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ABSTRACT

Duration of Parental Leave and Women's Employment*

The impact of the duration of parental leave on women's employment in Korea is examined by focusing on the heterogeneous effects. The results of the extension of the maximum job-protected leave from 12 months to 15 months are as follows. First, the policy change led to more female employees taking leave more often and for longer periods. The impact of leave take-up on high wage earners is found to be smaller than that on their low wage counterparts, but that on duration is larger; this points to a fixed cost in switching between own and paid child care. Further, those in large firms tend to benefit more than those in small- or medium-sized firms. Second, the extension encouraged women to return to work 2–3 years after childbirth, but this effect diminished after 4 years. The findings suggest that the distributional effect should be considered in designing leave policy.

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1. Introduction

While the need for maternity leave for women during pregnancy and childbirth is generally justified on the grounds of gender equity and health of mother and child, the case for parental leave for workers with infants and toddlers is not clear[1]. On the one hand, the employment-protected leave enables workers, whose career would otherwise have been interrupted by the burden of child care, to continue working. It may also generate benefits with respect to child development if the care by own parents is superior to that obtained through paid child care. On the other hand, the human capital of workers may deteriorate during the leave, which reduces the labor market opportunities available to them (Mincer and Ofek 1982). Therefore, the optimal legislation on parental leave is likely to depend on institutional conditions and social preferences. In fact, there is a considerable variation among OECD countries in parental leave legislation, in terms of both its maximum duration and the cash benefit given, as presented in Figure 1.[2]

Given the tradeoff involved in strengthening the parental leave legislation, the policy debate requires clarity on the consequences of policy change—an empirical question. However, it is difficult to identify the effect of the maximum duration and cash benefit separately because most policy variation involves changes in both dimensions. One of the few exceptions is the study by Lalive et al. (2014) that looks at a series of policy changes in Austria. The paper proposes to study the impact of parental leave on female employment in a setting where only the maximum duration of job-protected leave is altered. It exploits the natural experiment of the extension of parental leave—with the cash benefit fixed—and focuses its distributional impact on women's career.

With no uncertainty in the future, the pure extension of maximum duration should not induce women to take a longer leave, unless it is binding. However, in a world characterized by uncertainty, there may be an incentive for women to search longer for child care services and jobs during the leave (Ondrich et al. 2003; Lalive et al. 2014). There may also be a fixed cost involved in switching between own care and market care. The literature has paid

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[1] ILO Maternity Protection Convention (No. 183) recommends 14 weeks of maternity benefit to women in order to further promote equality of all women in the workforce and the health and safety of the mother and child (ILO, 2000).

[2] Note that the total paid leave in Figure 1 refers to the sum of maternity and parental leave. Total paid leave is more relevant for the international comparison because the length of maternity leave varies across countries and it sometimes includes parental leave as in Greece.

less attention on how to evaluate these mechanisms, and this paper seeks to remedy that.

The empirical literature shows mixed results on the effect of parental leave on female labor supply. Some studies argue that a short duration of leave promotes women's employment (Ruhm 1998; Hofferth and Curtin 2006), whereas others conclude that the extension of leave does not have any significant impact on the return to work in the long run (Schönberg and Ludsteck 2014; Lalive and Zweimüller 2009). Since the consequence of parental leave essentially depends on the socioeconomic context, the paper examines the Korean case, where the childcare market is underdeveloped, compared to those in European countries, and is predominantly composed of private providers.

While keeping the cash benefit intact, the Korean government extended the effective parental leave by a maximum of 3 months in January, 2008 and the eligibility was based on the birth date of the child. By comparing the data on women who gave birth right before the policy change with that on women who did so after the policy change, we estimate the effect of the extension of leave on leave usage and employment after childbirth. Since the benefit obtained from, and the opportunity cost of parental leave is likely to vary depending on the individual characteristics, such as income, not just the average effect, but also the distributional effect is estimated.

The key findings are as follows. First, with the job-protected leave extended, female employees indeed took up the leave more often and for a longer period than before. The extension increased the take-up rate by 5 percentage points and increased the duration by 50 days. Second, women with a higher wage generally took up the leave less often but for a longer period than those with lower wage due to the policy change. The policy effect was also generally greater for employees in large firms than those in smaller ones. Third, after the extension, the chance of returning to work increased by 2percentage points in the 2–3 year period after childbirth, but the difference disappears 4 years after childbirth. This suggests that the marginal extension of the one-year leave does not generate a positive or negative consequence in terms of women's career in the medium run. Fourth, the effect of leave extension on return to work is found to vary substantially, depending on individual wage and firm size. Specifically, it was estimated to be negative for women with an upper-middle level of wage, but positive for those in medium-sized firms. The longer the period after childbirth when these effects are measured, the less precise their estimates are. Nevertheless, they imply that a change in parental leave policy may generate a significant distributional effect in the target population.

The rest of the paper is organized as follows. The next section discusses theoretical prediction and the findings in recent literature. Section 3 introduces the institutional background, and Section 4 describes the data. Section 5 presents the statistical model and the empirical results. Section 6 concludes.

2. Theoretical Discussion and Previous Studies

For an employed woman with a newborn child, the optimal duration of parental leave is derived by balancing the marginal benefit and the marginal cost related to prolonging the leave. The benefit includes the childcare cost saved and the potential increase in the quality of care. The cost consists of the forgone earnings and the depreciation of human capital.

The parental leave legislation can be strengthened by improving the allowance during the leave or extending its maximum duration. A higher level of allowance directly increases the marginal benefit from taking a leave for all durations, which leads to an increase in the optimal duration during which there is no uncertainty [Panel (a) in Figure 2]. On the other hand, a longer maximum duration does not necessarily imply an increase in the increase in the optimal duration of leave unless the constraint is binding [Panel (b) in Figure 2]. However, when uncertainty is introduced, the extension of the potential leave may influence the women's choice through some channels listed below. First, women may be more selective in choosing the alternative child care with a longer job-protective leave, which is called *horizon effect* by Ondrich et al. (2003). Second, if employers replace leave-takers with newcomers permanently, upon their return to work, they will have a new position that is likely to be less satisfactory. Thus, women may find it less attractive to return to work if, under the legislation granting potentially longer leaves, employers are more likely to replace them with new workers. This is called the *replacement effect* (Ondrich et al. 2003). Third, the reservation wage may increase due to the longer period spent in searching for a job during parental leave, which is noted as the *reservation wage effect* by Lalive et al. (2014). Fourth, the extension of the job-protected leave lowers the cost of taking a leave when there a fixed cost is involved in switching between own care and paid care. While these four channels all predict that women will take a longer parental leave under the extended maximum duration regime, only the *fixed-cost effect* predicts a jump in the take-up. Of course, those constrained by the maximum duration will also take a longer leave when the duration is extended.

4

The effect of the promotion of parental leave on women's employment, which is of special interest to policy makers, is theoretically not clear. The promotion of parental leave may generate two opposing effects. On the one hand, it helps women with infants avoid a career interruption by lessening the burden of childcare. On the other hand, it discourages women to return to work as their human capital depreciates during the leave. Therefore, it is an empirical question, which needs to be addressed under certain institutional characteristics.

Regarding empirical evidence, most studies found that the extension of job-protected leave increased the usage of leave (Schönberg and Ludsteck 2014; Lalive and Zweimüller 2009). While the findings on the impact on women's labor force participation in the short run show mixed results across countries, the long-run effect is estimated to be small. Hanratty and Trzcinski (2009) found that women tended to delay their return to work after childbirth in response to the extension of the paid leave from 25 weeks to 50 weeks in Canada; however, their labor supply a year after birth did not change significantly. Baker and Milligan (2008), who examined the same policy change, found that women devoted more time to child care, but that the probability of a return to the previous workplace also increased. Therefore, they concluded that women's employment improved. However, it should be noted that Baker and Milligan (2008) only looked at labor supply within a year of giving birth.

In Austria, the paid leave was extended from one to two years in 1990, and then, shortened to 18 months in 1996. Lalive and Zweimüller (2009) found that this policy change led to reduced female labor supply in the 3-year period after birth but that there was no significant impact on labor supply over the 10-year period after birth. They concluded that the extension of parental leave does not harm women's career development.

In Germany, there have been a few policy shifts, in terms of both maximum duration and allowances in the parental leave legislation, since 1979. By investigating these policy variations, Schönberg and Ludsteck (2014) found that women tended to delay the return to work in Germany with the effect being largest for the extension from 2 months to 6 months and smallest for the change from 18 months to 36 months. They also found that the extension of the leave did not have a significant impact on women's employment in the long run. However, they concluded that the extension of leave has a negative consequence by noting that it lowers female wage in the long run. Kluve and Tamm (2013) examined the reduction in the maximum duration of paid leave accompanied by an increased financial incentive in Germany in 2007, and reported an increase in the mothers' return to work only in the 1.5-year period after childbirth but not beyond that.

Dahl et al. (2016) looked at the case of Norway, where the paid leave was expanded from 18 weeks to 35 weeks in stages. They found that the reform increased women's time at home after birth but did not find any significant change in women's employment in the short and long run. Ruhm (1998), who used panel data at country level in Europe, found that a short leave for three months increases female employment, but has no adverse impact on their wage. It was also found that a further extension increases women's employment but also decreases their wage.

