The Impact of the Minimum Wage on Female Employment in Japan

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Abstract

The statutory minimum wage in Japan is revised every year and increases by almost the same amount across prefectures, regardless of disparities in the wage distribution. Due to this feature of minimum-wage setting, the minimum wage cuts into the wage distribution in rural Japan. We examine the impact of the minimum wage on employment, focusing on women in their 20s and 30s, who are known to be typical, low-wage workers in Japan. The results, based on a panel estimation, suggest that the minimum wage has a measurable impact on employment; the workers whose current wage is below the revised minimum wage are about 20 to 30 percentage points less likely to be employed in the following year than comparable low-wage workers who are not affected by the revision of the minimum wage. The estimation results are sensitive to the choice of the control group, and this fact suggests the importance of controlling for unobserved heterogeneity regarding the employment probability.

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JEL Classification Code: J23, J38, J88

1 Introduction

This paper estimates the effect of the minimum wage on employment among middle-aged women in Japan. Japan's minimum wage has been set at a low level compared with its average wage for a long time. For example, the ratio of the minimum wage to full-time median earnings[1] in mid-1997 was 0.31 in Japan, whereas it was 0.57 in France, 0.49 in the Netherlands, 0.46 in New Zealand, 0.40 in Canada, 0.38 in the US, and 0.32 in Spain (Table 2.3 in OECD [1998]). This low level of the effective minimum wage has discouraged researchers' interest, and there has been virtually no research directly examining the minimum wage's effect on employment in Japan. However, we should doubt the effect of the minimum wage on the employment of middle-aged female workers, particularly in rural areas, because of the following reasons. First, the male-female wage gap in Japan is larger than it is in other developed countries. Second, while wage distributions are heterogeneous across Japan's prefectures, the regional minimum wage is not very heterogeneous, for egalitarian purposes. Third, current ongoing deflation and its associated nominal-wage decline presumably make the minimum wage more likely to bind. These economic conditions and the institution of minimum-wage setting in Japan may cause the minimum wage to have a more serious bite for subgroups of workers in certain regions. Neumark and Wascher [2004], for example, emphasized the importance of examining the

[1] including overtime pay and bonuses.

institution of minimum-wage setting for each country, in addition to looking at the national measure of the minimum wage. This research attempts to enact their suggestion.

The disemployment effect of the minimum wage has been widely examined in North American and European countries. Early studies attempted to identify the disemployment effect using time series data. However, since the late 1980s, US researchers have used cross-state variations of the minimum wage to identify its disemployment effect. The usage of time-series data became unpopular because it is difficult to disentangle the effect of the minimum wage from the effect of macro shocks that can be correlated with revisions in the minimum-wage level. More credit has been given to the results based on state-level panel data, which principally have applied a difference-in-difference (DID) approach to identify the minimum wage's disemployment effect. In these studies, the state that changed the minimum wage was classified as the treatment group and the other states, whose minimum wages were unchanged, were classified as the control group. A famous example of research that applied DID to identify the disemployment effect was Card and Krueger [1994], while another famous example that used all 50 states was Neumark and Wascher [1992]. As indicated by Card and Krueger [2000] and Neumark and Wascher [2000], there has been heated controversy regarding the existence of a disemployment effect of the minimum wage in the US, and we believe it is still fair to say that a definitive conclusion has not been reached.

While US researchers have exploited the existence of state variations in the minimum wage to identify its effect on employment, European researchers have struggled to define appropriate treatment and control groups because European countries tend to have uniform, nationwide minimum-wage systems. A recent study by Machin et al. [2003] examined the effect of the newly introduced, statutory national minimum wage on employment in a low-wage industry, the residential care homes industry. They used the initial average wage of the homes' workers to define the control and treatment groups. The workers in homes whose average wage was originally below the newly adopted minimum wage were classified as the treatment group, and those in homes whose initial average wage was above the minimum were classified as the control group. These researchers found a moderate disemployment effect. Pereira [2003] used the increase of the minimum wage that applied only to workers aged 18 and 19 in 1985 in Portugal to define the control and treatment groups. She found a significant decrease in the employment of these workers, as well as a significant increase in the employment of workers aged 20 to 25 through the substitution effect, using workers aged 30 to 35 as a control group. See Machin and Manning [1997] and Brown [1999] for a review of the literature regarding Europe.

Facing the difficulty of how to identify the disemployment effect of the minimum wage due to the system of minimum-wage setting in Japan, we adopted the methodology proposed by Currie and Fallick [1996] and Yuen [2003]. We compared the change in employment status among those workers

whose current wage is below the newly set minimum-wage level and those workers whose current wage is above the new minimum wage, using panel data of workers. The former group of workers was treated by the minimum wage, and other workers were not treated and thus served as a control group. If we find that the former group of workers was less likely to be employed in the following year than those workers in the latter group, we arguably can confirm the disemployment effect of the minimum wage. The estimation results point to a measurable disemployment effect: The average employment rate of the workers treated by the minimum wage was about 20 to 30 percent lower than that of the workers who were not treated by the minimum wage. The results vary depending on the choice of control group, indicating the importance of controlling for unobserved heterogeneity.

