Korea and the World Economy, Vol. 19, No. 2 (August 2018) 137-168

Childcare Facilities, Availability of Substitute Workers and Parental Leave Utilization*

Jungho Kim**

This study investigates to what extent parental leave (PL) utilization is influenced by two kinds of social infrastructure. The analysis based on National Employment Insurance database finds that 10%p increase in the availability of local childcare facilities raises the PL take-up by 1%p and its duration by five days and that 1%p rise in the female unemployment rate increases the take-up by 0.2%p and its duration by one day. These results suggest that an increase in the access to childcare service and in the availability of substitute workers promotes utilization of PL.

JEL Classification: J13, J18, J22
Keywords: parental leave, female labor supply, childcare facility, substitute workers, local labor market

* Received April 13, 2018. Revised June 4, 2018. Accepted August 28, 2018. This research originated from a part of the five-country study of the Asian Development Bank's technical assistance program for gender equality and development. This work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2015S1A5A8018439). The author is indebted to three anonymous referees for thoughtful comments and is solely responsible for all remaining errors.

** Associate Professor, Department of Economics, Ajou University, 206 Worldcup-ro, Yeongtong-gu, Suwon 16499, Korea, Research Fellow, IZA, Bonn, Germany, Tel: +82-31-219-2739, Fax: +82-31-219-2195, E-mail: jungho@ajou.ac.kr

1. INTRODUCTION

Parental leave (PL) legislation is one of the key policies that promote gender equity and work-life balance. Job-protected and paid leave is available for working parents in two thirds of OECD countries as of 2016 and the average length of its maximum duration is 37 weeks.[1] While it is questionable whether a long leave is beneficial for job continuity, recent studies show that the entitlement to a leave less than one year tend to improve child development as well as parents' employment (Rossin-Slater, 2017). Literature generally finds that the extension of maximum duration and the increase in cash benefit during the leave increase the take-up by eligible parents (e.g., Baker and Milligan, 2008; Lalive and Zweimüller, 2009; Kluve and Tamm, 2013; Schönberg and Ludsteck, 2014).

The entitlement to PL, however, does not guarantee that working parents can take a full advantage of it. PL would be of little use if they had a poor access to child care service which they need after coming back to work. They would also be reluctant to take a leave if they faced an implicit penalty in their career due to their absence in various ways. That is, how effective the entitlement to PL is heavily depends on the infrastructure of alternative child care arrangement and cultural institution in each society.

The main question of the paper is how to improve the effectiveness of the entitlement to PL in Korea. To be specific, it first reports how the utilization of PL varies among different groups of population. Secondly, it verifies whether the accessibility of childcare facilities and availability of substitute workers play a role in making the entitlement to PL effective. Korea is an interesting case, where the public demand for family-friendly policy has long been high. Korea's fertility and female labor market participation are in the lowest group among OECD countries.[2]

---

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

[2] According to OECD Family and Employment database, the average total fertility rate and female labor force participation rate among 35 OECD countries in 2015 were 1.68 children per woman and 63.0%, respectively, whereas those of Korea were 1.24 (the lowest) and 57.9% (the fifth lowest). According to OECD Family and Employment database, the average total

Recent literature tends to focus on the consequence of PL legislation itself. For example, Lalive *et al.* (2014) discusses that extending maximum duration of PL and increasing cash benefit during the leave makes the PL a more attractive child care arrangement for parents. Yet few studies have investigated the conditions under which the entitlement to PL is deemed to be effective by parents. Thus, the paper contributes to literature by shedding light on the nature of PL legislation. The empirical challenge is to construct variables representing these conditions, and we take advantage of administrative database.

In Korea, all employees covered by National Employment Insurance (NEI) are entitled to take a paid leave for one year at maximum. As the government introduced a series of measures strengthening PL legislation since 2001, the take-up rate increased rapidly from 16% in year 2002 to 74% in year 2013. Despite this sharp increase in the overall utilization of PL, the utilization is generally found to be higher in large cities and in large firms than in rural areas and in small firms. The overall take-up rate of PL taken by female employees who gave birth the period from July 2010 to June 2011 was 52.8%. For example, in 2010 and 2011, about seven out of ten female employees took a leave after giving birth in firms with more than 1,000 employees, whereas only four took a leave in firms with 10-99 employees.[3)] The disparity suggests that there may be a substantial variation in terms of the effective access to leave arrangement across population groups.

We propose two conditions potentially crucial for parents' decision of taking a leave: the access to childcare facilities and the availability of a substitute worker for the employee on leave. The market child care service is a direct alternative to own care during the leave, but the relationship can later become complementary as the working parent would need the childcare service for a few years after the leave ends. The effects of these two conditions on the

---

fertility rate and female labor force participation rate among 35 OECD countries in 2015 were 1.68 children per woman and 63.0%, respectively, whereas those of Korea were 1.24 (the lowest) and 57.9% (the fifth lowest).

3) The statistics is based on the group of female employees who gave birth the period from July 2010 to June 2011.

parents' utilization of the leave are estimated in the empirical analysis.

The micro data in NEI database are utilized and the sample consists of female employees who gave birth during the period from July 2010 to June 2011. An access to childcare service is measured by the enrollment rate of nurseries among infants in a municipality. The unemployment rate for women of childbearing age by municipality is used as a proxy for the availability of substitute workers in a local labor market.

It is found that indeed a better access to childcare facilities and a higher unemployment rate leads to a higher utilization of PL. Other things being equal, an increase in the enrollment rate of childcare facilities by 10%p is estimated to increase the take-up of PL by 1%p and its duration by five days. In addition, an increase in the female unemployment rate by 1%p would increase the take-up of leave by 0.2%p and its duration by one day. The findings imply that the effectiveness of the entitlement to PL should be considered in evaluating the PL legislation.

The next section introduces the institutional background. Section 3 discusses an individual choice of taking up a leave theoretically and reviews previous studies. Section 4 implements an empirical analysis of the determinants of PL usage. Finally, section 5 summarizes the finding and draws policy implication.

2. INSTITUTIONAL BACKGROUND

All female employees are entitled to paid maternity leave in Korea, which was introduced in 1953 under Labor Standards Act. In November 2001, the duration of maternity leave was extended from 60 days to 90 days, and NEI started to cover the cash benefit for the additional 30 days with a ceiling of 1.35 million KRW.[4] Since January 2006, NEI has been in charge of cash

[4] Article 72 of Labor Standards Act, Article 18 of Equal Employment Act, Article 4 of Employment Insurance Act.

benefit for the entire maternity leave for firms entitled to preferential support.[5)]

Equal Employment Act, that was enacted in 1987, entitled female employees with an infant under age one to unpaid PL for maximum 12 months. The amendment in 1995 extended the entitlement to male employees, and NEI started to provide the employer with a subsidy of 200,000 KRW per month. The law was further amended in 2001, making the grant of PL mandatory on the part of the employer, and prohibiting any unfair treatment of employees in regard to their decision on the leave. At the same time, NEI was mandated to cover the cash benefit of 200,000 KRW per month for leave-takers. The monthly benefit was increased in stages to 300,000 KRW in 2003, 400,000 KRW in 2004, 500,000 KRW in 2007 and 40% of salary with a minimum of 0.5 million KRW and a maximum of 1 million KRW in 2011. The eligibility was also expanded to cover parents with an infant less than three years old in 2008, and to those with children six years old or younger in 2010, and further to those with children eight years old or younger in 2014.[6)] In order to promote the utilization of PL, NEI also grants an employer a subsidy for hiring substitute workers as much as 300,000 KRW per month for large firms and 600,000 KRW for firms with preferential support.

While all employees are entitled to unpaid PL, the eligibility for cash benefit during the leave is restricted to the enrollees of NEI. According to Regional Employment Survey during the first half of 2013, the employment rate was 52.9% among women of childbearing age (15-49 years) and the share of employees among all workers was 82.8%.[7)] In principle, all wage earners are mandated to be covered by NEI, but only 67.6% of them were enrolled. This implies that the NEI female sample represents two-thirds of all employees, 55.9% of all workers and 29.6% of the population aged from 15 to 49.

