Duration of Parental Leave and Women's Employment

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The study examines the consequence of the extension of maximum job-protected and paid leave from 12 months to 15 months in Korea. The analysis, based on regression discontinuity design, finds the reform led to more female employees taking leave and for longer periods. The take-up of leave increased by five percentage points and the duration by 40 days. The probability of returning to work within three years after birth increased by two percentage points after the policy change, but the effect diminished by four years after birth. No significant impact on their return to their pre-birth job is found. This finding implies that a relatively small change in parental leave legislation may promote women's employment in the short-term. Moreover, the extension of the maximum duration of job-protected leave is not enough to support women's career development in the long-term. Finally, the short-term impact on women's employment was the largest for those with the lowest wage and in the smallest firms. Although the evidence is not definitive, the heterogeneous effect needs to be paid further attention in evaluating parental leave policy.

Keywords: Parental leave, Female labor supply, Timing of childbearing, Natural experiment

JEL Classification: J13, J18, J22

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I. Introduction

Although the need for maternity leave (ML) for women during pregnancy and childbirth is generally justified on the grounds of gender equity and the health of mother and child, the case for parental leave (PL) for workers with infants and toddlers is not clear.[1] On the one hand, 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 provided by a child's own parents is superior to that obtained through paid child care. On the other hand, the human capital of workers may deteriorate during leave, which reduces the labor market opportunities available to them (Mincer and Ofek 1982). Therefore, optimal legislation on PL is likely to depend on institutional conditions and social preferences. In fact, considerable variation is observed among OECD countries in PL legislation in terms of its maximum duration and the cash benefit given, as presented in Figure 1.[2]

Given the tradeoff involved in strengthening PL legislation, the policy debate requires clarity on the consequences of policy change—an empirical question. However, separately identifying the effects of the duration of job-protected leave and the amount of cash benefit during leave is difficult because most policy variation involves changes in both dimensions. One of the few exceptions is the study by Lalive *et al.* (2014), which examines a series of policy changes in Austria. The current study proposes studying the impact of PL duration on female employment in the setting of a natural experiment in Korea, where only the maximum duration of job-protected and paid leave is altered.

Theoretically, employees are expected to take a longer leave when the maximum duration is extended. In particular, women may have a higher level of reservation than men toward searching for alternative child care services or a new job opportunity during their leave (Ondrich

[1] ILO Maternity Protection Convention (No. 183) recommends 14 weeks of maternity benefit to women 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 international comparison because the length of maternity leave varies across countries, and it sometimes includes parental leave, as in Greece.

et al. 2003; Lalive *et al.* 2014). A fixed cost may also be involved in switching between parent-provided care and market care. Previous studies generally confirm this prediction (Rossin-Slater 2018). On the contrary, the literature shows mixed results regarding the effect of PL extension on female labor supply. The marginal effect of the introduction of short leave is suggested to be larger than that of the extension of an existing one (Ruhm 1998; Schönberg and Ludsteck 2014; Kunze 2016; Rossin-Slater 2018). However, caution is needed because the consequence of PL legislation essentially depends on the socioeconomic context.

The literature mainly deals with either universal paid leave mandated by the government in most European countries and Canada or with short unpaid leave mandated by firms in the US. Only a few studies have been conducted on PL legislation in Asian countries with, to our knowledge, no study on the consequence of extension of PL duration. Korea presents an interesting case in that its PL legislation is more generous overall than the US system but less generous than the European system. Further, the childcare market in Korea is underdeveloped compared with European countries and is predominantly composed of private providers.

In Korea, all female employees are entitled to 90 days of paid ML, and all employees are entitled to 12 months of unpaid PL. In addition, those enrolled in Employment Insurance (EI) receive a cash benefit during PL. However, women cannot take the full amount of PL because at least a half of the allotted ML should be taken after childbirth and PL eligibility expires on the child's first birthday. In 2008, the eligibility for PL was expanded from one to three years after birth, which extended the effective PL duration by a maximum of three months. The policy change also provided an option to split PL into two parts. As the 2008 reform applied to those who gave birth in 2008 or later, its consequence can be uncovered by comparing women who gave birth immediately before the policy change and those who did so after the policy change. The analysis is in line with recent studies that adopt regression discontinuity design and utilize a large administration database (Lalive and Zweimüller 2009; Schönberg and Ludsteck 2014; Dahl *et al.* 2016).

The key findings are as follows: First, the 2008 reform induced female employees to take up PL more often and for a longer period than previously. The extension of PL duration increased the take-up rate by 5 percentage points and increased the duration of leave taken by 40 days.

Second, after the extension, the likelihood of a woman returning to work within three years after childbirth increased by 2 percentage points, but the difference disappears four years after childbirth. No short-term impact is found in the return to the pre-birth job. This finding implies that a relatively small change in PL legislation can improve women's employment in the short term in countries like Korea. However, no significant impact in the medium-term suggests that other forms of government intervention is needed to support the career development of working mothers. Third, the short-term impact on women's return to work is the largest for those earning the lowest wages and working in the smallest firms, which implies that strengthening PL legislation may generate a distributional effect in the target population.

The rest of the study is organized as follows: The next section discusses the theoretical prediction and the findings in recent literature. Section III introduces the institutional background, and Section IV describes the data. Section V presents the statistical model and the empirical results. Section VI concludes.

II. Theoretical Discussion and Previous Studies

The basic features of PL legislation include the duration of job-protected leave, the cash benefit during the leave, and which institution mandates it. Although PL policy in the US consists of short unpaid leave mandated by individual firms, most advanced economies have adopted a system of universal paid leave mandated by the government.

Legal entitlement to PL is often promoted as a means of promoting equality, which implies that one's career should not be interrupted by childbearing. It may also be justified on the grounds of efficiency as related to externality and adverse selection (Ruhm and Teague 1997). For example, a positive externality would be associated with PL if a child was healthier under her parent's care than under paid care and if the medical costs were shared by the parents and the government. In a competitive labor market, the provision of PL by firms would be accompanied by lower wages. Employees with low risk of taking PL would choose a compensation package without the provision of PL. Given that the choice of a compensation package would signal whether women anticipate taking PL in the future, the provision of PL would not reach the socially desirable level without the government's intervention.

Even if the mandate on PL provision is justified, a different question

is raised whether a more generous system is more desirable. When the maximum duration of PL is extended, taking a leave becomes a more attractive option, and an employee is expected to take a longer leave than before. This proposition can be illustrated by using the job search model proposed by Lalive *et al.* (2014).

Generally speaking, being on leave after giving birth brings a benefit and cost. On the one hand, a woman may enjoy emotional satisfaction from caring for her own child and save expenditures on paid care. In addition, the care a mother provides is likely to be of higher quality than paid care. The benefit in each period is expected to decrease because the difference in quality between own care and paid care tends to be smaller for older children. On the other hand, while on leave, a woman may be concerned about foregone earnings, the depreciation of her skills, or the possibility of being replaced at her workplace. Her career may be disrupted by unfair treatment upon return to work. The costs associated with each period are likely to rise as the duration of leave is extended.

A woman who is on leave after giving birth may be viewed as searching for a new job opportunity. Her reservation wage in each period can be derived by comparing the value of accepting a job offer to the value of continuing the search and that of returning to her pre-birth job (Lalive *et al.* 2014). Her decision to keep searching or to return to work at time t is summarized as whether her reservation wage, w_t^*, exceeds the initial wage, w_0. The nature of benefit and cost associated with PL suggests that her reservation wage is likely to decline over time. The value of continuing a job search is also expected to drop instantly at the moment when job protection and cash benefits expire, which is the case in Korea. Then, the optimal duration of PL is determined by equating her reservation wage with her initial wage as in Figure 2.[3]

The determinants of PL take-up can now be discussed in the terms that are used to describe the reservation wage for continuing a job search. The literature suggests that the extension of the maximum duration of PL may increase the reservation wage within each period through different channels. First, with longer job-protected leave, women may become increasingly selective in choosing alternative

[3] Frijters and Van der Klaauw (2006) derive the optimal choice for a general setup of non-stationary job search model and show a unique optimal duration of search if the reservation wage is monotonically decreasing over time.

child care; this consequence is called the *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 returning to work less attractive if, under the legislation granting potentially longer leaves, employers would be more likely to replace them with new workers. This possibility 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 new job during PL, which is noted as the *reservation wage effect* by Lalive *et al.* (2014). Fourth, the extension of job-protected leave lowers the cost of taking a leave when a *fixed cost* is involved in switching between own care and paid care. These four channels all predict that women will take a longer PL under the extended maximum duration policy. Those constrained by the maximum duration will also take a longer leave when the duration is extended.

The impact of the extension of job-protected leave on labor market performance is not clear. On the supply side, it would encourage more women to look for a job in a more family-friendly environment. However, a trade-off would arise for the employed. On the one hand, it would help female employees with infants continue their career without interruption. On the other hand, they may find returning to work more difficult as they take a longer leave. On the demand side, firms may try to hire fewer female employees to minimize the costs associated with PL. Hence, the overall effect in the labor market can only be assessed empirically in the context of a particular social institution.

The entitlement to job-protected leave has been considered a potentially effective policy for promoting female employment in Korea, given that the country's labor market is highly unfavorable to women and families compared with other advanced economies. The gender gap in employee wages was 34.6% in 2017, the largest among OECD countries, and the gap in employment was 19.4%, the fourth highest after Turkey, Mexico, and Chile.[4] In the same year, half of non-employed women aged 15 to 54 reported that their career had been interrupted due to marriage and childcare, and the ratio was over two-thirds

[4] OECD data, https://data.oecd.org/.

among those in their thirties.[5] Since 2006, the Korean government has unfolded a package of family-friendly policies as response to growing public demand. Public spending on family benefits, including childcare support and cash payment during PL, increased rapidly from 0.22% of the GDP in 2006 to 1.39% in 2017.[6] Nevertheless, the indicators show little improvement. For example, the total fertility rate in 2017 was 1.05 children per woman, the lowest among OECD countries, and the female employment rate was 56.9%, below the OECD average of 60.1%.

