ROCKWOOL Foundation Berlin
Institute for the Economy and the Future of Work (RFBerlin)

DISCUSSION PAPER SERIES 57/25

The Motherhood Effect on Earnings amid Declining Fertility: Evidence from Korea

Jisoo Hwang, Inkyung Yoo

www.rfberlin.com AUGUST 2025

The Motherhood Effect on Earnings amid Declining Fertility: Evidence from Korea

Authors

Jisoo Hwang, Inkyung Yoo

Reference

JEL Codes: J16, J13

Keywords: Motherhood effect, child penalty, selection into motherhood, parental leave

Recommended Citation: Jisoo Hwang, Inkyung Yoo (2025): The Motherhood Effect on Earnings amid Declining Fertility: Evidence from Korea. RFBerlin Discussion Paper No. 57/25

Imprint

RFBerlin
ROCKWOOL Foundation Berlin –
Institute for the Economy
and the Future of Work

Gormannstrasse 22, 10119 Berlin
Tel: +49 (0) 151 143 444 67
E-mail: info@rfberlin.com
Web: www.rfberlin.com

The Motherhood Effect on Earnings amid Declining Fertility: Evidence from Korea*

Jisoo Hwang † Inkyung Yoo ‡

August 2025

Abstract

Across developed countries, women's earnings decline sharply following childbirth while men's earnings remain unaffected. But how will the "motherhood effect" evolve as more women choose *not* to have children? We examine changes in the motherhood effect on earnings amid rising childlessness in South Korea, the country with the world's lowest fertility rate. Using an event study framework and administrative data covering the entire population, we find that earnings losses after childbirth have *increased* across recent cohorts of mothers. We provide suggestive evidence that the expansion of parental leave and a stronger positive selection into motherhood contributed to this trend.

JEL Codes: J16, J13
Keywords: Motherhood effect, child penalty, selection into motherhood, parental leave

*We thank Prashant Bharadwaj, Yunji Choi, Gordon Dahl, Hae-young Hong, Melissa Kearney, Seok Ki Kim, Elira Kuka, Jungmin Lee, Uta Schönberg, and seminar participants at the ASSA 2024 Annual Meeting, NBER 2024 Conference on Fertility and Declining Population Growth in High-Income Countries, Conference on Socioeconomic Opportunity and Inequality at the University of Chicago, Brown University, University of California, San Diego, Academia Sinica, International Symposium on Applied Economics at National Chengchi University, Hong Kong Labor Symposium, Seoul National University, and Korea Labor Institute for helpful comments. Hwang gratefully acknowledges financial support by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2022S1A5A2A03051501), Creative-Pioneering Researchers Program through Seoul National University, and Seoul National University Institute for Research in Finance and Economics (SIRFE). Hannah Kim, Jooho Moon, and especially Minsuk Kim provided excellent research assistance. This project was approved by the National Health Insurance Service (NHIS-2024-10-1-056) and Seoul National University (IRB No. E2407/002-002). The paper was previously presented under the title "Child penalty amid declining fertility: Evidence from administrative data in South Korea."

†Corresponding author. SNU College, Seoul National University, 1 Gwanak-ro, Gwanak-gu, Seoul 08826, South Korea. Email: jisoohwang@snu.ac.kr.

‡Bank of Korea, 39 Namdaemun-ro, Jung-gu, Seoul 04531, South Korea. Email: inkyung0718@bok.or.kr.

1 Introduction

Across societies, mothers' earnings decline substantially after the arrival of children, whereas fathers' earnings remain unaffected. This phenomenon—often termed the "child penalty" or the "motherhood penalty"—represents one of the largest remaining barriers to closing the gender pay gap in developed countries (Goldin, 2021; Cortés and Pan, 2023; Kleven et al., 2024a). In fact, recent studies suggest that eliminating the gender pay gap has become synonymous with eliminating the child penalty, prompting growing research on how policies and shifting norms may help reduce it (Andresen and Nix, 2022a; Kleven, 2022; Lim and Duletzki, 2023).

However, from an individual woman's perspective, there is another sure way to avoid the child penalty: not having any children. Fertility is declining in many parts of the world, often accompanied by a rise in childlessness (Hellstrand et al., 2021; Sobotka, 2021; Kearney et al., 2022; Doepke et al., 2023; Hwang, 2023). How will the impact of children on earnings evolve as more women choose *not* to have children? Will the child penalty also decline in countries with very low fertility, or could it persist even as overall gender gaps in the labor market narrow? The answer may depend on how selection into motherhood shifts—whether mothers increasingly comprise women who anticipate smaller earnings losses, or conversely, those who are more willing and able to bear them. Such changes have important implications not only for interpreting the motherhood effect, but also for designing effective policies.

We address these questions by examining changes in the motherhood effect on earnings in South Korea (henceforth, Korea). Korea provides an ideal setting for this study for three reasons. First, it is at the forefront of declining fertility rates, with the world's lowest total fertility rate, at 0.78 children per woman (Figure A1).[1] Among recent cohorts of women born between 1976 and 1985, who are the focus of our study, childlessness

[1] This is less than half the OECD average of 1.5 children per woman. Korea's total fertility rate has been below 1 since 2018.

rate by age 37 nearly doubled from 19% to 35% (Figure A2). Second, the motherhood penalty is a major policy issue, as Korea has one of the largest gender pay gaps among high-income countries (OECD, 2023). Lastly, Korea's National Health Insurance Service (NHIS) provides exceptional administrative data of the entire population, including information on employment, earnings, leave status, healthcare utilization, and household members at the monthly level since 2002.

To estimate the impact of children on earnings, we adopt an event study framework around the birth of the first child, following Kleven et al. (2019a). Using a balanced sample and tracking outcomes from three years prior to five years after first childbirth, we find that women's earnings decline by more than 41%, with a sharp drop beginning during pregnancy and no recovery observed within five years. Unlike other developed countries, we find that the earnings loss is driven primarily by the extensive margin of labor supply, with employment falling by 44% by the fifth year. Men's earnings trajectories remain largely unaffected by childbirth.

Interestingly, we find that the motherhood effect on earnings has *increased* across recent cohorts of women. The earnings loss one year after childbirth rose from 40% in the 1976–80 cohort to 46% in the 1981-85 cohort. The gap is even larger when comparing non-adjacent cohorts: 37% for women born in 1976-78 versus 49% for those born in 1983-85, marking a 12%p increase. This pattern stands in sharp contrast to prior evidence showing declining child penalties over time, as family policies expand and societies become more gender-equal (Andresen and Nix, 2022a; Kleven, 2022; Lim and Duletzki, 2023).

We conduct a series of additional analyses to explore potential mechanisms underlying the increasing motherhood effect. First, we examine the role of family policies, particularly the expansion of parental leave. We find that mothers born in 1981-85 are twice as likely to be on leave six months after first childbirth as those born in 1976-80. When we replace earnings during leave spells with pre-leave earnings, the cohort gap

in the motherhood effect is reduced by roughly half. This suggests that greater use of parental leave, driven either by policy reform or changes in the composition of mothers, accounts for a substantial portion of the observed increase in the motherhood effect.

Second, we examine changes in the selection into motherhood by directly comparing mothers to childless women in each cohort. Leveraging the panel structure of our data, we compare their baseline characteristics and find that positive selection into motherhood based on economic factors has strengthened over time: employed women, those with higher earnings, and those in secure jobs are more likely to become mothers in the 1981-85 cohort than in the 1976-80 cohort. These traits are closely linked to the capacity to take extended parental leave, even at the cost of earnings losses. Complementary evidence from the National Family and Fertility Survey further indicates that mothers in more recent cohorts report stronger beliefs in the personal value of having children. While suggestive, these findings are consistent with the idea that the rising motherhood effect may partly reflect growing selection into motherhood. As more women remain childless, those who become mothers are increasingly selected, both in terms of economic resources and family-oriented preferences.

Lastly, we consider whether recent cohorts of mothers are employed in occupations that are less compatible with childcare. We merge the Korean Labor Income Panel Study with job characteristics data from the Korea Network for Occupations and Workers to examine differences in the extent of "greedy jobs" between cohorts (Goldin, 2024). We find no evidence that mothers in the more recent cohorts work longer hours or hold jobs with greater time demands.

We contribute to the literature in at least three ways. First, we contribute to the growing literature on child penalties by offering novel insight into how the child penalty may evolve in the context of rising childlessness. Following the work of Kleven et al. (2019a), many studies demonstrate the effect of first childbirth on labor market outcomes using an event study framework, focusing on understanding the mechanisms that operate within

couples.[2] However, as more women choose to remain childless, selection into motherhood itself becomes an increasingly relevant factor in shaping the observed motherhood effect on earnings.[3] Distinguishing between secular changes in the motherhood effect and changes in selection into motherhood is important, as they imply fundamentally different interpretations and policy responses. In particular, the latter can lead to no changes (or an increase) in the motherhood effect even amid improving gender equality and benefits for working parents. Interpreting the motherhood effect solely as a "child penalty" may therefore be misleading (Kearney and Levine, 2025).

Second, to our knowledge, this is the first study to analyze the child penalty using administrative data covering the entire population of an Asian country. Prior studies with comprehensive data have primarily focused on the U.S. and European countries, while research on Asia has relied on survey data (Yoo and Lee, 2020; Kim and Hahn, 2022; Kleven et al., 2024a; Stansbury et al., 2024) or administrative records limited to certain subpopulations (Fukai and Kondo, 2025; Okuyama et al., 2025).[4][5] Our paper fills the gap in the literature, and reveal distinctive patterns that reflect unique features of the region's labor markets and policies, including a sharp decline in women's employment

[2]See Cortés and Pan (2023) for a review. Some prior studies focus on potential determinants such as biological traits (Kleven et al., 2021; Andresen and Nix, 2022b), comparative advantage (Angelov et al., 2016), gender norms (Andresen and Nix, 2022b; Kleven, 2022), and promotion practices (Okuyama et al., 2025), while others focus on the effects of policies such as paternity leave (Andresen and Nix, 2022a), parental leave (Kleven et al., 2024b), public childcare (Lim and Duletzki, 2023), and flexible work arrangements (Harrington and Kahn, 2023).

[3]An earlier literature on the association between the presence of children and the gender pay gap used a fixed-effects model to explore the role of selection. For example, Juhn and McCue (2017), using SIPP data to compare cross-sectional and fixed-effects estimates, suggest that the decline in the motherhood effect on earnings may be overstated once selection is taken into account.