This paper is one of the few studies that examine the extension of job-protected leave in an Asian country, and the Korean case is interesting in that the childcare market is underdeveloped, compared to those in European countries. Generally speaking, the childcare facilities in Korea are heavily regulated and fall below the quality of care demanded by mothers. This study complements Kim (2012), who estimated the effect of allowance during parental leave on female labor supply in Korea.

3. Institutional Background

Maternity leave and parental leave legislation were reinforced in Korea in 2001. The mandatory maternity leave of 60 days had been in place by the Labor Standard Law in 1953, and the employers were responsible for the payment during the leave. The maternity leave has been extended to 90 days since 2001 and, at the same time, the payment over the final 30 days has been covered by Employment Insurance (EI).[3] For those in small- and medium-sized firms, EI has paid the maternity benefit for the entire period of the leave since 2006.

The entitlement to unpaid parental leave up to one year for female employees was introduced under Men Women Equal Employment Act in 1987, and the eligibility was extended to either the mother or father in 1995. EI provides subsidy for both employers and employees during the leave. A subsidy of KRW 200,000 per month has been paid to employer during the leave since 1995. A subsidy of KRW 200,000 per month has also been paid to those

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[3] The maternity benefit is 100% of wage, and has a ceiling of KRW 1,350,000. USD 1 = KRW 938.20, as of December 31, 2007.

employers who hire a substitute worker for a leave-taker.[4] The monthly allowance of 200,000 won for leave-takers was adopted in 2001, and it increased to KRW 300,000 in 2003, to KRW 400,000 in 2004, to KRW 500,000 in 2007, and to 40% of regular salary with a ceiling of KRW 1,000,000 in 2011.

During the period from its introduction to 2007, the eligibility for parental leave expired upon the first birth anniversary of the child. Combined with the mandatory maternity leave, this implies that the effective maximum duration of the leave is 10.5 months because at least 45 days of the maternity leave has to be taken after giving birth. Those who use the full maternity leave after giving birth could take the parental leave for at most 9 months. The eligibility expanded to those with children under age 3 in 2008 and to those with children age 6 or below in 2010.[5] The expansion in 2008 increased the effective parental leave by 1.5–3 months, which is the source of the policy variation in the study. Figure 3 illustrates two extreme cases. In case (1) of Figure 3, a woman who takes a half of the maternity leave after birth experiences an increase in the maximum duration of parental leave by 1.5 months after the policy change. For a woman in case (2), who uses the entire maternity leave after birth, the maximum duration of parental leave increases by 3 months. Note that all other characteristics of the parental leave legislation remained the same in January 2008.

One critical issue for identification is the timing of the announcement on the policy change. The amendment on Men Women Equal Employment Act was passed on 30th, December 2005, that is, two years before the new eligibility rule was put into effect. Therefore, it is possible for parents to time their delivery in order to take advantage of the extended leave. Whether those women who gave birth right before and after the change are comparable with each other will be discussed in the next section.

Since the introduction of the allowances for employees, the usage of parental leave increased rapidly. The take-up rate among those who gave birth in November 2001 was 18%, and it reached 35% in December 2007 and 53.6% in January 2011. The average duration of leave increased from 176 days in November 2001 to 236 days in December 2007 and 259 days in January 2011.

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[4] The subsidy was KRW 300,000 per month for small- and medium-sized firms.

[5] It is possible to split parental leave and use more than once since 2008. It is observed that most of leave-takers utilize the leave in the first year after childbirth.

4. Data Description

The data for the analysis are constructed from Employment Insurance (EI) database, and the sample consists of female employees enrolled in EI. As of 2008, the proportion of the EI enrollees to the female labor force aged between 20 and 39 is 48.2% and the proportion of female wage-earners in the same age group is 58.8%. Although not all female employees are covered by EI, it still represents a majority of the wage-earners. The EI database consists of workplace data, enrollee data, and motherhood protection data. The information on the usage of maternity leave and parental leave is matched with the employment history, which is constructed from the enrollee data and workplace data. The women who did not receive maternity leave benefit but received parental leave benefit are excluded because the event of childbirth is measured by the take-up of maternity leave. Since EI database is managed for the purpose of administration, it contains no information on the household of enrollees, which imposes a limitation on the analysis.

The usage of parental leave by birth month exhibits a clear discontinuity before and after the expansion of the eligibility in 2008. As can be seen in panel (a) of Figure 4, there is a jump of about 5 percentage points in the take-up rate by the two groups who gave birth in December 2007 and January 2008. The trend of the duration of leave in 2008 is about 20 days longer than that in 2007, as shown in panel (b). The difference in the trend of the duration is about 40 days when we look at only the leave-takers, as in panel (c). Interestingly, the change in the behavior is observed mostly at the ends of distribution under the extended leave policy. According to panel (d), the proportion of women who took leave for 9 months dropped by 4 percentage points, whereas the proportion of those who look leave for 11 months and 12 months increased by 2 and 7 percentage points, respectively.

The key question is whether taking a longer leave leads to a higher probability of working in the future. In order to detect the effect of the extended leave on women's return to work, we focus on the time period around the policy change. Specifically, women who gave birth in December 2007 are compared with those in January 2008, after controlling for seasonality is controlled, as in Lalive et al. (2014).[6] An employee is identified as working

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[6] The difference between the December and January group in the previous years is taken into account in the comparison. That is, the difference between women who gave birth in December 2006 and January 2007 is subtracted from the value for women whose childbirth was in December 2007. However, the removal of seasonality does not make any significant difference in the analysis.

when she is found to be covered in principle by EI during the parental leave.[7] Figure 6 displays the proportion of women working at different stages after childbirth for each group. Female employees tend to leave labor market more and more as time passes after their childbirths. As can be seen in panel (a) for the December group, the share of stayers in the 12th month after the delivery is 82%, drops quickly to 75% at the 15th month, and then declines gradually to 62% 4 years after birth. While the general trend is the same for the January group, it is slightly higher than that for December group. The difference is about 2%p for the 12–15 month period after childbirth, which seems to be the direct consequence of the prolonged parental leave. After that, the difference contracts to be 1%p at 2 years after the birth and increases to 2%p for the 2–3.5 year period after birth and declines again to 1%p at 4 years after birth. As for the proportion of women working at the same workplace in panel (b), the difference of 3%p between two groups is observed in the 15th month after childbirth, but becomes gradually smaller in magnitude and disappears at three years after childbirth.[8] In sum, the extension of parental leave seems to improve women's return to work within three years. However, its magnitude is rather small compared to the increase in usage of parental leave and it does not seem to last for more than three years. In addition, the policy change seems to help women to look for another job, rather than stay with the same employer.

The final sample includes those women who gave birth in December 2007 and January 2008. The descriptive statistics of the two groups are presented in Table 1. There is no significant difference in the basic characteristics except age. The average age is 30 years and the group who gave birth in January 2008 is 2 months older than the group in December 2007. The rest of basic information described those who gave birth in December 2007. The average hourly wage is KRW 7,400, and the monthly earning is KRW 1,543,000 (both are 2010 rates). As for education level, the share of those with high school diploma or below is 30%. The shares of two-year college graduates and university graduates or above are 26% and 44%, respectively. The average work experience of enrollees in EI is 4.5 years. As for the 16 province dummies and 21 industry dummies, there are three variables

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[7] In general, the self-employed are not covered by EI. Hence, it is noted that working status throughout the paper indicates whether an individual is working as an employee or not.

[8] The workplace refers to an establishment in the EI system, where the production activity is physically taking place. A firm may have a few workplaces, but the data does not contain firm ID. Therefore, an individual who left a workplace but stayed covered under the EI system may be in a new firm or in a different location of the old firm. The review of data suggests that the latter is less frequent.

for which the difference in the *p*-value for significance is less than 5 percent (not shown). Hence, the two groups seem to be well-balanced.

The duration of maternity leave after giving birth is 76 days for the December group, whereas it is one day shorter for the January group. This suggests that the expansion of the eligibility in 2008 increased the effective maximum duration of parental leave, on average, by 2.5 months. The usage of parental leave by the January group is 41.8%, which is 5%p higher than that by the December group. The duration of parental leave by the January group is 22.7 days longer than that by the December group. The difference in the duration of maternity leave is significant but its magnitude is not substantial, compared with that in the case of parental leave. Therefore, the main change in response to the policy change is likely to be through the parental leave rather than maternity leave.

The proportion of those working among the December group is 80.9% in the 12th month after birth, and decreased to 68.7% in the 24th month, 64.7% in the 36th month, and 62.1% in the 48th month. The working status is defined as the enrollment in EI. The employment level of the January group exhibits is significantly higher than that for the December group in the 12th month and the 36th month after birth by 1.6%p and 1.9%p, respectively. The increase in employment at the 12th month can be interpreted as a direct consequence of higher usage of parental leave since the enrollment is preserved during the leave.

The ratio of those who return to the workplace they worked in before giving birth among the December group is 69.8% in the 12th month after birth, and gradually declines to 52.3%, 44.9% and 39.9% in the 24th, 36th and 48th month, respectively, after birth. There is no significant difference in the return to the original workplace between the two groups.