To the best of our knowledge, there are three studies that have examined the relation between minimum wage and wage distribution in Japan. Using a comprehensive current status survey of part-time workers (*Pāt Taimu Rōdōsha Sōgō Jittai Chōsa*), Abe [2001] examined the wage distribution of part-time, female workers in 1990 and 1995 in comparison with the minimum wage set for each prefecture. She concluded that, on average, the minimum wage is set at a low level, so that it generally does not bind. However, she found that the prefectural minimum wage tends to bind in rural areas because the average wages there are generally low, while the level of the minimum wage is not so heterogeneous across prefectures. She speculated that the disemployment effect of the minimum wage would be minimal because the

minimum wage does not bite the wage distribution. Based on the same data, Kohara [2000] found that the minimum wage cuts into the distribution of wages in rural areas, and Nagase [1997] pointed out that about 50 percent of part-time workers earned less than 100 yen plus the minimum in 1990. The above studies pointed out that the minimum wage in Japan is set at a low level compared with its average wage, but it does cut into the wage distribution in rural areas. None of the above studies, however, examined the impact of the minimum wage on employment.

The rest of the paper is organized as follows. Section 2 outlines the empirical strategy to identify the disemployment effect of the minimum wage. Section 3 explains the data. Section 4 reports and discusses the results. Section 5 checks the robustness of the results, and Section 6 concludes.

2 The Statutory Minimum Wage in Japan

To consider the identification strategy, we now briefly explain the institution of minimum-wage setting in Japan (See Araki [2002] and Sugeno [2002] for further explanations). The Japanese minimum wage is a statutory minimum wage based on the Minimum Wages Law enacted in 1959, which was substantially revised in 1967. The current law defines two types of minimum wages: 1. regional minimum wages based on collective agreement; and 2. minimum wages based on the studies and deliberations of minimum wage councils. Although the first system assumes that the minimum wage agreed upon by craft-wide or industry-wide bargaining will be extended to non-

unionized workers in the same sector, such bargaining does not really exist under the Japanese enterprise union system. Thus, practically speaking, all minimum wages in Japan are currently type 2. Under this system, the chief of the prefectural labor bureau determines the level of the prefectural minimum wage, based on the regional minimum wage councils' deliberations. These deliberations are largely influenced by the "criteria" for the amount of minimum-wage increase set annually by the central minimum-wage council. The central minimum-wage council consists of representatives of public interest (academicians and a retired bureaucrat), employers, and employees. The central council divides all Japanese prefectures into four ranks, based on the actual levels of wages within them and differentials in the cost of living. The central minimum-wage council then issues the "criteria" for the amount of a minimum-wage increase for each rank. Prefectures classified as Rank A set the highest minimum wage; the daily minimum wage was 5,514 yen and the hourly minimum wage was 698 yen in 1999 in Tokyo, an increase in 49 yen from the previous year. At the same time, prefectures in Rank D set the lowest minimum wage. For example, the daily minimum wage was 4,756 yen and the hourly minimum wage was 595 yen in Miyazaki in the same year, and the difference from the previous year was 42 yen for the daily minimum. Between 1993 and 1999, which is the sample period for our analysis, the classification of prefectures into ranks changed once, in 1995. In this re-classification, 3 prefectures moved from Rank C to B, 2 prefectures moved from Rank D to C, and two prefectures moved from Rank B to C (Abe

[2001]). Except for this re-classification, each prefecture had been classified into the same rank every year. Because the amount of increase was about one or two percent of the original minimum wage and the rate of the minimum wage increase was almost homogeneous across prefectures, it is virtually impossible to identify the minimum wage's disemployment effect based on the variation in the change of the minimum wage across prefectures. This fact prohibits us from using DID as an identification strategy in Japan. Prefectural minimum wages are revised every year based on the above procedure, and the revised minimum wages take effect beginning on September 30 or October 1 of the same year.[2]

The legal enforcement of the minimum wage is weak in Japan. The prefectural labor bureau is in charge of enforcement, and when it detects employers' non-compliance, they could be responsible for fines up to 20 thousand yen (about 160 US dollars), which is negligible. Employers who violate the minimum-wage law must compensate employees for the difference between the minimum wage and the actual wage. The minimum wage is mostly enforced through public pressure on employers. In particular, larger-sized employers would lose their reputations if the public were to notice that they paid less than the minimum wage to their workers.

[2]There are some exceptional cases in which the revised minimum wage takes effect in the middle of October, but this is very rare.

3 Data

This study uses the Japan Panel Survey of Consumers (JPSC) collected by the Institute for Research on Household Economics (*Kakei Keizai Kenkyusho*). This survey is based on a national, representative sample of women who were between the ages of 24 and 34 in 1993, which was the starting year of the survey.[3] The survey included 1,500 women at the beginning and added 500 women in 1997. The survey has been implemented between October 1 and October 31 every year. We pooled all the data between 1993 and 1999 and obtained special permission to use the data set with each respondent's prefecture code. This prefecture code enabled us to match a prefectural minimum wage to each respondent. The information on the prefectural minimum wage was obtained from The Pandect of Minimum Wage Determination (*Saitei Tingin Kettei Yōran*), which is published every year. We disregarded the industrial minimum wage because the industry code recorded in the JPSC is too rough to match the industrial minimum wage, which is defined with very detailed industry classifications.