[4]Examples of studies using comprehensive data in Western developed countries include Angelov et al. (2016) (Sweden), Kleven et al. (2019a) (Denmark), Kleven et al. (2019b) (Austria, Denmark, Sweden), Sieppi and Pehkonen (2019) (Finland), Andresen and Nix (2022b) (Norway), Rabaté and Rellstab (2022) (Netherlands), Almond et al. (2023) (U.S), Lim and Duletzki (2023) (Germany), and Kleven et al. (2024b) (Austria).

[5]Prior studies on Korea use an unbalanced panel or cross-sectional data. However, these approaches may yield biased estimates if the composition of mothers varies over event time due to differential selection. Okuyama et al. (2025) use personnel records of employees who continue to work before and after childbirth at a Japanese manufacturing firm. Fukai and Kondo (2025) use local tax records in certain municipalities that participated in a project led by the University of Tokyo. As a result, individual income can only be tracked for those who remain within the same municipality. Their data also do not distinguish between individuals on parental leave and those who are not employed.

beginning during pregnancy, substantial heterogeneity in the motherhood effect by firm size, and a significant increase in parental leave across cohorts.

Lastly, our findings contribute to the growing literature on fertility decline in high-income countries.[6] While identifying the causes of Korea's very low fertility rate is beyond the scope of this study, our findings on substantial motherhood effects on employment and earnings suggest that balancing work and family remains a significant challenge, potentially discouraging marriage and childbearing among recent cohorts. Our evidence on increasing selection into motherhood further highlights the role of childcare costs and shifting social norms in shaping fertility decisions (Hwang, 2023).

The remainder of the paper is organized as follows. Section 2 describes the data and our estimation framework. Section 3 presents the results on the motherhood effect on earnings across cohorts and subgroups. In Section 4, we conduct additional analyses to explore potential mechanisms. Finally, Section 5 concludes.

2 Data and Empirical Strategy

2.1 Data

We use 2002–2020 administrative records from the National Health Insurance Service (NHIS). The NHIS data covers all residents in Korea (about 50 million) because Korea has universal health insurance. The data consists of multiple databases on health insurance eligibility, medical records, and household members, which can be linked using unique individual identifiers.

The eligibility database contains basic demographic variables such as age and sex, as well as socioeconomic variables such as health insurance type and monthly earnings. An

[6] Prior studies discuss factors such as the mismatch between traditional gender norms and women's rapid economic advancement (Hwang, 2016; Myong et al., 2021; Goldin, 2025) and high private education costs and intense parental investments (Anderson and Kohler, 2013; Kim et al., 2024). See Doepke et al. (2023) and Kearney and Levine (2025) for an overview of the decline in fertility in high-income countries.

individual's health insurance type is determined by their employment status. All regular employees and employers with at least one employee have "employee insurance," and are obligated to pay insurance fees determined as a fixed percentage of their monthly earnings.[7] We define employment as being enrolled in employee insurance, including individuals who are on leave. Monthly earnings refer to pre-tax labor income, excluding public transfers such as parental leave allowances, adjusted to 2020 values using the Consumer Price Index.

Employer information, such as firm ID, location, and industry classification, is also linked to individuals on a monthly basis. Using firm ID, we calculate firm size and firm female ratio by counting the number of (male and female) employees with the same firm ID. We define large firms as those with at least 300 employees, which is a proxy of job quality in Korea.[8] We also distinguish public sector firms. While public sector jobs may not always offer higher salaries, they offer job security. We define female-dominated firms as those in which more than 50% of the employees are female.

The medical records database contains comprehensive information on healthcare utilization, including details such as the date treatment was initiated and the type of procedure or surgery performed. Because 99.8% of births in Korea occur in hospitals (Statistics Korea, 2022), the database allows us to identify the timing of first childbirth. We define a woman's first childbirth as her earliest birth among all recorded births in the data, for which the procedure code indicates that it was her "first" birth.[9] We use the date of treatment to define a woman's year and month of first childbirth.

[7] Some non-regular workers with short-term contracts (less than three months) may not be employee-insured. Other types of health insurance are "medical aid," "dependent," and "regional." Medical aid is a form of public assistance to provide low-income groups with healthcare, and comprises less than 2% of our sample. All other individuals who are neither employee-insured, medical aid, nor their dependents are covered by regional insurance, which includes the unemployed and the retired.

[8] Employees in small and medium-sized firms earn, on average, 62% of the wages earned by employees in large firms (Ministry of Employment and Labor, 2020). Large firms are also typically held to higher workplace standards, such as the requirement to provide onsite daycare centers.

[9] Procedure codes are assigned by the doctor. Individuals who had multiple "first" childbirths according to the procedure codes account for 1.4% of all mothers. In this case, we use the earliest record as the first childbirth.

The household members database contains information on individual's relationship to the household head for those registered at the same residence, and is also updated monthly. We use this information to identify the woman's husband. Since only 2% of births in Korea occur outside of marriage (OECD Family Database, 2024), we can identify the father of the child in most cases using this information.

2.2 Sample construction

To examine earnings from at least three years before to five years after first childbirth in the 2002–2020 NHIS data, we study mothers who had their first child between 2005 and 2015. We focus on women born between 1976 and 1985, grouping them into five-year cohorts 1976-80 and 1981-85, for cross-cohort comparisons. These cohorts are young enough to reflect the recent decline in fertility to very low levels in Korea, with the cumulative cohort fertility rate dropping from 1.5 children per woman in the 1976-80 cohort to 1.2 children in the 1981-85 cohort (Hwang, 2023). At the same time, they are old enough for us to observe their prime childbearing years in the data.

Age at first childbirth between 2005 and 2015 is cohort-specific by design. For women in the 1976-80 cohort, we observe childbirths between ages 25–39, while for the 1981-85 cohort, we observe childbirths between ages 20–34. We may then find cohort differences in the motherhood effect simply due to the difference in observable ages at first childbirth. To address bias from data truncation, we therefore restrict the sample to women who had their first child between the ages of 25 and 34, the age range that overlaps for both cohort groups.[10] This age range covers the vast majority of births among women in these cohorts.[11] We then apply weights to the 1976-80 sample to match the distribution of age at first childbirth of the 1981-85 sample (Figure A3). In all our main analysis, we

[10] Prior studies on over-time changes in child penalties do not consider this issue, because they focus on yearly effects rather than cohort comparisons. Since we study selection into motherhood, a cohort-based analysis is more relevant.

[11] According to authors' calculations using data from the Vital Statistics and Population Projections, nearly 80% of women born between 1976 and 1985 gave first childbirth within the age range of 25 and 34.

present results from the weighted sample. We also exclude foreigners (less than 1%) and women with the top 0.1% earnings one year before childbirth to minimize the influence of outliers on our results.

To identify the husbands of the women in the month of first childbirth, we use relationship codes in the household members database. For accuracy, we only use the codes for the household head and the spouse of the household head. Since the NHIS data do not contain marriage records, we cannot identify the husband if the woman is not living with him in the month of first childbirth or if neither spouse is listed as the household head. As a result, 74% of women are matched with their husbands. We further exclude husbands older than age 60 or with missing data during the study period (less than 0.8%). This leaves us with a final balanced panel sample of 594,490 couples with the woman in the 1976-80 cohort and 536,383 couples with the woman in the 1981-85 cohort.

[Table 1 here]

Table 1 presents the summary statistics of women and men 12 months before first childbirth ("reference month"). As aforementioned, weights are applied to the 1976-80 cohort to match the age at first childbirth distribution of the 1981-85 cohort, so women's average age is the same at 28 for both cohort groups. Men's cohort grouping label is based on their wives' year of birth rather than their own. Men are on average 31 years old at the reference month. Regional distribution is similar across cohorts, with about half of the sample living in the Seoul Metropolitan Area.

Note that there is a significant gender difference in labor market outcomes even before having children. Less than 60% of women are employed one year before first childbirth compared to nearly 80% of men. Women's average monthly earnings is $1,256 in the 1976-80 cohort group, compared to $2,408 among men. If we restrict the sample to women who are employed at the reference month (panel B), the average monthly earnings become comparable to those of their husbands.

For both genders, we observe higher employment rates and earnings in the more re-

cent cohort group. Especially among women, employment rate increases by 8%p from 52% in the 1976-80 cohort to 60% in the 1981-85 cohort. Women's average earnings also increases from $1,255 to $1,457. The increase among men is much smaller, leading to a reduced gender gap in pre-childbirth labor market outcomes across cohorts.[12]

2.3 Event study framework

We estimate the impact of children on earnings following the event study methodology described in Kleven et al. (2019a). The approach is based on the idea that sharp changes in labor market outcomes around the event of first childbirth is arguably orthogonal to unobserved factors which should evolve smoothly over time. Specifically, we run the following regression separately for each gender-cohort group g:

$$Y_{ism}^{g} = \sum_{j \neq -12} \alpha_j^g \cdot I[j = t] + \sum_k \beta_k^g \cdot I[k = age_{is}] + \sum_y \gamma_y^g \cdot I[y = s] + \nu_{ism}^g \tag{1}$$

where i denotes individual, s year, m month. Y is the outcome of interest, such as monthly earnings, expressed in levels rather than logs to preserve zero values. t denotes event time relative to the month of first childbirth. $I[j = t]$ is an indicator variable which equals to 1 if the event time $j = t$, and 0 otherwise. The reference period is $t = -12$, so each estimate of the event time dummy is the impact relative to one year before first childbirth. $I[k = age_{is}]$ and $I[y = s]$ are indicator variables for age equal to k, and year equal to y, respectively. These fixed effects control nonparametrically for life-cycle and time trends.

To compare the impact of children across outcomes and groups, we convert the level effects from equation (1) into percentage effects as in prior studies:

$$P_t^g \equiv \frac{\hat{\alpha}_t^g}{E[\tilde{Y}_{ism}^g | t]} \tag{2}$$

[12] The average gender gap in employment rates and earnings decreased significantly from the 1976 to 1985 cohort, not only within our sample but also across the entire cohort population (Figure A4).

where $\tilde{Y}^g_{ism} = \hat{\beta}^g_{age_{is}} + \hat{\gamma}^g_s$ is the average predicted outcome excluding the event time dummies. Since $\tilde{Y}^g_{ism}$ accounts for yearly shocks and the age profiles of each gender-cohort group, it reflects the fact that earnings increase over time as the age profiles develop, are larger for men than for women, and are larger for the 1981-85 cohort compared to the 1976-80 cohort (Figure A5). P^g_t can thus be understood as the percentage change in outcome compared to this counterfactual scenario where childbirth did not occur for that group.