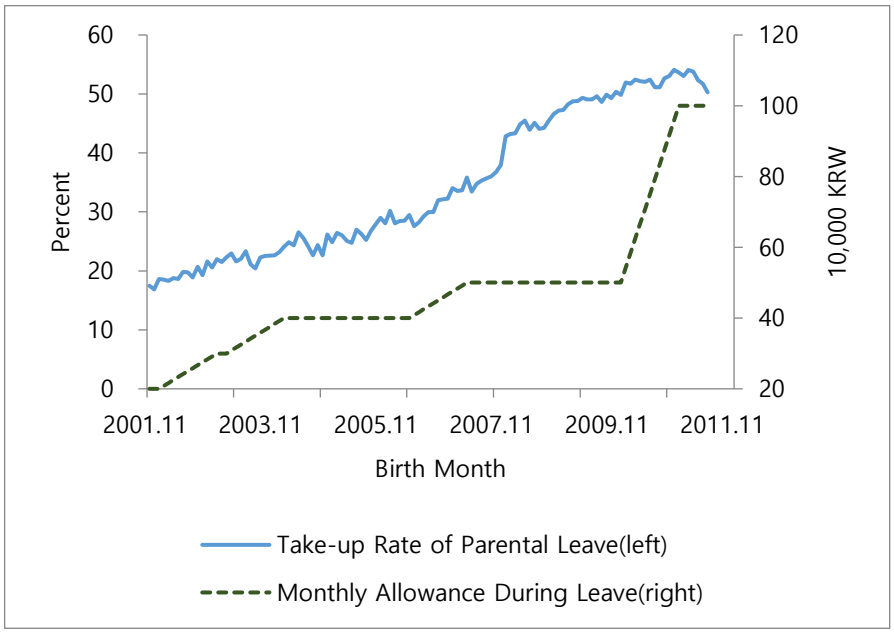
---

5) The firms entitled to preferential support largely refers to small- and medium-sized enterprises.

6) The expansion of the entitlement applies to those who become parents after the change is effective.

7) Regional Employment Survey in the first half of 2013 was conducted by Statistics Korea and its nationally representative sample consisted of 199,000 households and their members. Information on individual demographic characteristics and economic activities was collected through interviews and internet surveys. The reference period is one week from 14th to 20th of April, 2013. Excluded from the population were those on military duty, sentenced prisoners, and combat policemen including those conscripted.

Figure 1 Take-up of Parental Leave and Cash Benefit



Notes: The take-up rate of parental leave denotes the ratio of leave-takers among those who gave birth in each month. The observation period for parental leave take-up is from November 2001 to May 2012. The monthly allowance indicates the average monthly cash benefit that a leave-taker would receive during the leave of the maximum duration (12 months).
Source: National Employment Insurance DB.

We focus on only women because relatively few men take PL.[8] The take-up of PL among enrollees of NEI steadily increased over the last decade. As shown in figure 1, the take-up rate of PL rose from 17% among those who gave birth in 2001 to over 50% among those who had birth in 2011.[9] During the same period, the cash benefit for leave takers increased in stepwise fashion,

[8] The share of men among leave-takers was 2.0% in 2010 and 2.4% in 2011. This implies that the PL take-up rate among the eligible men is less than 1% given that there are more male than female employees covered by NEI.

[9] A woman is observed to take a leave if she does it before May 2012 due to the coverage of the data. This generates an issue of right-censoring because later cohorts have more time (three or six years) to take a leave after childbirth. However, the expansion of entitlement is unlikely to distort the trend of PL take-up because most of women tend to take a leave within six months after childbirth. See footnote 18 for a detailed explanation.

but the take-up rate seems to be described more by a linear trend than by the change in the cash benefit.[10)]

There is a large variation in the utilization of PL across different firms and regions. According to panel (1) of figure 2, based on women who gave birth in 2010 and 2011, the relationship between firm size and take-up exhibits a U-shaped curve. About a half of eligible women took a leave in firms with less than ten employees, and 42% of them took a leave in firms with 10 to 99 employees. Meanwhile, the take-up rate was 53% and 69% for firms with 300-999 employees and firms with a thousand or more employees, respectively. Panel (2) indicates that the difference in take-up rates between the lowest and the highest provinces amounts to 22%p. The take-up among eligible women was 35% and 45% in Chonnam and Gangwon provinces, respectively, while it was 56% in Kyunggi and 57% in Daejon provinces.

While all employees have a legal right to take PL, the effective entitlement is likely to depend on working environment and social infrastructure. Our first variable of interest is the availability of childcare centers because the support for caring children under age 6 has the largest budget among policies promoting work-life balance. The central government's budget for early childhood education and care was 10.8 trillion KRW in 2016, which amounts to a half of the budget for all policies design to promote childbearing.[11)] While there are other important dimensions of childcare policy like subsidy for childcare service and child allowances, they are indistinguishable from period effect because they are universally applied to all children. Hence we focus on the local supply of paid childcare services.

The second variable to be examined is the availability of substitute workers. The increase in the burden of colleagues is often reported to be one of the major concerns discouraging employees from taking PL. For example, 36% of firms reported that employees do not feel free to take PL, and 51% of them

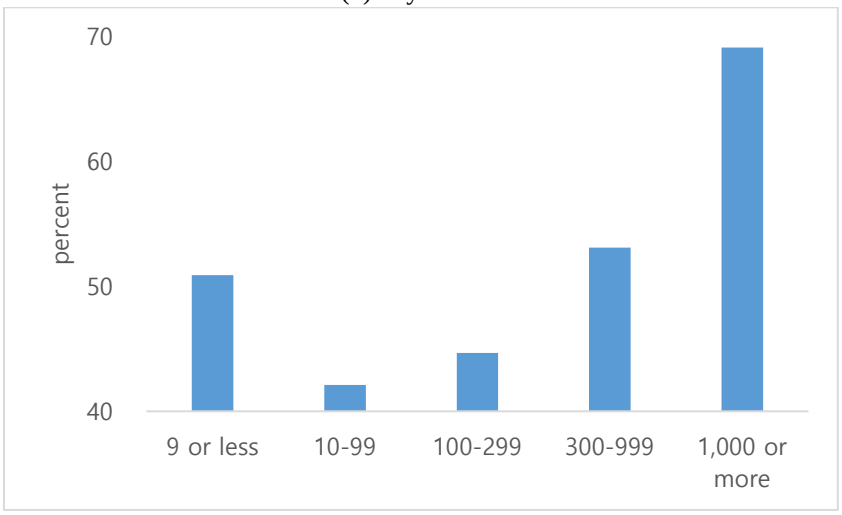
---

[10)] When there is a change in cash benefit, the new benefit is applied to all the recipients. For example, when the benefit increased from 200,000 KRW to 300,000 KRW in January of 2003, an employee who gave birth in December 2002 was eligible for receiving 200,000 KRW in the first month and 300,000 KRW per month during the rest of the leave.