The construction of our analysis sample is illustrated in Table 1. We restricted our analysis sample to those workers who received their wage on an hourly or daily basis. This is because the minimum wage in Japan is defined on either an hourly or daily pay basis, and reported wages are directly comparable to the minimum wage. We avoided imputing hourly or daily

[3]Information on their family members also was collected.

wage from monthly salary and hours or days of work in a month because these constructed variables are presumably erroneous, due to measurement errors in hours or days of work. The definition of the treatment variable is very sensitive to this presumed measurement error because the amount of minimum-wage change tends to be small.

Our estimation also required observations for two consecutive years; 1,438 observations remained after this sample restriction. This basic analysis sample is called the full sample hereafter. We further restricted our sample to the workers whose current wage was below 110 percent of the ongoing minimum wage to include only low-wage workers in the sample. This restriction reduced the sample size to 236, and we call this sample restricted sample A hereafter. To exclude those workers who were temporarily classified as low-wage workers, we further restricted our sample to workers whose wage was less than 110 percent of the current wage for two years or more during the sample period. This additional restriction reduced the sample size to 152, and we call this sample restricted sample A' hereafter. This restricted sample A' is used to estimate the random- and fixed-effects models. Restricted sample A includes those workers whose wages were below the current minimum wage. We further restricted our sample to exclude these workers and call the sample restricted sample B. This sample includes 148 observations. The observations that belonged to restricted sample B for two years or more are called restricted sample B', and its sample size is 96. The restricted samples B and B' are used in the robustness check.

The summary statistics of the annual percentage change of the minimum wage are tabulated in Table 2. The average annual percentage change of the minimum wage is around 1.9 percent, which is not large. However, we must note that this change takes place *every* year. Thus the 1.9 percent increase in the minimum wage amounts to about a 9.9 percent ($=100 \times (1.019^5 - 1)$) increase in the minimum wage in the five-year period between 1993 and 1998. Because this time span corresponds to the Japanese economy's recession period, the general consumer price index increased by only 2.85 percent between 1993 and 1998. Considering this low inflation rate, a small annual change in the minimum wage may have had detrimental effects on employment.[4]

Figures 1 through 4 draw the percentage gap between the current wage and the minimum wage among daily and hourly paid workers. From these figures, we can learn that the prefectural minimum wages were not binding among the prefectures classified as Ranks A and B. However, a large number of workers was paid less than the minimum wage in the prefectures in Ranks C and D. The mean of the percentage gap is 21.2 percent, with a standard error of 31.3 percent. This number is comparable to the 27.1 percent reported for 1995 in Abe [2001] based on the Comprehensive Survey of the Current Status of Part-time Workers (*Pāt taimu rōdōsha sōgō jittai chōsa*), whose sample size was about 30,000.

[4]This steady increase in the real minimum wage is evidenced in Chart 2.1 in OECD [1998]. Among the Organisation for Economic Cooperation and Development (OECD) countries, Japan was an exception in that it experienced an increase in its real minimum wage during the 1990s.

The descriptive statistics for the analysis sample appear in Table 3. Column (1) reports the means of the dependent and independent variables of the observations for the control group in the full sample. Columns (2) and (3) report the means of variables for the control group in restricted samples A and B, respectively. Comparing the columns for the control group with column (4), which is the column for the treatment group, we notice that the individual characteristics were similar between the control and treatment groups in terms of marital status, the number of children, and age. Workers in the treatment group had slightly more years of job tenure, but slightly fewer years of job experience. Workers in the control group of the full sample naturally had more extensive higher educational backgrounds than workers in the treatment group; however, workers in the control group in the restricted samples A and B had slightly less education than workers in the treatment group. There are some individuals who were in the sample in year $t-1$, but not in year t because they did not respond to the interview or had missing information. This sample attrition may have caused attrition bias in our estimation. We calibrated the seriousness of the attrition bias by examining the characteristics of the attritors in year $t-1$. The sample means for these attritors are tabulated in Column (5). Comparing the sample means for Columns (1) and (5), we arguably can conclude that these attritors were not significantly different from the non-attritors in terms of observed characteristics in year $t-1$.

4 Empirical Models

We attempted to identify the disemployment effect of the minimum wage using panel data. We employed the perfectly competitive labor market model as a theoretical economic setting, in which both workers and employers behave as wage takers. We attempted to trace the reduction of employment along with the labor demand curve due to the minimum-wage hike by estimating the following linear probability model:

$$emp_{it} = \beta_0 + \beta_1 bind_{it-1} + x_{it-1}\gamma + u_{it},\ given\ emp_{it-1} = 1, \qquad (1)$$