5. Empirical Results

5.1   Usage of Parental Leave

The framework for statistical analysis is the regression discontinuity model (RDD), where the difference in outcome variables between two groups differing by the exposure to the policy change is interpreted as its causal effect. Specifically, the statistical model explaining an outcome variable, y_i, is as follows.

$$y_i = \beta_d d(x_i) + m(x_i) + u_i, \ E(u_i|x_i) = 0 \qquad (1)$$

x_i denotes the date of childbirth for a woman i, and u_i represents an error term. $d(x_i)$ is an index function, which takes 1 if the date of birth is after τ, and 0 otherwise. That is, $d(x_i) = 1[x_i \geq \tau]$. Here τ indicates January 1st, 2008. Note that $d(x_i)$ is right-continuous.

$$\lim_{x \downarrow \tau} d(x_i) - \lim_{x \uparrow \tau} d(x_i) = d(\tau) - \lim_{x \uparrow \tau} d(x_i) = 1 - 0 = 1 \qquad (2)$$

Further, $m(x_i)$ is a function of x_i that is continuous at τ. In equation (1)and β_d denotes the effect of the extension of duration of parental leave on the outcome of interest. Assuming that women who gave birth in the neighborhood of January 1st, 2008 do not differ with respect to unobservable characteristics, such as preference for leisure, the estimated effect of policy change can be interpreted as a causal effect. Since the case under study presents the sharp RDD, the heterogeneous local average treatment effect is defined as in Becker, Egger, and von Ehrlich (2013).

$$y_i = \{\beta_d + g(z_i)\}d(x_i) + n(x_i, z_i) + \varepsilon_i, \ E(\varepsilon_i|x_i, z_i) = 0 \qquad (3)$$

z_i indicates a set of individual characteristics assumed to be associated with the treatment effect.

The usage of the parental leave is measured by the two choices of take-up and its duration. First, a linear probability model for the decision to take a leave is considered. The estimation results are shown in Table 2. Each model differs in the use of a specific time window, starting from the date of policy change; these range from two weeks to three months, but the estimate of the policy effect is fairly stable. This further suggests that the selection of the new regime is likely to be limited because the deliberate timing of childbirth is more difficult over a shorter period of time. Now we discuss only the results of model (4), wherein the December group and the January group are compared. The extension of the maximum duration increased the probability of take-up by 5.35%p, and the effect is statistically significant at the conventional level of significance. The magnitude of the estimate is close to that observed in Figure 4. The coefficients of age and age squared imply that women tend to take leave less often before reaching age 31 and tend to take it more often after passing that age. Wage is found to have a substantially negative impact on the take-up. An increase in wage by one percent lowers the probability of take-up by 22.2%p. While there is not much difference between college graduates and high school graduates, the university graduates tend to take leave more often than high school graduates. This suggests that highly educated

11

women perceive more benefit from own care than their less educated counterparts. As work experience is accumulated, women have a tendency to take leave more often.

Next, the Tobit model is employed for estimating the determinants of the duration of the leave since the duration is censored at 0. Table 3 presents the estimation results. As in Table 2, the models in Table 3 are distinguished by the time windows used. The estimates of policy effect are also stable across different models. According to model (4) of Table 3, with the potential leave extended, the duration of the leave was 49.7 days longer than before, which is again similar in magnitude to the case in Figure 4. The effects of the other variables are qualitatively close to those in Table 2.

Therefore, the extension of the entitled leave indeed increased the usage of the parental leave, as is predicted by theory. Although the four channels discussed above are consistent with the increased duration of leave, the increase in the take-up rate can be explained most clearly by the fixed cost incurred in switching between own and paid child care.

The fact that the benefit and cost related to parental leave are likely to vary depending on the individual characteristics implies a heterogeneous policy effect. We explore this possibility by allowing the marginal effects to vary across wage and firm size. First, whether the policy effect increases or decreases with wage is not clear. On the one hand, to the extent that human capital depreciates faster for skilled workers than the unskilled, women with a higher wage face a larger opportunity cost in taking a leave than those with a lower wage. On the other hand, if the fixed cost incurred in switching from own to market care is larger for women with higher wage, then they are more likely to use parental leave after the policy change than those with lower wage. That is, high wage-earners may think of taking a leave for 15 months as worthwhile but not a leave for 12 months owing to the cost associated with the change in arrangement. The estimation results are shown in Table 4, where those who gave birth in December 2007 are compared with those who gave birth in January 2008. Model (1) and Model (4) are the basic specification, which estimates the average treatment effect for all women. Model (2) indicates that the increase in take-up rate is negatively correlated with women's wage but that the relationship is not monotonic. The effect of policy change on each quintile of wage distribution is plotted in panel (a) in Figure 5. The take-up by those in the 3rd quintile increased by 6.9%p, whereas the leaves taken by those in the 1st and 5th quintiles

increased by 5.9%p and 5.0%p, respectively.[9] According to Model (5), on the other hand, the policy effect on duration of leave tends to increase with wage, although the pattern is not uniform, as in the case for the take-up rate. The treatment effect on duration for each wage group is displayed in panel (c) in Figure 5. The estimates suggest that those in the 3rd quintile took the leave for 14 days longer than those in the bottom 20% and for 5 days longer than those in the top 20% of the wage distribution. Therefore, after the policy change, women with a middle level of wage took up the leave more often and for a longer duration than those with a low or high level of wage. It is also notable that those with the highest level of wage took up the leave less often but used it for a longer period of time than other women, on average, although all the wage groups took the advantage of the extension of parental leave.

Next, regarding the firm size, the policy effect is expected to be stronger for large firms since a large firm is likely to offer more favorable working conditions for raising children than a small firm. A large firm has an incentive to offer higher compensation than a smaller firm owing to efficiency wage and firm-specific skills. In addition, the possibility of finding a substitute for the leave taker and the activity of labor union may contribute to the atmosphere supporting child care. Column (3) in Table 4 implies that the treatment effect on the take-up rate becomes larger as a firm size increases but that the relationship is not monotonic. The marginal effect is plotted in panel (b) of Figure 5. The take-up rate increased by 8.2%p in firms with 300–999 employees, while no significant change was detected in those with 100–299 employees. The marginal effect on duration of leave also exhibits the same direction, according to column (6) of Table 4 and panel (d) of Figure 5. Those in a firm with 300–999 employees took leave for 79 days after the policy change, while those in a firm with 100–299 employees did not change their behavior significantly. In sum, employees in large firms benefited more from the extension of parental leave than those in small firms, while those in medium-sized firms benefited the least.

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[9] The 20th, 40th, 60th and 80th percentile of real wage per hour is KRW 4,893, KRW 6,044, KRW 7,182, and KRW 9,150, respectively (USD 1= KRW 1,134.8 in 2010).

5.2   Return to Labor Market

The proportion of female employees who were working after giving birth exhibits a nonlinear trend over the last decade. Roughly speaking, the employment level of women one, two, three or four years after birth tended to decrease gradually until 2008 and to increase gradually after that. It is noted that the Korean government has made continuous efforts to meet the growing public demand for family-friendly working environment since 2001. One example is strengthening the motherhood protection, and other examples include the government budget for childcare policy, which increased from 0.23% of GDP in 2005 to 0.71% in 2012. It is important to note that no major change in family policy coincided with the extension of parental leave.

A linear probability model for the return to work after giving birth is adopted in order to estimate the consequence of policy change on female employment. Table 5 presents the estimation results, and each model differs by the time at which the return to work is measured. Column (1) indicates that the probability of returning to work within 12 months after birth increased by 1.6%p due to the policy change. Further, panel (a) of Figure 7 based on columns (2) through (5) and other estimation reveals that the extension of the parental leave had increased the probability of returning to work within 27–39 months after giving birth by around 2%p but that the impact diminishes for longer periods. While the extension of potential leave by three months may be a relatively small change, the results suggest that the marginal extension of the mandated leave of one year neither promotes nor impede women's employment in the medium run.

The differential effects on wage group of the policy change are estimated in columns (6) through (10) of Table 5 and Figure 8. It is found that the extension of leave encouraged women in most wage groups to return to work within 4 years after birth. These positive effects are in the range of 1–3%p, but they are not precisely estimated. Those in the fourth quintile of wage distribution form an exception, and they actually had a lower probability of returning to work after the policy change. Specifically, for this group, the probability of returning to work within 18 months after childbirth decreased by 4.2%p, and the effect is statistically significant at the 5% level of significance. The magnitude of the negative impact on those in the fourth quintile tends to become smaller and less precisely estimated as time passes after childbirth. The results imply that those with an upper-middle level of wage may value own care more or may be able to afford staying at home more than other women.

14

Next, the firm size is viewed as another source of variation in the treatment in columns (11) through (15) of Table 5 and Figure 8. While no significant impact of policy change is detected for most women in firms of different sizes, those in the medium-sized firms are found to return to work more often due to the extension of leave. After the policy change, the probability of returning to work 18 months after birth increased by 6.8%p for those working in firms with 100–299 employees. However, the effect is of a smaller magnitude when measured at a later period after childbirth. Interestingly, those in the medium-sized firms are the very group who increased the usage of parental leave less than others due to its extension. The finding of a relatively small impact on usage of parental leave and a large impact on return to work for medium-sized firms implies that a conflict between work and life is not evenly distributed in the Korean labor market.

The effects of other determinants are qualitatively similar across models and are as expected by theory (not shown). Older women tend to return to work less often before age 30, and tend to return more after that. Women with a higher wage tend to return more often than those with a lower wage. For example, the incidence of the return to work within 36 months after birth is 12%p higher for women in the top 20% of the wage distribution than those in the bottom 20%. University graduates tend to return to work more often than high school graduates. Women with a longer tenure have a greater tendency to return to work.