Yet, the effect of PL policy in Korea or other Asian countries has limited evidence. Asai (2015) examines the increase in income replacement during PL from 25% to 40% in Japan, whereas Kim (2012) looks at the increase in cash benefits from 14% to 36% of average earning in stages in Korea. Neither study found that these changes promoted job continuity for female employees. Another direction for strengthening PL legislation is extending the maximum duration of job-protected leave, which, to our knowledge, has not been investigated for any Asian country. Thus, this study aims to fill this gap in the literature.

Extending the maximum duration of PL in the vicinity of one year has had no definitive impact on women's employment in other countries. Hanratty and Trzcinski (2009) find that working mothers' labor supply did not change significantly in response to the extension of job-protected and paid leave from 25 weeks to 50 weeks in Canada.[7] Baker and Milligan (2008), who examined the same policy change, find that the probability of women returning to their pre-birth employer increased. However, neither study examined the labor market outcome beyond one year after childbirth. Dahl *et al.* (2016) looked at the case of Norway, where paid leave was expanded from 18 weeks to 35 weeks in stages.[8] They find that the reform increased women's time at home after

[5] The share of those who reported career interruption was 51.2% for women aged 15 to 54, and 72.2% for those in their thirties. Local Area Labor Force Survey, Statistics Korea.

[6] Presidential Committee on Ageing Society and Population Policy, Bank of Korea.

[7] The duration of job-protected leave also increased from 29–35 weeks to 52–54 weeks in most provinces, but the change was not uniform in Canada. One exception is Quebec, where the 72-week job-protected leave was retained.

[8] The length of job protection was one year throughout the reforms in Norway.

birth but did not find any significant change in women's employment in the short and long term.

In the context of more generous PL systems in European countries, evidence suggests that the extension of the maximum duration of PL had a relatively small impact on women's labor force participation in the long term (Lalive and Zweimüller 2009; Kluve and Tamm 2013; Schönberg and Ludsteck 2014).[9] As for short-duration PL policies in the US, mixed results have been reported on its labor market effects. Most studies find that the entitlement of 12 weeks of unpaid leave under the Family Medical Leave Act had little impact on women's employment in the short term (Waldfogel 1999; Baum 2003; Han *et al.* 2009). In contrast, the introduction of six-weeks of paid leave increased female labor supply two to three years after childbirth in California in the United States (Rossin-Slater *et al.* 2013; Baum and Ruhm 2016).

The literature suggests that the marginal benefit (cost) of the introduction of short leave in terms of labor market performance tends to be larger (smaller) than that of the extension of an existing PL policy (Ruhm 1998; Schönberg and Ludsteck 2014; Kunze 2016; Rossin-Slater 2018). Notably, the impact of PL legislation is likely to depend on institutional characteristics related to the opportunity cost of childbearing. The Korean case is interesting in that the childcare market is underdeveloped compared with those in European countries. Generally speaking, childcare facilities in Korea are heavily regulated and fall below the quality of care demanded by mothers. Methodologically, our analysis is in line with recent studies exploiting the natural experiment of policy change and utilizing a large administration database (Lalive and Zweimüller 2009; Schönberg and Ludsteck 2014; Dahl *et al.* 2016).

III. Institutional Background

All female employees are entitled to take a paid ML for 90 days, and

[9] In Austria, the maximum duration of paid leave was extended from one to two years in 1990 and shortened to 18 months in 1996 (Lalive and Zweimüller 2009). It was lengthened from 2 months to 36 months in stages in Germany for the period from 1979 to 1992 (Schönberg and Ludsteck 2014). In Germany, the maximum duration of paid leave was reduced from 24 to 12 months, and the amount of cash benefit was raised in 2007 (Kluve and Tamm 2013).

all employees are entitled to take an unpaid job-protected leave for 12 months.[10] In 2007, EI covered 100% of monthly earnings during ML up to KRW 1.35 million or USD 1,439.[11] EI also provided PL-takers with a flat cash benefit of KRW 0.5 million or USD 533 per month.[12] Only one of the parents could take PL for a child, and the take-up by fathers was low; the share of fathers among those who initiated PL in 2008 was 1.2%.

Even though employees were legally entitled to take PL for 12 months, they could only take a maximum leave for 9 or 10.5 months due to eligibility restrictions on ML and PL. That is, at least 45 days of ML need to be taken after childbirth, and the eligibility of PL expires on the child's first birthday. The reform in 2008 moved the expiration date of PL eligibility from the child's first birthday to the third. It also allowed employees to split PL into two parts. In 2010, the expiration date was further changed to the child's sixth birthday, which was retroactively applied to those who gave birth in 2008. As a result, the maximum duration of job-protected and paid PL was extended by 1.5 to 3 months for EI enrollees, which is the source of the policy variation in the study.

Figure 3 illustrates two extreme cases. In case (1) in Figure 3, a woman who takes half of her ML after childbirth experiences an increase in the maximum duration of PL by 1.5 months after the policy change. For the woman in case (2), who uses the entire ML after birth, the maximum duration of PL increases by three months. In sum, the policy change included the extension of the maximum duration of PL and the flexible timing of leave, but the former seems to have been more substantial than the latter. The increase in the take-up of PL was the largest over the period from 12 to 15 months after childbirth, as is shown in the next section. Note that all other characteristics of PL

[10] Mandatory ML of 60 days was introduced by the Labor Standard Law in 1953 and was extended to 90 days in 2001. The entitlement to unpaid parental leave up to one year for female employees was introduced under the Men Women Equal Employment Act in 1987, and the eligibility was expanded to either the mother or father in 1995.

[11] EI paid cash benefits during ML to those in small- and medium-sized firms for 90 days, but only for the final 30 days to those in large firms. USD 1 = KRW 938.20 as of December 31, 2007.

[12] Employers covered by EI also received a subsidy of KRW 200,000 or USD 213 per month during PL and a subsidy of KRW 200,000 or USD 213 per month (KRW 300,000 or USD 320 for small- and medium-sized firms) when they hired a substitute worker for a PL-taker.

legislation remained the same after the reform in 2008.

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

Another policy change is related to PL legislation. The entitlement to have reduced working hours for one year during childcare period was enacted in 2008. Workers with young children enrolled in EI are entitled to have a mix of PL and reduced working-hour arrangement, but the combined period should not exceed one year. The EI database did not record the cases of reduced working hours until October 2011, when the cash benefit was introduced for those on reduced working-hour arrangement. A total of 29 female employees had reduced working hours in December 2011, which amounted to 0.09% of those on PL in the same month. The ratio increased to 0.53% in December 2012. As the reduced working-hours arrangement is expected to have been less popular without cash benefit, its effect on the usage of PL and employment among those who gave birth in 2008 seems limited.

The number of births before and after the reform in 2008 do not exhibit a significant change. Figure 4 panel (a) presents the year-to-year change in the daily number of births in December 2007 and January 2008. The predicted value based on the quadratic form of period and January dummy is also displayed with its 95% confidence interval. In panel (a), the detrended daily number of births is larger in January than in December, but the difference is not statistically significant (not shown). The same pattern is observed for 2006–2007 in panel (b) and for 2008–2009 in panel (c). The only discernible pattern is that the detrended number of births on January 1 is slightly higher than that on December 31 for 2007–2008.[13] Hence, we cannot rule out a selection in terms of birth timing on December 31 and January 1. Technically

[13] Although not shown in Figure 4, a 7-day moving average is also informative because a substantial variation occurs between weekdays and weekends. The 7-day moving averages indicate a jump on January 1, 2008 but that the number of births quickly returns to the trend over the two months. Although no such jump is found on January 1, 2007, a small uptick is found on January 1, 2009.

speaking, misreporting is strictly prohibited in hospitals in Korea, but it may be possible in remote areas. Another possibility is the intentional scheduling of Caesarean sections (C-sections), although medical professionals suggest that it is highly limited.[14] This issue is addressed in the next section.

IV. Data Description

The EI database records information on all employees and workplaces enrolled in EI and is managed by the Korea Employment Information Service. Access to the database requires approval by the Ministry of Employment and Labor, which is in charge of EI administration. Although all employers with one or more employees are obliged to be enrolled in EI, the EI coverage for employees is far from full implementation. As of March 2008, only 9.1 million employees had been covered by EI, which amounted to 55.7% of all employees in Korea. First, some exceptions include organizations in agriculture, fishery, and small-scale construction projects (*i.e.*, less than approximately 18,000 USD in size), with fewer than five employees. Second, and more importantly, EI coverage varies substantially across the employment types. According to Table A1 in the Appendix, regular workers (65.7%) are covered twice as often as non-regular workers (37.3%). Among non-regular workers, more than half of those with a fixed-term or limited open-ended contract were covered by EI, whereas only 6% of part-timers and a quarter of other non-regular workers, including temporary agency workers, are covered.

The data used for the analysis are a population, not a sample, because they include all female employees enrolled in EI. Note that the

[14] In principle, the timing of birth is possible through C-sections. The number of C-sections in Korea is generally high among OECD countries, and 36.7% of all live births were delivered via C-sections in 2007 and 2008. Unfortunately, the number of C-sections by month is not available. An alternative is to look at the number of births on Sundays. According to medical professionals, manipulating the timing of deliveries on Sundays is difficult. Given that the EI database includes the birthdate of a child, computing the number of births on Sundays is possible. The number of births in January is approximately 20% larger than that in December even on Sundays for a period from 2002 to 2011 (not shown). Hence, little indication tells that the timing of birth was particularly manipulated in December 2007 and January 2008.

cash benefit during PL is a program provided by EI. Approximately 2.7 million women had been covered by EI at the end of 2007, and 130,000 among them gave birth in 2007 or 2008 with a monthly average of 5,000 births/month. Female enrollees in EI represented 48.2% of all female workers and 58.8% of all female wage-earners among those aged 20 to 39 in 2008. Notably, two-thirds of female employees in their 20s and 30s are regular workers (Table A1). Hence, the subjects of the study can be understood as female wage-earners in relatively more standard and formal positions.

