(0.522)	(0.266)	(0.638)	(0.283)	(0.629)
Log of GDP					-0.240*	-0.612***
					(0.129)	(0.115)
R-squared	0.987	0.988	0.987	0.988	0.987	0.988
Number of observations	8,413	6,768	8,413	6,768	8,413	6,768
B. Period of slack labor market						
Period	Feb. 2005 - Dec. 2013		Apr. 2006 - Dec. 2013			
Log of minimum wage	1.507***	4.659***	1.463***	6.264***	1.486***	5.786***
	(0.394)	(1.225)	(0.392)	(1.388)	(0.410)	(1.305)
Log of GDP					-0.470**	-0.848***
					(0.192)	(0.167)
R-squared	0.984	0.986	0.983	0.985	0.984	0.986
Number of observations	5,029	4,371	5,029	4,371	5,029	4,371
C. Period of tight labor market						
Period	Jan. 2014 - Dec. 2019		Jan. 2014 - Mar. 2018			
Log of minimum wage	0.635	1.048	1.372*	2.051***	1.378*	2.051***
	(0.631)	(0.675)	(0.699)	(0.639)	(0.696)	(0.634)
Log of GDP					-0.0593	-0.134
					(0.119)	(0.145)
R-squared	0.993	0.993	0.993	0.994	0.993	0.994
	3,384	2,397	3,384	2,397	3,384	2,397
Prefectural specific time trends	NO	YES	NO	YES	NO	YES

Notes: The sample period for (3)-(6) is shorter than (1) and (2) due to the availability of regional GDP data.
All specifications include prefecture fixed effects and time fixed effects.
Clustered standard errors at the level of the prefecture in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A-1 Summary Statistics (2005-2019)

Variable	Obs	Mean	Std. dev.	Min	Max
Raw values					
New vacancies (location of work)	8,413	16952.74	15389.2	2455	106048
New vacancies (location of register)	8,413	16955.47	18277.6	2617	139399
New vacancies (full time)	8,413	10588.24	11811.45	1521	96115
New vacancies (part time)	8,413	6367.223	6666.745	767	59212
New job seekers	8,413	11191.19	10177.58	1698	82505
Active vacancies (location of work)	8,413	45833.92	43050.44	6708	287644
Active job seekers	8,413	46204.98	42816.56	8378	299017
New recipients of UI benefit	8,413	3456.67	3436.857	439	34447
Minimum wage	8,413	707.3459	71.98013	606	1013
Prefectural GDP (one million yen)	6,768	1.13E+07	1.61E+07	1713879	1.06E+08
Log of the variables					
New vacancies (location of work)	8,413	9.458251	0.707115	7.805882	11.57165
New vacancies (location of register)	8,413	9.415816	0.735648	7.869784	11.8451
New vacancies (full time)	8,413	8.923644	0.761001	7.327123	11.4733
New vacancies (part time)	8,413	8.455889	0.712897	6.642487	10.98888
New job seekers	8,413	9.040554	0.710088	7.437206	11.32061
Active vacancies (location of work)	8,413	10.43095	0.737223	8.811056	12.56948
Active job seekers	8,413	10.44742	0.719347	9.033364	12.60826
New recipients of UI benefit	8,413	7.807856	0.779392	6.084499	10.44718
Minimum wage	8,413	6.556602	0.098009	6.40688	6.920671
Prefectural GDP	6,768	15.78122	0.850634	14.35427	18.4812

Table A-2 Classification of Prefectures Based on Establishment Size

proportion of small establishments: low				
Tokyo	Aichi	Kanagawa	Shiga	Osaka
Mie	Chiba	Ibaraki	Hyogo	Shizuoka
Tochigi	Kyoto	Hiroshima	Saitama	Gunma
Toyama	Okayama	Fukuoka	Miyagi	Hokkaido
Yamaguchi	Fukushima	Nara	Ishikawa	
proportion of small establishments: high				
Kochi	Shimane	Wakayama	Aomori	Miyazaki
Akita	Tottori	Kagoshima	Tokushima	Nagasaki
Gifu	Yamagata	Iwate	Yamanashi	Ehime
Okinawa	Oita	Kumamoto	Fukui	Saga
Nagano	Niigata	Kagawa		