The estimation results remain qualitatively similar when the return to the original workplace is used as a dependent variable, according to Table 6 and panel (b) of Figure 7. One difference is that no temporary increase is found in the return rate to the original workplace. With the extension of parental leave, both *replacement* and *reservation wage effects* predict that women would have a weaker incentive to return to their original workplace. The finding of the difference in the effect on the return to work and that on the return to the original workplace is consistent with the *replacement* and *reservation wage effects*, but the fact that the difference is only temporary suggests that these mechanisms are of limited magnitude.

6. Conclusion

The paper investigated the consequence of the extension of maximum parental leave from 12 to 15 months in Korea. The findings are summarized as follows. First, with the job-protected leave extended, female employees

15

indeed took up the leave more often and for a longer period than before. The extension increased the take-up rate by 5%p and increased the duration by 50 days. Second, while women with higher wage were generally found to take up leave less often and for a longer period than those with lower wage, those with a middle level of wage were estimated to benefit most from the policy change in terms of leave usage. This is consistent with a hypothesis that the fixed cost incurred in switching between own and market childcare increases with the level of wage. Third, on the whole, the policy effect on usage of leave was found to be larger for employees in large firms than for small ones. However, those in the medium-sized firms benefited the least. Fourth, the probability of returning to work within 4 years after birth did not change significantly after the extension, which suggests that the marginal extension of leave in the vicinity of one year does not lead to a negative consequence in terms of women's employment. Fifth, the effect of policy change on return to work is found to vary substantially depending on individual wage and firm size. In particular, the probability of returning to work within 18 months after birth decreased by 4.2% for women with an upper middle level of wage, whereas it increased by 6.8%p for those in medium-sized firms. While these effects tend to be mitigated over time, it suggests that women do not benefit equally from the equal right to take a parental leave.

Although the magnitude of the policy change in Korea is smaller than those in Austria or Germany, the finding on its effect on women's employment is consistent with Schönberg and Ludsteck (2014) and Lalive and Zweimüller (2009). However, our results suggest that the distributional effect could be quite substantial even when the average effect is negligible. Thus, policy debate on the design of parental leave should focus on the segment of population that benefits more than the others.

One drawback of the study is that the household characteristics of individuals are not considered owing to their unavailability. Differential effects across household income groups would be highly relevant to the effectiveness of social insurance. Further, examining the nature of the benefit or cost related to parental leave could be another direction for further research.

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Figure 1 Total Length of Maternity and Parental Leave and Average Payment in OECD countries (2016)
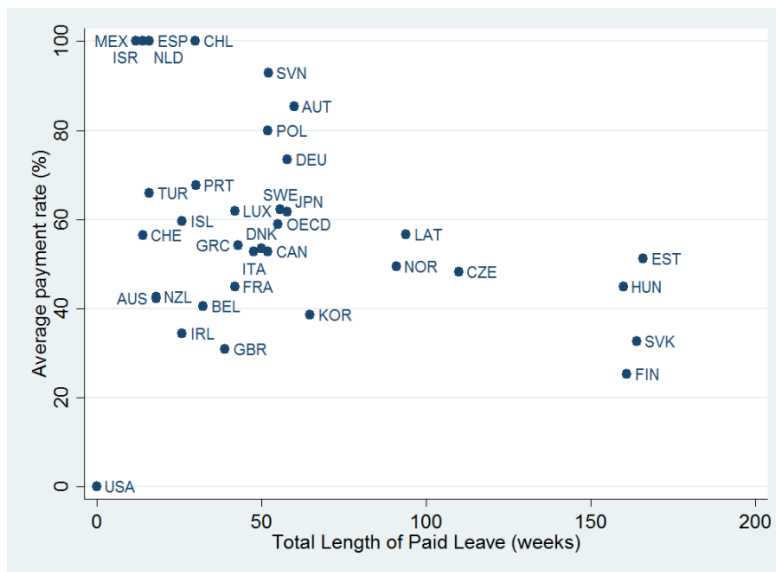

Note: Total paid leave refers to the combination of maternity and parental leave, and the graph is based on paid leave entitlements in place as of April 2016. The "average payment rate" refers the proportion of previous earnings replaced by the benefit over the length of the paid leave entitlement for a person earning 100% of average national (2015) earnings. "OECD" indicates the average of the 35 OECD countries.

Source: OECD Family Database, Indicator PF2.1: http://www.oecd.org/social/family/database.htm.

Figure 2 Optimal Duration of Parental Leave under Certainty
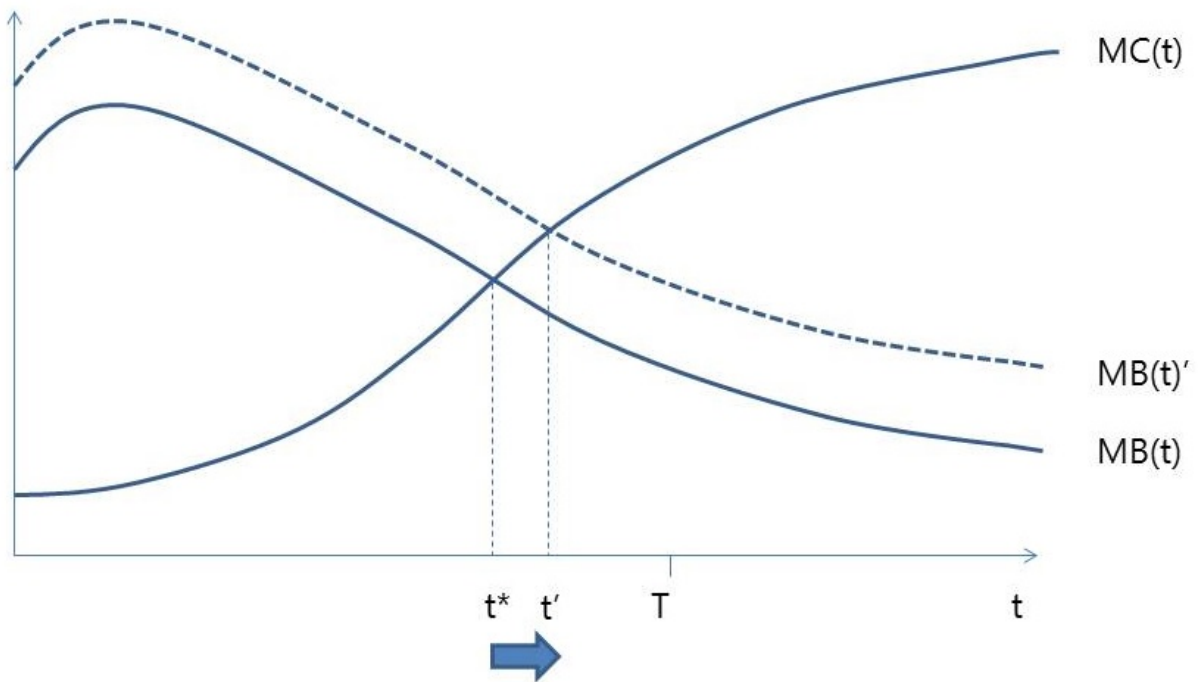
(a) Effect of increase in the monthly allowance
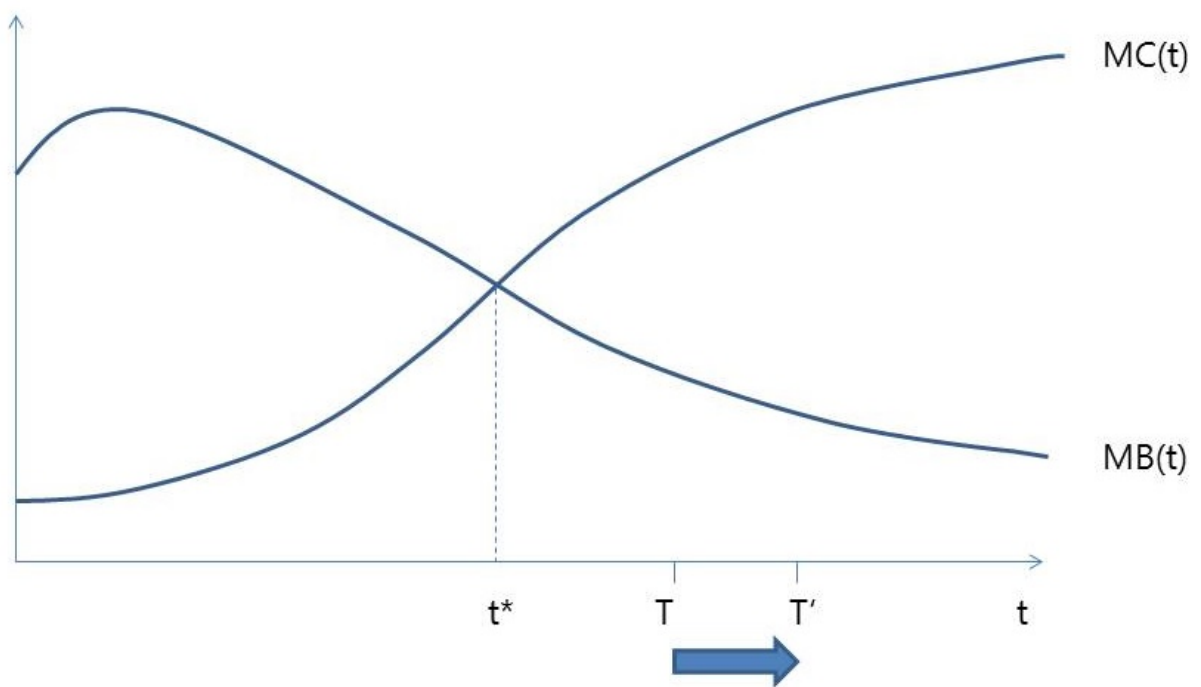
(b) Effect of increase in the maximum duration

Note: $MB(t)$ and $MC(t)$ indicate the marginal benefit and cost associated with taking a leave at time t after childbirth, respectively.