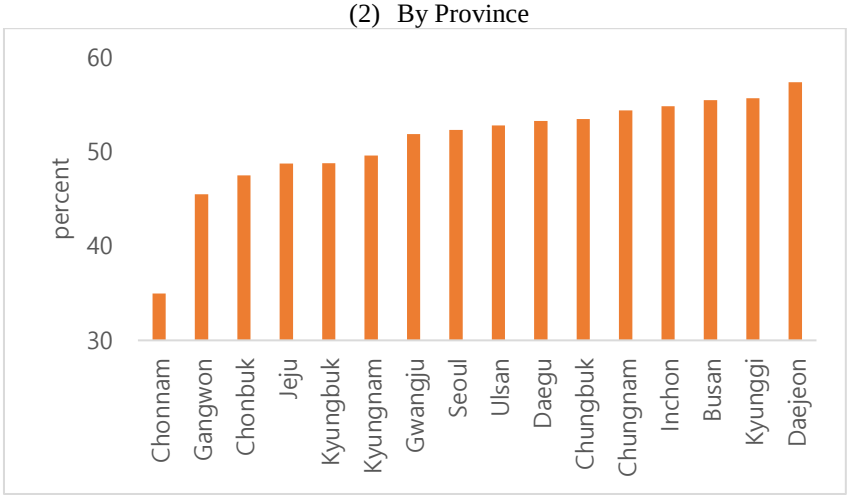
[11)] The Government of Korea, "The Third Plan for Ageing Society and Population," 2016.

Figure 2 Take-up of Parental Leave by Firm Size and by Province

(1) By Firm Size



(2) By Province



Notes: The sample consists of female employees who gave birth during the period from July 2010 to June 2011. The observation period for parental leave take-up is from July 2010 to May 2012.
Source: National Employment Insurance DB.

mentioned the increase in the burden of colleagues as the most significant reason (Kim *et al*., 2016). In fact, the Korean government started to run a bank of substitute workers for leave-takers in 2014. There are also many

aspects of PL legislation including the cash benefit for PL-takers, maximum duration of PL, the subsidies for employers who let employees take PL and those who hire substitute workers. Again this characteristics of PL legislation remained the same for the period under study, and we look into the condition of local labor market as a potential determinant of PL utilization.

3. THEORETICAL DISCUSSION AND LITERATURE

In general, taking PL involves both cost and benefit for an employee. The cost in each period includes foregone earning, the depreciation of her skill or an increase in the chance of being replaced at workplace.[12] Moreover, she may face unfair treatment upon return to work disrupting her career path even if it is against the laws. Hence the cost is likely to rise as her leave becomes longer.

The benefit from her own care during a leave includes the reduced expenditure on paid child care and the improved quality of care. The latter stems from the fact that the monitoring of childcare service is costly. The mother may also get the emotional satisfaction of being able to take care of her own child. As a child grows, it is likely that the difference in quality between the market and own childcare becomes smaller, thus reducing the benefit in each period.[13]

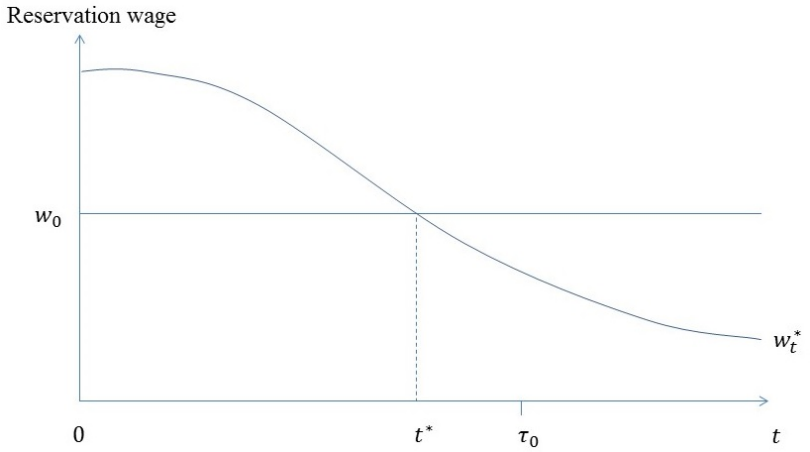
The role of social infrastructure regarding one's decision to take PL may be understood in a framework of job search model as in Lalive *et al*. (2014). A woman who is on PL after giving birth may be considered as searching for a new job opportunity. It can be shown that the decision rule for a utility-maximizer is to accept any new offer of wage higher than her reservation wage (Lalive *et al*., 2014). With the cost increasing and the benefit decreasing, the

---

[12] Mincer and Ofek (1982) suggest that the depreciation of human capital during the leave may lead to a lower productivity in her career.

[13] In fact, the recent literature suggests that the return to investment on human capital may be the highest during the infant stage and that it may decline over the life cycle (e.g., Heckman, 2000; Goodman and Sianesi, 2005).

Figure 3 Optimal Duration of Parental Leave



Notes: A woman gives birth at $t = 0$ and goes on PL for maximum τ_0 periods. She finds an optimal timing of returning to pre-birth job by setting her reservation wage at time t, w_t^*, equal to the previous wage, w_0.

reservation wage is likely to decline over time. Then the optimal duration of PL is determined by condition that her reservation wage equals the initial wage as in figure 3.[14)]

Note that the determinants of PL take-up can now be discussed in terms of those of reservation wage. As can be seen in figure 3, a higher reservation wage is directly associated with a later return to the previous workplace and thus a longer duration of PL, and vice versa. First, when there are few substitute workers available in a local labor market, women tend to face a higher cost in terms of an implicit penalty and therefore to have a lower reservation wage. This effect may be larger for small- and medium-sized enterprises than for large firms possibly due to smaller economy of scale. Second, it is subtle for the case of childcare service. On one hand, paid childcare service in the neighborhood is a direct alternative to own care during PL, which lowers the benefit of being on leave. On the other hand, an access

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

to nurseries may increase the benefit by complementing the usage of PL because women would need childcare service after coming back to work from the leave. For example, Kim (2013) found that employees take PL more often when the firm has its own childcare facility at workplace in Korea.[15)]

What would be the case for PL legislation from a public policy point of view? In theory, a woman may continue to develop her career by taking a job-protected leave after childbirth and her own care may be better for child development than market care. The recent literature, however, provides mixed results. Some studies found that the extension of paid PL induced women to take a longer leave in Austria, Germany, Norway and Korea but that it did not have any significant impact on their employment in the medium and long run (e.g., Lalive and Zweimüller, 2009; Schönberg and Ludsteck, 2014; Dahl *et al*., 2016; Kim, 2018).[16)] On the contrary, other studies reported that the introduction of six-week paid leave increased female labor supply two to three years after childbirth in California, the United States (e.g., Rossin-Slater *et al*., 2013; Baum and Ruhm, 2016).

The literature is not clear about the relationship between PL and child development either. It is estimated that the extension of PL increased mother's home care in Canada, Sweden, Demark, Austria, Germany and Norway but that it did not lead to an improvement in child's cognitive ability or educational attainment (e.g., Baker and Milligan, 2015; Liu and Skans, 2010; Rasmussen, 2010; Danzer and Lavy, 2018; Dustmann and Schönberg, 2012; Dahl *et al*., 2016).[17)] However, the introduction of paid leave for four

---

15) The model generates a few more implications. A higher initial wage increases the value of returning to the previous job, thus induces a woman to take a shorter leave other things being equal. A faster depreciation of skill means a higher cost which lowers a reservation wage. A woman who values caring for her own children more than others are said to have a higher value of being at home, which leads to a higher reservation wage. An increase in cash benefit during the leave raises the reservation wage.

16) In Austria, the maximum duration of paid PL was extended from one year to two years in 1990, but reduced to 18 months in 1996. It was stretched from 2 months to 36 months in stages in Germany for the period from 1979 to 1992, and from 18 weeks to 35 weeks in Norway for the period from 1987 to 1992. In Korea, the effective maximum duration of maternity and PL together was extended from 12 months to 15 months in 2008.

17) The Canadian government extended the paid PL from 25 weeks to 50 weeks in 2000 and the Swedish from 12 months to 15 months in 1988. The maximum paid leave was extended

months reduced the children's high school drop-out rates and increased their earnings at the age of 30 in Norway according to Carneiro *et al*. (2015). Further, Rossin (2011) and Stearns (2015) reported that infants' health outcomes including birth weight improved as a result of the introduction of 12-week unpaid leave and 6-week paid leave, respectively, in the United States.

