

Effects of Paternity Leave Take-up Rate in Fathers' Industry of Work on Mothers' Employment and Health

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Despite the ongoing development of the system of parental leave and the improvement of the childcare environment, why do many women drop out of the labor force after birth giving? One possible reason is the reality that fathers' involvement in childcare has not made headway, leaving most of the burden of childcare to mothers. While mothers are expected to be encouraged to continue working by their spouses' (fathers') proactive involvement in childcare, the influencing factors of mothers' employment include not only the spouses' intentions and wishes but also whether or not the environment to which the father is exposed is favorable for taking paternity leave. Efforts are underway to improve the employment environment so that both mothers and fathers can care for children while continuing to work. Are those efforts actually effective in encouraging mothers to continue working? This paper, using a fixed-effects model and focusing on the average paternity leave take-up rate in fathers' industry of work, examines the effects of fathers' working environment on mothers' employment. Our analysis found that the paternity leave take-up rate in fathers' industry of work has the effect of increasing mothers' employment. It should be noted that, the possibility remains that the strength of this effect may be limited. We also found that the effect has heterogeneity depending on the age of the couple's child (children)—the effect is stronger in the case of couples with a child (children) of pre-elementary school age than in the case of couples whose youngest child is of elementary school age or older. One possible reason for this is that fathers may be encouraged to be involved in childcare when there are more persons around them who take paternity leave. Indeed, we found that a rise in the paternity leave take-up rate in fathers' industry of work leads to a significant increase in their childcare involvement probability, although the strength of the effect is limited. On the other hand, when we examined the effect of a rise in the paternity leave take-up rate in the fathers' industry of work on the mother in aspects other than employment, robust effects were not observed with respect to the mother's health outcomes.

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I. Introduction

As resolving gender inequalities in the labor market is an important theme that has drawn strong interest in recent years, efforts have been underway to develop employment and childcare environments favorable for women to care for children while continuing to work after birth giving. As will be explained in Section II, the system of parental leave in Japan has become well-developed and are held in high regard internationally. Moreover, the number of “children on the waiting list for nurseries” due to capacity shortages, has been on a downtrend, dropping to the lowest level on record in 2020. The parental leave take-up rate for mothers in 2020, for example, was as high as 81.6% (Ministry of Health, Labour and Welfare, MHLW, 2020), apparently indicating that most mothers use parental leave. However, the parental leave take-up rate for mothers as defined in the survey is the percentage of “women who started to take parental leave” among “women who gave birth while continuing to work” during a certain period, which means that women who chose to discontinue working after becoming pregnant or giving birth are excluded from the calculation. As of 2010–2014, among women who were working before becoming pregnant, nearly half (46.9%) of them left the company after becoming pregnant for the first time or giving birth to their first child, according to the “National Fertility Survey (on Married Couples)” by the National Institute of Population and Social Security Research.

Despite the ongoing development of the system of parental leave and the improvement of the childcare environment, why do many women choose to discontinue working after birth giving? One possible reason is the reality that fathers’ involvement in childcare has not made headway, leaving most of the burden of childcare to mothers. In FY2020, the paternity leave take-up rate in Japan was as low, at 12.7% (MHLW 2020). Despite the presence of the well-developed system of parental leave, few fathers use them. While mothers are expected to be encouraged to continue working by fathers’ proactive involvement in childcare, the influencing factors of mothers’ employment include not only the spouses’ intentions and wishes to take leave but also whether or not the environment to which the father is exposed is favorable for taking paternity leave.

Although there is some accumulated body of research on the effects of taking paternity leave on mothers, there has until now been no firm consensus on the effects. Dunatchik and Özcan (2021), Farré and González (2019), and Patnaik (2019), using data obtained in the United States and Europe, show that reforming the paternity leave system increases mothers’ employment. There are also studies, using data obtained in Northern Europe, showing that reforming the paternity leave system narrows the wage inequality within married couples (such as Andersen 2018; Druedahl, Ejrnæs, and Jørgensen 2019). On the other hand, other studies, also using data obtained in Northern Europe, find that reforming the paternity leave system does not have effects on mothers’ employment or income (such as Cools, Fiva, and Kirkeboen 2015; Ekberg, Eriksson, and Friebe 2013). In other words, it is not self-evident whether or how the paternity leave affects mothers’ employment or income. Among previous studies using Japanese data, some show that the availability of paternity leave, shorter working hours, and a flexible work arrangement in fathers’ workplaces increase their childcare involvement rate (Ishii-Kuntz 2013). Meanwhile, Kobayashi and Usui (2017), using the “2011 Internet Survey on Life and Work (LOSEF 2011)” (Institute of Economic Research, Hitotsubashi University), analyzes fathers’ and mothers’ work arrangements and the situation of breastfeeding. It shows that when fathers work under the flexible work system or similar arrangements, breastfeeding is encouraged, pointing out that one factor behind that is an increase in the husband-wife sharing of the burdens of housework and childcare.

As described above, the ease of taking paternity leave in fathers’ workplaces is expected to have a positive effect on mothers by encouraging fathers’ involvement in childcare. However, as there have been few studies that analyze the effects of paternity leave on mothers, there has not been a firm consensus.¹ This paper examines whether the ease of taking paternity leave in fathers’ workplace affects mothers’ employment. Specifically, the ease of taking paternity leave in fathers’ workplace is captured in terms of the average paternity leave take-up

rate in their industry of work, and the effects of this factor on mothers' employment are identified using a fixed-effect model.

Many previous studies focusing on the effects of the system of parental leave treated the situation of employment as an outcome because the system is intended to help reconcile work with childcare. However, the deterioration of mothers' health during the period of birth giving and childcare also generates gender inequalities in the labor market. In particular, mothers' mental health has become a serious issue in Japan. For example, it has been shown that the probability of a mother's contracting depression one month after birth giving (postpartum depression) is 14.3% in Japan (Tokumitsu et al. 2020). Previous studies have shown that factors such as poor matrimonial relationship, stressful incidents, including the death of a close relative, low academic achievement, an income decline, and the loss of a job increase the probability of contracting postpartum depression (such as Nguyen et al. 2021; Wesselhoeft et al. 2020). When considering paternity leave's effects on whether mothers continue working after birth giving, it is important to look into whether it has positive effects not only on mothers' employment situation but also on their health. Therefore, this paper also analyzes whether the ease of taking paternity leave in fathers' workplace may be beneficial for mothers' health, including postpartum mental health.