Figure 3 Change in the Parental Leave Policy in 2008
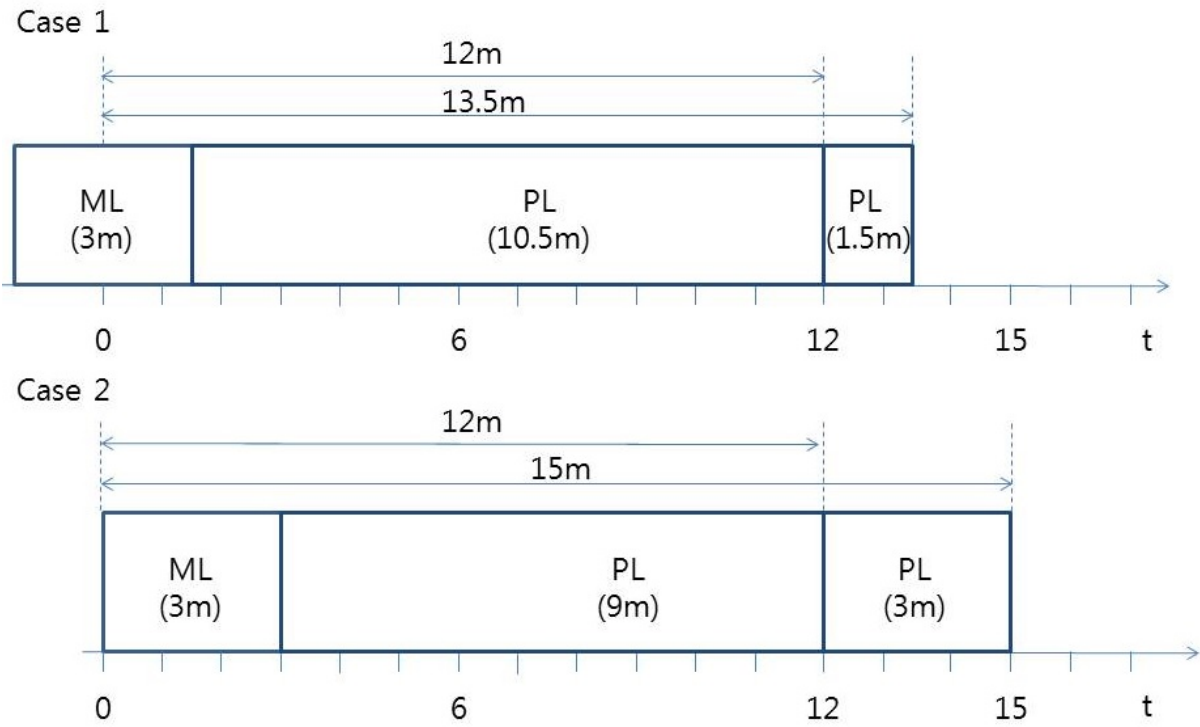
Note: ML and PL refers to maternity leave and parental leave, respectively, and their lengths are measured in months. The date of childbirth is denoted by 0. Maternity leave of 90 days is mandatory and at leave 45 days should be taken after childbirth. Case 1 and 2 illustrate two extreme cases.

Figure 4 Take-up Rate and duration of Parental Rate before and after the Extension

(a) Take-up Rate

(b) Duration for all women

(c) Duration for Leave-takers

(d) Distribution of duration
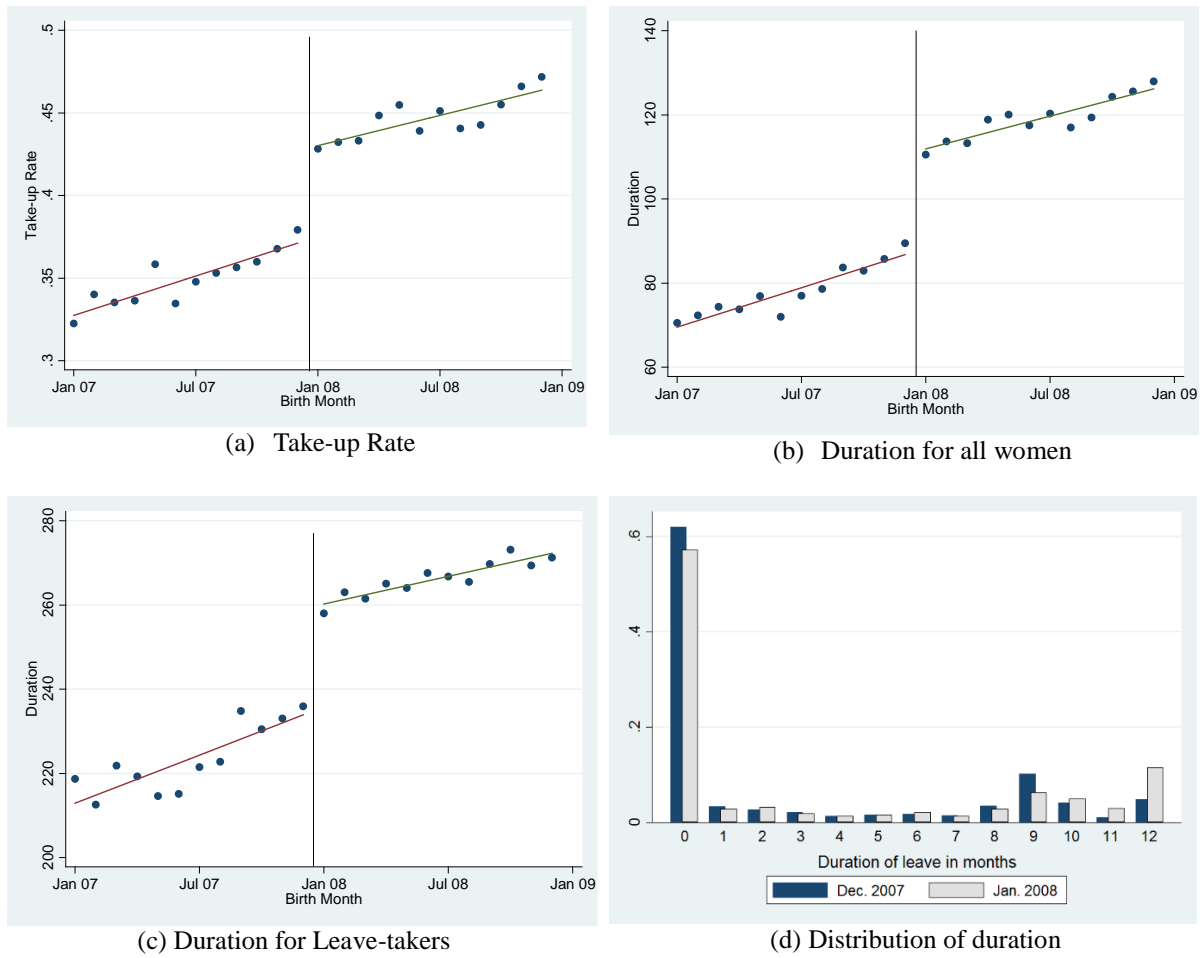
Note: In panels (a) through (c), each data point represents an average among women who gave birth in the same month. In panel (d), each bar indicates the proportion of women who took the leave for the corresponding duration, and women who gave birth in December 2007 are compared with those in January 2008.

Source: Employment Insurance Database.

Figure 5 Heterogeneous Effects of the Leave Extension on Usage of Parental Leave
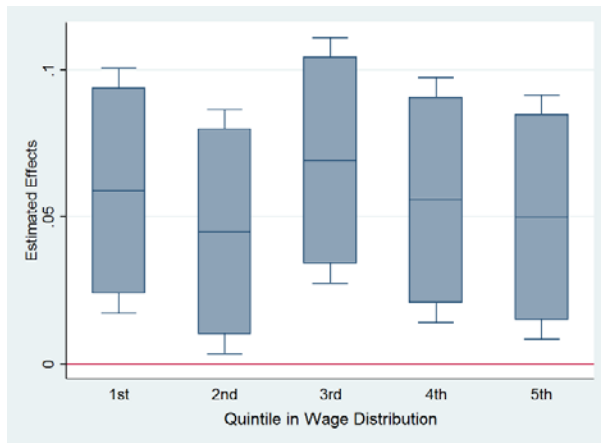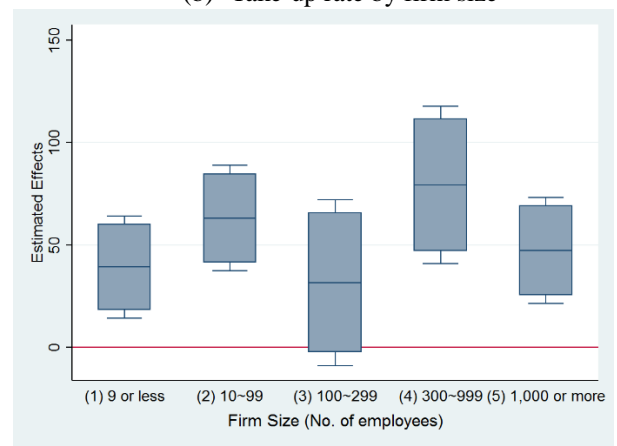