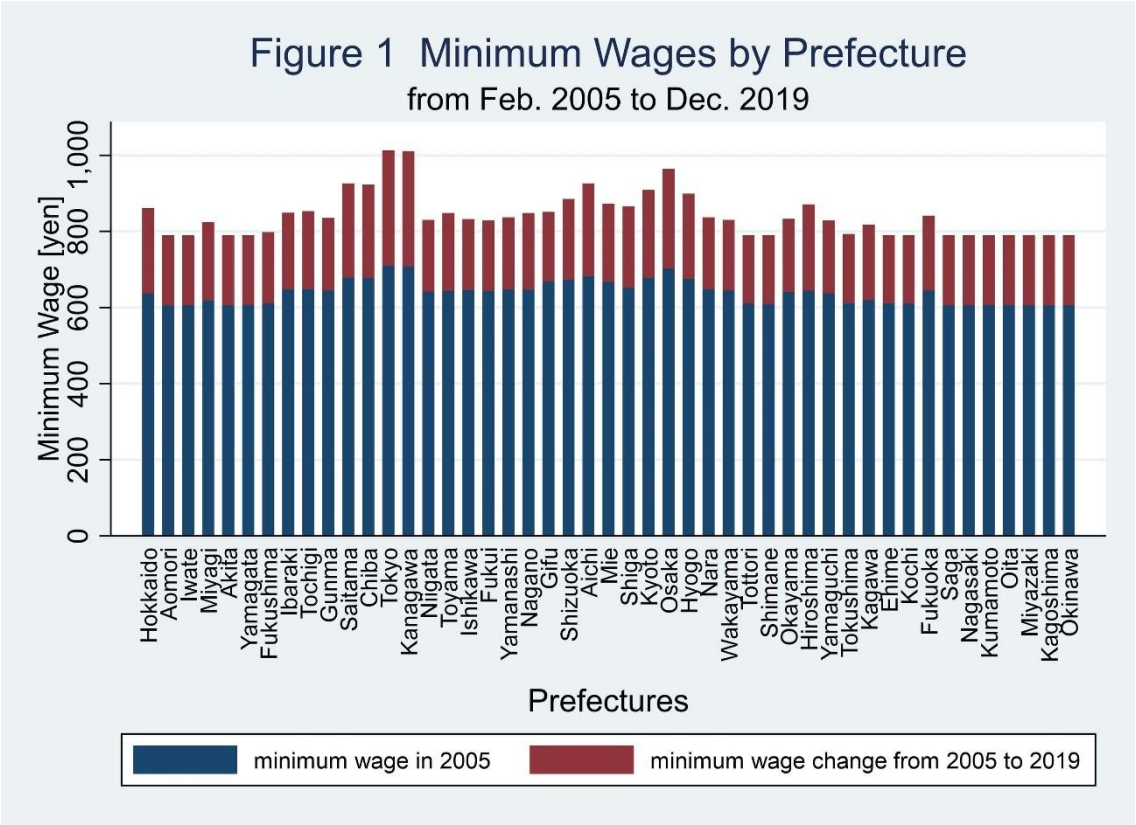
Figure 1 Minimum Wages by Prefecture
from Feb. 2005 to Dec. 2019
Minimum Wage [yen]
0
200
400
600
800
1,000
Hokkaido
Aomori
Iwate
Miyagi
Akita
Yamagata
Fukushima
Ibaraki
Tochigi
Gunma
Saitama
Chiba
Tokyo
Kanagawa
Niigata
Toyama
Ishikawa
Fukui
Yamanashi
Nagano
Gifu
Shizuoka
Aichi
Mie
Shiga
Kyoto
Osaka
Hyogo
Nara
Wakayama
Tottori
Shimane
Okayama
Hiroshima
Yamaguchi
Tokushima
Kagawa
Ehime
Kochi
Fukuoka
Saga
Nagasaki
Kumamoto
Oita
Miyazaki
Kagoshima
Okinawa
Prefectures
minimum wage in 2005
minimum wage change from 2005 to 2019