To sum up, the literature suggests that the extension of an existing PL legislation tends to have no significant impact on women's employment or child development but that the introduction of short paid or unpaid leave tends to have a positive impact on both outcomes. As Rossin-Slater (2017) suggested, the marginal benefit of the introduction of short leave is likely to be larger than that of the extension of an existing leave and the impact of PL legislation is likely to depend on the institutional characteristics such as universal child care service and health insurance. These findings imply that it is an important question for policy makers what conditions improve the effective access to PL entitlement in Korea, where its maximum duration is one year. To our knowledge, this is the first study that investigates this issue empirically.

4. EMPIRICAL ANALYSIS

4.1. Statistical Model

A woman considers whether to take a leave or not after childbirth, and the determinants of the decision are estimated with the Probit model. The model is formulated as follows:

$$\Pr\left(Y_{ijt}=1\right)=\Phi\left(\alpha+\beta Care_{jt}+\gamma Unemp_{jt}+X_{ijt}'\delta+\theta_j+\nu_t\right). \qquad (1)$$

In equation (1), the dependent variable Y_{ijt} has a value of one if a female

from 14 weeks to 20 weeks in 1984. See footnote 16 for the policy changes in Austria, Germany and Norway.

worker *i* living in area *j* and who gave birth at period *t* takes a leave, and zero otherwise.[18] The area is defined as the municipality where the firm is located, and the unit of the time period is a month.[19] The accessibility to childcare facilities in area *j* at period *t* is denoted by $Care_{jt}$, and is measured as the ratio of infants who were enrolled in the childcare facilities to the total number of infants 0-2 years old.

The availability of substitute workers is measured by the unemployment rate of women of childbearing age (15-49) in a local labor market, expressed as $Unemp_{jt}$.[20] The individual characteristics is denoted by X_{ijt} and the regional characteristics that does not change over time by θ_j. The time effect, ν_t, measures the macroeconomic shock or policy change influencing the whole economy in each period. The function $\Phi(\cdot)$ represents a cumulative density function of standard normal distribution. A series of month effects, province effects and industry effects are controlled in the estimation. In addition, the statistical inference takes into account the

---

[18] There is an issue of right-censoring in measuring the dependent variable. Those who gave birth between July 2010 and June 2011 are entitled to take PL within six years of childbirth, but the NEI database covers PL take-up only until May of 2012. However, most of women seem to take a leave within six months after giving birth. Specifically, 86.0% of leave-takers took a leave within three months after childbirth, and 96.5% of them within six months. Given that mothers are supposed to take a maternity leave for minimum 45 and maximum 90 days after the delivery, this implies that women tend to take a leave practically as soon as they can. Further, the share of women who took a leave within a year after childbirth is 98.3% among those who gave birth 2010, and it is 99.9% among those who gave birth in 2011. Although it is not substantial, this difference is likely to be absorbed by the birth month dummies in the statistical model. Hence, the bias in the estimates due to right-censoring seems to be minimal.

[19] There are 16 provinces and 230 municipalities (si/gun/gu) in the sample of all women who gave birth between July 2010 and June 2011. Due to the limited availability of unemployment rate at municipality level, metropolitan areas are excluded from the final sample, which consists of 9 provinces and 156 municipalities.

[20] There are two reasons why female unemployment rate is more appropriate than unemployment rate for all the population. First, the occupational segregation by gender is still high in Korea, even though its level is falling (Sa, 2015). In the US, Blau and Kahn (2017) report that there exists a substantial degree of occupation and industry differences by gender and that they account for a half of gender wage gap in 2010. This may be due to the difference in preferences, career interruption or discrimination. Second, the job of substitute worker lasts for one year at maximum, and therefore is less attractive to men than to women, in general. In fact, the pool of job-seekers at the substitute worker banks in Korea is predominantly female (http://matchingbank.career.co.kr/).

potential correlation among the observations from the same municipality.[21)]

One's observed duration of leave differs from her desired length of leave because the former is censored at 0 and the maximum duration, 12 months.[22)] The Tobit model identifies the determinants of the latent variable, the desired duration of leave. Formally, an individual worker's optimal length of leave, Y_{ijt}^{*}, is modeled as a function of a set of explanatory variables, Z_{ijt}, including the accessibility of child care facilities and the availability of substitute workers.

$$Y_{ijt}^{*} = \alpha + \beta Care_{jt} + \gamma Unemp_{jt} + X_{ijt}'\delta + \theta_j + \nu_t + \varepsilon_{ijt} = Z_{ij,t}'\rho + \varepsilon_{ijt}. \quad (2)$$

Her observed length of leave, Y_{ijt}, will be the same as the optimal duration, Y_{ijt}^{*}, when the latter is longer than zero and shorter than the maximum duration, *T*, and the former will be censored at zero or *T* otherwise.

$$Y_{ijt} = \begin{cases} T & if \quad Y_{ijt}^{*} \geq T \\ Y_{ijt}^{*} & if \; 0 < Y_{ijt}^{*} < T \\ 0 & if \quad Y_{ijt}^{*} \leq 0 \end{cases}. \quad (3)$$

Assuming the error term of equation (2) follows the normal distribution, the conditional expected function of observed duration has the following relationship (Maddala, 1983).

---

21) There exists an issue of endogeneity at municipality level. That is, there may be more childcare facilities available in areas where the demand for childcare services is high. If leave-takers tend to have a high demand for childcare services, the effect of access to childcare centers is likely to be overestimated. In the same vein, those considering to take a leave may choose to work in areas where there are more substitute workers available. Then the estimated effect of availability of substitute workers is also likely to be biased positively. This issue is not perfectly addressed in the current analysis given the short time span and the lack of valid instrumental variables. Hence, the estimates may be interpreted as upper bounds.

22) Censoring is clearly observed in the final sample. About a half of women (47.7%) did not take a leave, and about one ninth (11.7%) of them took a leave of maximum 12 months.

$$E\left[Y_{ijt}|Z_{ijt}\right] = Z'_{ijt}\rho\left[\Phi\left(\frac{T - Z'_{ijt}\rho}{\sigma}\right) - \Phi\left(-\frac{Z'_{ijt}\rho}{\sigma}\right)\right]$$
$$+\sigma\left[\phi\left(-\frac{Z'_{ijt}\rho}{\sigma}\right) - \phi\left(\frac{T - Z'_{ijt}\rho}{\sigma}\right) + T\left[1 - \Phi\left(\frac{T - Z'_{ijt}\rho}{\sigma}\right)\right]\right]. \quad (4)$$

In equation (4), σ indicates the standard deviation of the distribution of error term and $\phi(\cdot)$ represents the probability density function of the standard normal distribution. The coefficients, ρ, measures the marginal effect of a variable on the desired length of leave.

It is notable that there are a number of policies influencing PL utilization. The cash benefit for PL-takers, maximum duration of PL, subsidy for childcare service and child allowances are expected to promote the usage of PL through labor supply. On the other hand, the subsidies for employer who let employees take PL and those who hire substitute workers for PL-takers would operate through labor demand. Controlling all of these policies is critical to the precision of estimation. However, most of the policies above remained the same during the period from July 2010 to June 2011. Some policies like subsidy for childcare service changed in 2011, but those changes are absorbed by period effect since they were applied to all municipalities in Korea.[23)]

4.2. Data Description

The population in the analysis is the female employees covered by NEI and who gave birth.[24)] By using data on maternity protection in the NEI micro database, we selected a group of 86,654 employees who gave birth during a period from July 2010 to June 2011, in which the measures on childcare and labor markets are available. The characteristics of the workplace is also collected and matched with the sample of employees.

---

23) Note that the estimation exploits the variation over areas and over periods of childbirth. This is because women are assumed to make a decision of PL take-up based on the social infrastructure in a period of childbirth.

24) In NEI database, a female worker is identified to give birth when she receives the cash benefit during the maternity leave.