The estimates from the event-study approach can be interpreted as causal when the event is exogenous to unobserved determinants of the outcome. One way to empirically assess this assumption is to examine trends in outcome prior to the event. However, upward or downward pretrends are often observed in the literature on child penalties, especially in settings where couples adjust their labor supply upon marriage.[13] As we show in the next section, we do not observe parallel pretrends in earnings between men and women in Korea. Although this is an interesting pattern in itself, this poses a challenge in interpreting the coefficients as purely causal. Throughout, we present the estimates for mothers and fathers separately, and do not aim to interpret the gender difference to be solely due to childbirth, as they may be combined with the effects of marriage. Meanwhile, we observe nearly identical pretrends between cohorts within each gender.

[13] For example, upward-sloping pretrends are observed among women in Norway, Sweden, Austria and Finland (Andresen and Nix, 2022b; Kleven et al., 2019b; Sieppi and Pehkonen, 2019). Downward-sloping pretrends are observed among women in countries such as the U.S., U.K, Australia, Belgium, Italy, and Türkiye (Kleven et al., 2019b, 2024a).

3 Results

3.1 The motherhood effect on earnings

We first present the effect of children on earnings for the entire sample of women born between 1976 and 1985, and their husbands, as defined in subsection 2.2.[14] Figure 1 shows the estimated effects at event time t following equation (2), where red circles represent women and blue diamonds represent men. 95% confidence intervals are marked in light gray, but are not noticeable because the estimates are very precise. The coefficient at the reference month (12 months before first childbirth) is set to 0.

[Figure 1 here]

Three key patterns emerge in Figure 1(a). First, as in prior studies, we observe a substantial decline in mothers' earnings around the time of first childbirth, whereas fathers' earnings remain unaffected. Women's earnings are lower by 36% in the month of first childbirth and continue to decrease without recovery, reaching 43% five years post-childbirth. The magnitude is larger than the child penalty found in Norway (21%, Andresen and Nix 2022b), Denmark (24%, Kleven et al. 2019a), Sweden (35%, Kleven et al. 2019b) and is comparable to that of the United Kingdom (45%, Kleven et al. 2019b).

Second, our monthly data reveal that the sharp decline in women's earnings begins during pregnancy. Women's earnings are 6% lower 9 months before childbirth, around the time when the pregnancy is likely to become known. The downward trend then steepens, reaching a 28% loss 3 months before childbirth, accounting for roughly 65% (= 28/43) of the motherhood effect on earnings within the first year of childbirth. In other words, more than half of the earnings decline occurs months before, rather than after, childbirth, as pregnant women reduce their labor supply. This pattern has been difficult to detect in prior studies, which typically rely on annual data.

[14] We do not use age-at-childbirth weights on the 1976-80 cohort in this section, because we are not making cohort comparisons.

Third, pretrends exist in earnings profiles and differ by sex. While men's earnings profiles are slightly upward-sloping but relatively flat, women's earnings profiles decline even before pregnancy. Our finding is consistent with evidence of women's "marriage penalty" (Yoo and Lee, 2020), with marriage typically preceding childbirth by on average of 1.8 years in Korea.[15]

The decrease in women's earnings may result from changes in either the extensive or intensive margin of labor supply. Figure 1(b) and Figure 1(c) explore these margins by showing the results on employment and earnings conditional on employment, respectively. The effect of motherhood on employment is substantial. Women's employment rate falls by 37% at childbirth, plateaus at around 42% from about 3 months to 12 months after childbirth, and then drops again to about 47% at 18 months post-childbirth.[16] Because Korea offers up to one year of paid parental leave, during which workers can maintain their employment, the dip after one year suggests that some women may be quitting their jobs after taking leave.

On the other hand, the earnings dynamics conditional on being employed is relatively flat in Figure 1(c). Although this result should be interpreted with caution, as employment in each t is endogenous, it suggests that the effect of motherhood on earnings in Korea is driven primarily by mothers leaving the labor market rather than by reducing working hours or switching jobs. This contrasts with findings from other high-income countries such as the U.S. (Cortés and Pan, 2023), Denmark (Kleven et al., 2019a), and the Netherlands (Artmann et al., 2022), where the impact of first childbirth is shown to

[15]The NHIS data do not contain date of marriage. The average time gap between marriage and childbirth for the 1976–85 cohorts is calculated by the authors using the Vital Statistics.

[16]To compare with prior studies on Korea, Kim and Hahn (2022) report an employment decline of approximately 40% at year 5, based on an unbalanced panel from the Korean Labor and Income Panel Study. Kleven et al. (2024a) report an employment penalty of around 60% at year 0 and 40% at year 5, using cross-sectional data from the Household Income and Expenditure Survey. The recovery observed in their study may reflect differences in data or sample construction. In particular, they do not use a balanced panel or restrict the sample by women's birth cohort. As a result, older cohorts, who are more likely to have given birth earlier, constitute a larger share of the sample in later periods of event time. Estimates may reflect changes in sample composition over event time rather than genuine recovery in individual outcomes if selection into motherhood varies by cohort.

be similar in magnitude across extensive and intensive margins of labor supply. These differences highlight the overall rigidity of Korea's labor market, including the limited opportunities for transitions into or out of part-time arrangements.

3.2 Changes in the motherhood effect across cohorts

Now we investigate whether the motherhood effect changed across cohorts. Figure 2(a) presents the result on earnings by sex and cohort group. Estimates for women from the 1976-80 and 1981-85 cohorts are shown in gray (dashed lines) and red (solid lines) circles, respectively. Estimates for their husbands are in light blue (dashed lines) and dark blue (solid lines) diamonds, respectively. As mentioned in subsection 2.2, weights are applied to the sample of women in the 1976-80 cohort to match the age-at-childbirth distribution of the women from the 1981-85 cohort. Husbands are assigned the same weight as their wives.

[Figure 2 here]

Figure 2(a) shows that women in the more recent cohort experience a *larger* relative drop in earnings following childbirth. After exhibiting identical pretrends until the month of first childbirth, the earnings dynamics diverge between the two cohort groups. At 12 months postpartum, women in the 1981-85 cohort experience a 45.6% decline in earnings, compared to a 40.3% decline among those in the 1976-80 cohort. If we compare non-adjacent cohorts within our sample, women born in 1976-78 and 1983-85, for example, we find a larger and more persistent cohort difference (Figure 2(b)).[17] Women born in 1983-85 experience a drop of 49% in earnings one year after childbirth, compared to 37% among women born in 1976-78, resulting in a difference of 12%p. Even five years after childbirth, the motherhood effect remains 5.4%p larger for the more recent cohort. By contrast, husbands' earnings profiles remain relatively flat across cohorts.

[17] The overlapping age at first childbirth for these two cohort groups are 27–32. We revise the weights correspondingly for Figure 2(b).

Given the overall narrowing of gender gaps in labor market outcomes (Figure A4) and the declining trend in child penalties documented in prior studies, it is striking that the effect of motherhood on earnings in Korea has not decreased, but instead increased. The magnitude of this change is also not trivial, particularly given that it unfolds within a single generation, across ten recent birth cohorts.[18]

Note that because the effect of children is presented in percentages relative to the counterfactual outcome, the increase in the motherhood effect is *not* simply a byproduct of the secular increase in the female labor force participation rate or wages in Korea. As mentioned above, counterfactual earnings (denominator of equation (2)) take this into account, as it is larger for the more recent cohort (Figure A5). The cohort gap in the motherhood effect on earnings is even more persistent when we use a common denominator for both cohort groups (Figure 2(c)) or look at level effects (Figure A6(a)).

[Figure 3 here]

In Figure 3, we examine the impact of children on employment and earnings conditional on employment, by cohort group. We find that employment trajectories are nearly identical across cohorts (Figure 3(a)). On the other hand, earnings conditional on employment exhibit different patterns by cohort: they are negative for the 1981-85 cohort but positive for the 1976-80 cohort (Figure 3(b)). When we further exclude individuals on leave, the trajectories become comparable across cohorts (Figure 3(c)). These results suggest that while the overall motherhood effect itself is mostly driven by the decline in employment (Figure 1), the cohort difference is not. Instead, the difference in the motherhood effect on earnings across cohorts appears to stem from changes in the composition of mothers and/or differences in the post-childbirth behaviors (e.g., leave-taking) of those who remain employed. We explore these mechanisms in section 4.

[18] We cannot extend the comparison to earlier cohorts, as age at first childbirth is not be comparable given the data period.

3.3 Heterogeneity in the motherhood effect

To assess whether the increase in the motherhood effect on earnings is particularly pronounced in certain subgroups, we replicate our analysis across various subgroups defined by characteristics observed before first childbirth. Categories include age at childbirth (25–29, 30–34), earnings (low, high), firm size (small, large), firm sector (public, private), firm female ratio (under 50%, over 50%), husband's employment status, husband's earnings (low, high), and region of residence (Seoul Metropolitan Area or not).[19] For ease of comparison, Figure 4 presents the impact of children on earnings one year after first childbirth (e.g. the estimate at $t = 12$ in Figure 2(a)) for each subgroup. Gray bars represent the results for the 1976-80 cohort, and red bars represent the 1981-85 cohort.

[Figure 4 here]

There are significant differences in the magnitude of the motherhood effect on earnings based on certain baseline characteristics. As documented in previous studies, younger mothers and those with relatively lower socioeconomic status experience larger declines in earnings after childbirth. For instance, among women in the 1976-80 cohort who were employed before childbirth, the motherhood effect for low-income individuals is nearly twice as large as that for high-income individuals (64% vs. 28%). The disparity is also substantial between employees of small and large firms (49% vs. 32%) and between the public and private sectors (11% vs. 47%). In contrast, the ratio of female employees in a firm does not appear to be an important factor in determining the size of the motherhood effect on earnings. Difference by region of residence is also not notable.

Regardless of the heterogeneity, we find that the motherhood effect on earnings increased across cohorts in *all* subgroups. That is, the cohort difference found in Figure 2(a) is not driven by a specific demographic category. However, the size of the increase varies across subgroups. Among women who were employed before childbirth, the increase in

[19] The threshold for high earnings is $2,200 (KRW 2,200,000) for women and $3,000 (KRW 3,000,000) for men, which is approximately the median value. Large firms are those with more than 300 employees.

the motherhood effect across cohorts is relatively more pronounced among those in the public sector (from 11% to 22%) and those with higher earnings (from 28% to 34%).