Our analysis found that a rise in the paternity leave take-up rate in fathers' industry of work has the effect of increasing mothers' employment. It should be noted the possibility remains that the strength of this effect may be limited. The effect has heterogeneity depending on the age of the couple's child (children). The effect is stronger in the case of families with a child (children) under seven years old (pre-elementary school age) than in the case of families whose youngest child is of elementary school age or older. This paper also paid attention to changes in the degree of fathers' involvement in childcare as a pathway whereby the ease of taking paternity leave in fathers' workplace affects mothers' employment. Our analysis found that a rise in the paternity leave take-up rate in fathers' industry of work significantly increases the probability of fathers' involvement in childcare, although the strength of this effect is limited. On the other hand, when we examined the effects of the ease of taking paternity leave in fathers' workplaces on mothers' health, including mental health, robust effects were not observed.

This study highlights the following. First, the paper explores possible pathways whereby the ease of taking paternity leave in fathers' workplace affects mothers' employment and indicates the possibility that the degree of fathers' involvement in childcare may be a pathway. Specifically, four criteria—(1) whether the father changes the child's diapers and clothes; (2) whether the father comforts and plays with the child; (3) whether the father communicates with the mother about childcare; and (4) whether the mother feels an excessive burden regarding housework, childcare, and nursing care—are used to measure the degree of fathers' involvement in childcare. In particular, in the case of mothers with a pre-elementary school child (children), their spouses' involvement in childcare may affect the decision as to whether to continue working. Our research also looked into whether fathers are encouraged to be involved in childcare when the paternity leave take-up rate in their industry of work is high. Second, this paper also pays attention to mothers' health as an outcome.² In particular, it is of great significance to examine the effects on postpartum mental health, which has become an increasingly important issue. This paper evaluates mothers' mental health based on the Centre for Epidemiological Studies Depression (CES-D) scale, a major indicator of depression. Third, our analysis uses Japanese data. As previous studies mainly used data obtained in the United States and Europe, the accumulated body of research using data from elsewhere is sparse. While there is a well-developed system of parental leave in Japan, the traditional concept of gendered division of roles—that fathers work outside home while mothers concentrate on family matters—still remains entrenched. In addition, although the paternity leave take-up rate in Japan has been on an uptrend in recent years, it is still low compared with the rates in other developed countries. By using Japanese data to examine the effects of change in fathers' workplace environment on mothers, this paper can provide insights that

serve as the basis for considering measures necessary for Japan to increase mothers' employment and maintain their health.

This paper is structured as follows. Section II below provides an overview of the parental leave system in Japan. Section III presents our estimation model, and Section IV explains the data used in the analysis. Section V reports on the estimation results, and Section VI summarizes the research results and our interpretation thereof.

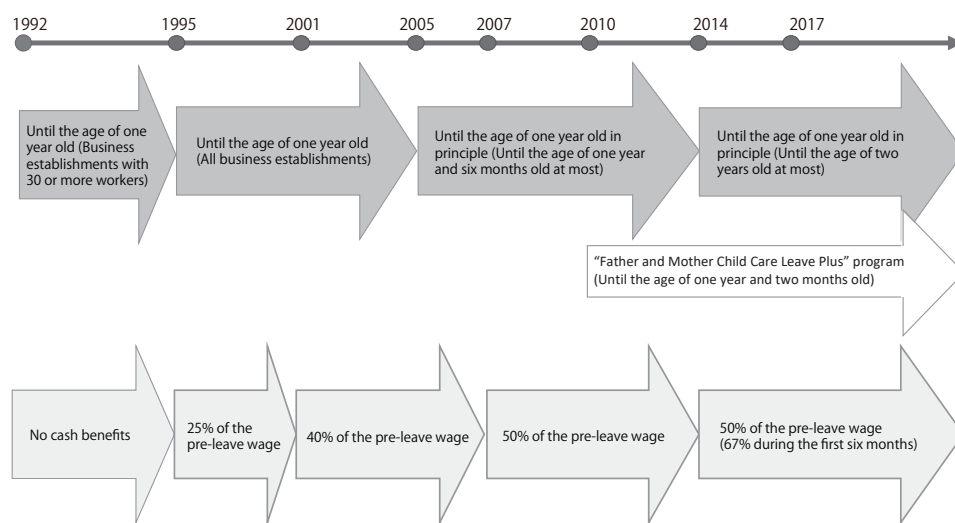
II. Changes in the Japanese system of parental leave

This section provides an overview of the history of the system of parental leave in Japan. Under the system of pre- and postpartum leave as defined by the Labor Standards Act, in order to protect the health of pregnant and postpartum mothers, working women who have become pregnant are entitled to up to 42 days of leave before giving birth and up to 56 days of leave thereafter. On the other hand, under the system of parental leave as defined by the Childcare and Nursing Care Leave Act, both men and women raising children under one year old are entitled to parental leave, respectively. Those who take parental leave are eligible to receive cash benefits during the leave period. The current amount of cash benefits is equivalent to 67% of the pre-leave wage during the first six months of the period and 50% during the remainder of the period for both men and women. During the leave period, leave takers are exempted from paying social security premiums.

It was in 1991 that the Act on Child Care Leave was enacted for the first time in response to the shrinkage of the population of children and a rapid decline in the fertility rate that came with the empowerment of women and the advance of the nuclear family trend. This law represented the first legal institutionalization of the granting of leave specifically intended to allow workers with a child (children), to temporarily discontinue working in order to care for children. More specifically, the law stipulated that when workers with children under one year old, regardless of whether they are fathers or mothers, have requested to take leave, employers cannot refuse the request in principle, nor can they dismiss the workers on account of their request for leave or their leave-taking. However, initially, the law did not provide for the payment of cash benefits, meaning that the leave was unpaid. Moreover, the law was applicable only to business establishments that employed 30 or more workers permanently, and there were many other challenges, such as the absence of an explicit provision to impose penalties against legal violations or to prohibit discriminatory treatment of workers taking parental leave. It was in 1995 that the legal provision for parental leave became applicable to all business establishments. In the same year, the payment of cash benefits equivalent to 25% of the pre-leave wage during the period of parental leave was introduced. Thereafter, through repeated legal amendments, the system of parental leave has undergone changes, including the extension of the leave period and the expansion of cash benefits payment. Figure 1 provides an overview of the changes in the period of parental leave and the amount of cash benefits.