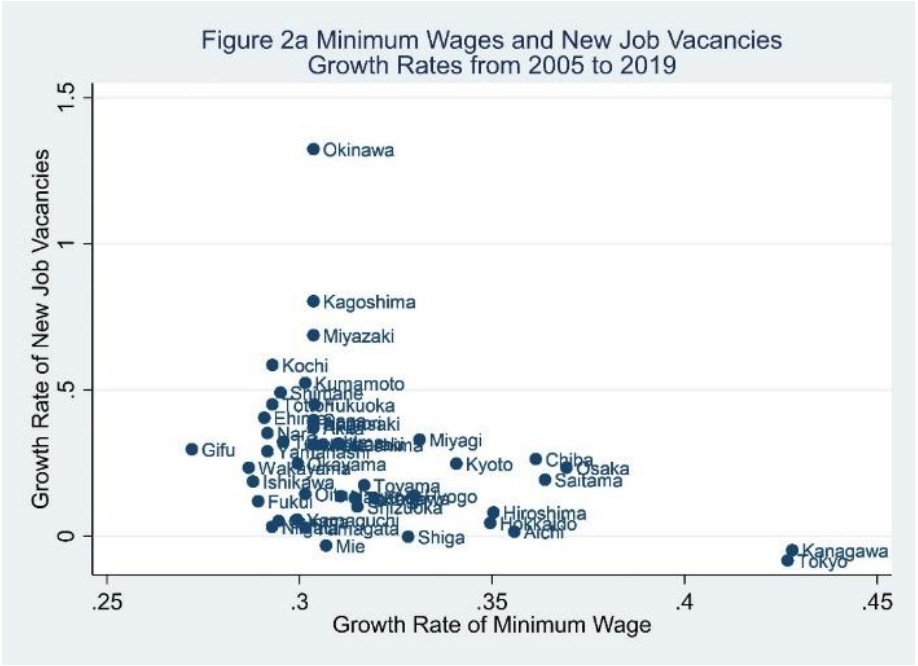
Figure 2a Minimum Wages and New Job Vacancies
Growth Rates from 2005 to 2019
Growth Rate of New Job Vacancies
0
.5
1
1.5
Okinawa
Kagoshima
Miyazaki
Kochi
Kumamoto
Fukuoka
Miyagi
Gifu
Kyoto
Chiba
Osaka
Saitama
Ishikawa
Toyama
Fukui
Hiroshima
Aichi
Shiga
Mie
Kanagawa
Tokyo
.25
.3
.35
.4
.45
Growth Rate of Minimum Wage