(a) Take-up rate by wage
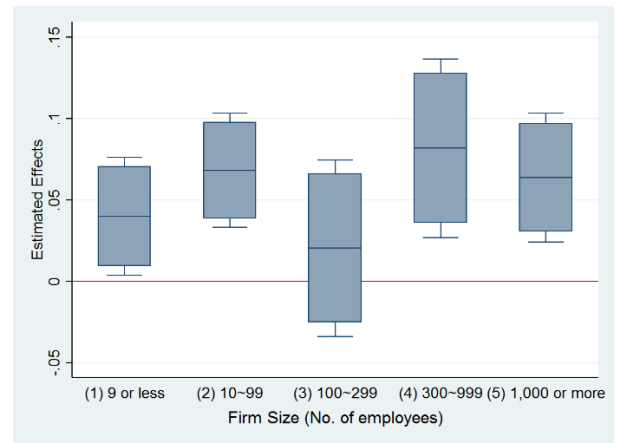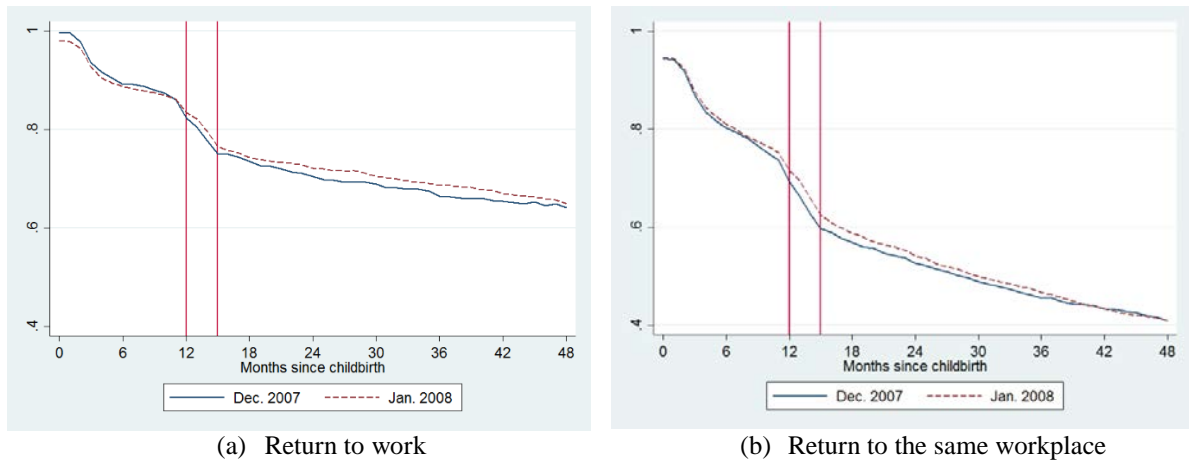
(b) Take-up rate by firm size
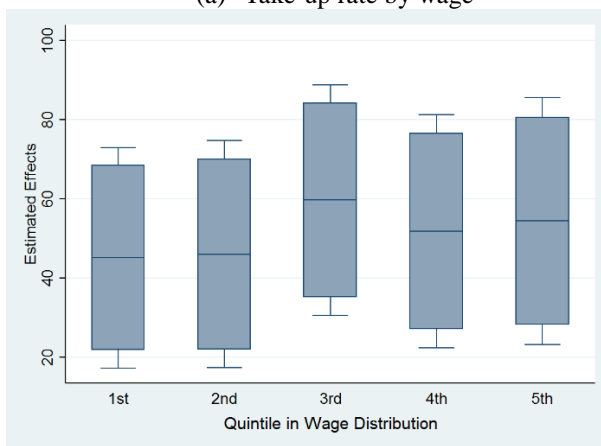
(c) Duration by wage

(d) Duration by firm size

Note: Boxes indicate the 90% confidence interval and lines indicate the 95% confidence interval of the estimate. The plots are based on the results in Table 4.

Figure 6 Proportion of Women Working after Giving Birth before and after the Leave Extension

(a) Return to work   (b) Return to the same workplace

Note: Each data point represents a proportion of women working in panel (a) or working at the same workplace as before childbirth in panel (b). The groups of women who gave birth in December 2007 and in January 2008 are compared with each other. The seasonality is removed by subtracting from the series for December 2007 group the differences between women who gave birth in December 2006 and January 2007.

Source: Employment Insurance Database.

Figure 7 Effects of the Leave Extension on the Probability of Returning to Work



(a) Return to work

(b) Return to the same workplace
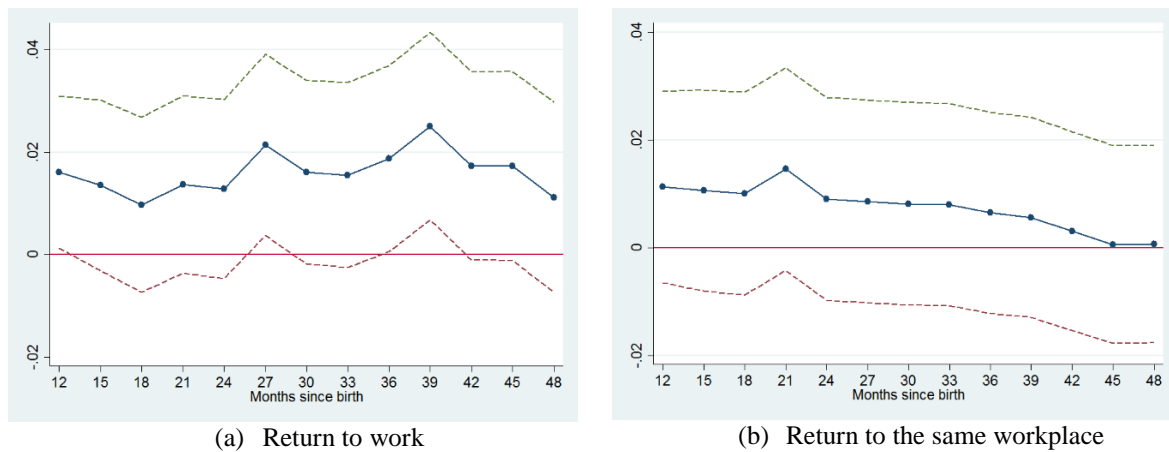
Note: Each data point represents an estimate of the effect of policy change on the probability of returning to work at each period after childbirth. The dotted series indicate the 95% confidence interval. Panel (a) and panel (b) include models (1) to (5) in Table 5 and Table 6, respectively.

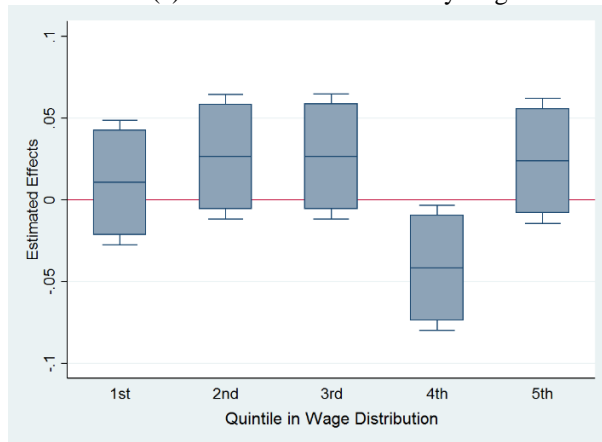Source: Employment Insurance Database.

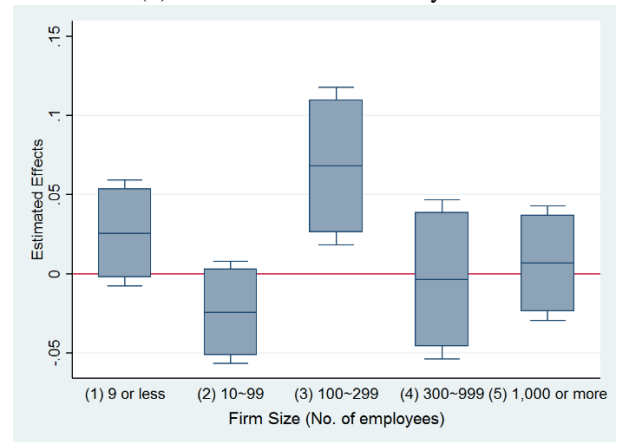Fig. 8 Heterogeneous Effects of the Leave Extension on Return to Work
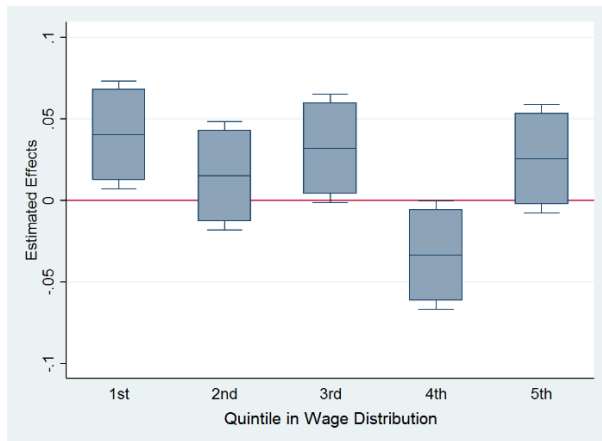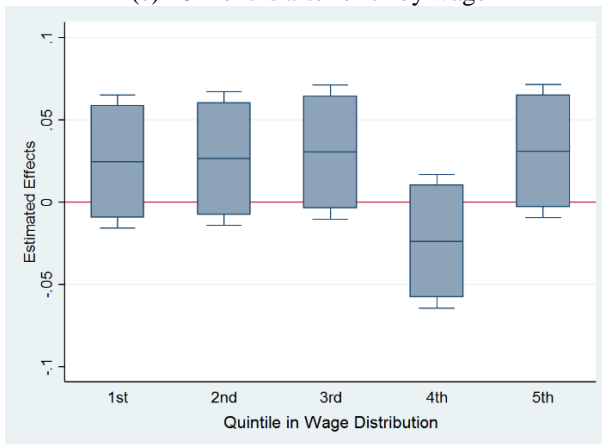