One factor behind the repeated reforms of the system of parental leave has been the need to develop an employment environment favorable for both mothers and fathers to care for children while continuing to work as part of the effort to help them reconcile work with childcare amid the continuing shrinkage of the population of children. In particular, the legal amendment in 2010 provided for measures to encourage fathers to take paternity leave. For example, the program "Father and Mother Child Care Leave Plus" that was established in the same year, when fathers and mothers both take childcare leave, allows parents to extend the leave period to the day when the child turns one year and two months old. The "Daddy Leave," another leave program established around that time, allows fathers who took paternity leave within eight weeks from their spouses' birth giving to take it again at a later time.³ Yet another reform was the abolition of employers' right to refuse requests for parental leave from mothers and fathers when their spouses were full-time housewives/househusbands. In modern Japan, where double-income families account for the majority of working families, those reforms were intended to realize working arrangements to enable both fathers and mothers to be involved in raising children

by preventing the concentration of the burden of childcare on mothers. While the system of parental leave has been further developed, how has the actual situation of the parental leave take-up rate changed? According to the “Basic Survey of Gender Equality in Employment Management,” there is a significant difference in the situation of the parental leave take-up rate between men and women (Figure 2). Women’s parental leave take-up rate gradually increased in the second half of the 1990s through the first half of the 2000s, and it has stayed at a high level, above 80%, since 2007. Meanwhile, men’s paternity leave take-up rate stayed below 2% until 2010 and was still lower than 3% in 2015. In the past five years or so, the paternity leave take-up rate has been on an uptrend, rising to a record high of 12.7% in 2020, but it is still short of the government’s target of 13%. Of the fathers who took paternity leave, around 80% took less than one month of leave, and the percentage of those who took less than five days of leave was as high as 36.3% (MHLW 2018). In addition to the low leave-taking rate,

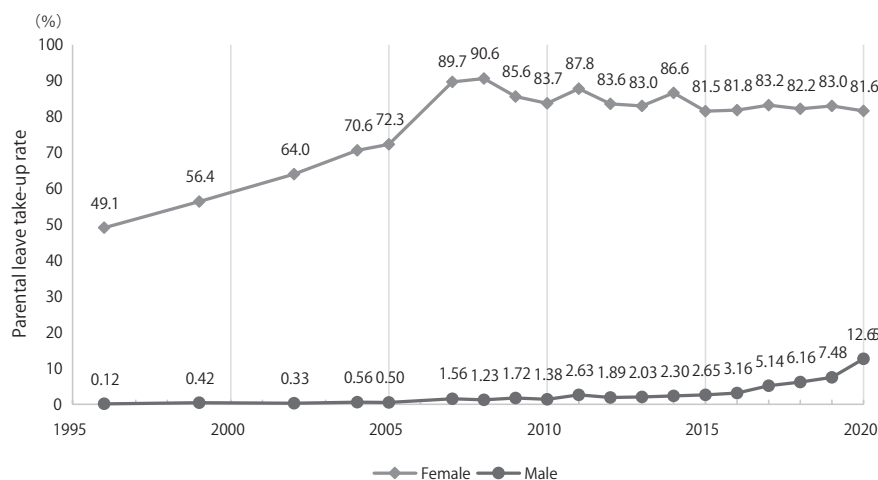


Source: Created by authors.

Notes: 1. The figure shows the changes by 2021.

2. For the outline of the system, see <https://www.mhlw.go.jp/english/policy/children/work-family/dl/190410-01e.pdf>.

Figure 1. Changes in the parental leave system



Source: Created by authors based on the “Basic Survey of Gender Equality in Employment Management” (MHLW).

Figure 2. Changes in parental leave take-up rate by gender

the short duration of the leave taken is also a challenge.

III. Estimation model

This paper analyzes the effects of the paternity leave take-up rate in fathers' industry of work on mothers' decision as to whether to continue working and on their health. More specifically, estimation is conducted

$$y_{it}^k = \beta \text{Childcare leave rate}_t^k + X'_{it}\gamma + I_i + I_k + I_t + u_{it}^k$$

through the following formula based on a fixed-effects model.

The meanings of the symbols in the above formula are as follows: y_{it}^k = the employment probability and health conditions of the mother in the married couple i in which the father works in the industry k in the year t ; $\text{Childcare leave rate}_t^k$ = the paternity leave take-up rate in the fathers' industry of work (industry k) in the year t ; X'_{it} = other control variables; I_i = individual-specific effects; I_k = industry dummy; I_t = year dummy; u_{it}^k = error term.

Using a fixed-effects model and adopting the fixed effects and industry-specific trends as explanatory variables make it possible to identify the effects of change in the paternity leave take-up rate after removing time-invariant factors, such as the married couple's willingness to work and attitude toward gendered division of roles and controlling for the average difficulty of taking paternity leave that is determined by the level of the technology dealt in fathers' industry of work and the trends in its change over time. In addition, in order to verify the robustness of this model, we conduct estimations regarding the following three cases: a case where industry-specific trends are not controlled; a case where clustering is conducted on an industry-by-industry basis; and a case where prefecture-specific effects are controlled.

When a change in the paternity leave take-up rate is caused by factors that are not exogenous, the above estimations become biased. For example, it is very possible that a father changes jobs because of the birth of a first child. It is also likely that a father moves from one industry to another where he can take leave easily because of the deterioration of his spouse's health conditions. In cases like those, the change in the paternity leave take-up rate is affected by dependent variables. Therefore, our research verifies the robustness of the model by also conducting an estimation using a sample group limited to those who continued to engage in the same job.

As mentioned earlier, while Japan's system of parental leave is well-developed, the paternity leave take-up rate is low. The presence of a well-developed leave system is no guarantee for a high leave-taking rate. One of the important points of our analysis is that the key variable is not fathers' eligibility criteria regarding paternity leave or the situation of leave-taking by individuals but the paternity leave take-up rate in each father's industry of work. According to the data used for the analysis, in Japan, it is rare for fathers to take paternity leave. The median duration of the period of paternity leave taken is five days, with only around 10% taking 20 days or more of leave. This is an extremely short duration given that the median duration of leave taken by mothers is 10 months. It is possible that many fathers used ordinary paid leave for the purpose of childcare instead of taking paternity leave. It is also possible that instead of taking leave, fathers secured time for childcare by changing working arrangements, such as using staggered working hours and increasing hours worked at home. Our analysis shed light on how mothers are affected by a change in the paternity leave take-up rate in their spouses' industry of work, including cases where the father himself did not take paternity leave. The situation of paternity leave-taking in fathers' industry of work cannot be viewed to exactly represent the working environment faced by the individual fathers. Even so, a rise in the paternity leave take-up rate in each father's industry of work does not merely mean an increase in the leave-taking rate among a limited group of men entitled to paternity leave but also may affect a wide segment of workers in the same industry by improving the efficiency of work processes, by promoting changes in workplace practices, such as the reduction of after-hours drinking parties and holiday

company events, and by changing workers' attitude toward childcare.