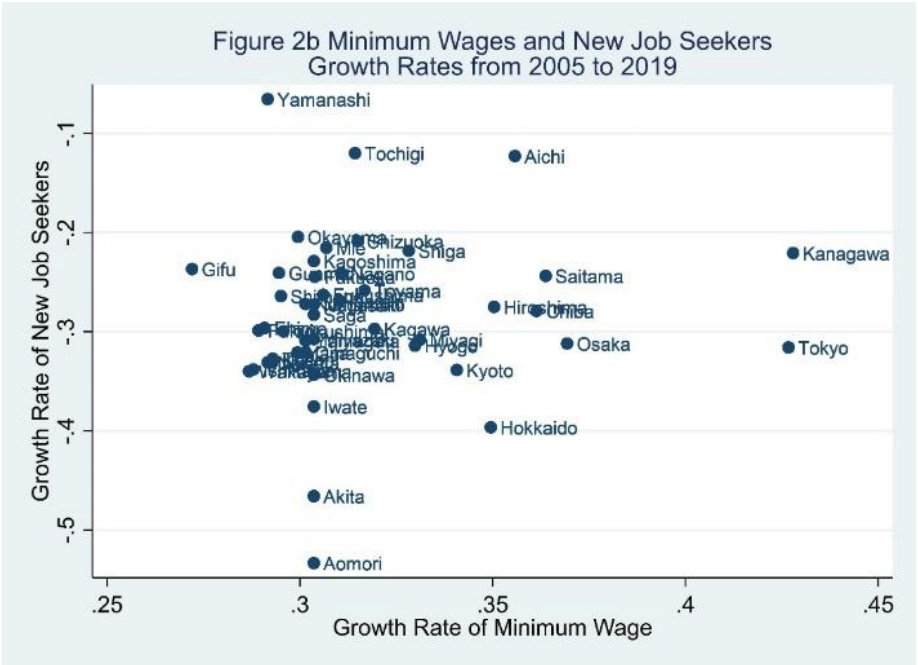
Figure 2b Minimum Wages and New Job Seekers
Growth Rates from 2005 to 2019
Growth Rate of New Job Seekers
-.5
-.4
-.3
-.2
-.1
Yamanashi
Tochigi
Aichi
Shiga
Kanagawa
Gifu
Saitama
Hiroshima
Osaka
Tokyo
Kyoto
Iwate
Hokkaido
Akita
Aomori
.25
.3
.35
.4
.45
Growth Rate of Minimum Wage

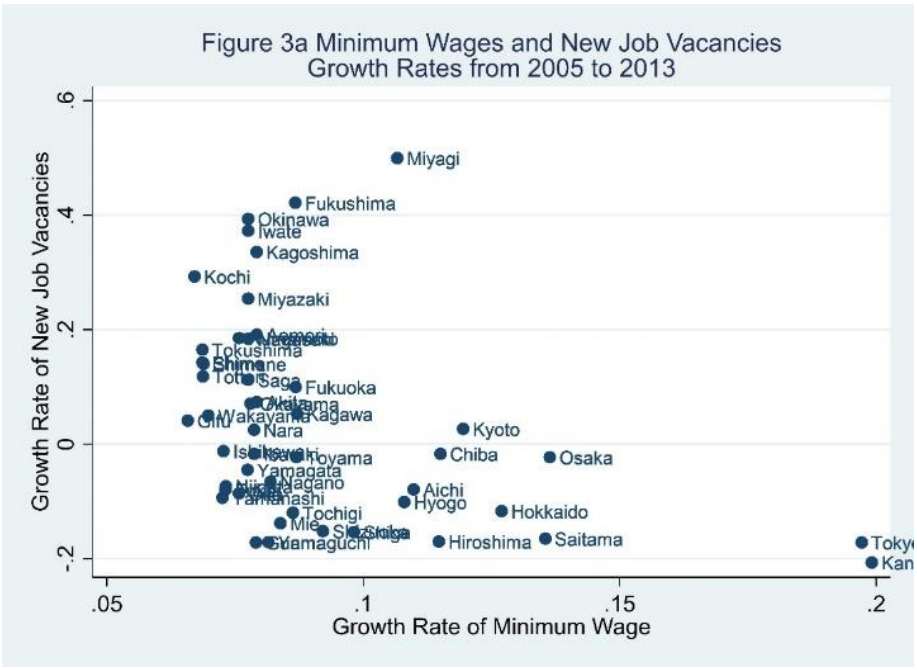
Figure 3a Minimum Wages and New Job Vacancies
Growth Rates from 2005 to 2013
Growth Rate of New Job Vacancies
-.2
0
.2
.4
.6
Miyagi
Fukushima
Okinawa
Iwate
Kagoshima
Kochi
Miyazaki
Tokushima
Fukuoka
Kyoto
Chiba
Osaka
Toyama
Yamagata
Aichi
Hyogo
Hokkaido
Tochigi
Hiroshima
Saitama
Nara
.05
.1
.15
.2
Growth Rate of Minimum Wage