One measure of the access to childcare facilities is the quota assigned to those facilities. While both quota and current enrollment are available for all children under age 6 from the administrative database of the Ministry of Health & Welfare, only enrollment is available for children aged 0 to 2 (Hong *et al*., 2012). Hence the quota for infants is approximated by their enrollment. It turns out that quota and enrollment are highly correlated.[25] The childcare center enrollment rate among infants is defined as the number of children aged 0 to 2 enrolled at childcare centers divided by the size of infant population and is calculated for each municipality per quarter. The number of infants aged 0-2 per year per municipality were estimated from annual population registration data. Since the population registration data have only the population size for age 0-4 group, the ratio of the group aged 0-2 to the group aged 0-4 is calculated for each municipality from the 2010 population census and is then applied to the government registration data.[26]

The unemployment rate in a local labor market was computed based on Regional Employment Survey. Following the standard definition used by Statistics Korea, the unemployment rate of women of childbearing age was calculated per municipality per quarter. One limitation was that the one's municipality is not identified for the residents of metropolitan areas in Regional Employment Survey. Hence, the final sample was restricted to a total of 43,460 female employees living in provinces, excluding those in metropolitan areas.

The summary statistics of the final sample is shown in table 1. On average, the female workers are 30.4 years old, and earned about 7,000 KRW per hour (in terms of 2010 value), and had a tenure of 4.8 years at current workplace. Around a half of women took a PL after childbirth (52.3%), and the average

---

[25] In principle, the quota represents a constraint, while the enrollment reflects a decision of parents. In the data for sample period, the correlation coefficient between quota and enrollment for children aged 0 to 5 in the sample period is 0.935 at facility level and 0.995 at municipality level.

[26] For year 2010, the number of infants 0-2 years old per municipality could be calculated using the population census provided by the Statistics Korea. However, the same information was not available for 2011. The population registration data were utilized for both years for consistency.

Table 1 Summary Statistics (N=43,460)

Variables	Mean	Std. Dev.	Min.	Max.
Take-up of parental leave	0.5232	0.4995	0	1
Duration of parental leave (days)	126.7855	143.1620	0	366
Duration of parental leave among leave-takers (days)	242.3299	105.7036	16	366
Age (years)	30.3818	3.3205	19	49
Monthly earning (10,000 KRW, base year 2010)	147.2566	55.0056	48.12	556.11
Hourly wage (1,000 KRW, base year 2010)	7.0068	2.6885	2.34	33.62
Log hourly wage	1.8861	0.3374	0.85	3.52
Tenure (years)	4.7766	3.8078	0	16.00
Share of infants enrolled at childcare facilities (municipality)	0.4847	0.0943	0.24	0.81
Female unemployment rate (15-49, municipality)	0.0387	0.0370	0	0.28
Female employment rate (15-49, municipality)	0.4960	0.0854	0.21	1
Female labor market participation rate (15-49, municipality)	0.5161	0.0871	0.21	1
Occupation share (age under 50)	0.1888	0.0718	0.02	0.39
Log no. of the employed under NEI (age under 50)	10.7917	1.0247	6.50	12.26
Firm size: less than 10 employees	0.2549	0.4358	0	1
Firm size: 10-99	0.2848	0.4513	0	1
Firm size: 100-299	0.1116	0.3149	0	1
Firm size: 300-999	0.0967	0.2956	0	1
Firm size: 1,000 or more	0.2519	0.4341	0	1
Province: Gangwon	0.0418	0.2000	0	1
Province: Kyunggi	0.5219	0.4995	0	1
Province: Kyungnam	0.1056	0.3074	0	1
Province: Kyungbuk	0.0740	0.2618	0	1
Province: Chonnam	0.0476	0.2128	0	1
Province: Chonbuk	0.0550	0.2279	0	1
Province: Jeju	0.0297	0.1698	0	1
Province: Chungnam	0.0681	0.2520	0	1
Province: Chungbuk	0.0563	0.2306	0	1

Notes: The sample consists of female employees who gave birth between July 2010 and June 2011 and who were covered by NEI. The sample size for occupation share and log number of the employed under NEI is 43,281. The observation period for parental leave take-up is from July 2010 to May 2012.

Source: National Employment Insurance DB.

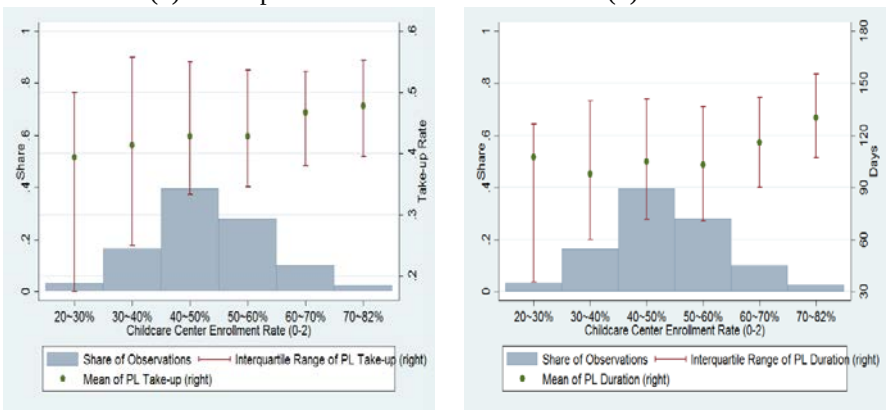
duration of leave was about four months. When limited to the leave-takers, the average duration was about eight months. The childcare center enrollment rate among infants at municipality was 48.5% on average, but there was a large variation across areas, which ranged 24.4-81.5%. The mean female average employment rate and the participation rate of economic activity were 49.6% and 51.6%, respectively. Regarding firm size, a quarter of women work at workplaces with less than 9 employees and at those with a thousand or more, respectively. The share of workers is 28.5% for those with 10-99 employees and is 20.8% for those with 100-999 employees. In terms of geography, the distribution is largely consistent with that of total population. About a half of women reside in Kyunggi province, and the shares of other provinces are in the range of 3-11%.

Next, the correlation between the accessibility to childcare centers and the utilization of PL is reviewed. The measure of utilization of PL was aggregated by quarter and by place of residence at the time of childbirth. As shown in the first panel of figure 4, the take-up rate is positively correlated with the share of infants enrolled at nurseries. In the second panel, the duration of leave also exhibits a positive correlation with the utilization of childcare centers among infants. This suggests that the access to childcare service and the entitlement of PL may complement each other.

The condition of the local labor market is now plotted against the utilization of PL. According to the first panel of figure 5, the correlation between female unemployment rate and PL utilization exhibits an inverted U-shape for the whole range but has a clear positive relationship over the range of 0- 8%, which covers more than 95% of observations. The second panel shows that the duration of leave also has a positive correlation with the female unemployment rate for most of the range. An increase in the local unemployment rate implies more job-seekers in the labor market, which enables the firm to find substitute workers easily. Therefore, the correlation in figure 5 suggests that the availability of substitute workers is a potentially important factor in a worker’s decision on whether to take PL or not.

Figure 4 Utilization of Parental Leave and Accessibility to Childcare Facilities

(1) Take-up (2) Duration

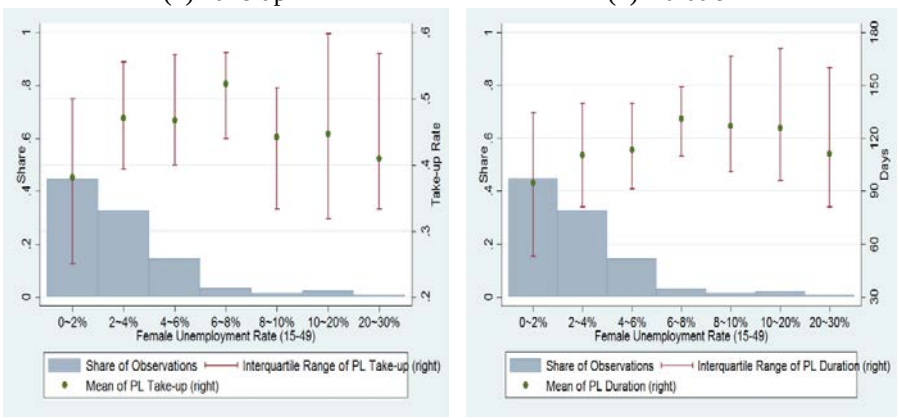


Notes: The graph is based on 617 municipality-quarter observations, each of which represents the mean values for female employees who gave birth in a municipality and in a quarter. The sample consists of female employees who gave birth during the period from July 2010 to June 2011.