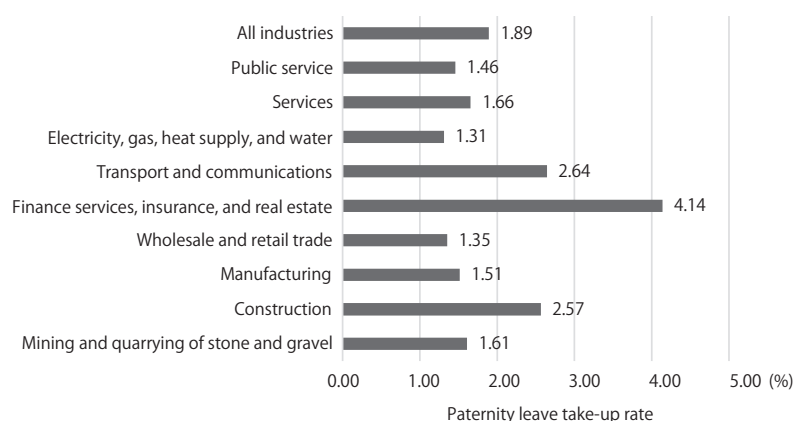
IV. Overview of data

This paper uses individual data from the “Japanese Panel Survey of Consumers” of Keio University’s Panel Data Research Center, more specifically data from the 2008 to 2017 versions of this survey, which contain necessary datasets. The survey was first conducted in 1993 by the former Institute for Research on Household Economics, covering women aged 24 to 34. Since then, the survey has been annually conducted, with new cohorts added to the sample group every five years. This survey is distinctive for its large number of questions related to women and families, so we can obtain information not only on women’s employment status and health conditions but also on their children’s age and their spouses’ employment situation and involvement in childcare.

The key dependent variable is mothers’ employment probability. The mothers’ employment probability is represented by a dummy variable that takes the value 1 when the mother is working and the value 0 when the mother is a student, full-time housewife, or otherwise non-working person. The key explanatory variable is the paternity leave take-up rate in spouses’ (fathers’) industry of work, which is calculated by dividing by 100 the percentage of fathers whose spouses gave birth and who took paternity leave (the paternity leave take-up rate) based on data obtained from “the Basic Survey of Gender Equality in Employment Management.” As a result, this variable takes values between 0 and 1.⁴ It should be noted that the paternity leave take-up rate among public servants used here is a figure obtained from Ministry of Internal Affairs and Communications (MIAC, 2022) because “the Basic Survey of Gender Equality in Employment Management” does not cover the public servant category. “The Survey on Working Conditions at Local Governments” does not contain information regarding national government employees, but regarding the paternity leave take-up rate among public services that is used for our analysis, we adopt information obtained from this survey as a substitute because the “Japanese Panel Survey of Consumers” does not distinguish between national and local government employees.

Figure 3 shows the paternity leave take-up rate by industry in the years of survey (from 2008 to 2017) under analysis. While the average leave-taking rate across all industries is 1.9%, the rate varies significantly from industry to industry. For example, the leave-taking rate in the finance services, insurance, and real estate industries is three times as high as the rate in the electricity, gas, heat supply, and water industries. The industry-wise differences in the leave-taking rate are presumably attributable to factors such as differences in the workplace culture, employment arrangement, and the male-female ratio. Among the factors that may increase the paternity leave take-up rate are the promotion of flexible working arrangements, such as a discretionary work system, encouragement given for taking paternity leave in pursuit of diversity-driven business management, and an increase in the employment of regular workers, for whom taking paternity leave is easier than for non-regular workers. However, it should be kept in mind that the trends in the industry-specific rates of taking parental leave are different between mothers and fathers. For example, in some industries, the leave-taking rate is low among fathers but is high among mothers. Among other explanatory variables used in our analysis are mothers’ age, the number of children, and fathers’ monthly salary. For the purpose of controlling the effects of fathers’ industry of work and year, an industry dummy, a year dummy, and an industry-specific trend are used.

This paper also focuses on the presence or absence of fathers’ involvement in childcare as a pathway whereby an increase in the taking of paternity leave in fathers’ industry of work affect mothers’ decision to continue working. Specifically, four criteria—(1) whether the father changes the child’s diapers and clothes; (2) whether the father comforts and plays with the child; (3) whether the father communicates with the mother about childcare; and (4) whether the mother feels an excessive burden regarding housework, childcare, and nursing care—are used to develop dummy variables regarding the degree of fathers’ involvement in childcare, each of which takes the value 1 when the criterion is met.



Source: Created by the authors based on “Japanese Panel Survey of Consumers” (Keio University, Panel Data Research Center).

Figure 3. Paternity leave take-up rate by industry

As for the effects in aspects other than work, we also analyze the effects on mothers’ health outcomes. More specifically, we pay attention to mental health and subjective health outcomes. Data concerning the following items of the abbreviated 12-item version of the CES-D scale, known as measures of depression, are used as indicators of mental health: “I was bothered by things that usually don’t bother me”; “I felt that I could not shake off the blues even with help from my family or friends”; “I felt depressed”; “I had trouble keeping my mind on what I was doing”; “I did not feel like eating; my appetite was poor”; “I felt that everything I did was an effort”; “I felt fearful”; “My sleep was restless”; “I talked less than usual”; “I felt lonely”; “I enjoyed life”; and “I felt sad.” Samples were asked how many times they experienced each of the abovementioned feelings during a one-week period, and points were awarded as follows in accordance with the answers given: none = 0 points; once or twice = 1 point; three or four times = 2 points; almost every day = 3 points. The total sum of the values awarded for the 12 items is calculated, with the full-mark value at 36. However, regarding the item “I enjoyed life,” the awarding of points was reversed—when the answer was “never,” for example, 3 points were awarded. For the analysis regarding mental health, in addition to the total sum of points awarded, the total sum of points awarded expressed as a z-score⁵ is also used. In some cases, a cut-off score, such as 16 points, is used under the CES-D scale. However, regarding the abbreviated 12-item version of the CES-D scale used in our analysis, there is not a widely used cut-off score, so there is not a firm measure to evaluate mental health. Therefore, in addition to the total sum of points awarded and a z-score, we pay attention to the relative weakness of mental health and adopt two dummy variables—one that takes the value 1 when the sample is among the top 10% in terms of mental health weakness, and the other that takes the value of 1 when the sample is among the top 20%. By using four different measures of mental health, we verify whether the results obtained are robust.

As for the subjective health outcomes, we identified the weakness of health by asking the question “Usually, what is your state of health?” and using a dummy variable that takes the value 1 when the answer is “Not very good,” or “Not good at all” and the value 0 when the answer is “Very good,” “More or less good,” or “Neither good nor bad.” It should be kept in mind that the samples who provided data used in this paper are mothers and that the measures used here are based on mothers’ own perceptions. Descriptive statistics of the key variables above are shown in Table 1.