where i is the index for individuals, t is the index for year, emp_{it} is the dummy variable that takes 1 if the individual i is employed in year t and takes 0 if the individual is either unemployed or out of the labor force. The dummy variable $bind_{it-1}$ indicates the minimum wage treatment (i.e., $mw_{it-1} \leq w_{it-1} \leq mw_{it}$, where mw_t is the statutory minimum wage in year t on an hourly or a daily basis and w_t is hourly or daily wage), and x_{it-1} is the vector of explanatory variables that captures the offered wage, the reservation wage, and the regional labor market condition. The vector x includes an intercept, age, the number of children, the category dummy variables for educational attainment (high school, career college, junior college or technical college, college or graduate school, other schools), a dummy variable for married person, the dummy variables for the number of children (zero, one, two, and three or more), the prefecture-level effective job opening-application ratio in regional

employment security offices, and prefecture and year dummy variables.[5] If the minimum wage lowers the probability of employment in the following year, $\beta_1 < 0$ is expected. Although the dependent variable is binary, we adopted the linear probability model because allowing for each worker's fixed effects is easy in the framework of such models.

The parameters in this model are consistently estimated via OLS under the assumption that the error term is not correlated with the independent variables. This assumption is violated if those workers belonging to the treatment group (i.e., $bind_{it-1} = 1$) have unobserved characteristics that make them more likely to drop out of the labor market than the workers belonging to the control group (i.e., $bind_{it-1} = 0$). To relax this rather strong assumption, we allow for each worker's heterogeneity by assuming

$$u_{it} = c_i + v_{it}. \tag{2}$$

If the independent variables are strictly exogeneous from the composite error term u_{it}, then the random effects estimator is the efficient estimator under the assumption that the conditional variance/covariance of v_{it} is constant/zero and that c_i is homoskedastic. The fixed effects estimator is a consistent estimator, even when individual time-fixed heterogeneity, c_i, is correlated

[5]The actual years of job-market experience after graduating from the final school, which can be constructed by the JPSC, could be included as an independent variable to capture the degree of labor- market attachment. However, labor-market experience is not a strictly exogenous variable because current labor-market status determines the years of actual job market experience in the future. This violation of strict exogeneity causes an inconsistency in the fixed- and random-effects estimators. Therefore, we decided not to include actual years of job experience as an independent variable.

with the independent variables as far as the variables are strictly exogenous to v_{it}. Thus, the fixed-effects estimator allows for the possibility that those low-wage workers treated by the minimum wage have a weak labor-market attachment.

The issue of the workers' heterogeneity in the treatment and control groups also is addressed by restricting the control group. To avoid the possibility of comparing very different types of workers to estimate the minimum wage's effect, we restricted our analysis sample to low-wage workers (i.e., those workers whose current wage is less than 110 percent of the current minimum wage). By comparing the estimated results from the full and restricted samples, we can roughly learn how the workers' heterogeneity affected our estimates. As mentioned, the revised minimum wage takes effect on either September 30 or October 1, depending on the prefecture, while the survey takes place sometime in October. Thus, when (1) is estimated, we implicitly assume that the revision of the minimum wage that takes place at the beginning of October affects the employment status that is reported in October.

5 Results

Table 4 reports the estimated impact of the minimum wage on employment. The results in Column (1) indicate that those whose last year's wage was below the current minimum wage were 10 percentage points less likely to be employed in the current year. The estimated results are not statistically

significant, however. To apply the panel estimation methods, we restricted the sample to those individuals that were observed for two years or more, and this sample restriction reduced the sample size to 1,213. The results of the OLS estimation appear in Column (2). The size of the coefficient shrinks, probably because the treatment group and the control group became more homogeneous in terms of their degree of labor-market attachment due to the added sample restriction. The results of the random- and fixed-effects estimations appear in Columns (3) and (4), respectively. All the results indicate that we cannot reject the null hypothesis that the minimum wage does not affect employment in the current year, due to the large standard error around the estimated coefficients.

The estimation results reported above may be criticized because the control group includes those workers who received wages far above the minimum wage. If workers with a high wage have a stronger attachment to employment, then the above estimations overestimate the adverse effect of the minimum wage on employment. To address this possible criticism, we restricted our sample to those individuals whose last year's wage was below 110 percent of the last year's minimum wage to include only low-wage workers in the control group. Notice that those workers whose last year's wage was below the last year's minimum wage also are included in this control group. The results of the estimation based on this restricted sample A appears in Table 5. For the OLS and random-effects estimation, we obtain the coefficients around -0.13, with a standard error of 0.10 or 0.12. For the fixed-effects

estimation, we obtain the coefficient of -0.22 with a standard error of 0.13. Even though these coefficients are not precisely estimated, they imply that those workers who were treated by the minimum wage were less likely to be employed in the following year. The difference in the results from Table 4 implies that those workers with a higher current wage had less attachment to employment. When those workers with the minimum wage treatment are compared with low-wage workers without the minimum wage treatment, we find that the minimum wage has a larger disemployment effect because of low-wage workers' stronger attachment to employment. We prefer the estimates in Table 5 to the estimates in Table 4 because low-wage workers are a more natural control group for the workers treated by the minimum wage. This result contrasts with the results obtained from the US and Canada; in those countries, low-wage workers are more likely to drop off from employment. We speculate that this is because we used female workers as a sample. High-wage female workers presumably have better marriage offers and may be more likely to drop out of the labor market, even after considering the fact that they receive a high wage.[6]

[6]To check this point in our data, we ran a regression of the marital status in year t on the wage gap from minimum wage in year t-1, holding the marital status and other variables in year t-1 constant. The result of regression is:

$$\hat{married}_{it} = 0.09_{(0.03)}(\frac{w - mw}{mw})_{it-1} + 0.90_{(0.02)} married_{it-1} + \cdots, N = 1144, R^2 = 0.86,$$

where standard errors robust against panel clustering and heteroskedascity are in parentheses. Age, education category dummy variables, and prefecture dummy variables are included as additional explanatory variables. This regression result supports our speculation.