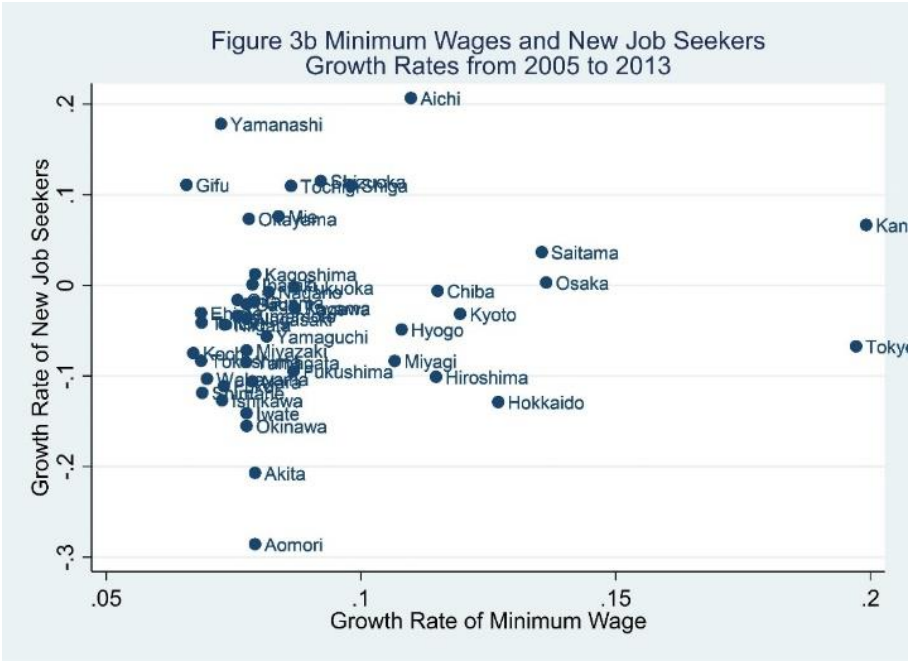
Figure 3b Minimum Wages and New Job Seekers
Growth Rates from 2005 to 2013
Growth Rate of New Job Seekers
-.3
-.2
-.1
0
.1
.2
Aichi
Yamanashi
Gifu
Saitama
Osaka
Chiba
Kyoto
Hyogo
Yamaguchi
Miyagi
Hiroshima
Hokkaido
Iwate
Okinawa
Akita
Aomori
.05
.1
.15
.2
Growth Rate of Minimum Wage