Table 1. Descriptive statistics

	Number of observations	Average	Standard deviation	Minimum	Maximum
Dependent variables:					
Employment dummy	9,615	0.583	0.493	0	1
Total sum of points awarded regarding mental health	7,359	6.323	5.144	0	36
Z-score regarding mental health	7,359	0	0.999	-1.301	5.882
Among the top 10 in terms of mental health weakness	7,359	0.112	0.316	0	1
Among the top 20 in terms of mental health weakness	7,359	0.209	0.406	0	1
Dummy for subjective mental health weakness	9,599	0.114	0.318	0	1
Independent variables:					
Paternity leave take-up rate by industry	9,615	0.021	0.022	0	0.158
Mother's age	9,615	38.648	6.150	26	56
Number of children	9,615	2.026	0.750	1	5
Father's monthly income	9,615	37.462	17.460	0	720
Father's involvement in childcare:					
Change of diapers/clothes	2,611	0.567	0.496	0	1
Playing with children	2,611	0.714	0.452	0	1
Communication	2,611	0.843	0.364	0	1
Sense of burden	2,226	0.413	0.492	0	1

Note: Regarding paternal involvement in childcare, the sample group is limited to couples whose youngest child is under seven years old.

V. Estimation results

First, the results of the analysis of the effects of change in the paternity leave take-up rate in fathers' industry of work on mothers' employment based on a fixed-effects model will be explained below. The estimation results are shown in Table 2. According to the estimation results in (1), a rise in the paternity leave take-up rate in fathers' industry of work leads to an increase in mothers' employment, at a significance level of 5%. Given that the paternity leave take-up rate used as the explanatory variable is a figure obtained by dividing by 100 the paternity leave take-up rate expressed in percentage terms, the co-efficient means that a rise of 1 percentage point in the paternity leave take-up rate in fathers' industry of work leads to an increase of 0.5 percentage point in mothers' employment probability. In short, mothers are more likely to continue working if their spouses work in an industry where more fathers take paternity leave. It should be noted that the strength of this effect is limited. This finding was obtained after controlling for the fixed effects of married couple, fathers' industry of work, and year, the trends specific to fathers' industry of work and the observable characteristics of mothers and families.

Next, Table 3 shows the summary of the results of an additional estimation conducted to verify the robustness of the obtained results shown in Table 2 (1). (1) shows once again the main results obtained using the basic model that were shown in Table 2. Under the basic model, it is assumed that changes that identify β are attributable not only to differences in the paternity leave take-up rate across industries but also to differences in industry-specific trends. (2) shows the results of an estimation conducted after excluding industry-specific trends in order to verify whether the results vary depending on the presence or absence of industry-specific trends. The analysis found that the main results are not affected by the presence or absence of industry-specific trends. In addition, as the

Table 2. Effects of the changes in paternity leave take-up rate in fathers' industry of work on mothers' employment probability

	Dependent variable: employment probability		
	(1) All samples (mothers)	(2) Samples whose youngest child is seven years old (elementary school age) or older	(3) Samples whose youngest child is under seven years old
Paternity leave take-up rate	0.501** (0.246)	-0.057 (0.269)	0.735* (0.397)
Mother's age	0.023*** (0.008)	-0.117* (0.009)	0.072*** (0.013)
Number of children	-0.084*** (0.016)	0.018 (0.035)	-0.262*** (0.023)
Father's monthly income	-0.001* (0.000)	-0.000 (0.000)	-0.001*** (0.000)
Constant term	474.022 (330.080)	1.988*** (0.425)	435.026* (233.753)
Average value of the dependent variable	0.583	0.703	0.454
Standard deviation of the dependent variable	0.493	0.457	0.498
Coefficient of determination	0.096	0.039	0.156
Observations	9,615	4,991	4,624
Number of id	1,534	952	1,037

Notes: 1. The marks ***, **, and * indicate the presence of significant effects at levels of 1%, 5%, and 10%, respectively.
2. The figures in parentheses represent robust standard errors even when there is heteroscedasticity.
3. All estimations were controlled for the dummy for the fathers' industry of work, industry-specific trends, and the year dummy.

Table 3. Verification of robustness of the results

	Dependent variable: employment probability				
	(1) Main results	(2) Without industry-specific trends	(3) Industry-by-industry clustering	(4) Controlled for prefecture-specific effects	(5) Excluding fathers who changed jobs
Paternity leave take-up rate	0.501** (0.246)	0.452* (0.251)	0.501 (0.277)	0.465* (0.243)	0.597* (0.309)
Mother's age	0.023*** (0.008)	0.034*** (0.002)	0.000 (0.000)	0.022*** (0.008)	0.019** (0.009)
Number of children	-0.084*** (0.016)	-0.086*** (0.017)	-0.084** (0.026)	-0.083*** (0.017)	-0.073*** (0.019)
Father's monthly income	-0.001** (0.000)	-0.001** (0.000)	-0.001 (0.001)	-0.001* (0.000)	-0.001 (0.000)
Constant term	474.022 (330.080)	-0.645*** (0.249)	474.855*** (95.586)	472.253 (330.595)	99.746*** (35.553)
Coefficient of determination	0.096	0.093	0.666	0.104	0.087
Observations	9,615	9,615	9,436	9,605	7,008
Number of id	1,534	1,534		1,533	1,224

Notes: 1. The marks ***, **, and * indicate the presence of significant effects at significance levels of 1%, 5%, and 10%, respectively.
2. The figures in parentheses represent robust standard errors even when there is heteroscedasticity.
3. The estimations in (1), (3), and (5) were controlled for the dummy for the Fathers' industry of work, industry-specific trends, and the year dummy.
4. The estimation in (2) was controlled for the dummy for the fathers' industry of work and the year dummy.
5. The estimation in (4) was controlled for the dummy for the fathers' industry of work, industry-specific trends, the year dummy, and the prefecture dummy.

basic model focused on the paternity leave take-up rate in fathers' industry of work, we also conducted an estimation based on the clustering of standard errors in fathers' industry of work. According to the analysis results, shown in (3), the effects on mothers' employment are significant, despite being somewhat smaller than under the basic model, at a significance level of 11%, with the sign and value of the coefficient remaining unchanged. (4) shows the results of an estimation conducted after controlling for prefecture-specific effects. The paternity leave take-up rate used in this paper is the national average—which means that differences across prefectures are unobservable—so prefecture-specific effects were not adopted as a variable in the basic model. (4) indicates that the presence or absence of prefecture-specific effects do not significantly affect the estimation results.