The EI database consists of workplace data, enrollee data, and motherhood protection data. The information on the usage of ML and PL is matched with employment history, which is constructed from enrollee data and workplace data. Women who did not receive a cash benefit during ML but received a cash benefit during PL are excluded because the event of childbirth is measured by ML take-up. The EI database records wages for a job once in the first year and contains no information on the household of enrollees.[15]

The usage of PL by birth month exhibits a clear discontinuity before and after the extension of PL duration in 2008. As can be seen in panel (a) of Figure 5, the rate of PL take-up by female employees increased gradually over time, but a jump of approximately 5 percentage points occurred between December 2007 and January 2008. The duration of leave in 2008 trends approximately 20 days longer than that in 2007, as shown in panel (b). In both graphs, the 95% confidence interval of predicted values indicate that a jump in the trend is significant. The prediction model includes a quadratic time trend and a dummy for being year 2008 or later. As the eligibility for the new rule is based on the date of childbirth, the consequence of the policy change can be uncovered by examining women who gave birth shortly before and after the change. Specifically, women who gave birth in December 2007 are

[15] The policy effect on earnings cannot be examined due to the limited availability of wages in the EI database. In a separate module, EI records the earnings of applicants for cash benefits during ML, which is the source of the pre-birth wages in the analysis. One option is to use other panel data, but the sample size is too small to be analyzed. For example, the Korean Labor Income and Panel Survey, the longest-running survey in Korea with more than 6,000 households, includes 257 women who gave birth in 2007, and only 25 among them are employees covered by EI.

considered a control group and those who gave birth in January 2008 a treatment group.

The assumption for identification is that the control and treatment groups are comparable with each other. The descriptive statistics of the two groups presented in Table 1 suggests that they are well-balanced in terms of pre-birth characteristics except for age. The average age at birth is 30 years, but the treatment group is two months older than the control group. This observation is puzzling, but it may reflect a general trend of an increase in age at childbirth.[16] The control group earned an average of KRW 7,412 (USD 7.90) per hour and KRW 1.55 million (USD 1,655) per month before giving birth.[17] As for the education level of the control group, the share of those with a 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 control group typically had 4.6 years of work experience by the time of childbirth. None of these variables significantly differed for the treatment group.[18] [19]

Interestingly, the number of births in January is 30% larger than that in December in Table 1. In fact, a substantial variation is found in the number of births by month in Korea, as shown in Figure A1 in the Appendix, and the difference in the number of births in December and January has been observed for all years, as in Figure A2.

The intensity of the treatment may be endogenous due to women's choice of timing their ML. The duration of ML after giving birth is 76 days for the control group, whereas it is 0.6 days shorter for the treatment group. This finding suggests that the expansion of the eligibility in 2008 increased the effective maximum duration of PL by an average of 2.5 months. Although the difference in ML duration is

[16] The age variable measures the difference between a woman's birthdate and the date of her childbirth. The mean age at birth increased from 30.59 years in 2007 to 30.79 years in 2008 at the national level and from 29.80 years to 30.17 years among EI enrollees.

[17] Pre-birth earning is defined as the average earning over the three-month period before ML begins. Wage and earning are in terms of 2010 KRW.

[18] As for the 16 province dummies and 21 industry dummies, the *p*-value for significant difference is less than 5% for three variables (not shown).

[19] The selection of being treated may exist over a longer period of time. When a two-year-period is examined, the treatment and control groups do not significantly differ from each other with respect to the observable characteristics except for age. Table A2 in the Appendix presents the comparison.

statistically significant, the magnitude is not substantial. Furthermore, the distribution of the duration of ML after childbirth did not change significantly after the policy change (not shown). Hence, assuming that the intensity of treatment is exogenous is reasonable.

The treatment group used PL significantly more than the control group. The take-up of PL by the treatment group is 43.0%, which is 5%p higher than that by the control group. The treatment group took PL for 20.1 days longer than the control group. Interestingly, the change in behavior is observed mostly at the end of the distribution. According to panel (a) of Figure 6, the proportion of women who took leave for 9 months dropped by 4 %, whereas the proportion of those who took leave for 11 months and 12 months increased by 2% and 7%, respectively.

The 2008 reform allowed employees to split PL but only once. For example, if an employee took a four-month leave twice, she could not take any more PL. According to Table 1, the share of women who split PL was 3.0% for the treatment group, whereas it was 0.3% for the control group. The number of women who split PL seems to be exaggerated due to reporting errors given that the interval between the two parts of leave is less than one month for approximately 10% of cases. This kind of error is not unusual because the EI database is constructed for administrative purposes and is not subject to cross-checking among variables. This error also explains the non-zero rate of splitting PL among the control group. On average, the treatment group took PL for 21 days longer than the control group, with 17 days longer in the first leave and four days longer in the second. The mean interval between the two parts of leave is 14 days for the treatment group.

The increase in the duration of PL is mostly from leave taken 12 months after childbirth. The lengths of leave taken 12 and 15 months after childbirth are, respectively, 21 and 17 days longer for the treatment group than the control group. A significant share of the treatment group took leave later than the control group. Approximately 5.5% of women in the treatment group initiated PL 12 months after delivery, and approximately 4.8% did 15 months after.

Taken together, the share of women on PL at each point of time since childbirth in panel (b) of Figure 6 clearly indicates that the 2008 reform induced women to take leave that was longer and later. The largest difference in the share between the treatment and control groups is observed for the period from 12 to 15 months after childbirth. The difference is approximately 1.5%p at 15 months after childbirth, and

the difference remains more or less the same four years after childbirth. This finding also implies that the effect of the second extension of the eligibility period in 2010 is relatively small.[20]

The key question is whether taking a longer leave leads to a higher probability of working in the future. Working status is defined as enrollment in EI.[21] Although female employees tend to increasingly leave the labor market as time passes after their childbirths, the employment level of the treatment group is significantly higher than that of the control group 12 months and 36 months after birth by 1.9%p and 2.4%p, respectively. The increase in employment 12 months after the 2008 reform can be interpreted as a direct consequence of the higher usage of PL given that enrollment is preserved during leave. However, the difference disappears four years after childbirth. Panel (a) of Figure 7 displays the proportion of women working at different stages after childbirth for each group with seasonality controlled, as in Lalive *et al.* (2014).[22] As for the proportion of women working at the pre-birth workplace in panel (b) of Figure 7, a difference of 3%p between the two groups is observed 15 months after childbirth but becomes gradually smaller in magnitude and disappears three years after childbirth.[23]

In sum, the extension of PL seems to improve women's return to work within three years. However, its magnitude is small compared with the increase in usage of PL, and it does not seem to last for more than three years. The policy change seems to help women look for another

[20] Panel (b) of Figure 6 shows that some women in the control group were on leave 12 months after childbirth. This result is due to reporting errors including the inconsistency between the date of delivery reported for ML and that for PL.

[21] In general, self-employed individuals are not covered by EI. Hence, working status throughout the study indicates whether an individual is working as an employee or not.

[22] 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.

[23] Workplace refers to an establishment in the EI system where production activity is physically taking place. A firm may have a few workplaces, but the data do 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.

job rather than stay with their pre-birth employer. It could well be that women looking for another job merely took advantage of a longer leave. Even if that were the case, it can still be considered a positive consequence of the policy change in the sense that the efficiency of the labor market improved.

V. Empirical Results

A. 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 due to exposure to the policy change is interpreted as its causal effect. Specifically, the statistical model explaining an outcome variable, y_i, is as follows.

$$y_i = \beta_d d(x_i) + u_i,\ \mathrm{E}(u_i | x_i) = 0 \tag{1}$$

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 the value of 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 1, 2008. Note that $d(x_i)$ is right-continuous.

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

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

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

z_i indicates a set of individual characteristics assumed to be associated with the treatment effect. A set of pre-birth individual and firm characteristics may be included as control variables in equations (1) and (3).

The usage of PL is measured by the two choices of take-up and its duration, and a linear probability model, Tobit model, and Cox proportional hazard model are considered. Table 2 shows the estimation results. Each model differs in the use of a specific time window, starting from the date of policy change; these time windows range from two weeks to three months, but the estimate of the policy effect is fairly stable. This result further suggests that the selection of the new system is likely to be limited because the deliberate timing of childbirth is more difficult over a shorter period of time. The probability of taking up PL is approximately 5%p higher for the treatment group than for the control group. The demand for PL by the treatment group is approximately 40 days longer than that by the control group. The treatment group tended to have approximately 15% lower hazard of ending PL than the control groups, which implies that the treatment group took leave for a longer period than the control groups. All the estimates are statistically significant at the conventional level of significance. Therefore, the extension of job-protected leave indeed increased the usage of PL, as 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.

Figure 4 raises a concern that the timing of birth may be manipulated on January 1. To address this issue, basic models are estimated for the sample excluding those who gave birth on December 31, 2007 and those who did on January 1, 2008. According to Table 2, the estimated policy effect on the PL take-up for a two-week window is 0.8%p smaller when births on December 31 and January 1 are excluded, but the difference diminishes as the window is increased. For a two-month window, the estimated policy effect is 0.02%p. The same pattern is detected in the effect on duration of leave. Hence, the choice to give birth on January 1, New Year's Day, does not seem to be a serious concern.

All the results change little when no observable characteristics are controlled (not shown). Regarding other control variables, women who earned higher pre-birth wages, had more experience, or worked in middle-size firms tend to take a shorter leave than their counterparts, as in Table A3 in the Appendix. This finding may be explained by a higher opportunity cost to being on leave for those women.

B. Return to the Labor Market

A linear probability model for the return to work after giving birth was adopted to estimate the effects of the policy change on female employment. Table 3 gives the estimation results, and each model differs with regard to when the return to work is measured. Both models are estimated with and without control variables. The two sets of results are qualitatively similar, but the magnitude of the effects are slightly smaller when other characteristics are controlled. The discussion below is based on the model with control variables to maintain consistency with the results on PL usage.

Table 3 and panel (a) of Figure 8 indicate that the 2008 reform increased the probability of returning to work within 27-42 months after giving birth by approximately 2%p, but the impact diminishes beyond that period. However, no short-term effect is found in the return rate to the pre-birth workplace. Table 3 and Panel (b) of Figure 8 show that the probability of returning to the pre-birth workplace 15 months after childbirth increased by 1.5%p after the policy change, but the effect declines over time. Yet, the coefficients are imprecisely estimated for the whole period. With the extension of PL duration, the *replacement effect* and *reservation wage effect* predict that women would have weaker incentives to return to their pre-birth workplaces. The finding of the difference in the effect on the return to work and that on the return to the pre-birth job is consistent with the *replacement effect* and *reservation wage effect*, but the fact that the difference is only temporary suggests that these mechanisms are of limited magnitude.