The above estimation strategy may invite another criticism because the sample includes those who work for employers not complying with the minimum wage. Those who work for non-complying employers earn an even lower wage than those workers who are presumably treated by the minimum wage. Thus, those workers intrinsically may have a stronger attachment to employment than workers treated by the minimum wage. If this is the case, we may have overestimated the adverse effect of the minimum wage on employment. To address this possibility, we further restrict our sample to those workers whose current wage is above the current minimum wage, but less than 110 percent of the current minimum wage. The results of the estimations based on this restricted sample B appear in Table 6. The results reported in Column (1) suggest that the results based on restricted sample A suffered from downward bias because workers who received less than the minimum wage had a stronger attachment to employment. However, once the sample is confined to workers who were included in restricted sample B for more than two years (i.e., the sample that can be used for the random- and fixed-effects estimations), the estimated coefficient becomes about -0.3, with standard error of 0.13, as reported in Column (2). The increase in the size of the coefficient in absolute value compared with Column (1) implies that the effect of the minimum wage on employment was stronger among those who were low-wage workers for more than 2 years in the sample. It is natural to expect that the effect of the minimum wage treatment would be more severe among "permanent" low-wage workers because the sample

used to estimate Column (1) may have included those temporary low-wage workers for whom the effect of the minimum wage treatment would be weak. This change in the results is similar to the change found in Yuen [2003].

We repeated the analysis in Table 5 using a restricted analysis sample that included workers whose last year's wage was below 120 percent of last year's minimum wage. Table 7 reports the results of the regressions. The estimated coefficients become smaller in absolute value in all of the specifications. The change in the results from Table 5 can be explained by lower labor-market attachment among the relatively high-wage workers. In other words, the difference in the employment rate between the treatment and control groups becomes smaller because the results reported in Table 7 include more workers who have a weaker degree of labor-market attachment. Table 8 reports the results of the regressions that use workers whose last year's wage was above last year's minimum wage but below 120 percent of it. A comparison of Table 6 and Table 8 indicates that the estimated coefficients become smaller in this larger sample. Again, this change in the results can be explained by the higher degree of heterogeneity among workers in the control group. The change in the results suggests that we should carefully pick up the workers in the control group so that workers in this group share unobserved characteristics close to those of workers in the treatment group.

6 Discussion

Critics might argue that our results are tenuous because the conclusions from our analysis critically depend on the choice of the analysis sample; either to use $mw_{i,t-1} < w_{i,t} \leq 1.1 \times mw_{i,t-1}$ or $mw_{i,t-1} < w_{i,t} \leq 1.2 \times mw_{i,t-1}$. However, we believe that the results based on the former sample deliver more reliable estimates because the former sample includes only very low wage workers who are more relevant to the minimum wage than the wage earners who earn a higher wage.

If some good proxy variable were available to capture the degree of employment probability, we could have included that variable in the regression model. However, when such a variable is not available, it is reasonable to examine the disemployment effect of the minimum wage under the assumption that the unobserved characteristics that affect the employment probability are similar, on average, if the wage level in the initial year is similar. This is the reason why we utilized a narrowly defined control group.

It would be preferable to compare the employment probability of workers whose previous year's wage was just below the revised minimum wage and workers whose wage was just above it.This strategy would identify the causal effect of the minimum wage treatment on the employment probability because unobserved determinants of the employment probability are presumably identical for these two groups of workers. This Regression Discontinuity Design cannot be applied to our data due to the small sample size because

the discontinuity cannot be precisely estimated. Further analysis based on large-scale micro data using this regression discontinuity design would be promising as future research.

Thus far, we have neglected the issue of panel attrition. If being affected by the minimum wage itself causes panel attrition, then our estimates may have been subject to attrition bias. However, we expect this bias to be minimal. Among the 1,505 observations in year $t-1$ (= 1420 (control group) + 18 (treatment group) + 67 (attrition)), 67 observations dropped out of the sample in year t, as reported in Table 3. To test for systematic attrition due to the minimum-wage treatment, we regressed the dummy variable indicating the panel attrition on the treatment dummy of minimum wage ($bind_{i,t-1}$), along with other explanatory variables included in Table 4. The coefficient for this treatment dummy is -0.039, with a standard error of 0.011. This result suggests that high-wage earners were more likely to attrit, which is consistent with the previous results. However, in the restricted samples A and B, only one individual dropped out between years $t-1$ and t. Thus, we conclude that the issue of panel attrition is negligible.