Finally, Table 3 shows the results of an estimation conducted after excluding fathers who changed jobs during the analysis period in order to verify the robustness of the obtained results. The exclusion of those fathers eliminates the possibility of a change in the paternity leave take-up rate being caused by fathers' choice to move to a company where the paternity leave take-up rate is higher in pursuit of a working environment better suited to reconcile childcare with work. The analysis found that the main results regarding the effects on mothers' employment remain unchanged when the estimation is limited to fathers who did not change jobs. If the main results shown in Table 2 (1) reflect additional effects from fathers' moving to a company with a higher paternity leave-taking rate, the coefficient regarding the paternity leave take-up rate is expected to become smaller under the estimation that excludes fathers who changed jobs. However, the coefficient indicated in Table 3 (5) is not smaller, so it can be said that a rise in the paternity leave take-up rate has a positive effect on mothers' decision to continue working regardless of whether or not their spouses changed jobs.

From the abovementioned estimation results, it is presumed that change in the paternity leave take-up rate in fathers' industry of work may have a positive effect, albeit a limited one, on mothers' employment and that the effect is expected to have heterogeneity depending on the age of their children. Table 2 shows the results of re-estimating the model using subsamples by age of their children. (2) shows the estimation results regarding a sample group of couples whose youngest child was seven years old or older, that is, whose youngest child was of elementary school age or older, while (3) shows the estimation results regarding a sample group of couples whose youngest child is under seven years old.

The estimation results indicate that the effects of changes in the paternity leave take-up rate in fathers' industry of work on mothers' employment are stronger in the sample group of mothers whose youngest child was under seven years old than in the sample group of mothers whose youngest child was seven years old or older and the significance is also higher in the former group. This means that the effects of the paternity leave take-up rate in fathers' industry of work on mothers' employment have heterogeneity depending on the age of the youngest child. It has a relatively large effect on mothers whose youngest child was of pre-elementary school age compared to mothers whose youngest child was of elementary school age or older. This finding is consistent with intuition given that younger child (children) require a higher burden of childcare.

The analysis results in Table 2 indicate that a rise in the paternity leave take-up rate in fathers' industry of work leads to an increase in mothers' employment, although the strength of this positive effect is limited, and also that the effect is stronger in the case of mothers whose youngest child was of pre-elementary school age than in the case of mothers whose youngest child was of elementary school-age or older. What are possible pathways whereby change in the paternity leave take-up rate in fathers' industry of work affects mothers? One possibility is that an increase in workplace colleagues who take paternity leave may lead to change in the degree of fathers' involvement in childcare. If fathers become more involved in childcare, thereby reducing the burden of childcare on mothers, mothers may be encouraged to continue working. Here, we use information on mothers' perception as to whether their spouses are involved in childcare as an indicator of the degree of fathers' involvement in childcare in order to analyze the effects of change in the paternity leave take-up rate in fathers' industry of work

on the degree of fathers' involvement in childcare.

The estimation results are shown in Table 4. The estimation results in (1) indicate that a rise in the paternity leave take-up rate in fathers' industry of work increases their probability of taking on the task of changing children's diapers and clothes at a significance level of 5%. A rise of 1 percentage point in the paternity leave take-up rate in fathers' industry of work leads to an increase of 1.17 percentage points in their probability of taking on the task of changing children's diapers and clothes. According to the estimation results in (2), no effect on fathers' probability of comforting and playing with children can be observed at least at a significance level of 10%. According to the estimation results in (3), the coefficient on the fathers' probability of communicating with mothers about childcare are significant at a significance level of 1% and a rise of 1 percentage point in the paternity leave take-up rate in fathers' industry of work leads to an increase of 1.15 percentage points in their probability of communicating with mothers about childcare. According to the estimation results in (4), the coefficient on the mothers' probability of feeling an excessive burden is negative but insignificant at least at a significance level of 10%. Although the burden felt by mothers tends to decline, significant effects cannot be observed.

The above findings indicate that regarding at least some of the criteria used in the analysis, change in the paternity leave take-up rate in fathers' industry of work has effects on their involvement in childcare. Therefore, it is presumable that change in the paternity leave take-up rate in fathers' industry of work affects mothers' employment by leading at least mothers to have the perception that their spouses are involved in childcare, such as changing children's diapers and clothes or communicating with them about childcare.⁶ It should be noted that the strength of those effects is limited. On the other hand, we also conducted an estimation incorporating fathers' involvement in childcare into the basic model. The estimation results indicate that, even after controlling for fathers' involvement in childcare, which is considered to be important for mothers' decision as to whether to continue working, a rise in the paternity leave take-up rate in fathers' industry of work leads to a significant increase in mothers' employment (see Supplementary Table). It cannot be said that the degree of fathers'

Table 4. Effects of the changes in paternity leave take-up rate in fathers' industry of work on fathers' involvement in childcare

	(1) Change of diapers/ clothes	(2) Playing with children	(3) Communication	(4) Sense of burden
Paternity leave take-up rate	1.171** (0.585)	-0.263 (0.577)	1.147*** (0.442)	-1.372 (0.869)
Mother's age	-0.125*** (0.018)	-0.079*** (0.022)	-0.024 (0.016)	0.030 (0.024)
Number of children	0.362*** (0.029)	0.229*** (0.027)	0.040* (0.021)	0.125*** (0.037)
Father's monthly income	0.001 (0.001)	0.002 (0.001)	0.002 (0.001)	-0.001 (0.002)
Constant term	-475.455** (195.827)	-104.380 (86.010)	-59.257 (39.567)	122.727* (73.487)
Coefficient of determination	0.229	0.145	0.022	0.030
Observations	2,611	2,611	2,611	2,226
Number of id	726	726	726	661

Notes: 1. The marks ***, **, and * indicate the presence of significant effects at levels of 1%, 5%, and 10%, respectively.

2. The figures in parentheses represent robust standard errors even when there is heteroscedasticity.

3. All estimations were controlled for the dummy for the fathers' industry of work, industry-specific trends, and the year dummy.

4. The analysis was limited to a sample group whose youngest child was under seven years old.

involvement in childcare has been fully controlled through the variables used in our analysis. However, the finding that the paternity leave take-up rate in fathers' industry of work has significant effects even when fathers' actual involvement in childcare is taken into consideration suggests the possibility that an increase in those who took paternity leave in fathers' industry of work may have positively affected mothers through factors other than fathers' direct involvement in childcare, such as change in fathers' working environment, health conditions, or the attitude toward childcare.