One of the differences in PL policies between Korea and other countries, like Austria and Germany, is whether workers are allowed to choose when to take up PL. As presented in panel (b) of Figure 6, the share of women on leave in the treatment group is larger even at 15 months after childbirth and beyond compared with the control group. As a woman is recorded as being employed when on leave in the data, the flexibility of the timing of PL seems to explain a part of the short-term increase in the probability of returning to work. However, the positive impact of the 2008 reform disappears four years after childbirth, which is the time frame relevant for evaluating this policy change. Lalive and Zweimüller (2009) report that the 1990 reform in Austria that extended the duration of PL from one to two years lowered the probability of returning to work 60 months after childbirth by

7%p. Schönberg and Ludsteck (2014) infer that a series of reforms that affected the duration of job protection and cash benefits in Germany lowered the share of women returning to the labor market 52 months after childbirth by 1%p –5%p. No negative impact of the reform in Korea on the return to work 48 months after childbirth can be understood due to the smaller magnitude of extension of PL and the flexibility of its timing.

The finding that this change led women to return to work more often than before in the short term generates interesting implications. First, a small change in PL legislation may make a difference. That is, non-financial incentives may reduce substantially the opportunity cost of rearing children for working women, which is a new finding in the literature on Asian countries. Second, the finding indicates that women looking for a new job took advantage of PL or that the change helped women look for a job. In either way, the matching quality in the labor market may have improved as a result of the job search process. Third, and most importantly, the extension of the maximum duration of job-protected leave was not enough to support women's career development in the long term. It implies that employees face other barriers to childbearing three years after giving birth. Hence, public support for various childcare services other than PL is needed to help women avoid career interruption, which is consistent with the findings of previous studies (Asai 2015; Kim 2012).

The effects of other determinants are qualitatively similar across models and are as expected by theory (Table A3 in Appendix). Women who earned higher pre-birth wages, had more experience, or worked in larger firms tended to return to work more often than their counterparts.

The benefit from taking PL is likely to be larger for those with more children than those with only one child. Therefore, with more children, women are expected to use PL more often and to return to work less often. Although the EI database does not have information on employees' number of children, it has the records of all female employees who received the cash benefit during ML since November 2001. Most female enrollees of EI are expected to take ML upon childbirth and to receive the cash benefit during ML. Hence, if a woman were enrolled in EI continuously for a period from 2001 to 2008, then all her childbirths could be identified. As this case is not applicable for many women, the birth history based on EI database is far from

perfect. Nevertheless, an index for the first childbirth observed in EI database can be constructed, and the full set of estimation is conducted with the index as an additional control variable (not shown). The share of women who gave first birth was 81% among those who gave birth in December 2007 or January 2008, and the results indicate that the estimated policy effect did not change at all with birth order controlled. Interestingly, women who had the first childbirth tend to use PL less often and for a shorter period than their counterparts. Moreover, they tend to return to work less often than those with second or third childbirths. This finding suggests that women with first childbirth prefer taking care of their child by themselves. However, this interpretation requires caution as career-oriented women are likely to stay employed after their first childbirth and have more births.

The reform in 2008 allowed women to take PL for a longer period and in a later period. The estimated policy effect may be larger than the case where only the maximum duration is extended. Given that separating the effects of these two aspects of the policy change is difficult, one way to address this issue indirectly is to examine the change in one's employment status controlling the timing of PL take-up. The results given in Table A4 and Table A5 in the Appendix are qualitatively similar to those in Table 3. Quantitatively speaking, the short-run effect is larger on the return to work measured after take-up of PL (3%p) than on the employment measured after childbirth (2%p). However, the comparison is not straightforward as the former is based on the selected sample of leave-takers. Despite the limited analysis, it finds at least no evidence that the effect of extended maximum PL duration would be substantially smaller than the effect of the 2008 reform.[24]

C. Heterogeneous Effects

The theory suggests that one's response to the extension of the maximum duration of job-protected leave depends on one's reservation wage for continuing a job search. *A priori*, predicting what the heterogeneous effects of the policy change would be with regard to one's wage or firm size is difficult, because those are related to various

[24] Alternatively, the sample may be restricted to those who took up ML and PL consecutively. However, this is essentially the same as the analysis on the return to work *x*-months after take-up of PL.

factors including the type of human capital, return to own care, and the implicit cost at the workplace. Nevertheless, knowing which group benefited more from the strengthened PL legislation than others is useful for two reasons. First, we may be able to draw implications concerning the role of PL from the relationship between the usage of PL and the return to work across groups. Second, PL legislation is one of many policies designed to promote work–life balance among employees. Detecting the differential effect of the policy change among groups helps policymakers design an effective set of policies that support the entire population at work and at home.

Regarding wages, on the one hand, the *replacement effect* is likely smaller for skilled workers than for the unskilled, because the skilled are more difficult to replace than the unskilled. On the other hand, women who earn higher wages may have higher standards for child care services and have a higher reservation wage than those who earn a lower wage, which generates a larger *horizon effect* and *reservation wage effect*. In addition, if the *fixed cost* incurred in switching from own care to market care is larger for women with higher wages, then they are more likely to use PL after the policy change than those with lower wages. That is, high-wage earners may consider taking a 15-month leave worthwhile but not a 12-month leave owing to the cost associated with the change in arrangement.

As for the firm size, the policy effect is expected to be stronger for large firms because 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 the efficiency wage and firm-specific skills. In addition, at a large firm, finding a substitute for a leave-taker is highly possible, and employees are more likely to have the support of an active labor union, which may also contribute to the atmosphere supporting child care.

Table 4 summarizes the results on heterogeneous effects. The effects of the policy change on PL usage among wage groups exhibit an inverted U-shape. The middle wage group, the 3rd quintile, took up PL more often than any other group, but their rate of return to work did not increase substantially compared with other groups. In fact, the rate of return to work 36 months after childbirth increased the most for the lowest wage group. This result suggests that the extension of job-protected leave may not be sufficient for promoting women's employment. Interestingly, the rate of return to work 18 months after

childbirth decreased by 3.4%p for the upper-middle wage group, the 4th quintile, after the policy change. This finding is a bit puzzling but may be explained by a higher household income or a larger return to own care among the upper-middle wage group compared with other groups.

Regarding the firm size, those in middle-sized firms benefited the least from the policy change in terms of PL usage. Yet, the largest impact on the return to work 18 months after childbirth is observed for the same group. This finding implies that the conflict between work and life is not evenly distributed in the Korean labor market. The impact on the return to work 36 months after childbirth is the largest for those in the smallest firms.

The fact that the impact on women's employment in the short term was the largest for those with the lowest wages and in the smallest firms suggests that policy options other than strengthening PL legislation are needed to support those who earn higher wages and who work in medium- and large-sized firms.

VI. Conclusion

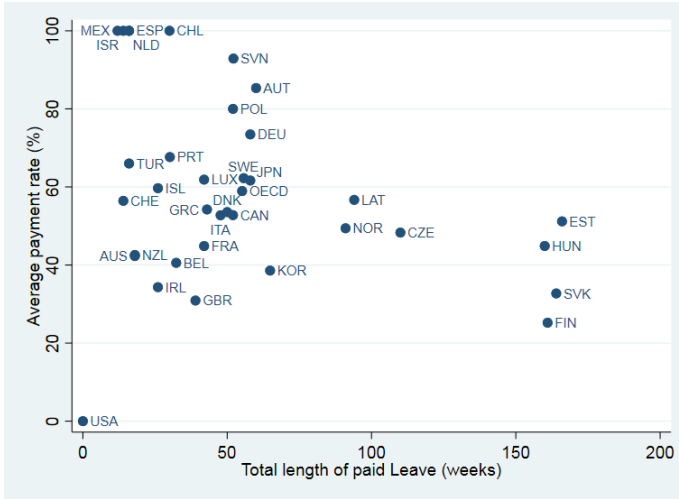
This study investigated the consequences of the PL policy change in Korea, namely the extension of the maximum duration from 12 months to 15 months accompanied by an option to split the allotted leave. The findings, which are based on a RDD, are summarized as follows. First, in response to the 2008 reform, female employees took up leave more often and for a longer period than previously. The extension of PL duration increased the take-up rate by 5%p and increased the average duration of leave by 40 days. Although a substantial part of the change was observed over a period from 12 to 15 months after childbirth, the treatment group also opted to take up PL later than that period. Second, the 2008 reform increased women's employment in the short term, but had no significant impact on their return to their pre-birth jobs. The probability of returning to work within three years after birth increased by 2%p after the policy change, but the effect diminished four years after birth. This finding suggests that the marginal extension of leave from one year does not result in a positive or negative consequence in terms of women's employment in the medium term. Third, the policy effect varies across different pre-birth wage groups and firm sizes although no general pattern is detected. No strong correlation between the policy effect on PL usage and that on employment among

groups implies that other conditions are needed to promote women's employment under more generous PL legislation. The short-term impact on women's employment was the largest for those earning the lowest wages and working in the smallest firms, which suggests that policy options other than strengthening PL legislation may be more effective in supporting those earning higher wages and working in medium- and large-sized firms.

Although the magnitude of the policy change in Korea is smaller than that in Austria or Germany, the finding on the change's effect on women's employment is consistent with Schönberg and Ludsteck (2014) and Lalive and Zweimüller (2009). Interestingly, the results suggest that a small change in PL legislation to allow a longer duration and greater flexibility in usage may make a difference in the short term in countries like Korea. Whether the policy change helped women find a new job or women looking for a new job took advantage of PL is unclear, but the quality of matching in the labor market is expected to improve as a result. The finding that the extension of the maximum PL duration does not promote women's return to work in the medium term may be explained by the limited access to child care services for working mothers with children older than one year, which Asai (2015) discussed was a factor in the case of Japan. According to a report in 2009, in Korea, half of working mothers with children under the age of three used childcare centers, whereas 20% and 30% of them received support from coresiding and non-coresiding grandparents of children, respectively.[25] Whether PL legislation and child care policy are complementary to each other would be an interesting follow-up question. Our results do not indicate substantial distributional effects, but they need to be further explored in evaluating PL legislation as the reservation wage for new job search is likely to vary across different groups of the population. Such knowledge would help us understand how to improve effective access to leave entitlement among the disadvantaged.