7 Conclusion

We examined the impact of the minimum wage on employment in Japan, using data collected between 1993 and 1999. To estimate the effect, we compared the transition rate from employment to non-employment in a one-year window between two groups of workers. One of these groups consisted

of workers whose wage was originally above the revised level of the minimum wage and therefore was not affected by this revision. The other group consisted of workers whose wage was below the revised minimum wage and potentially was treated by the revision. The estimation results based on the sample of low-wage workers indicate that workers in the latter group were about 20 to 30 percentage points less likely to be employed in the following year than those in the former group. We should, however, note that these estimation results are rather sensitive to the composition of the selected control group, which is not affected by the minimum wage hike. This suggests the importance of controlling for unobserved heterogeneity in workers' labor market attachment.

We should admit that we could not draw a definitive conclusion regarding the impact of the minimum wage on employment because of the small sample size. However, our results suggest the existence of a measurable disemployment effect in Japan, whose magnitude could be comparable to that found in the US and Canada. Further study of this issue with larger government statistics is needed. The research design suggested in this paper should be helpful in future research.

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Table 1: Sample Selections

Selections	Description	Number of Observations
Raw data, 1993-1999 pooled		10534
Workers who are paid on an hourly or daily basis		1916
Observed at both t-1 and t		1837
All explanatory variables for regression are available	Control group and treatment group	1438
$w_{i,t-1} \leq 1.10 * mw_{i,t-1}$	Sample A	236
In sample A for more than two years	Sample A'	152
$mw_{i,t-1} \leq w_{i,t-1} \leq 1.10 * mw_{i,t-1}$	Sample B	148
In sample B for more than two years	Sample B'	96
$mw_{i,t-1} \leq w_{i,t-1} \leq mw_{i,t}$	Treatment group	18

Table 2: Distribution of the Annual Percentage Change of the Minimum Wage, 1993-1998 pooled

	No. of Individuals	Mean	Standard Deviation
All Prefectures	1410	1.88	0.57
Rank A	351	1.86	0.57
Rank B	408	1.88	0.57
Rank C	417	1.85	0.56
Rank D	234	1.95	0.56

Table 3: Sample Means

Variables	(1)	(2)	(3)	(4)	(5)
	In Sample in Year t				Out of Sample in Year t
	Control group			Treatment group	
	Full Sample	Sample A ($w_{i,t-1} \leq 1.10\ mw_{i,t-1}$)	Sample B ($mw_{i,t-1} \leq w_{i,t-1} \leq 1.10\ mw_{i,t-1}$)		
$Employment_{it}$	0.837	0.876	0.869	0.722	
Characteristics in Year t-1					
Hourly wage	900.57	624.55	646.05	618.75	878.27
Daily wage	6507.9	4097.81	5060.1	4879.7	7260.0
Married	0.717	0.812	0.823	0.722	0.642
Number of children	1.231	1.541	1.492	1.278	0.986
Age	31.46	31.66	31.66	31.83	30.00
Job tenure	2.152	2.318	1.966	3.986	2.290
Years of experience	9.155	8.857	8.608	7.653	7.719
Educational background:					
College or graduate school (16+ years)	0.074	0.023	0.015	0.056	0.075
Junior or technical college (14 years)	0.200	0.165	0.192	0.278	0.119
Career college (14 years)	0.180	0.133	0.131	0.056	0.239
High school (12 years)	0.522	0.651	0.623	0.556	0.522
Junior high school (9 years)	0.020	0.028	0.038	0.000	0.045
Other	0.004	0.000	0.000	0.056	0.000
Prefecture effective job openings-application ratio	0.59	0.61	0.60	0.61	0.51
City size:					
13 large cities	0.234	0.147	0.123	0.111	0.284
Other cities	0.549	0.555	0.669	0.722	0.433
Towns or villages	0.217	0.298	0.208	0.167	0.284
Number of Observations	1420	218	130	18	67

Notes: The sample includes the 1171 female workers who were paid on an hourly basis and the 267 female workers who were paid on a daily basis. The dummy variable, $employment_{it}$, equals one if the respondent was employed during year t and zero if she was not employed during year t.

Table 4: The Effects of the Minimum Wage on Employment
Sample: All Observations
Dependent Variable: $employment_{it}$

Explanatory Variables	(1) OLS	(2) OLS	(3) Random Effects	(4) Fixed Effects
$bind_{i,t-1}$	-0.101	-0.037	-0.057	-0.114
	(0.088)	(0.082)	[0.103]	[0.105]
Number of Observations	1438	1213	1213	1213

Notes: Clustering robust standard errors and Huber-White standard errors are in parentheses and square brackets, respectively. The sample includes female hourly and daily paid workers who were employed during year t-1. Other explanatory variables in the estimation models are an intercept, age, the dummy variables for the number of children, prefecture effective job openings-application ratio, and the dummy variables of year, prefecture, marital status, and education.