4 Potential Mechanisms

In this section, we conduct additional analyses to explore potential mechanisms underlying the increase in the effect of motherhood on earnings. We consider changes in family policies, selection into motherhood, and job characteristics.

4.1 Expansion of family policies

During the study period, the Korean government expanded various family benefits, including paid parental leave, cash subsidies, and public childcare. Among these, parental leave plays a particularly important role for working parents in Korea's rigid labor market, where reducing working hours without exiting one's job is often not feasible. The government progressively broadened the eligibility criteria and increased the amount of parental leave allowance. While most parents who take leave do so within the first year of childbirth, eligibility was extended from those with a child under age 1 to those with a child under age 8. The allowance amount also increased over time, reaching up to 80% wage replacement with a monthly cap of approximately $1,500 by 2022.[20]

[Figure 5 here]

In Figure 5(a) and Figure A7, we find that the more recent cohort of mothers are indeed much more likely to take leave after having children.[21] Around six months after first childbirth, 17% of mothers in the 1981-85 cohort are on leave compared to just 8% in

[20] $1,500 is about 62% of the average earnings among employed women before having children (panel B of Table 1).

[21] While the exact type of leave is not specified in the NHIS data (e.g., parental leave, sick leave, study leave, etc.), the sharp increase in leave coincides with the timing of first childbirth in Figure 5(a), which substantiates that the vast majority of leave of absence in our sample is parental leave.

the 1976-80 cohort.[22] Fathers' leave-taking remains negligible across cohorts. Since individuals on leave do not receive their regular earnings while remaining employed, the increase in parental leave take-up among mothers helps explain our findings in Figure 2(a) and Figure 3: mothers in the more recent cohort experience greater earnings losses but not greater employment losses after having children. Because parental leave allowances are modest in size, replacing zero earnings during leave periods with the expected value of parental leave allowance does not meaningfully change the results (Figure 5(b)).[23]

However, attributing the increase in the motherhood effect on earnings primarily to the expansion of parental leave assumes that these mothers would have continued working——either without leave or with a shorter duration——had the policy not changed.[24] In Figure 5(c), we consider this hypothetical scenario: we plot the motherhood effect on earnings under the extreme assumption that leave-takers would have continued working in the absence of the reforms. Specifically, for individuals on leave, we replace zero earnings during leave with their earnings one month preceding the leave.[25] The hypothetical earnings dynamics are plotted in black for the 1976-80 cohort and pink for the 1981-85 cohort, compared to their actual dynamics shown in gray and red, respectively. The cohort difference in the motherhood effect at 12 months reduces from 5.3%p to 2.8%p. The increase in leave may be able to explain up to 47% (2.5/5.3) of the cohort difference in

[22] Parental leave take-up is not the highest immediately after childbirth, because most working mothers first use maternity leave. In Korea, maternity leave and parental leave refer to two distinct types of leave provided to parents. Maternity leave offers 90 days of paid leave, with the first 60 days fully covered by the employer and the remaining 30 days paid through Employment Insurance with a cap. Parental leave is a leave of absence in which employees do not receive their regular earnings but instead receive parental leave allowance.

[23] Because the NHIS data do not contain actual amounts of parental leave allowance, we calculate the expected value based on policy parameters, including month of childbirth, pre-leave earnings, and duration of leave (see Table A1 for details). If the total duration of leave exceeds 12 months and a new child is born, we assume a new leave spell begins.

[24] If, instead, the more generous parental leave helped retain employed women who would have otherwise quit, we would expect to observe a *reduction* in the employment penalty across cohorts. Empirical findings on the impact of parental leave on mothers' labor supply are mixed. See Olivetti and Petrongolo (2017) for a review.

[25] Adams-Prassl et al. (2024) argue that, if the focus is on labor market attachment (rather than the value of work supplied to the formal labor market), earnings during leave should be replaced with their pre-leave levels when estimating child penalties, as these reflect the terms parents are entitled to return to.

the motherhood effect on earnings in the short run.

Meanwhile, other changes in family policies seem to be less relevant to our findings. Childcare allowances were introduced for families with young children and grants for newborns, but the impact is likely limited in our setting due to both the size and timing of the cash subsidies.[26] Figure 4 also shows that the motherhood effect on earnings did not widen particularly among low-earning households, where cash subsidies would have a greater income effect.

Public childcare provision also improved as large firms were required to provide workplace daycare centers, and eligibility for daycare and preschool vouchers expanded from households with a child under age 2 to those with a child under age 7. If these policies allowed parents to spend less on private childcare services, the resulting income effect could dampen mothers' labor supply. However, this effect is likely limited, as households could choose either a home-care allowance (paid in cash) or vouchers for daycare. In contrast, if the expansion of public childcare freed up mothers' time and helped increase their labor supply, we would expect to observe a *decrease* in the motherhood effect on earnings.[27]

In sum, among family policy reforms, the expansion of paid parental leave may have contributed to the recent increase in the effect of motherhood on earnings. Under the extreme assumption that leave-takers would have worked continuously in the absence of the reform, the increase in leave could account for almost half of the cohort difference in the short run. However, whether the increase in leave-taking and the motherhood effect on earnings can be solely attributed to the policy change is debatable, as we discuss below.

[26] Childcare allowance is $100 per month, and was introduced in 2018 when the youngest children in our sample (born in 2015) are already three years old. Grants for newborns increased from $200 to $500 during our study period, but is a one-time lump sum payment. Kwak (2021) shows that grants for newborn infants in Korea did not affect women's labor supply within the same year.

[27] Min and Lee (2020) show that childcare subsidies in Korea helped increase the labor supply of mothers with multiple children, who receive higher priority for admission to daycare centers. Andresen and Nix (2022a) and Lim and Duletzki (2023) also provide evidence of early public childcare reducing the child penalty in Norway and Germany, respectively.

4.2 Change in selection into motherhood

The characteristics of mothers may change over time, not only due to secular trends, but also due to differential selection into motherhood amid rising childlessness. Even holding all else constant (including policies), differential selection alone could alter the magnitude and dynamics of the motherhood effect. If women who expect smaller earnings losses are increasingly the ones who choose to have children, the observed penalty may decline. Conversely, if those who are more willing and able to absorb the earnings losses become mothers, the motherhood effect may remain stable or even increase. In this section, we explore selection into motherhood from two perspectives: economic resources and family-oriented preferences.

4.2.1 Economic resources

A commonly cited reason for very low fertility in Korea is that young people feel that they cannot "afford" to have children. Housing and education costs have increased, while job stability has declined in recent decades (Hwang, 2023; Kim et al., 2024). According to the 2005 National Survey on Marriage and Childbirth Trends conducted by the Korea Institute for Health and Social Affairs, men and women who intend to have only one child mentioned the high cost of raising children as the primary reason (40% among men and 47% among women).[28] In this context, women who are better financially prepared may become more likely to have children. Table 1 indicates that earnings one year prior to first childbirth are, on average, higher in the 1981–85 cohort than in the 1976–80 cohort for both mothers and their husbands, although this could reflect secular trends.

To directly assess whether selection into motherhood has changed across cohorts, we therefore compare the baseline characteristics of mothers and childless women within each cohort. We first identify women who are childless until age 37 using NHIS data.

[28] Other responses include job insecurity, lack of childcare options, work-family incompatibility, lack of time for leisure and personal development, health issues, and other.

We use age 37 as the threshold because most women have their first childbirth by their late 30s, and the youngest cohort in our sample (women born in 1985) is 37 years old in the last year of the medical records database.[29] Then we perform one-to-one random matching between the women in this childless sample and those in our mother sample based on their year of birth. The resulting analysis sample consists of pairs of women from the same cohort—one who has children and one who remains childless. We assign the event time (t) of the mother as a hypothetical event time for the matched childless woman.

[Table 2 here]

We run a regression where the dependent variable equals one if a woman gives birth by age 37 and zero otherwise, on her baseline characteristics at −12 months. Table 2 presents the results. Column (1) indicates that being employed increases the likelihood of becoming a mother by 8%p. Conditional on being employed, an increase in monthly earnings of $1,000 further increases the likelihood of becoming a mother by 1.5%p.[30] In column (2), we find that working in the public sector or a female-dominated firm are also positively associated with becoming a mother by age 37.

More importantly, we find that the interaction terms between the 1981-85 cohort dummy and woman's employment or earnings are positive and statistically significant (column (3)–(4)). Women's employment, earnings, and working in the public sector are positively associated with becoming a mother by age 37, and these relationships have become stronger in the 1981-85 cohort compared to the 1976-80 cohort. We find qualitatively similar results when we restrict the comparison group to childless but married women in Table A2.[31] A $1,000 increase in husband's earnings is also associated with a

[29] Earnings records in the NHIS data are available until 2020, but hospital records are available until 2022.

[30] This finding is not inconsistent with the generally negative association between women's educational attainment and fertility rates in Korea, given the distinction between the extensive and intensive margins of fertility. Although highly educated women have fewer children on average, they do not necessarily have higher childlessness rates (Hwang, 2023).

[31] Due to the positive correlation between wife's and husband's earnings, the coefficient on woman's earn-

roughly 2%p increase in the likelihood of becoming a mother, but this effect has slightly weakened in the more recent cohort (columns (7)–(8) of Table A2). The finding implies that selection into motherhood has become more *positive* across cohorts with regard to women's own employment, earnings, and job security.

Theoretically, stronger positive selection into motherhood does not necessarily imply an increase in the motherhood effect. In fact, it could reduce the observed penalty, as women with higher opportunity costs may choose to minimize career interruptions. However, motherhood effect could increase if women with "good jobs" are also more likely to take advantage of the expansion of parental leave described above. Although the policies were enforced at the national level, large firms or the public sector are known to offer a more supportive environment that facilitate employees' leave-taking without substantial disadvantages to their career prospects.[32] Many public sector organizations even allow extensions beyond the statutory one-year leave. Hence, mothers with such jobs and/or higher incomes may be better positioned to take longer parental leave. The heterogeneity in leave-taking by firm characteristics provides supportive evidence (Figure A8). The increase in leave take-up and duration is particularly pronounced among women with higher baseline earnings and those employed in large firms or the public sector.

[Table 3 here]

Table 3 examines in more detail the relationship between mothers' baseline characteristics and their labor supply responses after childbirth. Specifically, we regress the

ings switches from positive to negative when we additionally control for husband's earnings in columns (5)–(8) of Table A2. However, the interaction terms between the 1981-85 cohort dummy and woman's employment or earnings are still positive and statistically significant (columns (7)–(8)).