One drawback of the study is that household characteristics of individuals are not considered owing to their unavailability. Differential effects across household income or demographic structure would be

[25] 2009 National Childcare Center Survey, Ministry of Health and Welfare, Republic of Korea. The respondents were allowed to answer multiple childcare arrangements.



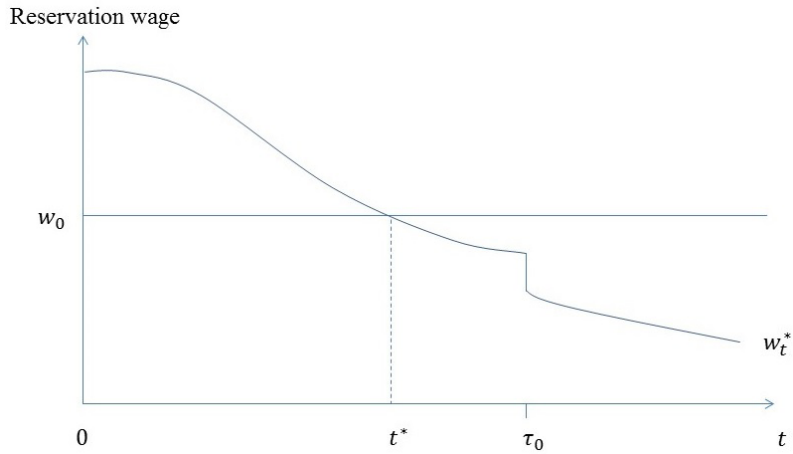
Note: Total paid leave refers to the combination of maternity and parental leave. The graph is based on paid leave entitlements in place as of April 2016. The "average payment rate" refers to the proportion of previous earnings that were replaced by the benefit over the length of the paid leave entitlement 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 1

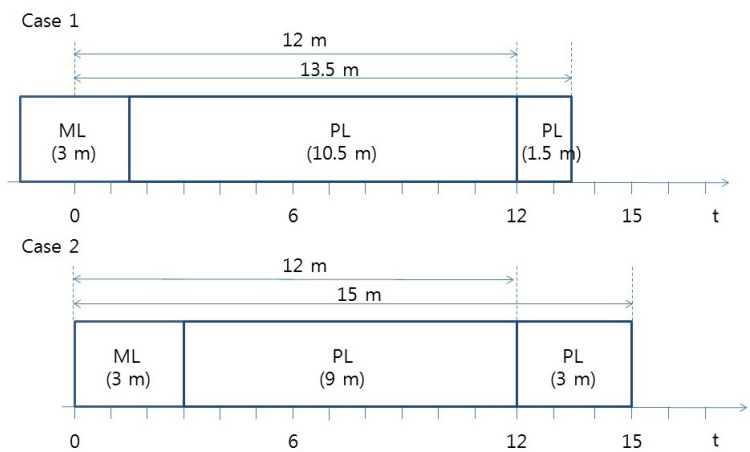
TOTAL LENGTH OF MATERNITY AND PARENTAL LEAVE AND AVERAGE PAYMENT IN OECD COUNTRIES (2016)

highly relevant to the effectiveness of social insurance. Further, the nature of the benefit or cost related to PL has huge opportunities for exploration. Lastly, whether a more generous PL legislation leads to more births could be another interesting question for further research.



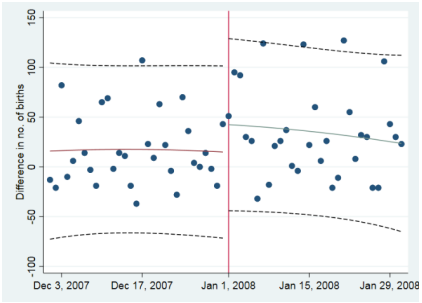
Note: A woman gives birth at $t = 0$ and may go on leave for a maximum of τ_0 periods. She finds the optimal timing of returning to her pre-birth job by equating the reservation wage for continuing her job search at time t, w_t^*, with the initial wage, w_0.

FIGURE 2
OPTIMAL DURATION OF PARENTAL LEAVE

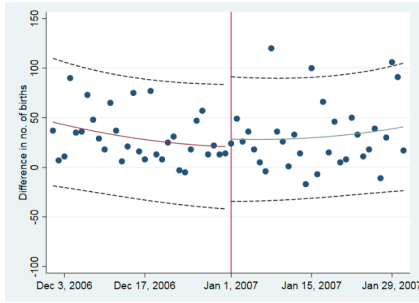


Note: ML and PL refer to maternity leave and parental leave, respectively, and their lengths are measured in months. The date of childbirth is denoted by 0. Maternity leave of 90 days is mandatory, and at least 45 days should be taken after childbirth. Cases 1 and 2 illustrate two extreme cases.

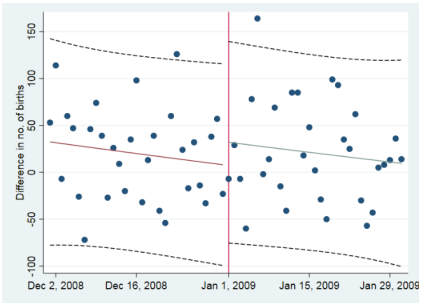
FIGURE 3
MAXIMUM DURATION OF PARENTAL LEAVE BEFORE AND AFTER THE 2008 REFORM



(a) 2007–2008



(b) 2006–2007

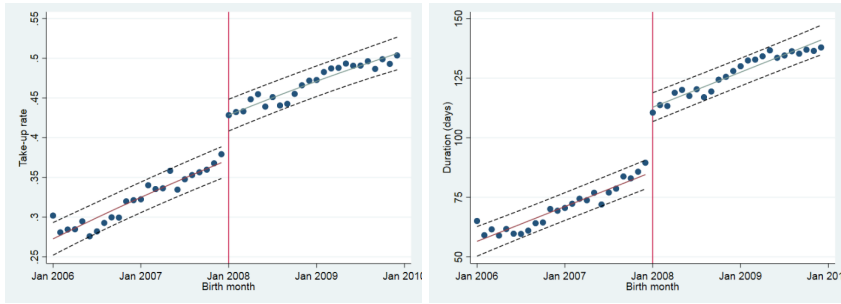


(c) 2008–2009

Note: Each data point indicates the year-to-year change in the daily number of births. The solid lines indicate the predicted values of regression model with quadratic terms of time period and a dummy for the second half in the sample. The dotted lines form the 95% confidence interval

FIGURE 4

DETRENDED DAILY NUMBER OF BIRTHS IN DECEMBER AND JANUARY



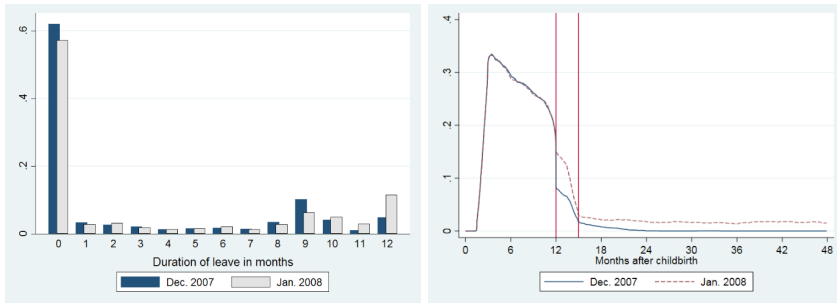
(a) Take-up rate (b) Duration

Note: Each data point represents the average among women who gave birth in the corresponding month. The solid lines indicate the predicted values of regression model with quadratic terms of time period and a dummy for year 2008 or later. The dotted lines form the 95% confidence interval.

Source: Employment Insurance Database.

FIGURE 5

USAGE OF PARENTAL LEAVE BEFORE AND AFTER THE 2008 REFORM



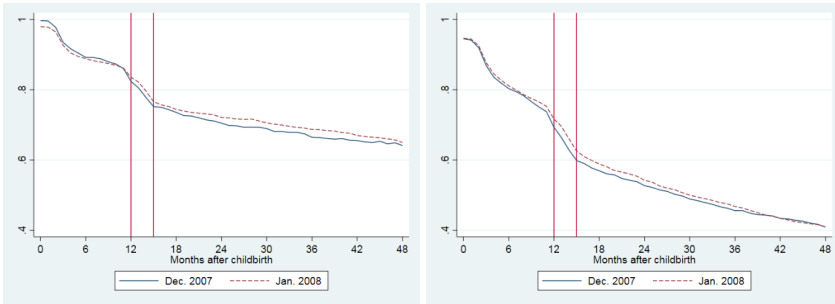
(a) Distribution of duration (b) Share of women on leave

Note: In panel (a), each bar indicates the proportion of women who took leave for the corresponding duration. In panel (b), the share of female employees on leave among those who gave birth is measured on a daily basis. In both panels, women who gave birth in December 2007 are compared with those in January 2008.

Source: Employment Insurance Database.

FIGURE 6

USAGE OF PARENTAL LEAVE BEFORE AND AFTER THE REFORM IN 2008



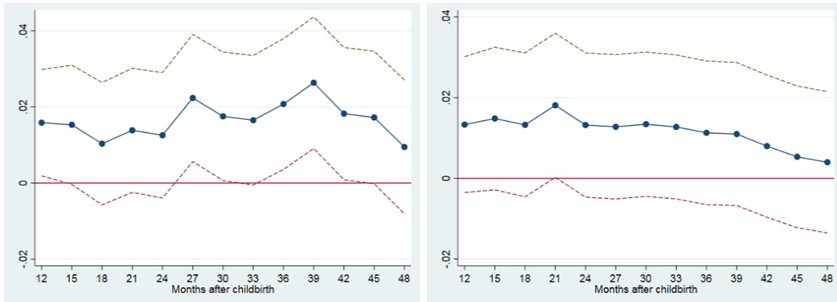
(a) Return to work (b) Return to the pre-birth workplace

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 the December 2007 group the differences between women who gave birth in December 2006 and January 2007.

Source: Employment Insurance Database.