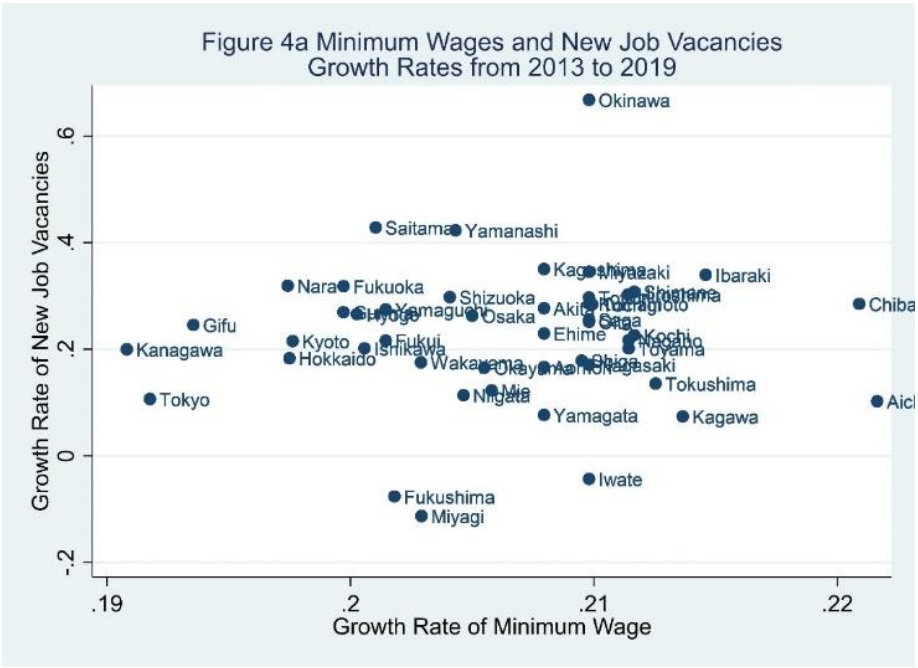
Figure 4a Minimum Wages and New Job Vacancies
Growth Rates from 2013 to 2019
Growth Rate of New Job Vacancies
-.2
0
.2
.4
.6
Growth Rate of Minimum Wage
.19
.2
.21
.22
Okinawa
Saitama
Yamanashi
Ibaraki
Nara
Fukuoka
Shizuoka
Chiba
Gifu
Osaka
Ehime
Kochi
Kanagawa
Kyoto
Fukui
Ishikawa
Hokkaido
Wakayama
Tokushima
Tokyo
Niigata
Mie
Yamagata
Kagawa
Iwate
Fukushima
Miyagi

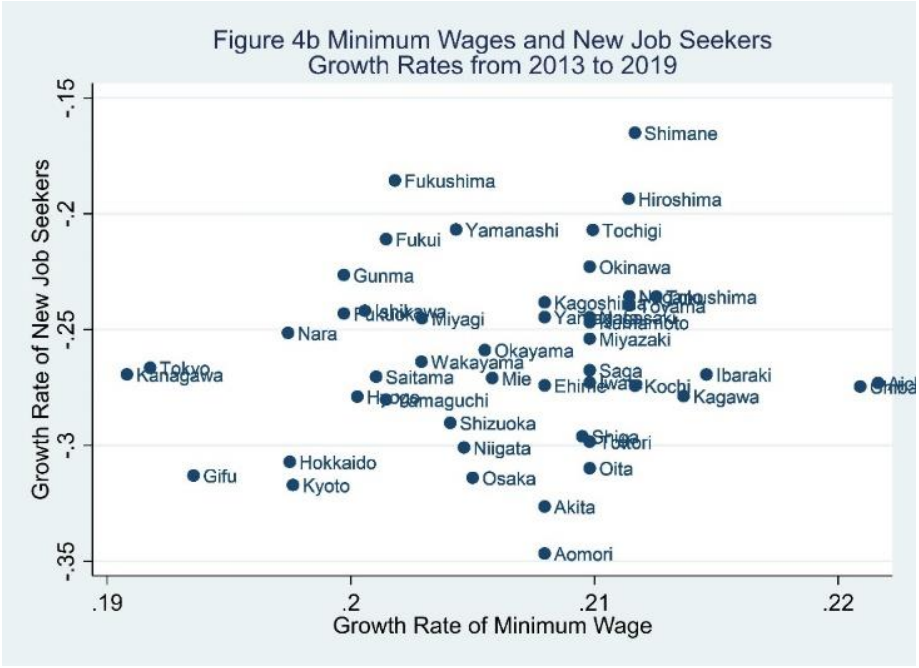
Figure 4b Minimum Wages and New Job Seekers
Growth Rates from 2013 to 2019
Growth Rate of New Job Seekers
-.35
-.3
-.25
-.2
-.15
Growth Rate of Minimum Wage
.19
.2
.21
.22
Shimane
Fukushima
Hiroshima
Yamanashi
Tochigi
Fukui
Okinawa
Gunma
Miyagi
Nara
Miyazaki
Okayama
Tokyo
Wakayama
Kanagawa
Saitama
Mie
Ibaraki
Kochi
Kagawa
Shizuoka
Niigata
Hokkaido
Oita
Gifu
Kyoto
Osaka
Akita
Aomori