Does change in the paternity leave take-up rate in fathers' industry of work affect mothers in aspects other than encouragement for continuing to work? Table 5 shows the results of an estimation regarding the effects of the paternity leave take-up rate in fathers' industry of work on mothers' mental health and subjective health outcomes. As explained in Section IV, our research identified mothers' mental health outcomes using the items of the abbreviated 12 item-version of the CES-D scale and uses four different measures—(1) the total sum of points awarded, (2) the total sum of points awarded expressed as a z-score, (3) the probability of being included among the top 10% in the sample group in terms of mental health weakness; and (4) the probability of being included among the top 20% in the sample group in terms of mental health weakness. The deterioration of mental health may negatively affect mothers not only in terms of work but in terms of their lives in general by causing panic disorder or depression, for example. Our research attempts to capture both the average effects and particularly serious negative effects on mental health by using multiple variables.

According to the estimation results, while the sign of the coefficient regarding the paternity leave take-up rate is negative in all of (1) to (4), significant effects can be observed at a significance level of 10% only with respect to the probability of being included among the top 10% in terms of mental health weakness. This means that the results are not robust. In addition, from the estimation results in (5), it cannot be said the paternity leave take-up rate in fathers' industry of work has significant effects on mothers' subjective health outcomes. In light of the results shown in Table 4, a rise in the paternity leave take-up rate in fathers' industry of work was expected to positively affect mothers' health outcomes by encouraging fathers' involvement in childcare and reducing the

Table 5. Effects of the changes in paternity leave take-up rate in fathers' industry of work on mothers' health

	(1)	(2)	(3)	(4)	(5)
	Total sum of points awarded	Mental health		Subjective health	
		Z-score	Top 10% dummy	Top 20% dummy	
Paternity leave take-up rate	-2.067 (2.978)	-0.432 (0.577)	-0.403* (0.244)	-0.378 (0.265)	0.147 (0.179)
Mother's age	0.142* (0.077)	0.023 (0.015)	0.008 (0.006)	0.006 (0.006)	0.005 (0.004)
Number of children	-0.319* (0.163)	-0.066** (0.032)	-0.009 (0.011)	-0.014 (0.012)	-0.006 (0.010)
Father's monthly income	-0.012* (0.007)	-0.002* (0.001)	-0.001** (0.001)	-0.001 (0.001)	0.000 (0.000)
Constant term	869.028 (769.151)	183.481 (146.917)	9.681 (15.942)	3.858 (17.607)	-9.033 (15.653)
Coefficient of determination	0.013	0.011	0.005	0.008	0.010
Observations	7,359	7,359	7,359	7,359	9,599
Number of id	1,371	1,371	1,371	1,371	1,534

Notes: 1. The marks ***, **, and * indicate the presence of significant effects at levels of 1%, 5%, and 10%, respectively.

2. The figures in parentheses represent robust standard errors even when there is heteroscedasticity.

3. All estimations were controlled for the dummy for the father's industry of work, industry-specific trends, and the year dummy.

maternal burden of childcare. However, the results shown in Table 5 do not indicate the presence of any such effect.

VI. Conclusion

Using the Japanese Panel Survey of Consumers, this paper examined whether promoting policy measures to help fathers reconcile work with childcare contributes to encouraging mothers to continue working, focusing on the effects of fathers' taking of paternity leave on mothers, on which few previous studies have been conducted.

In the analysis, we examined, using a fixed-effects model, whether an increase in men taking paternity leave in fathers' industry of work affects mothers' decision as to whether to continue working. As a result, we found that a rise in the paternity leave take-up rate in fathers' industry of work increases mothers' employment. It should be noted that the possibility remains that the strength of this effect may be limited. According to the estimation results in Table 2, which represent the main estimation results of our research, a rise of 1 percentage point in the paternity leave take-up rate in fathers' industry of work leads to an increase of 0.5 percentage point in mothers' employment probability. While it is difficult to make direct comparisons between our findings and the research results obtained in studies conducted in other countries, Patnaik (2019), for example, analyzes the effects of the parental leave reform implemented in the Canadian province of Quebec. This reform lowered the eligibility criterion regarding parental leave from 600 working hours per year to an easier-to-meet annual income threshold of 2,000 Canadian dollars, raised the amount of cash benefits from 55% to 70-75% of the pre-leave wage and created a five-week leave with cash benefits available exclusively for fathers. The analysis found as a result of the reform, the paternity leave take-up rate rose by around 50 percentage points, while mothers' employment increased by 4.6 percentage points. Dunatchik and Özcan (2021) also analyzes the effects of the same reform in the province of Quebec and finds that the reform led to a rise of 5 percentage points in mothers' labor participation. Meanwhile, Farré and González (2019), which examines the effects of the two-week paid paternity leave introduced in Spain, find that the measure led to an increase of 2.5 to 4.0 percentage points in mothers' probability of working at six months after birth giving.

It was also found that the effects on mothers' work is stronger in the case of families with a child (children) of pre-elementary school age, at which policy measures to help reconcile work with childcare are targeted, than in the case of families whose youngest child was of elementary school age or older. Given that the percentage of fathers who actually took paternity leave in the sample group of our analysis is very small, our research suggests that a sufficiently significant improvement in the workplace environment in fathers' industry of work has positive effects on the employment of mothers with a pre-elementary school child (children). It is also expected that encouraging men to take paternity leave may have positive effects on people who have no access to paternity leave, too.

This paper also paid attention to change in fathers' involvement in childcare as a pathway whereby the paternity leave take-up rate in fathers' industry of work affects mothers. Our analysis found that although the strength of this effect is limited, a rise in the paternity leave take-up rate in the workplace increases the probability of at least fathers with a pre-elementary school child (children) being involved in childcare. In other words, it is presumable that change in the rate of paternity leave in fathers' industry of work increases the probability of mothers perceiving fathers' involvement in childcare (this outcome is based on replies from mothers) and that as a result, mothers are encouraged to continue working. On the other hand, robust effects on mothers' health outcomes, including mental health and subjective health, were not observed.

The accumulated body of research concerning the relationship between fathers' workplace environment related to childcare and mothers' work is sparse, and there has not yet been an established consensus on whether or not an improvement in the environment is effective in encouraging mothers to continue working. While our

research examined the effects of change in fathers' workplace environment, as represented by the paternity leave take-up rate in fathers' industry of work, on mothers' employment, it is expected that encouraging fathers to take paternity leave will help reconcile birth giving and childcare with work in a broader sense by improving the efficiency of work processes and changing the attitude to childcare. Moreover, promoting policy measures to help reconcile childcare and work other than paternity leave may also generate similar positive effects by changing fathers' workplace environment.