FIGURE 7

PROPORTION OF WOMEN WORKING AFTER CHILDBIRTH BEFORE AND AFTER THE LEAVE EXTENSION



(a) Return to work (b) Return to the pre-birth workplace

Note: Each data point represents an estimate of the effect of the policy change on the probability of returning to work at each period after childbirth. The dotted lines indicate the 95% confidence interval. Panel (a) and panel (b) are based on estimates with control variables in Table 3.

Source: Employment Insurance Database.

FIGURE 8

EFFECTS OF THE LEAVE EXTENSION ON THE PROBABILITY OF RETURNING TO WORK

TABLE 1
DESCRIPTIVE STATISTICS BY BIRTH MONTH

Variables	Dec. 2007 (N=4,782)		Jan. 2008 (N=6,235)		Contrast	
	Mean	S.D.	Mean	S.D.	Diff.	*p*-value
Age at birth	29.842	(3.174)	30.017	(3.136)	0.175	0.004
Pre-birth wage (KRW 1,000, hourly)	7.412	(3.332)	7.481	(3.374)	0.069	0.283
Pre-birth earning (KRW 10,000, monthly)	155.286	(65.814)	157.102	(66.565)	1.816	0.154
Education: high school or below*	0.299	(0.458)	0.295	(0.456)	−0.004	0.638
Education: college*	0.260	(0.439)	0.271	(0.445)	0.011	0.212
Education: university or higher*	0.441	(0.497)	0.434	(0.496)	−0.007	0.497
Tenure (yrs.)	4.566	(3.440)	4.681	(3.538)	0.115	0.086
Firm size 9 or less	0.247	(0.432)	0.253	(0.435)	0.006	0.482
Firm size 10–99	0.269	(0.444)	0.271	(0.444)	0.002	0.837
Firm size 100–299	0.118	(0.323)	0.115	(0.318)	−0.004	0.555
Firm size 300–999	0.121	(0.326)	0.122	(0.327)	0.001	0.891
Firm size 1,000 or more	0.244	(0.430)	0.240	(0.427)	−0.005	0.556
Duration of maternity leave after birth (days)	76.239	(13.596)	75.664	(13.785)	−0.575	0.029
Usage of parental leave	0.381	(0.486)	0.430	(0.495)	0.049	0.000
Duration of parental leave (days)	89.972	(131.600)	110.951	(146.425)	20.980	0.000
Divided PL	0.003	(0.052)	0.030	(0.170)	0.027	0.000
Duration of PL 1st part (days)	89.182	(130.964)	106.007	(142.704)	16.825	0.000
Duration of PL 2nd part (days)	0.790	(11.967)	4.945	(31.759)	4.155	0.000
Interval between two PL parts (days)	0.317	(5.660)	14.114	(100.153)	13.797	0.000
Duration of PL within 12 months (days)	83.063	(121.325)	82.942	(121.586)	−0.121	0.959
Duration of PL after 12 months (days)	6.909	(30.660)	28.010	(73.711)	21.101	0.000
Duration of PL within 15 months (days)	88.189	(129.270)	92.427	(136.241)	4.238	0.098
Duration of PL after 15 months (days)	1.783	(17.222)	18.525	(68.329)	16.742	0.000
Take-up of PL after 12 months	0.000	(0.020)	0.055	(0.228)	0.055	0.000
Take-up of PL after 15 months	0.000	(0.014)	0.048	(0.214)	0.048	0.000
Working 12 months after birth	0.815	(0.389)	0.834	(0.372)	0.019	0.008
Working 24 months after birth	0.692	(0.462)	0.708	(0.455)	0.016	0.064
Working 36 months after birth	0.651	(0.477)	0.675	(0.469)	0.024	0.008
Working 48 months after birth	0.627	(0.484)	0.640	(0.480)	0.013	0.154
Pre-birth firm 12 months after birth	0.701	(0.458)	0.717	(0.450)	0.016	0.065
Pre-birth firm 24 months after birth	0.527	(0.499)	0.543	(0.498)	0.016	0.099
Pre-birth firm 36 months after birth	0.455	(0.498)	0.468	(0.499)	0.013	0.163
Pre-birth firm 48 months after birth	0.404	(0.491)	0.410	(0.492)	0.006	0.512

Note: The sample consists of women who gave birth in December of 2007 or January of 2008 and were enrolled in EI. Wage and earning are in terms of 2010 KRW. *The education variable was available for 97% of women who gave birth in December 2007 but only for 87% of those who gave birth in January 2008, because the EI database stopped recording the education of enrollees in recent years.

Source: Employment Insurance Database.

TABLE 2

EFFECT OF THE 2008 REFORM ON THE USAGE OF PARENTAL LEAVE

Dependent variable (Model)	Period of childbirth	All periods			Dec. 31 and Jan. 1 excluded		
		Coef.	*S.E.*	*N*	*Coef.*	*S.E.*	*N*
Take-up (OLS)	−7 vs. +7 days	0.0512	(0.0198)**	2,582	0.0433	(0.0213)*	2,242
	−14 vs. +14 days	0.0476	(0.0136)**	4,993	0.0422	(0.0140)**	4,653
	−21 vs. +21 days	0.0493	(0.0109)**	7,510	0.0461	(0.0112)**	7,170
	−31 vs. +31 days	0.0519	(0.0090)**	11,017	0.0498	(0.0092)**	10,677
	−46 vs. +46 days	0.0483	(0.0074)**	16,495	0.0468	(0.0074)**	16,155
Duration (Tobit)	−7 vs. +7 days	40.7854	(14.4041)**	2,582	33.5776	(15.5141)*	2,242
	−14 vs. +14 days	39.7520	(9.8606)**	4,993	35.0115	(10.2089)**	4,653
	−21 vs. +21 days	39.6916	(7.7857)**	7,510	36.7111	(7.9553)**	7,170
	−31 vs. +31 days	43.9348	(6.3151)**	11,017	42.0065	(6.4053)**	10,677
	−46 vs. +46 days	41.4094	(5.1779)**	16,495	40.0504	(5.2296)**	16,155
Hazard of ending PL (Cox proportional hazard)	−7 vs. +7 days	0.8698	(0.0267)**	2,582	0.8852	(0.0286)**	2,242
	−14 vs. +14 days	0.8738	(0.0190)**	4,993	0.8827	(0.0197)**	4,653
	−21 vs. +21 days	0.8699	(0.0155)**	7,510	0.8760	(0.0159)**	7,170
	−31 vs. +31 days	0.8483	(0.0126)**	11,017	0.8520	(0.0129)**	10,677
	−46 vs. +46 days	0.8529	(0.0105)**	16,495	0.8553	(0.0106)**	16,155

Note: Each model differs by the sample, which is based on whether the date of childbirth falls on the period around January 1, 2008. All models include age, age squared, log pre-birth wage, tenure, dummies for firm sizes, provinces, and industries as explanatory variables. Robust standard errors are in parentheses. * $p < 0.05$, ** $p < 0.01$.

TABLE 3
EFFECT OF THE 2008 REFORM ON THE RETURN TO WORK

Dependent variable:	Return to work in ... after childbirth		Return to pre-birth workplace in ... after childbirth	
Other variables controlled	No	Yes	No	Yes
12 months	0.0193	0.0159	0.0161	0.0133
	(0.0073)**	(0.0071)*	(0.0087)	(0.0086)
15 months	0.0191	0.0153	0.0173	0.0148
	(0.0084)*	(0.0080)	(0.0093)	(0.0090)
18 months	0.0143	0.0103	0.0160	0.0132
	(0.0086)	(0.0082)	(0.0095)	(0.0091)
24 months	0.0163	0.0126	0.0158	0.0132
	(0.0088)	(0.0084)	(0.0096)	(0.0091)
30 months	0.0209	0.0175	0.0157	0.0134
	(0.0090)*	(0.0086)*	(0.0096)	(0.0091)
36 months	0.0242	0.0207	0.0134	0.0113
	(0.0091)**	(0.0088)*	(0.0096)	(0.0091)
42 months	0.0220	0.0182	0.0100	0.0080
	(0.0092)*	(0.0089)*	(0.0095)	(0.0090)
48 months	0.0132	0.0095	0.0062	0.0040
	(0.0093)	(0.0090)	(0.0094)	(0.0089)

Note: Linear probability models are estimated, and the dependent variable is an index for being employed at each period after childbirth. The models with control variables include age, age squared, log pre-birth wage, tenure and dummies for firm sizes, provinces and industries as explanatory variables. The number of observations is 11,017. Robust standard errors are in parentheses. * $p < 0.05$, ** $p < 0.01$.

TABLE 4
HETEROGENEOUS EFFECT OF POLICY CHANGE IN 2008

Dependent variable:	(1) Take-up	(2) Duration of PL	(3) Hazard of ending PL	(4) Return to work after 18 months	(5) Return to work after 36 months
T × wage 1st quintile	0.0566	39.7289	0.8465	0.0202	0.0409
	(0.0207)**	(13.4183)**	(0.0270)**	(0.0201)	(0.0208)*
T × wage 2nd quintile	0.0316	35.1844	0.8291	0.0204	0.0180
	(0.0203)	(13.7338)*	(0.0271)**	(0.0194)	(0.0201)
T × wage 3rd quintile	0.0733	56.7093	0.8321	0.0229	0.0313
	(0.0204)**	(14.0137)**	(0.0266)**	(0.0185)	(0.0196)
T × wage 4th quintile	0.0531	46.4283	0.8551	−0.0341	−0.0174
	(0.0201)**	(14.4308)**	(0.0279)**	(0.0172)*	(0.0189)
T × wage 5th quintile	0.0444	42.1975	0.8793	0.0228	0.0312
	(0.0196)*	(15.3612)**	(0.0286)**	(0.0162)	(0.0185)
Dependent variable:	(6) Take-up	(7) Duration of PL	(8) Hazard of ending PL	(9) Return to work after 18 months	(10) Return to work after 36 months
T × firm size 9 or less	0.0407	37.8831	0.8421	0.0224	0.0379
	(0.0186)*	(12.8308)**	(0.0253)**	(0.0186)	(0.0188)*
T × firm size 10–99	0.0661	60.2284	0.8411	−0.0203	0.0015
	(0.0167)**	(13.5093)**	(0.0238)**	(0.0163)	(0.0175)
T × firm size 100–299	0.0176	28.1224	0.8853	0.0594	0.0328
	(0.0252)	(20.3971)	(0.0359)**	(0.0234)*	(0.0249)
T × firm size 300–999	0.0666	64.9160	0.7686	0.0030	0.0286
	(0.0265)*	(17.8296)**	(0.0300)**	(0.0216)	(0.0244)
T × firm size 1,000 or more	0.0569	31.7752	0.8870	0.0121	0.0148
	(0.0188)**	(11.0152)**	(0.0259)**	(0.0142)	(0.0161)

Note: "T" stands for an index of giving birth in year 2008. Columns (2) and (7) are based on Tobit models, and columns (4) and (8) represent hazard ratios in the Cox proportional hazard model. Other columns are based on linear probability models. All models include age, age squared, tenure and dummies for pre-birth wage groups, firm sizes, provinces and industries as explanatory variables. The sample consists of women who gave birth in December 2007 or January 2008 and who were enrolled in EI. A total of 11,017 observations are made in each estimation. Robust standard errors are in parentheses.