Figure 5a Estimated Minimum Wage Elasticities of New Vacancies
Using Rolling Regression (62 Months Window)
Elasticity
2
0
-2
-4
-6
2005m1
2010m1
2015m1
Starting Month


Figure 5b Estimated Minimum Wage Elasticities of New Job Seekers
Using Rolling Regression (62 Months Window)
Elasticity
5
4
3
2
1
0
2005m1
2010m1
2015m1
Starting Month

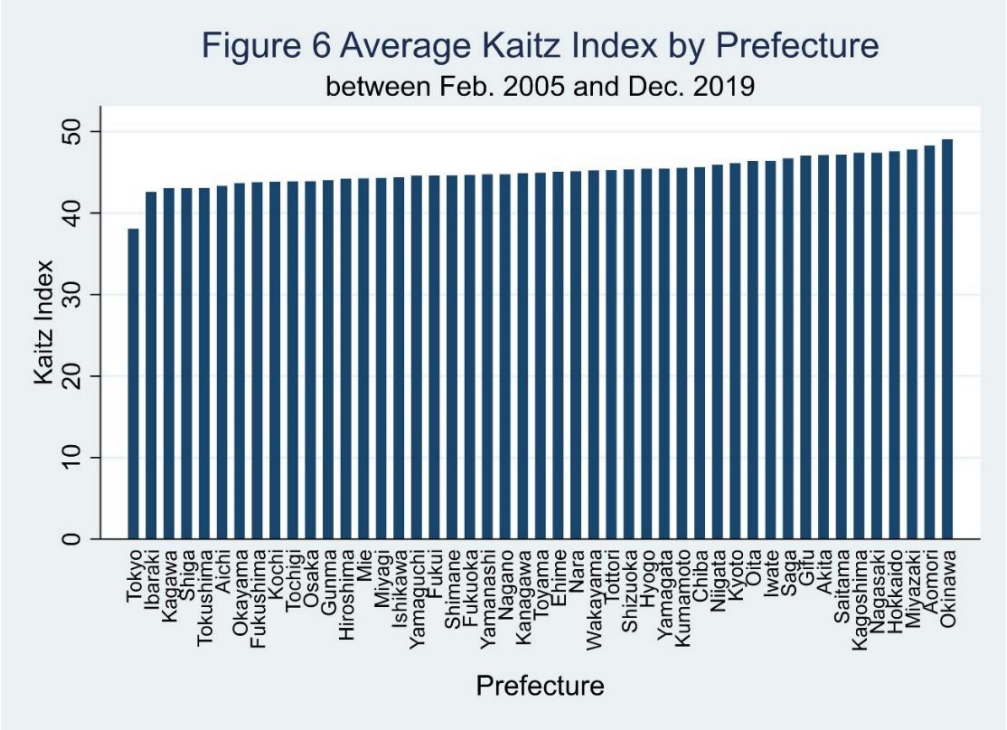
Figure 6 Average Kaitz Index by Prefecture
between Feb. 2005 and Dec. 2019
Kaitz Index
0
10
20
30
40
50
Tokyo
Ibaraki
Kagawa
Shiga
Tokushima
Aichi
Okayama
Fukushima
Kochi
Tochigi
Osaka
Gunma
Hiroshima
Mie
Miyagi
Ishikawa
Yamaguchi
Fukui
Shimane
Fukuoka
Yamanashi
Nagano
Kanagawa
Toyama
Ehime
Nara
Wakayama
Tottori
Shizuoka
Hyogo
Yamagata
Kumamoto
Chiba
Niigata
Kyoto
Oita
Iwate
Saga
Gifu
Akita
Saitama
Kagoshima
Nagasaki
Hokkaido
Miyazaki
Aomori
Okinawa
Prefecture