Table 5: The Effects of the Minimum Wage on Employment
Sample: Restricted Sample A ($w_{i,t-1} \leq 1.10 * mw_{i,t-1}$)
Dependent Variable: $employment_{it}$

Explanatory Variables	(1) OLS	(2) OLS	(3) Random Effects	(4) Fixed Effects
$bind_{i,t-1}$	-0.136	-0.125	-0.137	-0.223
	(0.104)	(0.117)	[0.126]	[0.126]
Number of Observations	236	152	152	152

Notes: The same note applies as in Table 4

Table 6: The Effects of the Minimum Wage on Employment
Sample: Restricted Sample B ($mw_{i,t-1} \leq w_{i,t-1} \leq 1.10 * mw_{i,t-1}$)
Dependent Variable: $employment_{it}$

Explanatory Variables	(1) OLS	(2) OLS	(3) Random Effects	(4) Fixed Effects
$bind_{i,t-1}$	-0.085	-0.296	-0.307	-0.397
	(0.125)	(0.132)	[0.151]	[0.139]
Number of Observations	148	96	96	96

Notes: The same note applies as in Table 4

Table 7: The Effects of the Minimum Wage on Employment
Sample: Restricted Sample C ($w_{i,t-1} \leq 1.20 * mw_{i,t-1}$)
Dependent Variable: $employment_{it}$

Explanatory Variables	(1) OLS	(2) OLS	(3) Random Effects	(4) Fixed Effects
$bind_{i,t-1}$	-0.113	-0.086	-0.103	-0.153
	(0.085)	(0.090)	[0.108]	[0.109]
Number of Observations	573	438	438	438

Notes: The same note applies as in Table 4

Table 8: The Effects of the Minimum Wage on Employment
Sample: Restricted Sample D ($mw_{i,t-1} \leq w_{i,t-1} \leq 1.20 * mw_{i,t-1}$)
Dependent Variable: $employment_{it}$

Explanatory Variables	(1) OLS	(2) OLS	(3) Random Effects	(4) Fixed Effects
$bind_{i,t-1}$	-0.085	-0.107	-0.114	-0.168
	(0.087)	(0.103)	[0.124]	[0.131]
Number of Observations	485	361	361	361

Notes: The same note applies as in Table 4

Figure 1: Distribution of current wage relative to minimum wage, Rank A prefectures

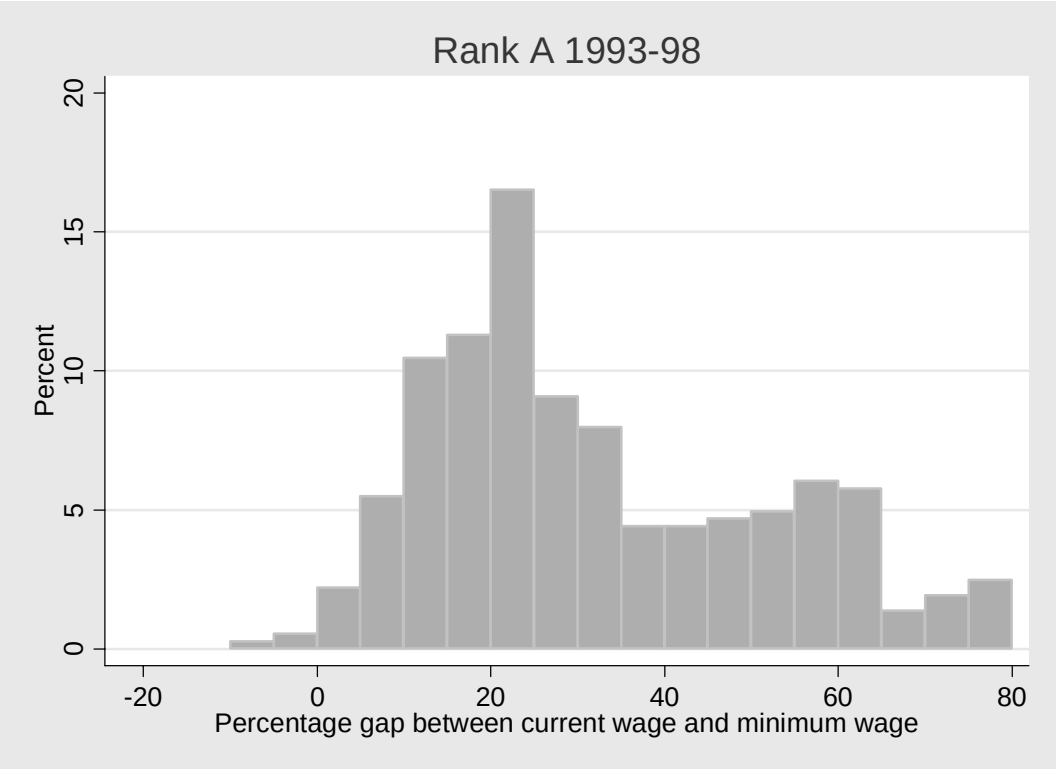

Figure 2: Distribution of current wage relative to minimum wage, Rank B prefectures