[32] There are variations in administrative details of implementing parental leave at the firm level. According to Ministry of Employment and Labor (2016), which surveyed 1,000 firms with at least five employees in Korea, 68% of large firms (with more than 300 employees) include the full duration of parental leave in the promotion eligibility period, while less than 55% of small firms (with fewer than 30 employees) do so. In terms of workplace culture regarding leave applications, 73% of large firms report that employees feel that they can freely apply to parental leave without pressure, compared to less than 40% in small firms.

duration (in months) of work without leave (columns (1)–(2)), leave (columns (3)–(4)), and non-employment (columns (5)–(6)) during the 61 months since first childbirth (from $t = 0$ to $t = 60$) on individual characteristics before first childbirth.[33] The three outcome variables are mutually exclusive and add to 61 months for each individual.

From the odd-numbered columns in Table 3, we find that the duration of working after childbirth decreased by about three months for the more recent cohort (column (1)), primarily due to a longer duration of leave rather than non-employment (columns (3) and (5)). Having higher earnings or working in the public sector are associated with significantly longer work and leave durations after childbirth, and hence shorter periods of non-employment. For example, being a public sector employee is associated with a leave duration that is 14 months longer, controlling for other characteristics.

The even-numbered columns in Table 3 show whether the relationships between baseline characteristics and labor supply responses after childbirth differ significantly by cohort. Compared to the 1976–1980 cohort, we find that the effects of higher earnings or working in the public sector became more pronounced in the 1981-85 cohort, leading to shorter working periods and longer leave (columns (2) and (4)). For example, being a public sector employee is associated with an additional four-month reduction in the working period due to a four-month extension of leave in the 1981-85 cohort compared to the 1976-80 cohort. We find qualitatively similar results when we additionally control for husband's earnings in Table A3.

The findings suggest that differential selection into motherhood based on economic factors, combined with more generous parental leave policies, may have contributed to larger motherhood effects on earnings in recent cohorts. Women with greater economic resources, in terms of earnings and job security, were more likely to become mothers in the 1981-85 cohort compared to the 1976-80 cohort. These women also took longer leave

[33] For these regressions, we define baseline characteristics at $t = -3$ instead of $t = -12$ because we want to capture the effect of work characteristics that are directly related to the post-birth labor supply response, rather than those associated with the decision to conceive a child. We find similar results when we use $t = -12$.

after childbirth, despite the associated earnings reductions.

4.2.2 Family-oriented preferences

Another potential dimension of selection is with respect to preferences. According to the Korean Longitudinal Survey of Women and Families, the percentage of women in their 20s who agree with the statement "having children is essential" dropped from 67% in 2010 to 37% in 2018 (Joo et al., 2021).[34] With shifting priorities and increasing childlessness, women who place greater value on family life may be increasingly more likely to become mothers. If so, the motherhood effect on earnings will increase, as these women are more likely to prioritize family over career advancement.

To investigate this possibility, we compare attitudes by cohort using data from the 2021 National Family and Fertility Survey. Conducted by the Korea Institute for Health and Social Affairs, the survey includes several questions about attitudes toward the personal value of having children. Specifically, individuals are asked if they agree with statements such as: "Having children is a source of joy in itself," "Having children strengthens family bonds and affection," and "Having children gives me a sense of being an adult." Figure A9 shows that women who have children are much more likely to strongly agree with these statements than childless women. Interestingly, however, mothers in the more recent cohort are slightly *more* likely to agree with each of these statements than mothers in the earlier cohort. For example, 54% of mothers in the 1981-85 cohort believe that having children strengthens family bonds and affection, compared to 49% of mothers in the 1976-80 cohort. We obtain similar results when we restrict the sample to a narrower age range.

We also examine the total number of births in the NHIS data, as a proxy for family-oriented preferences.[35] Figure A10 plots the cumulative number of births by event time

[34] Possible responses include "Strongly agree," "Somewhat agree," "Somewhat disagree," and "Strongly disagree."

[35] Twins are counted as one birth, as the number of births better reflects the mother's fertility choice.

for each cohort group. After jumping to exactly one birth at $t = 0$, the number of births gradually rises, starting around 18 months after the first birth. By year five, the average number of births is 1.78 for women in the 1976-80 cohort and 1.82 for those in the 1981-85 cohort. Despite the significant decline in cohort fertility rate during this period (Hwang, 2023), recent cohorts are slightly *more* likely to have additional children, conditional on having the first child.

Taken together, the combination of evidence—including the increase in the motherhood effect across all subgroups (Figure 4)—suggests increasingly positive selection into motherhood, not only along economic lines but also potentially in terms of preferences in more recent cohorts.

4.3 Greedier jobs?

An alternative explanation is that workplace environments have become less family-friendly over time. However, workplaces in Korea have become more accommodating to working parents in several respects. As mentioned in subsection 4.1, various family policies have been implemented, some of which directly aim to make work more compatible with parenting. In 2018, the government also revised the Labor Standards Act to reduce the maximum working hours from 68 to 52 per week, with the goal of improving work-life balance.

Nevertheless, working mothers may face greater penalties due to changes in occupational composition or characteristics, such as the increase in the returns paid to long hours ("greedy jobs," Goldin, 2014). If recent cohorts of women are more likely than earlier cohorts to hold such jobs, which are difficult to reconcile with childcare, they may be more inclined to switch to lower-paying, more flexible jobs or exit the workforce after having children.

Because the NHIS data do not contain information on occupation, we use auxiliary survey data—the Korean Labor Income Study (KLIPS) and the Korea Network for Occu-

pations and Workers (KNOW)—to analyze changes in working hours and occupational characteristics. Collected by the Korea Labor Institute, the KLIPS provides information on individuals' fertility and labor market outcomes, including working hours. We use 2002–2017 waves of the KLIPS to construct a sample of mothers who meet the same criteria (birth cohorts, age at first childbirth, and year of childbirth) as our main sample. To examine working hours, we restrict the sample to women with at least one non-missing working hours observation within three years before or after childbirth, and use the observation closest to the year of first childbirth.

The KNOW data are similar to the Occupational Information Network (O*NET) data in the U.S., and contain information on various occupational characteristics. We focus on two features relevant to work-family compatibility: time pressure and weekend work. Specifically, the survey questions are "How often does this job require the worker to meet strict deadlines?" and "How often do you go to work on weekends and holidays while performing your job?" respectively. The responses are recorded on a Likert scale, where higher values indicate a higher frequency. We calculate the average of the responses to these questions by occupation and merge the variables with the KLIPS sample using occupation codes.[36]

Figure A11(a), Figure A11(b), and Figure A11(c) present the distributions of weekly working hours, extent of time pressure, and weekend work, respectively, among women in the 1967–80 and 1981-85 cohorts before (dashed lines) and after (solid lines) first childbirth in the KLIPS sample. Across all three measures, there is little evidence to suggest that the more recent cohort of mothers hold "greedier" jobs.[37] In fact, time pressure decreased across cohorts, both before and after first childbirth. Although the lack of flexibility in work environments is an important factor in the overall gender pay gap, it does not appear to be the main driver of the increasing motherhood effect across recent

[36] About 55% of the KLIPS sample is matched to the KNOW variables. Some are not matched due to the difference in occupation codes between the two datasets.

[37] We find qualitatively similar results when we normalize each characteristic and combine them into an index as in Kim (2023).

cohorts.

5 Conclusion

The impact of children is the largest factor in explaining the gender pay gap in most developed countries, as women reduce their labor supply following childbirth. However, the motherhood effect also depends on who becomes a mother. This study examines how the increase in childlessness can affect the size, interpretation, and policy implications of the motherhood effect, focusing on South Korea, the country with the world's lowest fertility rate. Using comprehensive administrative panel data and an event study design, we show that the motherhood effect on earnings has *increased* across recent cohorts of women born between 1976 and 1985.

Why has the motherhood effect increased despite progress in overall gender equality? We provide suggestive evidence that the combination of two factors contributed to this trend: the expansion of parental leave policies and increasing selection into motherhood. As childlessness rose, mothers became more positively selected. Women who have higher earnings and greater job security are increasingly more likely to become mothers and better positioned to take advantage of extended parental leave, even at the cost of earnings reductions. Complementary survey evidence further suggests that recent cohorts of mothers place greater personal value on having children. The combination of evidence suggests increasingly positive selection into motherhood, not only along economic resources but also possibly with respect to preferences.

Beyond documenting the motherhood effect in an Asian context using rich administrative data, our findings offer broader implications for how it is interpreted and addressed through policy. Even in settings with improving gender equality and family policies, the motherhood effect may persist or even grow——not because gender gaps are worsening, but because of changes in who becomes a mother. Framing the impact of chil-

dren as a "child penalty" may thus obscure these underlying dynamics. At the same time, family policies such as parental leave may have limited impact on reducing the motherhood effect if gendered patterns in take-up persist and rigid labor market structures leave working mothers with few flexible options. These constraints not only shape the magnitude of the motherhood effect, but also influence fertility decisions themselves—raising important questions about who chooses, or is able, to become a parent in the first place.

References

Adams-Prassl, Abi, Mathias Fjællegaard Jensen, and Barbara Petrongolo, "Birth Timing and Spacing: Implications for Parental Leave Dynamics and Child Penalties," *IZA Discussion Papers*, 2024.

Almond, Douglas, Yi Cheng, and Cecilia Machado, "Large motherhood penalties in US administrative microdata," *Proceedings of the National Academy of Sciences*, 2023, *120* (29), e2209740120.

Anderson, Thomas M. and Hans Peter Kohler, "Education Fever and the East Asian Fertility Puzzle: A case study of low fertility in South Korea," *Asian Population Studies*, 2013, *9* (2), 196–215.

Andresen, Martin Eckhoff and Emily Nix, "Can the child penalty be reduced? Evaluating multiple policy interventions," *Working Paper*, 2022.

_ and _, "What causes the child penalty? Evidence from adopting and same-sex couples," *Journal of Labor Economics*, 2022, *40* (4), 971–1004.

Angelov, Nikolay, Per Johansson, and Erica Lindahl, "Parenthood and the gender gap in pay," *Journal of Labor Economics*, 2016, *34* (3), 545–579.

Artmann, Elisabeth, Hessel Oosterbeek, and Bas van der Klaauw, "Household specialization and the child penalty in the Netherlands," *Labour Economics*, 2022, *78*, 102221.