Appendix

A1. Representation of Employment Insurance Database

The enrollment rate of Employment Insurance (EI) among all employees in Korea was 55.7% as of March 2008, but it varied substantially across the type of employment, as shown in Table A1. Female enrollees of EI amounted to 58.8% of all female wage-earners among those aged 20 to 39 in 2008. Given that two-thirds of female employees in their 20s and 30s are regular workers, those enrolled in EI represent female wage-earners in relatively more standard and formal positions.

TABLE A1
EI ENROLLMENT RATE BY TYPE OF EMPLOYMENT (2008)

Type of employment	EI enrollment rate (%), male and female aged 15 or above	Share among female employees aged 20–39
Employed workers	55.7	1.00
Regular workers	65.7	0.67
Non-regular workers	37.3	0.33
Workers with a fixed-term contract or those with an open-ended contract but who could be dismissed against their own will*	54.0	0.21
Part-time workers*	6.1	0.10
Other non-regular workers*	25.7	0.09

Note: Other non-regular workers include temporary agency workers or on-call workers. The sub-categories of non-regular workers (*) are not exclusive from each other.
Source: Labor Force Survey in March 2008, Statistics Korea.

A2. Low Frequency Selection into the Eligibility of the Reform in 2008

The selection of being treated may have existed over a longer period of time. When a two-year period is examined, the observable characteristics of the treatment and control groups, however, are not significantly different from each other. A significant difference is detected with respect to share of firm sizes, but the magnitude is quite small. According to Table A2, those who gave birth in 2008 are slightly older and take up PL more often than those who gave birth in 2007. To be specific, the take-up rate of PL is 9.8%p higher and its duration is

40.8 days longer for the treatment group than the control group. This difference seems to include the effect of the policy change and is a trend over time. The chance of working 12 months after childbirth is 3.6%p higher for the treated than for the control group, but this chance is likely to be a direct consequence of taking PL for a longer period than before. No other variable is found to have changed significantly over the two years. Hence, the selection issue does not seem to be critical in the analysis.

TABLE A2
CHARACTERISTICS OF WOMEN WHO GAVE BIRTH IN 2007 AND 2008

Variables	2007 (N=61,825)		2008 (N=66,631)		Contrast	
	Mean	S.D.	Mean	S.D.	Diff.	*p*-value
Age	29.797	(3.101)	30.069	(3.179)	0.272	0.000
Pre-birth wage (KRW 1,000, hourly)	7.447	(3.278)	7.456	(3.302)	0.009	0.614
Pre-birth earning (KRW 10,000, monthly)	156.311	(64.918)	156.468	(65.935)	0.157	0.668
Education: high school or below*	0.309	(0.462)	0.304	(0.460)	−0.006	0.106
Education: college*	0.252	(0.434)	0.256	(0.436)	0.004	0.237
Education: university or higher*	0.439	(0.496)	0.441	(0.496)	0.002	0.640
Tenure (yrs.)	4.697	(3.465)	4.666	(3.595)	−0.031	0.114
Firm size 9 or less	0.240	(0.427)	0.255	(0.436)	0.015	0.000
Firm size 10–99	0.264	(0.441)	0.270	(0.444)	0.005	0.035
Firm size 100–299	0.120	(0.325)	0.113	(0.317)	−0.007	0.000
Firm size 300–999	0.121	(0.326)	0.120	(0.325)	−0.001	0.738
Firm size 1,000 or more	0.255	(0.436)	0.242	(0.428)	−0.012	0.000
Duration of maternity leave after birth (days)	76.402	(13.512)	76.336	(13.522)	−0.066	0.380
Usage of parental leave	0.350	(0.477)	0.448	(0.497)	0.098	0.000
Duration of parental leave (days)	78.411	(121.652)	119.240	(152.721)	40.828	0.000
Working 12 months after birth	0.809	(0.393)	0.844	(0.363)	0.036	0.000
Working 24 months after birth	0.704	(0.457)	0.700	(0.458)	−0.004	0.125
Working 36 months after birth	0.665	(0.472)	0.665	(0.472)	0.000	0.961
Working 48 months after birth	0.635	(0.481)	0.638	(0.481)	0.003	0.349
Pre-birth firm 12 months after birth	0.698	(0.459)	0.733	(0.443)	0.035	0.000
Pre-birth firm 24 months after birth	0.535	(0.499)	0.534	(0.499)	0.000	0.879
Pre-birth firm 36 months after birth	0.463	(0.499)	0.460	(0.498)	−0.003	0.232
Pre-birth firm 48 months after birth	0.407	(0.491)	0.406	(0.491)	−0.001	0.692

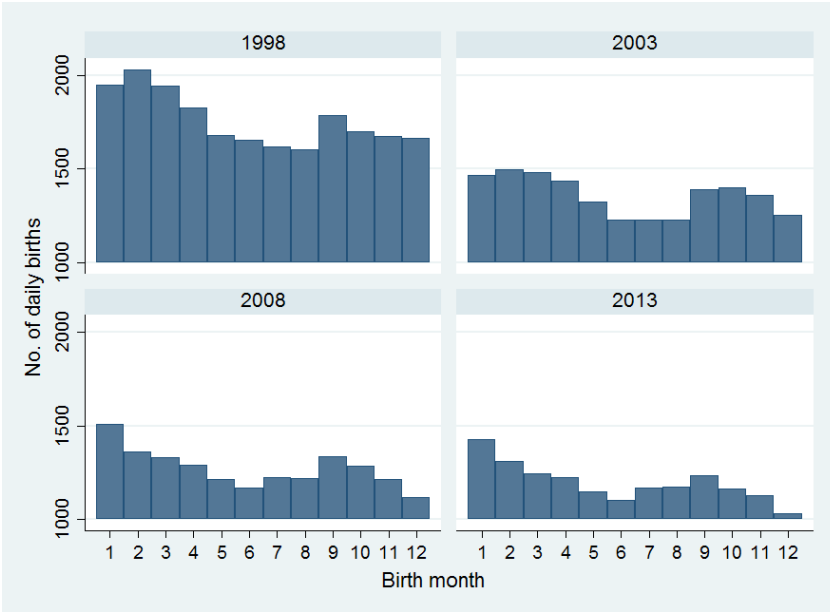
Note: The sample consists of women who gave birth in 2007 or 2008 and were enrolled in EI. *Education variable was available for 97% of women who gave birth in 2007 but only for 38% of those who gave birth in 2008, because the EI database stopped recording education of enrollees in recent years.

Source: Employment Insurance Database.

A3. Number of Births in December and January in Korea

A substantial variation is found in the monthly number of births in Korea. Figure A1 presents the number of births by month in Korea for selected years, which is standardized on a daily basis. The number is the largest in January or February and the smallest in June or December in a given year. The number of births declines from January to June, increases from June to September, and then again declines from September to December. This pattern is generally found for all years.

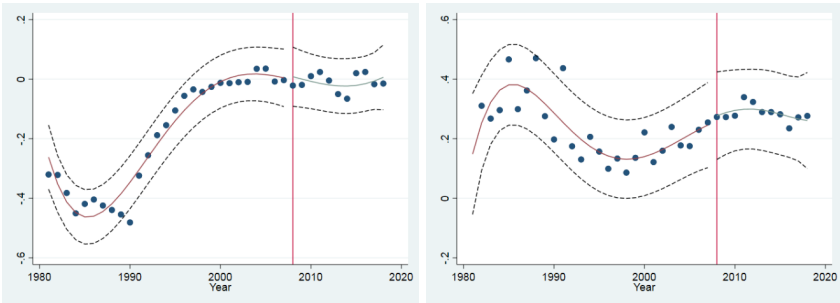
Although the monthly variation in the number of births is quite stable, the reason why it happens is not clearly understood. Koreans may prefer giving birth in an earlier period in a year to a later period, or it may be related to school age. The school calendar begins on March 1, and all children aged six as of the last day of February are eligible to enter an elementary school. This policy generates an incentive for parents to give birth in February rather than in March. This tendency was found in the 1980s and 1990s, but it weakened considerably in the 2000s as in panel (a) of Figure A2. In July 2007, the criterion for school age was moved from the end of February to the end of December due to the passage of a new law, which applied to children entering elementary school in 2010 or later. Therefore, parents would have an incentive to give birth in January rather than in December if they wanted to have their children a few months older than others in school. However, the difference in the number of births in December and January is observed in all years as in panel (b) of Figure A2. The number of births in January is 15%–40% larger than that in December at the national level since 1980s, and no jump in the trend occurs before and after 2008. The difference in births in February and March also exhibits no jump in the trend in panel (a).



Source: Korea Current Population Survey, Statistics Korea.

FIGURE A1

AVERAGE NUMBER OF DAILY BIRTHS PER MONTH IN KOREA



(a) February and March (b) December and January

Note: The sample period is from 1981 to 2018. The solid lines indicate the predicted values of regression model with fifth-order terms of time period and a dummy for year 2008 or later. The dotted lines form the 95% confidence interval.

Source: Korea Current Population Survey, Statistics Korea.