Source: National Employment Insurance DB, Childcare Statistics.

Figure 5 Utilization of Parental Leave and Female Unemployment Rate

(1) Take-up (2) Duration



Notes: The graph is based on 617 municipality-quarter observations, each of which represents the mean values for female employees who gave birth in a municipality and in a quarter. The sample consists of female employees who gave birth during the period from July 2010 to June 2011.

Source: National Employment Insurance DB, Regional Employment Survey.

4.3. Determinants of Parental Leave Utilization

The estimates of marginal effects are presented in table 2, where they are evaluated at mean of explanatory variables in the case of Probit model.[27] As can be seen in column (1), women with a higher wage and a longer tenure are less likely to take up a PL, while the effect of age is not precisely estimated. Specifically, an increase in the hourly wage by 10% lowers the probability of taking up the leave by 1.5%p, and one year of tenure leads to a decrease in the probability by 0.6%p. The pre-birth wage effect is in line with theory. The result on tenure is consistent with the presence of a firm-specific skill, which is likely to raise the cost during the leave and thus to lower reservation wage. As in descriptive analysis, the relationship between the take-up of a leave and the firm size is found to have a U-shaped curve. Compared to the reference group, the firms with less than ten employees, the workers in those with 10-99 employees 6.9%p less likely to take a leave, while the take-up rate is 6.0 and 25.7%p higher in those with 300-999 employees and those with a thousand or more employees, respectively. Differences in take-up among provinces are consistent with figure 2.

According to the basic model in column (2) of table 2, both the enrollment rate of childcare centers and the female unemployment indeed have a positive impact on the probability of take-up of a leave. The estimates imply that an increase in the childcare center enrollment rate by 10%p raises a chance of taking up a leave by 1.1%p, and they are marginally significant. This suggests that the accessibility to childcare facilities and the PL legislation do complement each other. An increase in the female unemployment rate by 1%p would increase the probability of take-up by 0.2%p, which is consistent with the hypothesis that more job-seekers in a local labor market make it easier for firms to find substitute workers for leave-takers.

Notice that the firm size effects and provinces effects are still present in column (2) of table 2 where the accessibility to nurseries and female

---

[27] The baseline probability calculated at mean of explanatory variables is 0.3981 in column (1) and (2) of table 2.

Table 2 Determinants of Parental Leave Utilization (Marginal Effects)

Dependent Variable	(1) Probit Take-up	(2) Probit Take-up	(3) Tobit Duration	(4) Tobit Duration
Childcare center enrollment rate (aged 0-2)		0.1055		53.8930
		(0.0591)*		(31.1926)*
Female unemployment rate (aged 15-49)		0.2245		121.7603
		(0.0845)***		(39.7556)***
Age	−0.0098	−0.0094	0.8382	1.0911
	(0.0090)	(0.0090)	(4.0383)	(4.0585)
Age squared	0.0001	0.0001	−0.0243	−0.0288
	(0.0001)	(0.0001)	(0.0648)	(0.0652)
Log hourly wage	−0.1542	−0.1527	−100.8765	−100.1106
	(0.0085)***	(0.0087)***	(4.5701)***	(4.6714)***
Tenure (years)	−0.0062	−0.0062	−2.9764	−2.9858
	(0.0009)***	(0.0009)***	(0.5163)***	(0.5191)***
Firm size: 10-99 employees	−0.0692	−0.0690	−41.6472	−41.4865
	(0.0086)***	(0.0086)***	(4.6958)***	(4.7077)***
Firm size: 100-299 employees	−0.0130	−0.0129	−20.7610	−20.6530
	(0.0108)	(0.0108)	(6.1163)***	(6.1395)***
Firm size: 300-999 employees	0.0598	0.0602	14.2130	14.5016
	(0.0188)***	(0.0190)***	(9.2889)	(9.3674)
Firm size: 1,000 or more employees	0.2567	0.2574	104.4031	104.7153
	(0.0137)***	(0.0134)***	(6.7362)***	(6.6562)***
Province: Kyunggi	0.1027	0.1040	56.5057	56.9681
	(0.0126)**	(0.0127)**	(6.5898)**	(6.6415)**
Province: Kyungnam	0.0468	0.0431	28.1797	26.2571
	(0.0142)**	(0.0143)**	(7.4011)**	(7.4420)**
Province: Kyungbuk	0.0041	0.0002	10.4709	8.2258
	(0.0151)	(0.0151)	(7.8549)	(7.8722)
Province: Chonnam	−0.0892	−0.0920	−48.3410	−49.8675
	(0.0167)**	(0.0167)**	(8.8301)**	(8.8385)**
Province: Chonbuk	0.0167	0.0041	9.1984	2.4889
	(0.0159)	(0.0162)	(8.3037)	(8.4605)
Province: Jeju	0.0264	0.0073	−7.4690	−17.1519
	(0.0187)	(0.0202)	(9.6833)	(10.4451)

Province: Chungnam	0.0663 (0.0153)**	0.0690 (0.0154)**	43.0612 (7.9696)**	44.3218 (8.0024)**
Province: Chungbuk	0.0426 (0.0159)**	0.0447 (0.0159)**	21.1102 (8.2563)*	22.1236 (8.2570)**
σ			236.9499 (3.0451)***	236.8881 (3.0373)***
Log likelihood	−28,219.3	−28,210.0	−168,419.4	−168,409.3
No. of observations	43,453	43,453	43,460	43,460

Notes: In column (1) and (2), the marginal effects evaluated at mean of explanatory variables are presented, and workers in the mining industry were dropped as none of them had taken PL (7 observations). The reference category of firm size is 'less than 10 employees', and that of province is Gangwon. In all models, month effects and industry effects are controlled. The numbers in parenthesis are the standard errors with the correlation among those observations in the same municipality allowed (clustering). * $p<0.10$; ** $p<0.05$; *** $p<0.01$.

unemployment rate are controlled. Although the access to child care service and the labor market conditions in a local economy are significant factors of PL utilization, the working environment in small and medium-sized enterprises (SMEs) seems to be substantially different from that in large firms due to various other factors. One potential factor is that the SMEs are in a more competitive market than the large firms; another is the selection of female workers into SMEs and large firms. Indeed, the women's investment in human capital and their choice over firms are likely to be influenced by their prospect on the working conditions in different firms (Görlich and De Grip, 2009).

The estimates of Tobit model in columns (3) and (4) of table 2 are qualitatively similar to those of Probit model. Both the accessibility to childcare facilities and the female unemployment rate are found to increase the desired duration of leave. With an increase in the childcare center enrollment rate by 10%p, women tend to take a leave for 5.4 days longer. In addition, 1%p increase in the female unemployment rate tends to induce women to take a leave for 1.2 days longer. As for other variables, an increase in hourly wage by 10% and in tenure by one year are estimated to shorten the duration of leave by 10.0 days and by 3.0 days, respectively.

The magnitude of the estimates may be assessed in comparison to other

studies. Using NEI database for the period 2001 to 2008, Kim (2012) reported that an increase in monthly cash benefit from 200,000 KRW to 300,000 KRW over 12 month-period would lead to an increase in PL take-up by 5.46%p and its duration by 12.3 days. The cash benefit for PL-takers changed from a flat rate to a proportional rate in 2011, and this change lead to an increase in the monthly benefit from 500,000 KRW to one million KRW for women earning more than 2.5 million KRW per month. Yoon and Hong (2014) estimated that this group of highly-paid women took up PL 6.5%p more than before the policy change.