Cortés, Patricia and Jessica Pan, "Children and the remaining gender gaps in the labor market," *Journal of Economic Literature*, 2023, *61* (4), 1359–1409.

Doepke, Matthias, Anne Hannusch, Fabian Kindermann, and Michèle Tertilt, "The economics of fertility: A new era," in "Handbook of the Economics of the Family," Vol. 1, Elsevier, 2023, pp. 151–254.

Fukai, Taiyo and Ayako Kondo, "Parental Earnings Trajectories around Childbirth in Japan: Evidence from local tax records," *Working Paper*, 2025.

Goldin, Claudia, "A grand gender convergence: Its last chapter," *American Economic Review*, 2014, *104* (4), 1091–1119.

_, *Career and family: Women's century-long journey toward equity*, Princeton University Press, 2021.

_, "Nobel Lecture: An Evolving Economic Force," *American Economic Review*, 2024, *114* (6), 1515–1539.

_, "Babies and the macroeconomy," *Economica*, 2025.

Harrington, Emma and Matthew E Kahn, "Has the Rise of Work-from-Home Reduced the Motherhood Penalty in the Labor Market?," *Working Paper*, 2023.

Hellstrand, Julia, Jessica Nisén, Vitor Miranda, Peter Fallesen, Lars Dommermuth, and Mikko Myrskylä, "Not Just Later, but Fewer: Novel Trends in Cohort Fertility in the Nordic Countries," *Demography*, 2021, *58* (4), 1373–1399.

Hwang, Jisoo, "Housewife,"gold miss," and equal: The evolution of educated women's role in Asia and the U.S.," *Journal of Population Economics*, 2016, *29* (2), 529–570.

_ , "Later, fewer, none? Recent trends in cohort fertility in South Korea," *Demography*, 2023, *60* (2), 563–582.

Joo, Jaeseon, Dongsun Lee, Chiseon Song, Geonpyo Park, Jinsook Lee, Songyi Park, Yeongyu Lim, Junyoung Yang, and Changkyoon Son, "Korean Longitudinal Survey of Women Families : the 2020 Annual Report," *Korean Women's Development Institute*, 2021, *2021* (53).

Juhn, Chinhui and Kristin McCue, "Specialization then and now: Marriage, children, and the gender earnings gap across cohorts," *Journal of Economic Perspectives*, 2017, *31* (1), 183–204.

Kearney, Melissa S, Phillip B Levine, and Luke Pardue, "The puzzle of falling US birth rates since the great recession," *Journal of Economic Perspectives*, 2022, *36* (1), 151–176.

Kearney, Melissa Schettini and Phillip B Levine, "Why Is Fertility So Low in High Income Countries?," *NBER Working Paper*, 2025.

Kim, Anna and Youjin Hahn, "The motherhood effect on labour market outcomes: evidence from South Korea," *Asian-Pacific Economic Literature*, 2022, *36* (2), 71–88.

Kim, MinSub, "Work Environment for Work-Family Balance," Technical Report, Korea Development Institute 2023. [in Korean].

Kim, Seongeun, Michele Tertilt, and Minchul Yum, "Status externalities in education and low birth rates in Korea," *American Economic Review*, 2024, *114* (6), 1576–1611.

Kleven, Henrik, "The geography of child penalties and gender norms: Evidence from the United States," *NBER Working Paper*, 2022.

_ **, Camille Landais, and Gabriel Leite-Mariante**, "The child penalty atlas," *Review of Economic Studies*, 2024, p. rdae104.

_ **,** _ **, and Jakob Egholt Søgaard**, "Children and gender inequality: Evidence from Denmark," *American Economic Journal: Applied Economics*, 2019, *11* (4), 181–209.

_ **,** _ **, and** _ , "Does biology drive child penalties? evidence from biological and adoptive families," *American Economic Review: Insights*, 2021, *3* (2), 183–98.

_ **,** _ **, Johanna Posch, Andreas Steinhauer, and Josef Zweimüller**, "Child penalties across countries: Evidence and explanations," *AEA Papers and Proceedings*, 2019, *109*, 122–126.

_ , _ , _ , _ , **and** _ , "Do family policies reduce gender inequality? Evidence from 60 years of policy experimentation," *American Economic Journal: Economic Policy*, 2024, *16* (2), 110–149.

Kwak, Eunhye, "Analysis of the Effectiveness of Fertility Encouragement policies," Policy Research, Korea Labor Institute, Seoul, South Korea March 2021. [in Korean].

Lim, Nayeon and Lisa-Marie Duletzki, "The Impact of Early Public Childcare on Child Penalties: Evidence from West Germany," *Working Paper*, 2023.

Min, Gyurayng and Chulhee Lee, "The Effects of Universal Child Care Subsidy on Female Labor Supply and Fertility," *Korean Journal of Labor Economics*, 2020, *43* (4).

Ministry of Employment and Labor, "2015 Survey on Work-Life Balance," 2016.

_ , "Survey Report on Labor Conditions by Employment Type," Technical Report 2020. [in Korean].

Myong, Sunha, JungJae Park, and Junjian Yi, "Social norms and fertility," *Journal of the European Economic Association*, 2021, *19* (5), 2429–2466.

OECD, "Reporting Gender Pay Gaps in OECD Countries: Guidance for Pay Transparency Implementation, Monitoring and Reform," Technical Report, Paris, France 2023.

_ , "Fertility rates (indicator)," https://data.oecd.org/pop/fertility-rates.htm 2024.

OECD Family Database, "Share of Birth Outside of Marriage," 2024.

Okuyama, Yoko, Takeshi Murooka, and Shintaro Yamaguchi, "Unpacking the child penalty using personnel data: How promotion practices widen the gender pay gap," *Working Paper*, 2025.

Olivetti, Claudia and Barbara Petrongolo, "The economic consequences of family policies: Lessons from a century of legislation in high-income countries," *Journal of Economic Perspectives*, 2017, *31* (1), 205–230.

Rabaté, Simon and Sara Rellstab, "What determines the child penalty in the Netherlands? The role of policy and norms," *De Economist*, 2022, *170* (2), 195–229.

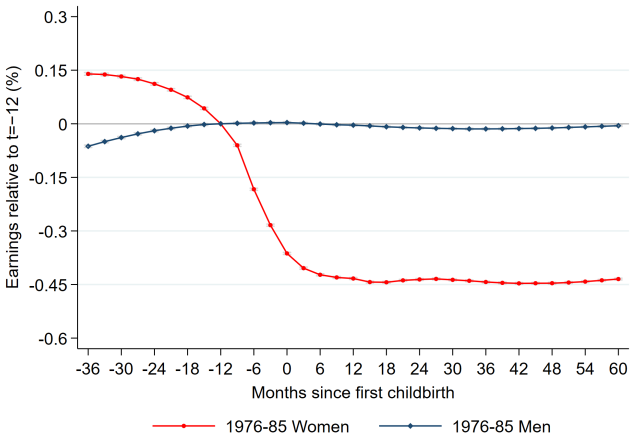
Sieppi, Antti and Jaakko Pehkonen, "Parenthood and gender inequality: Population-based evidence on the child penalty in Finland," *Economics letters*, 2019, *182*, 5–9.

Sobotka, Tomas, "World's highest childlessness levels in East Asia," *Population Societies*, 2021, *595* (11), 1–4.

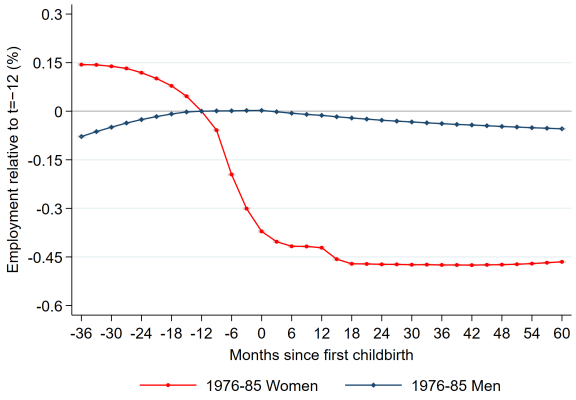
Stansbury, Anna, Jacob Funk Kirkegaard, and Karen Dynan, "Gender gaps in South Korea's labour market: children explain most of the gender employment gap, but little of the gender wage gap," *Applied Economics Letters*, 2024, *31* (17), 1726–1731.

Statistics Korea, "Population Census," 2022. Accessed: November 5, 2024.

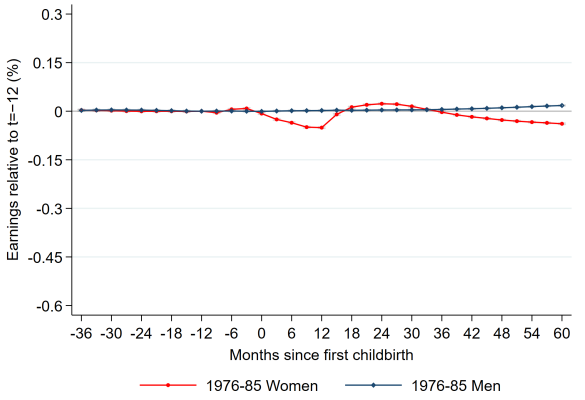
Yoo, Inkyung and Jungmin Lee, "The effects of marriage and childbearing on labor market outcomes and subjective well-being among women," *Korean Journal of Labor Economics*, 2020, *43* (4), 35–86. [in Korean].