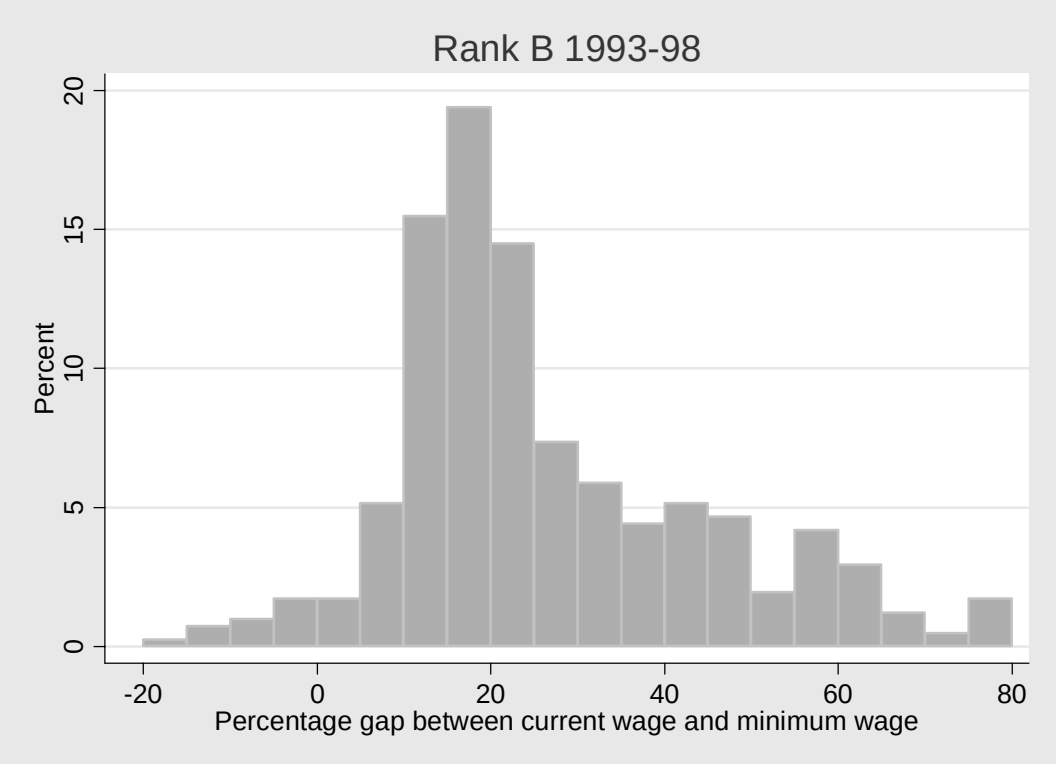

Figure 3: Distribution of current wage relative to minimum wage, Rank C prefectures

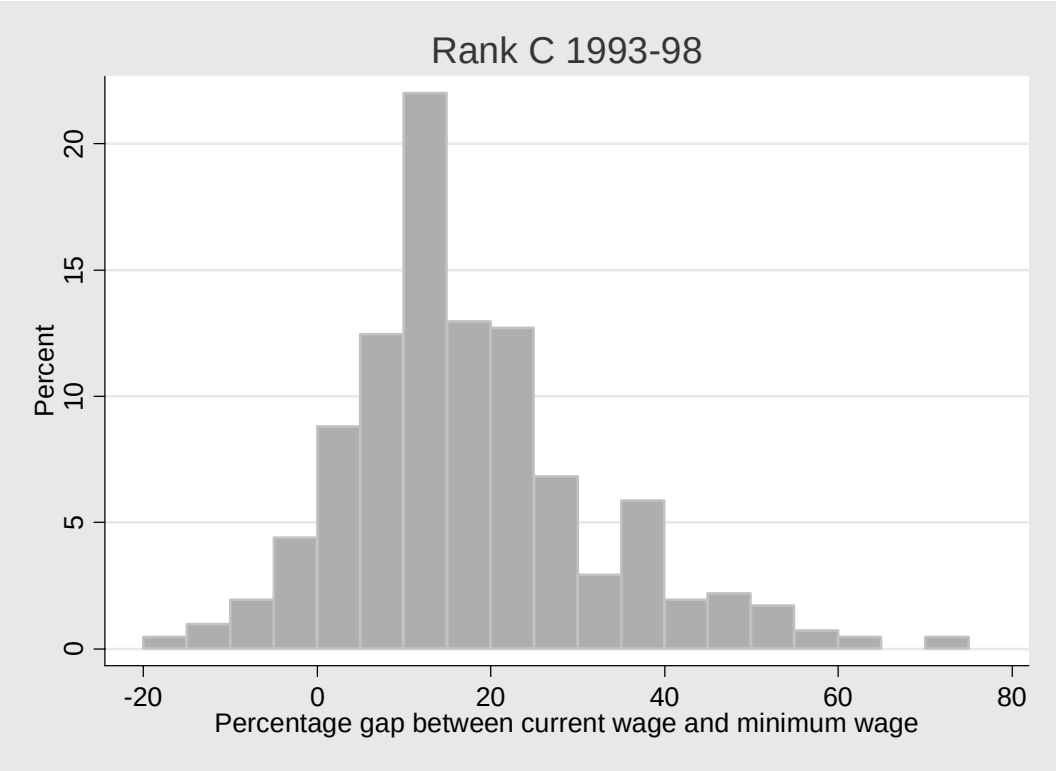

Figure 4: Distribution of current wage relative to minimum wage, Rank D prefectures