Note that the standard deviations of childcare center enrollment rate and female unemployment rate in the final sample are 9.4% and 3.7%, respectively. Back-of-the-envelope calculation suggests that, in terms of its effect on PL take-up, an increase in childcare center enrollment rate by one standard deviation is equivalent to an increase in monthly cash benefit by 18,000 KRW according to Kim (2012) and that by 76,000 KRW according to Yoon and Hong (2014).[28] Likewise, those cash benefits comparable to an increase in female unemployment rate by one standard deviation are 15,000 KRW (Kim, 2012) and 64,000 KRW (Yoon and Hong, 2014) in each case.

Regarding its impact on PL duration, one standard deviation increase in childcare center enrollment rate and female unemployment rate is equivalent to an increase in monthly cash benefit by 41,000 KRW and by 37,000, respectively, based on Kim (2012). To sum up, the effects of availability of childcare services and unemployment rate on PL utilization do not seem to be trivial, and the former is slightly larger than the latter.

The unemployed may not represent potential substitute workers because those who lose jobs tend to quickly switch to the economically inactive in Korea due to institutional characteristics. As a robustness check, female employment rate and labor market participation rate are used as alternative measures of availability of substitute workers. A higher female employment or labor market participation would mean a smaller pool of potential substitute workers and therefore would be associated with a low take-up of PL and a

[28] $0.1055 \times 9.4 \times (100{,}000/5.46) \approx 18{,}000$.

shorter duration. Table 3 suggests that indeed this is the case. Columns (1) and (7) are the main results in table 2. According to columns (2) to (3) and (8) to (9), an increase in female employment rate and labor market participation rate tend to induce women to take up PL less often and to take a shorter leave than otherwise.

To be precise, the substitutability among workers depends on the productivity and types of task. It is, however, challenging to identify the number of potential substitute workers for each leave-taker because we would need the detailed job history of the unemployed as well as the employed. Given the constraints, we present the share of occupation as an alternative measure. That is, when there are more employees of the same occupation in the municipality, the labor market for her occupation is likely to be larger and a leave-taker is likely to find the substitute worker more easily. Specifically, the share of seven groups of occupation among the employees under age 50 covered by NEI is constructed at municipality level.[29)]

According to column (4) and (10) of table 3, own occupation share does not have any significant impact on PL take-up or duration, but the size of workforce in all occupations covered by NEI has a positive impact. That is, an increase in size of the employed workforce at municipality by 10% leads to an increase in PL take-up by 0.24%p and its duration by 1.3 days. This result may reflect the effect of a large population, but is at least consistent with the view that PL take-up is influenced by an overall condition of local labor market.[30)] Using the occupation share among female employees made a little difference (not shown).

[29)] The list of occupation groups includes: (1) managers, (2) professional and technicians and associate professionals, (3) clerical support workers, (4) service and sales workers, (5) craft and related trades workers and skilled agricultural, forestry and fishery workers, (6) plant and machine operators, and assemblers, (7) elementary occupations.

[30)] For the same level of one's occupation share, the number of employees of one's occupation reflects the level of abundance of potential substitute workers if it is assumed that there is little cost in commuting across a municipality.

Table 3 Determinants of PL Utilization: Robustness Check (Marginal Effects)

	(1)	(2)	(3)	(4)	(5)	(6)
					Metropolitan areas included	
Dependent Variable	Probit Take-up	Probit Take-up	Probit Take-up	Probit Take-up	Probit Take-up	Probit Take-up
Childcare center enrollment rate (aged 0-2)	0.1055 (0.0591)*	0.0873 (0.0590)	0.0887 (0.0589)	0.1347 (0.0636)**	0.0670 (0.0477)	0.0687 (0.0475)
Female unemployment rate (aged 15-49)	0.2245 (0.0845)***					0.2234 (0.0856)***
Female employment rate (aged 15-49)		−0.1418 (0.0369)***				
Female labor market participation rate (aged 15-49)			−0.1183 (0.0335)***			
Occupation share (age under 50)				−0.0125 (0.0488)		
Log no. of the employed under NEI (age under 50)				0.0240 (0.0045)***		
Log likelihood	−28,210.0	−28,204.7	−28,207.6	−28,059.5	−56,705.1	−56,699.4
No. of observations	43,453	43,453	43,453	43,274	86,654	86,654

	(7)	(8)	(9)	(10)	(11)	(12)
					Metropolitan areas included	
Dependent Variable	Tobit Duration	Tobit Duration	Tobit Duration	Tobit Duration	Tobit Duration	Tobit Duration
Childcare center enrollment rate (aged 0-2)	53.8930 (31.1926)*	42.9985 (30.8150)	43.6655 (30.8151)	72.5371 (33.8052)**	31.5351 (24.8328)	32.5145 (24.7912)
Female unemployment rate (aged 15-49)	121.7603 (39.7556)***					118.2282 (39.3015)***
Female employment rate (aged 15-49)		−86.4630 (22.2323)***				
Female labor market participation rate (aged 15-49)			−73.1241 (20.0861)***			
Occupation share (age under 50)				−2.3897 (26.5176)		
Log no. of the employed under NEI (age under 50)				12.7371 (2.3145)***		
σ	236.8881 (3.0373)***	236.8247 (3.0371)***	236.8498 (3.0358)***	236.5661 (3.0517)***	235.8784 (1.6358)***	235.8585 (1.6358)***
Log likelihood	−168,409.3	−168,400.6	−168,404.4	−167,794.7	−339,601.1	−339,594.8
No. of observations	43,460	43,460	43,460	43,281	86,654	86,654

Notes: In columns (1) to (6), the marginal effects evaluated at mean of explanatory variables are presented, and, in columns (1) to (4), workers in the mining industry were dropped as none of them had taken PL (7 observations). The sample size is different in column (4) and (10) due to the availability of occupation share. In all models, individual characteristics, firm size effects, province effects, month effects and industry effects are controlled. The numbers in parenthesis are the standard errors with the correlation among those observations in the same municipality allowed (clustering). * $p<0.10$; ** $p<0.05$; *** $p<0.01$.

One limitation of the occupation share is that it reflects the market condition regarding only the employees. Another is that the information on occupation was recorded at the beginning of the current job spell in the NEI system. Hence the occupation would be imprecise if a worker was promoted, for example, from clerical support position to managerial position at the current firm.

Another issue is that the final sample do not represent the whole nation because metropolitan areas are not included. The same model is now estimated for the whole sample with unemployment rate at province level for metropolitan area. Column (5) in table 3 shows that the effect of childcare center enrollment rate on PL take-up is still positive but not statistically significant when it is controlled alone. In column (6) where both variables are included as explanatory variables, the effect of availability of childcare services is similar to that in column (5), while the effect of unemployment rate is positive and significant just as in column (1). The effects on duration of PL in columns (11) and (12) are found to be similar to those on PL take-up. Hence it is found that the positive effect of childcare center enrollment rate on PL utilization is limited to non-metropolitan areas. One reason may be that people go to daycare centers in other municipality more easily in large cities than in provinces. Or the alternative childcare arrangement including hiring nannies is available more in large cities than in provinces. If we assume that the labor market in metropolitan areas is integrated as one, i.e., that unemployment rate at province level is a valid measure, it is possible to interpret the result as implying that the effect of unemployment rate is present for the whole country.

5. CONCLUSION

PL legislation is one of the major instruments of Korea's national policy promoting work-family balance among working parents. As the legislation was strengthened in stages over a decade both in terms of the cash benefit

during the leave and maximum effective length of duration, more female employees took up the leave and for a longer duration. Focusing on the role of social infrastructure, the paper addressed to what extent the access to child care service and the availability of substitute workers contribute to the effective entitlement to PL.