(a) Earnings



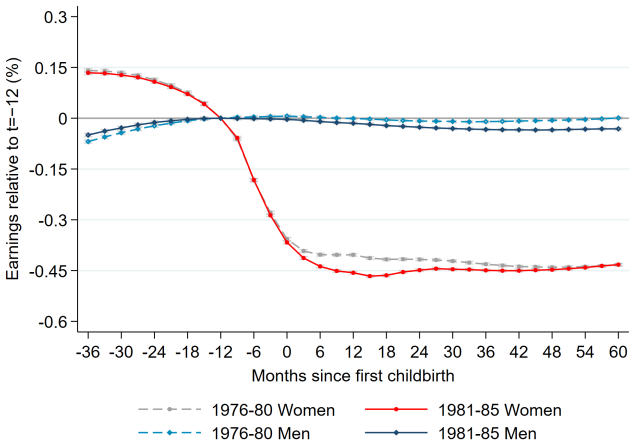
(b) Employment



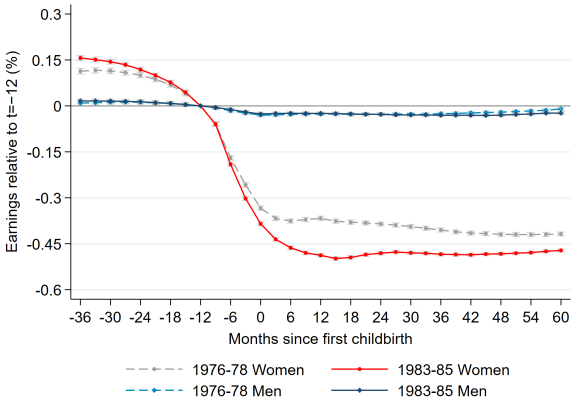
(c) Earnings Conditional on Employment

Figure 1: Impacts of Children on Earnings and Employment

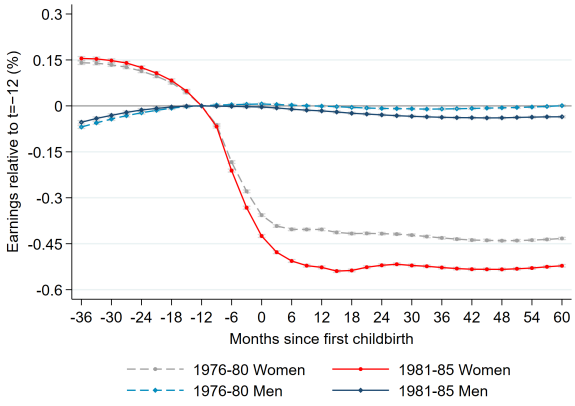
Notes. The figures show the event time coefficients estimated from equation (1) as a percentage of the counterfactual outcome absent children as defined in equation (2), for women and men separately. The sample consists of women born between 1976 and 1985 who gave first childbirth between 2005 and 2015, and their husbands identified at $t = 0$. Figure (c) excludes individuals who are not employee-insured. 95% confidence intervals are shown in light gray.



(a) Main sample



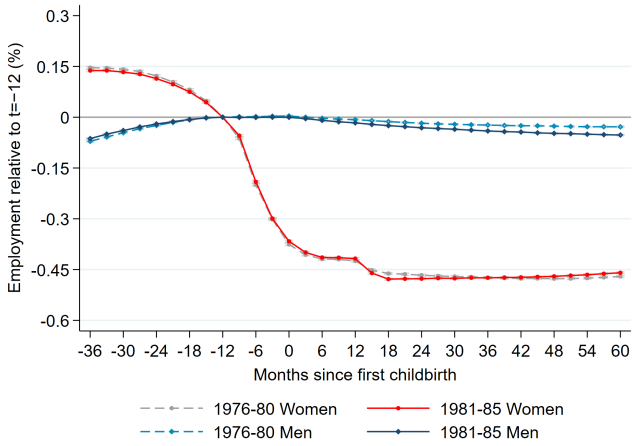
(b) Non-adjacent cohorts



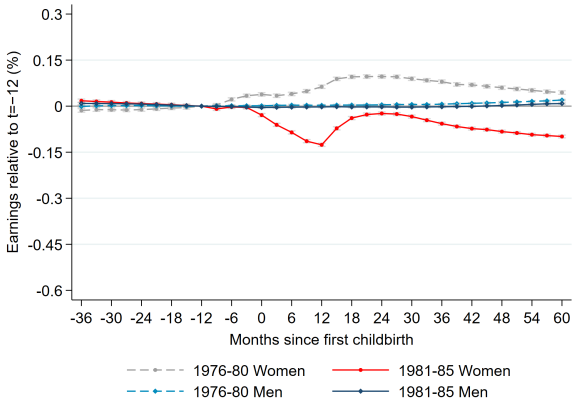
(c) Using a common counterfactual $\tilde{Y}_{1976-80}$

Figure 2: Impacts of Children on Earnings by Cohort

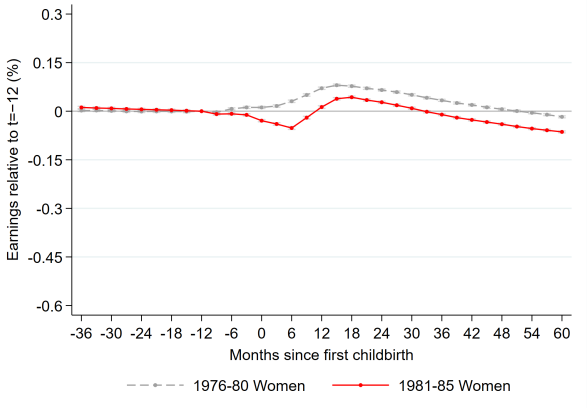
Notes. Figure (a) shows the event time coefficients estimated from equation (1) as a percentage of the counterfactual outcome absent children as defined in equation (2), for each group separately. The sample consists of a balanced panel of women born between 1976 and 1985 who gave first childbirth between 2005 and 2015, and their husbands, as defined in subsection 2.2. Figures (b) and (c) shows the event time coefficients as in (a), but using alternative sample or specification. Figure (b) sample consists of women born between 1976-78 and 1983-85 who gave first childbirth between 2005 and 2015. Figure (c) uses the counterfactual outcome without children for the 1976-80 cohort as the denominator when converting the level effect into percentage effects (equation (2)) for both cohort groups. 95% confidence intervals are shown in light gray.



(a) Employment



(b) Earnings Conditional on Employment



(c) Earnings Conditional on Working (w/o Leave)

Figure 3: Impacts of Children on Employment and Earnings Conditional on Employment by Cohort

Notes. The figures show the event time coefficients estimated from equation (1) as a percentage of the counterfactual outcome absent children as defined in equation (2), for each group separately. The sample consists of women born between 1976 and 1985 who gave first childbirth between 2005 and 2015, and their husbands, as defined in subsection 2.2. Figures (b) and (c) exclude individuals who are not employee-insured, with (c) further excluding those on leave. 95% confidence intervals are shown in light gray.

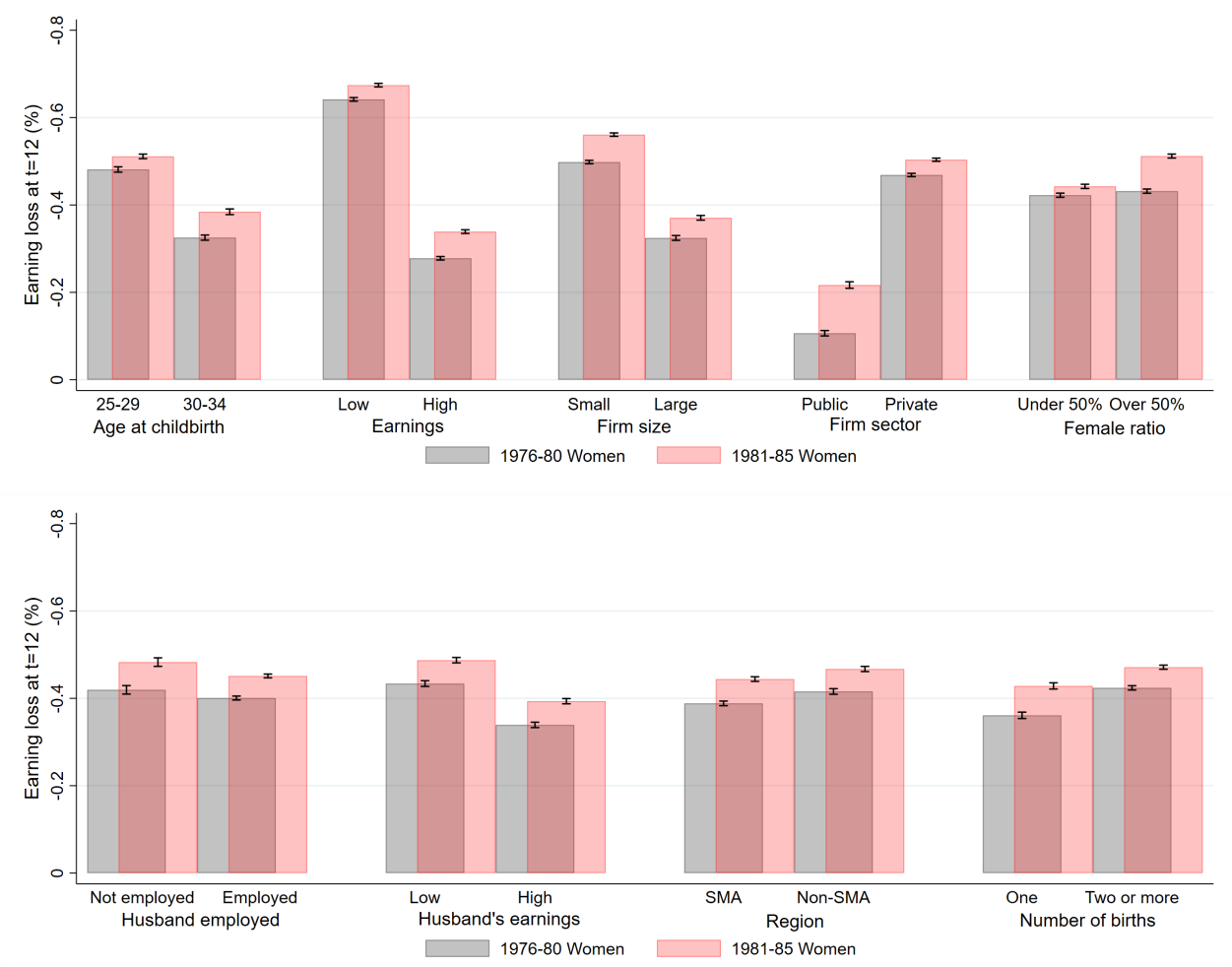
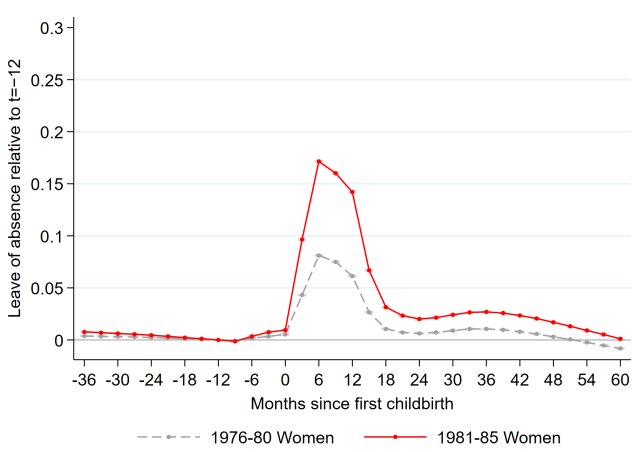
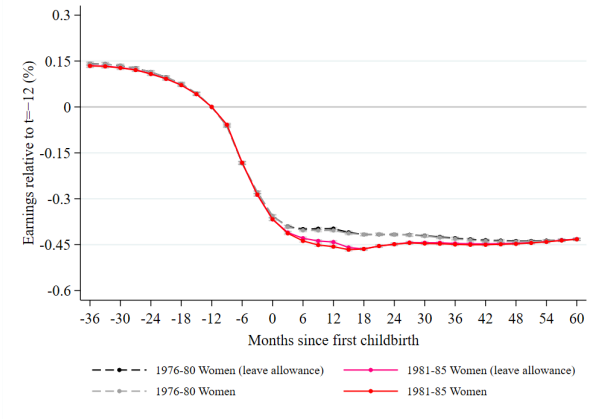