We also paid attention to the effects on mothers' health as well as on their decision whether to continue working and examined whether change in the paternity leave take-up rate in fathers' industry of work promotes mothers' good health. While we found the presence of robust effects on mothers' decision as to whether to continue working, few effects on health outcomes were observed. However, in recent years, we have come to often hear of postpartum depression and there are growing concerns about the deterioration of the mental health of women with children. For people suffering from depression and other mental health disorders, support from the people around them is indispensable. It is desirable that fathers' involvement in childcare become more widespread through paternity leave, which leads to realize a society in which mothers and fathers can care for children together without undermining maternal health. Moreover, it is expected that promoting mothers' good health will be beneficial in the long term from the angle of mothers' employment by improving their labor productivity or by preventing them from dropping out of the labor force. It is premature to conclude from the results of our research alone that fathers' working environment has no effect on mothers' health, and it is necessary to continue careful research on the effects on mothers in aspects other than employment.

Finally, we would like to mention future challenges. This paper captured fathers' working environment related to childcare in terms of the paternity leave-taking rate in their industry of work. However, in fact, the important influencing factors of fathers' involvement in childcare include not only industry-specific factors but also workplace factors such as company-specific leave programs, corporate culture and bosses' and colleagues' attitude toward childcare. In addition to further developing the system of parental leave, encouraging fathers' involvement in childcare by changing the workplace environment is also an important policy measure to help reconcile work with childcare. Further research is needed to capture the fathers' working and childcare environments from multiple angles and to examine specifically how the working environment should be improved.

This is a translation of the authors' paper "Dansei haigusha no gyoshu betsu ikuji kyugyo shutokuritsu ga josei no shugyo kakuritsu, kenko jotai ni ataeru eikyo" [Effects of Paternity Leave Acquisition Rates in Spouses' Industries on Women's Employment and Health] submitted to and published in the *Japanese Journal of Labour Studies* (vol.65, no.760, November 2023) with additions and amendments in line with the gist of *Japan Labor Issues*. We express sincere gratitude to two anonymous referees and the editorial committee of the *JJLS*. We also thank Professor Ayako Kondo for many useful comments at the 2022 spring convention of the Japanese Economic Association. The data for this secondary analysis, the "Japanese Panel Survey of Consumers," was provided by Panel Data Research Center at Keio University. We acknowledge the projects' contributors for making the data available. This study was financially supported by JSPS KAKENHI grant number JP22K20164.

Notes

1. There is some accumulated body of research concerning the effects of fathers' workplace environment, rather than the paternity leave take-up rate, on mothers. Samtleben et al. (2019) shows that even when there is a well-developed system of parental leave, concerns over the effects on career development and the difficulty of finding a substitute worker may become impediments to paternity leave-taking. Meanwhile, Ishii-Kuntz (2009) shows that one determinant factor of fathers' involvement in childcare is their workplace environment. Among previous studies that shows the presence of the effects of fathers' workplace environment on their involvement in childcare, there are some indicating that the availability of systems to help reconcile work with childcare, such as parental leave, shorter working hours, and flex time (Ishii-Kuntz 2013) and the autonomy of work (Ishii-Kuntz 2013; Hook, Ruppanner and Casper 2022) has the effect of increasing the fathers' childcare involvement rate. There are also studies indicating that the burden of work (Ko and Hwang 2021), the monotony of work (Hook, Ruppanner and Casper 2022), and workplace stress (Ishii-Kuntz 2013) has the effect of lowering the fathers' childcare involvement rate.

2. In previous studies that analyze the effects of fathers' involvement in childcare and paternal leave, mothers' employment and income (Andersen 2018; Cools, Fiva and Kirkebøen 2015; Druedahl, Ejrnæs and Jørgensen 2019; Dunatchik and Özcan 2021; Ekberg, Eriksson and Friebe 2013; Farré and González 2019; Patnaik 2019) and marital relationship (Goldacker et al. 2022; Olafsson and Steingrimsdóttir 2020; Avdic and Karimi 2018) have been mainly used as outcomes.
3. In 2022, the postpartum paternal leave (paternity leave granted at the time of the mother's birth giving) was introduced in place of the existing the "Daddy Leave", making it possible for eligible fathers to take up to four weeks of leave within eight weeks from the birth giving in addition to parental leave.
4. The paternity leave take-up rate was divided by 100, rather than used in the original percentage value, in order to facilitate comparisons of the coefficients of the estimated results.
5. A z-score of a relevant data point is obtained first by deducting the mean value of the dataset from the value of that data point and then dividing the obtained value by the standard deviation, resulting in an average value of 0 and a standard deviation of 1. In an analysis using a simple score representing the total sum of points awarded, an increase of 1 point is always considered to represent the same degree of effect, but when a z-score is used, the analysis can take into consideration the scattering of data points.
6. When we conducted an estimation using the time spent by fathers on childcare instead of fathers' involvement in childcare as a dependent variable, we did not observe significant effects on an all sample basis or by age of the youngest child. A previous study finds that the reform of the system of parental leave affected the time spent by fathers on childcare but had no effect on the time spent by fathers on housework (Farré and González 2019). While our research indicates the possibility that the time spent by fathers on childcare may increase given the increase in fathers' involvement in childcare, we may have been unable to observe significant effects because the data in this analysis does not distinguish between housework time and childcare time. Kohara and Maity (2021), who use the same data as the one used by us, find that fathers do not change the allocation of time even when the childcare environment has changed, with the result that household output (the time spent on childcare and housework) does not increase.

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Supplementary Table. Estimation controlled for fathers’ involvement in childcare

	Dependent variable: employment probability			
	(1)	(2)	(3)	(4)
Paternity leave take-up rate	1.202** (0.534)	1.246** (0.530)	1.243** (0.533)	0.881 (0.628)
Change of diapers/clothes	0.032 (0.026)			
Playing with children		0.023 (0.024)		
Communication			-0.025 (0.029)	
Sense of burden				0.013 (0.020)
Mother’s age	0.094*** (0.025)	0.092*** (0.025)	0.089*** (0.025)	0.068*** (0.024)
Number of children	-0.260*** (0.034)	-0.254*** (0.034)	-0.248*** (0.034)	-0.273*** (0.037)
Father’s monthly income	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Constant term	452.560* (249.937)	439.917* (242.165)	438.012* (243.811)	408.270* (237.087)
Coefficient of determination	0.175	0.174	0.174	0.166
Observations	2,611	2,611	2,611	2,226
Number of id	726	726	726	661

- Notes: 1. The marks ***, **, and * indicate the presence of significant effects at levels of 1%, 5%, and 10%, respectively.
2. The figures in parentheses represent robust standard errors even when there is heteroscedasticity.
3. All estimations were controlled for the dummy for the fathers’ industry of work, industry-specific trends, and the year dummy.
4. The analysis was limited to a sample group whose youngest child was under seven years old.

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