According to the analysis based on micro data of NEI, it is estimated that 10%p increase in the availability of local childcare facilities raises the take-up of PL by 1%p and its duration by five days. It is also found that 1%p rise in the female unemployment rate increases the take-up by 0.2%p and its duration by one day. These results are consistent with the hypothesis that the access to child care service and the entitlement to PL are complementary to each other and that the availability of substitute workers promotes utilization of leave. The magnitude of the effects does not seem to be trivial compared to the estimated effects of cash benefit in other studies. Other sources of the disparity in PL usage across areas are to explored in the future research.

The findings generate a few implications. First, given that there exists a substantial disparity in its utilization, a priority in family policy should be given to ensuring the effective entitlement to PL rather than to extending the maximum duration or increasing the cash benefit. Second, there is a large room for government to mitigate the disparity in PL legislation by providing public child care centers in less developed regions. Third, while the Korean government currently runs a bank of substitute workers, it does not seem to fully meet the demand. A better-managed network and job-training opportunities for job-seekers would enhance the matching process in the labor market. Fourth, a more concerted effort should be undertaken to scale up the coverage of NEI as one third of female employees are still not enrolled by NEI as of 2017. This should include a careful approach to embracing the non-regular workers under NEI as Keum and Yi (2013) suggest. Lastly, but not the least, the policies designed to reduce the disparity in general working condition between large firms and SMEs would contribute to equality in work-life balance across firms.

REFERENCES

Baker, Michael and Kevin Milligan, "How does Job-Protected Maternity Leave Affect Mothers' Employment?," *Journal of Labor Economics*, 26(4), 2008, pp. 655-691.

_____, "Maternity Leave and Children's Cognitive and Behavioral Development," *Journal of Population Economics*, 28(2), 2015, pp. 373-391.

Baum, Charles L. and Christopher J. Ruhm, "The Effects of Paid Family Leave in California on Labor Market Outcomes," *Journal of Policy Analysis and Management*, 35(2), 2016, pp. 333-356.

Blau, Francine D. and Lawrence M. Kahn, "The Gender Wage Gap: Extent, Trends, and Explanations," *Journal of Economic Literature*, 55(3), 2017, pp. 789-865.

Carneiro, Pedro, Katrine V. Løken, and Kjell G. Salvanes, "A Flying Start? Maternity Leave Benefits and Long-Run Outcomes of Children," *Journal of Political Economy*, 123(2), 2015, pp. 365-412.

Dahl, Gordon B., Katrine V. Løken, Magne Mogstad, and Kari Vea Salvanes, "What is the Case for Paid Maternity Leave?," *Review of Economics and Statistics*, 98(4), 2016, pp. 655-670.

Danzer, Natalia and Victor Lavy, "Paid Parental Leave and Children's Schooling Outcomes," *The Economic Journal*, 128(608), 2018, pp. 81-117.

Dustmann, Christian and Uta Schönberg, "Expansions in Maternity Leave Coverage and Children's Long-Term Outcomes," *American Economic Journal: Applied Economics*, 4(3), 2012, pp. 190-224.

Frijters, Paul and Bas van der Klaauw, "Job Search with Nonparticipation," *The Economic Journal*, 116(508), 2006, pp. 45-83.

Goodman, Alissa and Barbara Sianesi, "Early Education and Children's Outcomes: How Long do the Impacts Last?," *Fiscal Studies*, 26(4), 2005, pp. 513-548.

Görlich, Dennis and Andries De Grip, "Human Capital Depreciation during

Hometime," *Oxford Economic Papers*, 61(suppl_1), 2009, pp. i98-i121.

Heckman, James J., "Policies to Foster Human Capital," *Research in Economics*, 54(1), 2000, pp. 3-56.

Hong, Sok Chul, Jungmin Lee, Nary Shin, Young-Il Kim, Jungho Kim, Bookyung Cho, and Yoo-Jean Song, *In-depth Evaluation on Policies for Promoting Marriage, Childbirth, and Childcare*, Seoul, Korea: Korea Development Institute, 2012 (in Korean).

Keum, Jaeho and Insill Yi, "What Do We Know about Non-regular Workers in Korea?," *Korea and the World Economy*, 14(2), 2013, pp. 381-415.

Kim, Jungho, "Parental Leave and Female Labor Supply in Korea," *KDI Journal of Economic Policy*, 34(1), 2012, pp. 169-197 (in Korean).

_____, "Childcare Center at Workplace and Women's Employment," *Quarterly Journal of Labor Policy*, 13(2), 2013, pp. 127-154 (in Korean).

_____, "Duration of Parental Leave and Women's Employment," IZA Discussion Paper No. 11383, 2018.

Kim, Young-ok, Seunghyun Lee, and Seonhang Lee, *Current Status on Work-Life Balance*, Sejong, Korea: Department of Employment and Labor, 2016 (in Korean).

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(3), 2013, pp. 983-1005.

Lalive, Rafael, Analía Schlosser, Andreas Steinhauer, and Josef Zweimüller, "Parental Leave and Mothers' Careers: The Relative Importance of Job Protection and Cash Benefits," *Review of Economic Studies*, 81(1), 2014, pp. 219-265.

Lalive, Rafael and Josef Zweimüller, "How does Parental Leave Affect Fertility and Return to Work? Evidence from Two Natural Experiments," *The Quarterly Journal of Economics*, 124(3), 2009, pp. 1363-1402.

Liu, Qian and Oskar Nordstrom Skans, "The Duration of Paid Parental Leave and Children's Scholastic Performance," *The BE Journal of Economic Analysis & Policy*, 10(1), 2010, doi:10.2202/1935-1682.2329.

Maddala, Gangadharrao S., *Limited-Dependent and Qualitative Variables in Econometrics*, Cambridge, UK: Cambridge University Press, 1983.

Mincer, Jacob and Haim Ofek, "Interrupted Work Careers: Depreciation and Restoration of Human Capital," *Journal of Human Resources*, 17(1), 1982, pp. 3-24.

Rasmussen, Astrid Würtz, "Increasing the Length of Parents' Birth-Related Leave: The Effect on Children's Long-Term Educational Outcomes," *Labour Economics*, 17(1), 2010, pp. 91-100.

Rossin, Maya, "The Effects of Maternity Leave on Children's Birth and Infant Health Outcomes in the United States," *Journal of Health Economics*, 30(2), 2011, pp. 221-239.

Rossin-Slater, Maya, "Maternity and Family Leave Policy," in Susan L. Averett, Laura M. Argys, and Saul D. Hoffman, ed., *The Oxford Handbook of Women and the Economy*, Oxford, UK: Oxford University Press, 2017.

Rossin-Slater, Maya, Christopher J. Ruhm, and Jane Waldfogel, "The Effects of California's Paid Family Leave Program on Mothers' leave-taking and Subsequent Labor Market Outcomes," *Journal of Policy Analysis and Management*, 32(2), 2013, pp. 224-245.

Sa, Myung-cheol, "The Change of Occupational Segregation by Gender: Focus on Trend and Decomposition," *Quarterly Journal of Labor Policy*, 15(4), 2015, pp. 1-24 (in Korean).

Schönberg, Uta and Johannes Ludsteck, "Expansions in Maternity Leave Coverage and Mothers' Labor Market Outcomes After Childbirth," *Journal of Labor Economics*, 32(3), 2014, pp. 469-505.

Stearns, Jenna, "The Effects of Paid Maternity Leave: Evidence from Temporary Disability Insurance," *Journal of Health Economics*, 43, 2015, pp. 85-102.

Yoon, Ja Young and Minki Hong, "Effects of the Paid Maternity Leave Policy

on Female Employment," *Quarterly Journal of Labor Policy*, 14(4), 2014, pp. 31-57 (in Korean).