(a) 12 months after birth by wage
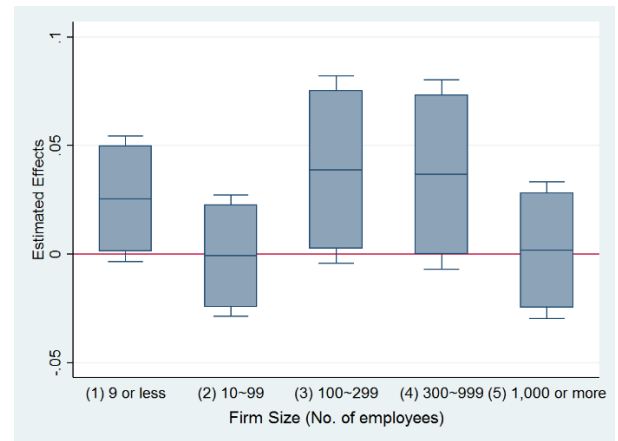
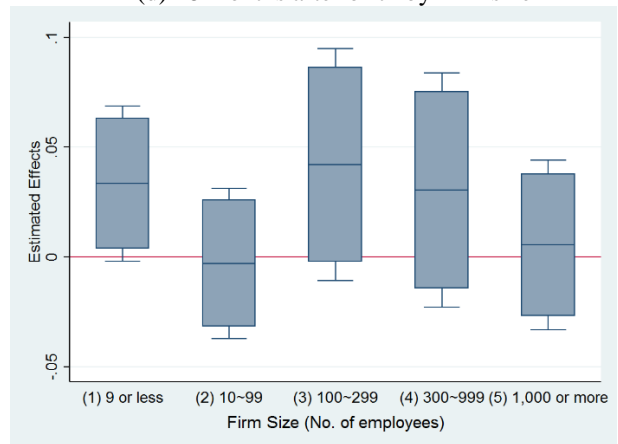(b) 12 months after birth by firm size

(c) 18 months after birth by wage

(d) 18 months after birth by firm size

(e) 36 months after birth by wage

(f) 36 months after birth by firm size

Note: Boxes indicate the 90% confidence interval and lines indicate the 95% confidence interval of the estimate. The plots are based on the results in Table 5.

Table 1 Descriptive Statistics by Birth Month

Variables	December, 2007 (N=4,450)		January, 2008 (N=5,446)		Contrast	
	Mean	S.D.	Mean	S.D.	Diff.	*p*-value
Age	29.841	(3.183)	30.033	(3.128)	0.193	0.003
Hourly wage (KRW 1,000)	7.354	(3.258)	7.373	(3.273)	0.019	0.769
Monthly earning (KRW 10,000)	154.296	(64.595)	154.981	(64.529)	0.684	0.600
Education: High school or below	0.299	(0.458)	0.295	(0.456)	-0.004	0.631
Education: College	0.260	(0.439)	0.271	(0.445)	0.011	0.208
Education: University	0.441	(0.497)	0.434	(0.496)	-0.007	0.496
Tenure (yrs.)	4.512	(3.433)	4.594	(3.542)	0.082	0.245
Duration of Maternity Leave After Birth	76.093	(13.609)	75.127	(13.888)	-0.966	0.001
Usage of Parental Leave	0.368	(0.482)	0.418	(0.493)	0.050	0.000
Duration of Parental Leave	87.702	(130.993)	110.372	(147.398)	22.670	0.000
Working 12 months after birth	0.809	(0.393)	0.825	(0.380)	0.016	0.041
Working 24 months after birth	0.687	(0.464)	0.698	(0.459)	0.012	0.215
Working 36 months after birth	0.647	(0.478)	0.665	(0.472)	0.019	0.054
Working 48 months after birth	0.621	(0.485)	0.633	(0.482)	0.011	0.243
Same firm 12 months after birth	0.698	(0.459)	0.710	(0.454)	0.011	0.213
Same firm 24 months after birth	0.523	(0.500)	0.530	(0.499)	0.007	0.465
Same firm 36 months after birth	0.449	(0.497)	0.454	(0.498)	0.005	0.640
Same firm 48 months after birth	0.399	(0.490)	0.398	(0.489)	-0.001	0.907

Note: The sample consists of women who gave birth in December of 2007 or January of 2008 and were enrolled in Employment Insurance.

Source: Employment Insurance Database.

Table 2 The Effect of the Leave Extension on the Take-up of Leave

	(1) -7 vs. +7 days	(2) -14 vs. +14 days	(3) -21 vs. +21 days	(4) -31 vs. +31 days	(5) -46 vs. +46 days
Year 2008	0.0594	0.0531	0.0494	0.0535	0.0522
	(0.0207)**	(0.0143)**	(0.0116)**	(0.0096)**	(0.0079)**
Age	-0.0188	-0.0229	-0.0552	-0.0440	-0.0370
	(0.0409)	(0.0288)	(0.0241)*	(0.0201)*	(0.0170)*
Age squared	0.0004	0.0003	0.0008	0.0007	0.0006
	(0.0007)	(0.0005)	(0.0004)*	(0.0003)*	(0.0003)*
Log real wage	-0.2392	-0.2432	-0.2263	-0.2215	-0.2149
	(0.0318)**	(0.0227)**	(0.0184)**	(0.0153)**	(0.0127)**
College(2-yr)	-0.0372	-0.0121	-0.0176	-0.0043	-0.0073
	(0.0273)	(0.0195)	(0.0159)	(0.0134)	(0.0110)
University	0.0267	0.0339	0.0431	0.0443	0.0424
	(0.0251)	(0.0180)	(0.0147)**	(0.0124)**	(0.0102)**
Tenure (yrs.)	0.0049	0.0043	0.0063	0.0052	0.0042
	(0.0031)	(0.0022)	(0.0018)**	(0.0015)**	(0.0013)**
R^2	0.06	0.06	0.06	0.06	0.06
N	2,381	4,576	6,834	9,896	14,482

Note: Linear probability models are estimated, and the dependent variable is an index for taking up a leave. Each model differs by the sample, which is based on whether the date of childbirth falls on the period around January 1st, 2008. All models include dummies for provinces and industries as explanatory variables. Standard errors are in parentheses. * $p<0.05$, ** $p<0.01$.

Table 3 The Effect of the Leave Extension on the Duration of Leave

	(1) -7 vs. +7 days	(2) -14 vs. +14 days	(3) -21 vs. +21 days	(4) -31 vs. +31 days	(5) -46 vs. +46 days
Year 2008	46.8774 (14.8753)**	46.1222 (10.3659)**	44.0445 (8.2475)**	49.7103 (6.7324)**	49.6401 (5.5350)**
Age	-3.5904 (28.3526)	-6.2802 (20.3425)	-31.6456 (16.6477)	-27.3547 (13.7906)*	-23.5213 (11.7237)*
Age squared	0.0955 (0.4596)	0.0956 (0.3316)	0.4954 (0.2720)	0.4410 (0.2252)	0.3789 (0.1916)*
Log real wage	-184.5387 (23.5597)**	-196.2208 (17.0357)**	-184.1427 (13.5115)**	-178.7965 (11.0094)**	-170.9721 (9.1368)**
College(2-yr)	-31.7139 (19.4695)	-11.2735 (14.0320)	-13.5658 (11.2983)	-1.8838 (9.3224)	-4.6941 (7.6919)
University	13.1919 (17.7868)	23.0939 (12.9486)	31.6442 (10.3729)**	31.2190 (8.5871)**	28.5972 (7.0839)**
Tenure (yrs.)	2.5968 (2.1982)	2.3424 (1.6164)	3.2560 (1.2965)*	2.5076 (1.0690)*	1.7930 (0.8841)*
σ	290.8034 (7.8226)**	291.2503 (5.6954)**	286.8246 (4.5664)**	284.2927 (3.7354)**	284.8884 (3.0974)**
Log Likelihood	-7,493.6	-14,223.2	-21,330.9	-31,209.7	-45,632.4
N	2,381	4,576	6,834	9,896	14,482

Note: Tobit models are estimated, and the dependent variable is the duration of parental leave taken by an individual. Each model differs by the sample, which is based on whether the date of childbirth falls on the period around January 1st, 2008. All models include dummies for provinces and industries as explanatory variables. Standard errors are in parentheses. * $p<0.05$, ** $p<0.01$.