FIGURE A2

CHANGE IN THE AVERAGE NUMBER OF DAILY BIRTHS OVER TWO CONSECUTIVE MONTHS

A4. Effect of Individual and Firm Characteristics on Usage of Parental Leave and Return to Work

Table A3 presents the effects of individual and firm characteristics on PL usage and employment after childbirth. Women who earned higher pre-birth wages, had more experience, or worked in middle-size firms tend to take a shorter leave than their counterparts. This trend implies a higher opportunity cost to being on leave for those women. Moreover, higher pre-birth wage, more experience, and employment in large firms are associated with a higher chance of returning to work. Specifically, an increase in pre-birth wages by one percent lowers the probability of take-up by 0.17%p and lowers the duration of leave by 1.4 days but

TABLE A3
EFFECT OF THE 2008 REFORM ON PARENTAL LEAVE USAGE AND THE RETURN TO WORK

Dependent variable (Model)	(1) Take-up (OLS)	(2) Duration of PL (Tobit)	(3) Hazard of ending PL (Cox proportional hazard)	(4) Return to work after 18 months (OLS)	(5) Return to work after 36 months (OLS)
Year 2008	0.0519	43.9348	0.8483	0.0103	0.0207
	(0.0090)**	(6.3151)**	(0.0126)**	(0.0082)	(0.0088)*
Age	−0.0117	−4.2524	0.9895	−0.0122	−0.0217
	(0.0184)	(12.5079)	(0.0285)	(0.0173)	(0.0182)
Age squared	0.0002	0.0824	1.0001	0.0002	0.0004
	(0.0003)	(0.2047)	(0.0005)	(0.0003)	(0.0003)
Log pre-birth wage	−0.1718	−142.1048	1.3420	0.1371	0.1173
	(0.0136)**	(9.8004)**	(0.0301)**	(0.0124)**	(0.0135)**
Tenure (yrs.)	−0.0023	−2.3173	1.0061	0.0163	0.0142
	(0.0015)	(1.0807)*	(0.0026)*	(0.0013)**	(0.0015)**
Firm size 10–99	−0.0789	−64.2996	1.1271	0.0817	0.0682
	(0.0129)**	(9.4417)**	(0.0239)**	(0.0127)**	(0.0131)**
Firm size 100–299	−0.0894	−79.6618	1.2007	0.1321	0.1289
	(0.0164)**	(12.5101)**	(0.0320)**	(0.0156)**	(0.0164)**
Firm size 300–999	0.0154	−8.3924	1.0757	0.1527	0.1357
	(0.0174)	(11.9076)	(0.0296)**	(0.0157)**	(0.0168)**
Firm size 1,000 or more	0.1685	92.6190	0.8962	0.1796	0.1696
	(0.0157)**	(10.4041)**	(0.0224)**	(0.0142)**	(0.0150)**

Note: All models include dummies for provinces and industries as explanatory variables. The sample consists of women who gave birth in December of 2007 or January of 2008 and who were enrolled in EI. A total of 11,017 observations are made in each estimation. Robust standard errors are in parentheses.

increases the probability of returning to work within three years after childbirth by 0.12%p. The probability of take-up and the probability of returning to work within three years after childbirth are 17%p higher for those employed in large firms with 1,000 or more employees than for those in firms with fewer than 10 employees. Interestingly, unlike other characteristics, a large firm is associated with a longer leave and a higher employment.

A5. Return to Work Measured after Take-up of PL

The reform in 2008 allowed women to take PL for a longer period and in a later period. The estimated policy effect may be larger than the case where only the maximum duration is extended. One way to address this issue indirectly is to examine the change in one's employment status controlling the timing of PL take-up rather than the timing of childbirth. Table A4 and Table A5 provide the results. According to Table A4, returning to work 12 months after the take-up of PL increased by 3.8%p after the reform, which is a direct consequence of the longer maximum duration. Returning to work two years after the take-up increased by 3.0%p, and the effect is statistically significant. However, no significant effect is found on returning to work three or four years after the take-up. No significant effect is found on the return to pre-birth workplace within four years after the take-up of PL as in Table A5. The results are qualitatively similar to those in Table 3. Quantitatively speaking, the short-run effect is larger on the return to work measured after take-up of PL (3%p) than on the employment measured after childbirth (2%p). However, the comparison is not straightforward as the former is based on the selected sample of leave-takers. In addition, a censoring issue should be considered. The number of observation becomes smaller as a wider window is examined in Table A4 and Table A5, because employment status is available only until March 2012 in the EI database for the analysis. Considering the limitation in the analysis, no evidence shows that the effect of extended maximum PL duration would be substantially smaller than the effect of the 2008 reform.

TABLE A4
EFFECT OF THE 2008 REFORM ON THE RETURN TO WORK

Dependent variable: Return to work in … after PL take-up	(1) 12 months	(2) 18 months	(3) 24 months	(4) 36 months	(5) 48 months
Year 2008	0.0375	0.0176	0.0302	0.0157	0.0121
	(0.0135)**	(0.0141)	(0.0144)*	(0.0148)	(0.0156)
R^2	0.09	0.11	0.11	0.09	0.08
N	4,446	4,375	4,330	4,221	3,903

Note: Linear probability models are estimated, and the dependent variable is an index for being employed at each period after take-up of parental leave. The models with control variables include age, age squared, log pre-birth wage, tenure and dummies for firm sizes, provinces and industries as explanatory variables. Robust standard errors are in parentheses. * $p < 0.05$, ** $p < 0.01$.

TABLE A5
EFFECT OF THE 2008 REFORM ON THE RETURN TO PRE-BIRTH WORKPLACE

Dependent variable: Return to pre-birth workplace in … after PL take-up	(1) 12 months	(2) 18 months	(3) 24 months	(4) 36 months	(5) 48 months
Year 2008	0.0264	0.0093	0.0181	0.0017	0.0136
	(0.0146)	(0.0146)	(0.0145)	(0.0143)	(0.0144)
R^2	0.07	0.11	0.12	0.12	0.12
N	4,446	4,375	4,330	4,221	3,903

Note: Linear probability models are estimated, and the dependent variable is an index for being employed by a pre-birth employer at each period after the take-up of parental leave. The models with control variables include age, age squared, log pre-birth wage, tenure and dummies for firm sizes, provinces and industries as explanatory variables. Robust standard errors are in parentheses. * $p < 0.05$, ** $p < 0.01$.

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References

Asai, Yukiko. "Parental leave reforms and the employment of new mothers: Quasi-experimental evidence from Japan." *Labour Economics* 36 (2015): 72-83.

Baker, Michael and Kevin Milligan. "How does job-protected maternity leave affect mothers' employment?" *Journal of Labor Economics* 26 (No.4 2008): 655-691.

Baum, Charles L. "The Effects of Maternity Leave Legislation on Mothers' Labor Supply after Childbirth." *Southern Economic Journal* 69 (No.4 2003): 772-799.

Becker, Sascha O., Peter H. Egger, Maximilian von Ehrlich. "Absorptive Capacity and the Growth and Investment Effects of Regional Transfers: A Regression Discontinuity Design with Heterogeneous Treatment Effects." *American Economic Journal: Economic Policy* 5 (No.4 2013): 29-77.

Dahl, Gordon, Katrine V. Løken , Magne Mogstad and Kari Vea Salvanes. "What is the Case for Paid Maternity Leave?" *The Review of Economics and Statistics* 98 (No.4 2016): 655-670.

Han, Wen-Jui, Christopher J. Ruhm and Jane Waldfogel. "Parental Leave Policies and Parents' Employment and Leave-Taking." *Journal of Policy Analysis Management* 28 (No.1 2009): 29-54.

Hanratty, Maria and Eileen Trzcinski. "Who benefits from paid family leave? Impact of expansions in Canadian paid family leave on maternal employment and transfer income." *Journal of Population Economics* 22 (No.3 2009): 693-711.

Hofferth, Sandra L. and Sally C. Curtin. "Parental Leave Statutes and Maternal Return to Work After Childbirth in the United States." *Work and Occupation* 33 (No.1 2006): 73-105.

Kim, Jungho. "Parental Leave and Female Labor Supply in Korea." *KDI Journal of Economic Policy* 34 (No.1 2012): 169-197.

Kunze, Astrid. "Parental Leave and Maternal Labor Supply." IZA World of Labor 2016: 279, doi: 10.15185/izawol.279.

Kluve, Jochen and Marcus Tamm. "Parental leave regulations, mothers' labor force attachment and fathers' childcare involvement: evidence from a natural experiment." *Journal of Population Economics* 26 (No.3 2013): 983-1005.

Lalive, Rafael and Josef Zweimüller. "How does Parental Leave Affect Fertility and Return to Work? Evidence from Two Natural Experiments." *Quarterly Journal of Economics* 124 (No.3 2009): 1363-1402.

Lalive, Rafael, Analía Schlosser, Andreas Steinhauer and Josef Zweimüller. "Parental Leave and Mothers' Careers: The Relative Importance of Job Protection and Cash Benefits." *The Review of*

Economic Studies 81 (No.1 2014): 219-265.

Mincer, Jacob and Haim Ofek. "Interrupted Work Careers: Depreciation and Restoration of Human Capital." *Journal of Human Resources* 17 (No.1 1982): 3-24.

Ondrich, Jan, C. Katharina Spiess, Qing Yang and Gert G. Wagner. "The Liberalization of Maternity Leave Policy and the Return to Work after Childbirth in Germany." *Review of Economics of the Households* 1 (No.1-2 2003): 77-110.

Rossin-Slater, Maya. "Maternity and Family Leave Policy." In Averett, Susan L., Laura M. Argys, and Saul D. Hoffman (eds.), *The Oxford Handbook of Women and the Economy*. New York: Oxford University Press, 2018.

Ruhm, Christopher J. "The Economic Consequences of Parental Leave Mandates: Lessons From Europe." *Quarterly Journal of Economics* 113 (No.1 1998): 285-317.

Ruhm, Christopher J. and Jackqueline L. Teague. "Parental Leave Policies in Europe and North America." In Blau, Francine and Ronald Ehrenberg (eds.), *Gender and Family Issues in the Workplace*. New York: Russell Sage Foundation Press, 1997.

Schönberg, Uta and Johannes Ludsteck. "Expansions in Maternity Leave Coverage and Mothers' Labor Market Outcomes after Childbirth." *Journal of Labor Economics* 32 (No.3 2014): 469-505.

Waldfogel, Jane. "The Impact of the Family and Medical Leave Act." *Journal of Policy Analysis and Management* 18 (No.2 1999): 281-302.