Table 4 The Effect of the Leave Extension on the Usage of Leave by Wage and Firm Size

	(1) LPM Take-up	(2) LPM Take-up	(3) LPM Take-up	(4) Tobit Duration	(5) Tobit Duration	(6) Tobit Duration
Year 2008 (T)	0.0557 (0.0095)**			51.1899 (6.6645)**		
T x wage 1st quintile		0.0588 (0.0212)**			45.1225 (14.1674)**	
T x wage 2nd quintile		0.0449 (0.0213)*			46.0471 (14.6095)**	
T x wage 3rd quintile		0.0692 (0.0213)**			59.6868 (14.8619)**	
T x wage 4th quintile		0.0557 (0.0213)**			51.8396 (15.0034)**	
T x wage 5th quintile		0.0499 (0.0212)*			54.4155 (15.8928)**	
T x firm size 9 or less			0.0399 (0.0185)*			39.1997 (12.7367)**
T x firm size 10~99			0.0682 (0.0179)**			63.0508 (13.1384)**
T x firm size 100~299			0.0203 (0.0277)			31.5491 (20.6531)
T x firm size 300~999			0.0817 (0.0280)**			79.2632 (19.6352)**
T x firm size 1,000 or more			0.0637 (0.0202)**			47.2343 (13.2470)**
Wage 2nd quintile	-0.0595 (0.0152)**	-0.0519 (0.0223)*	-0.0593 (0.0152)**	-45.6553 (10.2827)**	-46.0896 (15.2852)**	-45.6070 (10.2808)**
Wage 3rd quintile	-0.0812 (0.0156)**	-0.0870 (0.0228)**	-0.0806 (0.0156)**	-64.4064 (10.6458)**	-72.6834 (15.7635)**	-64.2919 (10.6455)**
Wage 4th quintile	-0.1219 (0.0161)**	-0.1202 (0.0230)**	-0.1214 (0.0161)**	-90.3629 (11.0449)**	-94.0766 (15.9754)**	-90.0758 (11.0437)**
Wage 5th quintile	-0.2194 (0.0173)**	-0.2144 (0.0239)**	-0.2196 (0.0173)**	-172.2803 (12.2616)**	-177.4802 (17.1987)**	-172.5353 (12.2611)**
Firm size 10~99	-0.0715 (0.0132)**	-0.0715 (0.0132)**	-0.0872 (0.0196)**	-59.0906 (9.3338)**	-59.0472 (9.3345)**	-72.7348 (14.0966)**
Firm size 100~299	-0.0930 (0.0176)**	-0.0931 (0.0176)**	-0.0825 (0.0254)**	-82.9518 (12.7822)**	-83.0113 (12.7822)**	-78.7749 (18.6415)**
Firm size 300~999	-0.0074 (0.0183)	-0.0072 (0.0183)	-0.0302 (0.0259)	-20.3003 (12.7521)	-20.3407 (12.7570)	-43.0182 (18.4392)*
Firm size 1,000 or more	0.1452 (0.0167)**	0.1453 (0.0167)**	0.1324 (0.0223)**	80.1722 (11.4354)**	80.2477 (11.4382)**	75.5270 (15.2880)**
σ				280.1675 (3.6788)**	280.1581 (3.6787)**	280.0709 (3.6774)**
R^2	0.08	0.08	0.09			
Log likelihood				-31024.01	-31023.67	-31021.64
N	9,869	9,869	9,869	9,869	9,869	9,869

Note: The sample consists of women who gave birth in December of 2007 or January of 2008 and who were enrolled in Employment Insurance. All models include age, age squared, education, tenure and dummies for provinces and industries as explanatory variables. Standard errors are in parentheses. * $p<0.05$, ** $p<0.01$.

Table 5 The Effect of the Leave Extension on the Return to Work

	(1)	(2)	(3)	(4)	(5)
	12 months	18 months	24 months	36 months	48 months
Year 2008 (T)	0.0157	0.0091	0.0118	0.0177	0.0104
	(0.0076)*	(0.0087)	(0.0089)	(0.0093)	(0.0095)
R^2	0.07	0.09	0.1	0.08	0.07
N	9,869	9,869	9,869	9,869	9,869
	(6)	(7)	(8)	(9)	(10)
	12 months	18 months	24 months	36 months	48 months
T x wage 1st quintile	0.0401	0.0105	0.0188	0.0246	0.0150
	(0.0169)*	(0.0195)	(0.0199)	(0.0207)	(0.0212)
T x wage 2nd quintile	0.0149	0.0263	0.0171	0.0264	0.0058
	(0.0169)	(0.0195)	(0.0199)	(0.0207)	(0.0212)
T x wage 3rd quintile	0.0317	0.0264	0.0016	0.0303	0.0284
	(0.0170)	(0.0196)	(0.0200)	(0.0208)	(0.0213)
T x wage 4th quintile	-0.0337	-0.0417	-0.0114	-0.0239	-0.0218
	(0.0170)*	(0.0195)*	(0.0200)	(0.0207)	(0.0212)
T x wage 5th quintile	0.0255	0.0238	0.0329	0.0309	0.0248
	(0.0169)	(0.0195)	(0.0199)	(0.0207)	(0.0212)
R^2	0.07	0.09	0.1	0.08	0.07
N	9,869	9,869	9,869	9,869	9,869
	(11)	(12)	(13)	(14)	(15)
	12 months	18 months	24 months	36 months	48 months
T x firm size 9 or less	0.0255	0.0257	0.0237	0.0334	0.0142
	(0.0148)	(0.0170)	(0.0174)	(0.0181)	(0.0185)
T x firm size 10~99	-0.0008	-0.0242	-0.0118	-0.0029	-0.0102
	(0.0143)	(0.0164)	(0.0168)	(0.0175)	(0.0179)
T x firm size 100~299	0.0389	0.0681	0.0572	0.0421	0.0215
	(0.0221)	(0.0254)**	(0.0260)*	(0.0270)	(0.0276)
T x firm size 300~999	0.0367	-0.0035	-0.0022	0.0305	0.0384
	(0.0223)	(0.0256)	(0.0262)	(0.0273)	(0.0279)
T x firm size 1,000 or more	0.0017	0.0067	0.0109	0.0054	0.0117
	(0.0161)	(0.0185)	(0.0189)	(0.0197)	(0.0201)
R^2	0.07	0.09	0.1	0.08	0.07
N	9,869	9,869	9,869	9,869	9,869

Note: Linear probability models are estimated, and the dependent variable is an index for being employed at each period after childbirth. All models include age, age squared, education, tenure and dummies for wage groups, firm sizes, provinces and industries as explanatory variables. Standard errors are in parentheses. * $p<0.05$, ** $p<0.01$.

Table 6 The Effect of the Leave Extension on the Return to the Same Workplace

	(1)	(2)	(3)	(4)	(5)
	12 months	18 months	24 months	36 months	48 months
Year 2008 (T)	0.0115	0.0098	0.0085	0.0057	-0.0001
	(0.0091)	(0.0096)	(0.0096)	(0.0095)	(0.0094)
R^2	0.05	0.09	0.11	0.11	0.12
N	9,869	9,869	9,869	9,869	9,869
	(6)	(7)	(8)	(9)	(10)
	12 months	18 months	24 months	36 months	48 months
T x wage 1st quintile	0.0363	0.0216	0.0225	0.0261	0.0175
	(0.0202)	(0.0214)	(0.0214)	(0.0212)	(0.0209)
T x wage 2nd quintile	0.0022	0.0283	0.0136	0.0022	-0.0092
	(0.0202)	(0.0214)	(0.0215)	(0.0213)	(0.0209)
T x wage 3rd quintile	0.0305	0.0200	0.0033	0.0028	0.0049
	(0.0203)	(0.0215)	(0.0215)	(0.0213)	(0.0210)
T x wage 4th quintile	-0.0455	-0.0550	-0.0291	-0.0340	-0.0381
	(0.0203)*	(0.0215)*	(0.0215)	(0.0213)	(0.0209)
T x wage 5th quintile	0.0338	0.0339	0.0322	0.0311	0.0245
	(0.0202)	(0.0214)	(0.0214)	(0.0212)	(0.0209)
R^2	0.05	0.09	0.11	0.12	0.12
N	9,869	9,869	9,869	9,869	9,869
	(11)	(12)	(13)	(14)	(15)
	12 months	18 months	24 months	36 months	48 months
T x firm size 9 or less	0.0265	0.0217	0.0160	0.0114	-0.0006
	(0.0177)	(0.0187)	(0.0187)	(0.0186)	(0.0182)
T x firm size 10~99	0.0031	-0.0085	-0.0044	0.0035	-0.0069
	(0.0171)	(0.0181)	(0.0181)	(0.0180)	(0.0176)
T x firm size 100~299	0.0557	0.0691	0.0619	0.0403	0.0117
	(0.0264)*	(0.0279)*	(0.0279)*	(0.0277)	(0.0272)
T x firm size 300~999	0.0405	0.0208	0.0116	0.0078	0.0262
	(0.0266)	(0.0282)	(0.0282)	(0.0280)	(0.0275)
T x firm size 1,000 or more	-0.0344	-0.0183	-0.0139	-0.0178	-0.0106
	(0.0192)	(0.0204)	(0.0204)	(0.0202)	(0.0198)
R^2	0.05	0.09	0.11	0.11	0.12
N	9,869	9,869	9,869	9,869	9,869

Note: Linear probability models are estimated, and the dependent variable is an index for being employed by the same employer at each period after childbirth. All models include age, age squared, education, tenure and dummies for wage groups, firm sizes, provinces and industries as explanatory variables. Standard errors are in parentheses. * $p<0.05$, ** $p<0.01$.