Figure 4: Heterogeneity in the Motherhood Effect on Earnings by Cohort

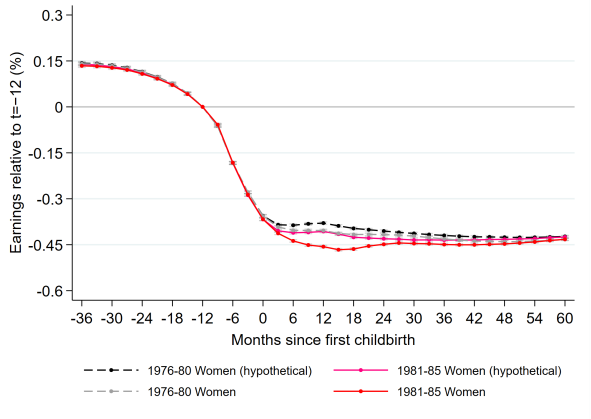
Notes. The figure shows the impact of children on earnings as in Figure 2(a) at $t = 12$, separately by subgroup and cohort. All subgroups are defined based on characteristics defined at $t = -12$, except for the total number of births which is defined at $t = 60$. Earnings and workplace characteristics are defined for employed individuals only. The threshold for high earnings is \$2,200 for women and \$3,000 for men. Large firms are those with 300 or more employees. The sample consists of a balanced panel of women born between 1976 and 1985 who gave first childbirth between 2005 and 2015, as defined in subsection 2.2. 95% confidence intervals are shown with spikes.



(a) Share of Mothers on Leave



(b) Earnings Including Parental Leave Allowance



(c) Hypothetical Earnings Without Leave

Figure 5: Impacts of Children on Earnings Considering Parental Leave by Cohort

Notes. Figure (a) shows the event time coefficients estimated from equation (1), and figure (b) and (c) shows the event time coefficients estimated from equation (1) as a percentage of the counterfactual outcome absent children as defined in equation (2), for each group separately. Figure (b) shows the results based on earnings that include parental leave allowances, where zero earnings during leave periods are replaced with the expected value of the allowance. Figure (c) plots the results using hypothetical earnings for employees on leave, by replacing zero earnings during leave with their earnings from one month preceding leave. The sample consists of a balanced panel of women born between 1976 and 1985 who gave first childbirth between 2005 and 2015, as defined in subsection 2.2. 95% confidence intervals are shown in light gray.

Table 1: Summary Statistics 12 Months Before First Childbirth

	Women		Men (husbands)	
	1976-80	1981-85	1976-80	1981-85
A. All				
Age	28.4102	28.4102	30.7236	30.7908
	(2.0987)	(2.2094)	(2.8368)	(3.0391)
Monthly earnings (1 USD)	1255.87	1457.31	2408.20	2590.47
	(1392.30)	(1506.08)	(1906.43)	(2042.02)
Employee	0.5220	0.5966	0.7517	0.7874
	(0.4745)	(0.4906)	(0.4104)	(0.4092)
Employee at −24 months	0.5674	0.6430	0.7108	0.7489
	(0.4706)	(0.4791)	(0.4307)	(0.4337)
Employee at −36 months	0.5590	0.6298	0.6479	0.6872
	(0.4716)	(0.4829)	(0.4537)	(0.4636)
Seoul Metropolitan Area	0.5365	0.5271	0.5502	0.5329
	(0.4737)	(0.4993)	(0.4725)	(0.4989)
N	594,490	536,383	594,490	536,383
B. Among women employed at* −12 *months				
Age	28.4690	28.4510	30.6941	30.7596
	(2.0533)	(2.1509)	(2.7036)	(2.895)
Monthly earnings (1 USD)	2405.64	2442.60	2635.53	2785.53
	(1099.67)	(1181.19)	(1864.84)	(1994.43)
Employee at −24 months	0.8639	0.8734	0.7622	0.7911
	(0.3246)	(0.3325)	(0.403)	(0.4065)
Employee at −36 months	0.7961	0.8129	0.6956	0.7263
	(0.3814)	(0.39)	(0.4356)	(0.4459)
Large firm (≥ 300 employees)	0.3285	0.3452	0.3412	0.3733
	(0.4446)	(0.4754)	(0.4488)	(0.4837)
Public sector	0.1136	0.0947	0.0729	0.0675
	(0.3004)	(0.2928)	(0.2461)	(0.2509)
Female firm (female ratio ≥ 50%)	0.5312	0.5541	0.2508	0.2556
	(0.2519)	(0.269)	(0.1893)	(0.2076)
Seoul Metropolitan Area	0.5632	0.5455	0.5742	0.5510
	(0.4695)	(0.4979)	(0.4681)	(0.4974)
N	312,505	320,018	312,505	320,018

Notes. The sample consists of a balanced panel of women born between 1976 and 1985 who gave first childbirth between 2005 and 2015, and their husbands, as defined in subsection 2.2. Men's cohort grouping is based on their wives' year of birth. Weights are applied to women in the 1976–80 cohort (and their husbands) to match the distribution of age at first childbirth of women in the 1981–85 cohort. Standard deviations are in parentheses.

Table 2: Selection into Motherhood

	Dependent variable: mother by age 37			
Baseline characteristics ($t = -12$)	(1)	(2)	(3)	(4)
Intercept	0.4905***	0.4892***	0.4928***	0.4919***
	(0.0007)	(0.0007)	(0.0008)	(0.0008)
81–85 cohort	−0.0083***	−0.0076***	−0.0137***	−0.0138***
	(0.0007)	(0.0007)	(0.0012)	(0.0012)
Seoul Metroplitan Area	−0.0806***	−0.0788***	−0.0768***	−0.0750***
	(0.0007)	(0.0007)	(0.0009)	(0.0009)
Employee	0.0825***	0.0750***	0.0791***	0.0717***
	(0.0011)	(0.0013)	(0.0016)	(0.0019)
Employee * monthly earnings (1,000 USD)	0.0149***	0.0129***	0.0123***	0.0101***
	(0.0004)	(0.0004)	(0.0006)	(0.0006)
Employee * large firm		0.0011		−0.0002
		(0.0011)		(0.0015)
Employee * public sector		0.0811***		0.0797***
		(0.0016)		(0.0023)
Employee * female firm		0.0078***		0.0085***
		(0.0010)		(0.0014)
81–85 cohort * Seoul Metroplitan Area			−0.0074***	−0.0073***
			(0.0013)	(0.0013)
81–85 cohort * employee			0.0078***	0.0080***
			(0.0022)	(0.0026)
81–85 cohort * monthly earnings			0.0048***	0.0052***
			(0.0008)	(0.0008)
81–85 cohort * large firm				0.0020
				(0.0021)
81–85 cohort * public sector				0.0043
				(0.0032)
81–85 cohort * female firm				−0.0018
				(0.0019)
N	2,261,746	2,261,746	2,261,746	2,261,746

Notes. The dependent variable equals 1 if a woman gives birth by age 37, and 0 otherwise. *81–85 cohort* is an indicator variable that equals 1 for women in the 1981-85 cohort and 0 for those in the 1976-80 cohort. The sample consists of women born between 1976 and 1985 who had their first childbirth between 2005 and 2015, as well as women who are childless until the age of 37. We conduct one-to-one random matching between mothers and childless women by their birth year. The dependent variable mean is therefore 0.5 by construction. We assign the event time (t) of the mother to the matched childless woman as a hypothetical event time. Standard errors are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 3: Duration of Work, Leave, and Non-Employment, among Mothers who were Employed before Childbirth

	Dependent variable: duration (in months) after first childbirth					
	Work		**Leave**		**Non-employment**	
Baseline characteristics ($t = -3$)	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	27.1870***	25.3297***	−0.3332***	0.9080***	34.1462***	34.7624***
	(0.0897)	(0.1228)	(0.0422)	(0.0576)	(0.0874)	(0.1198)
81-85 cohort	−3.4827***	−0.0145	3.8818***	1.5573***	−0.3991***	−1.5427***
	(0.0603)	(0.1679)	(0.0283)	(0.0787)	(0.0587)	(0.1637)
Seoul Metroplitan Area	−1.3821***	−2.2977***	1.1534***	1.3830***	0.2287***	0.9147***
	(0.0618)	(0.0909)	(0.0291)	(0.0426)	(0.0602)	(0.0887)
Monthly earnings (1,000 USD)	3.8379***	4.4662***	0.7865***	0.5268***	−4.6244***	−4.9930***
	(0.0250)	(0.0377)	(0.0118)	(0.0177)	(0.0244)	(0.0367)
Large firm	1.3005***	1.9609***	3.3284***	2.3037***	−4.6289***	−4.2647***
	(0.0672)	(0.0981)	(0.0316)	(0.0460)	(0.0654)	(0.0956)
Public sector	2.7226***	4.7587***	14.8027***	12.7640***	−17.5254***	−17.5227***
	(0.0867)	(0.1222)	(0.0407)	(0.0573)	(0.0844)	(0.1192)
Female firm	−1.0298***	−0.5796***	0.7674***	0.7351***	0.2625***	−0.1555*
	(0.0617)	(0.0897)	(0.0290)	(0.0420)	(0.0601)	(0.0875)
81-85 cohort * Seoul Metroplitan Area		1.6420***		−0.3949***		−1.2472***
		(0.1238)		(0.0580)		(0.1207)
81-85 cohort * monthly earnings		−1.1218***		0.4601***		0.6617***
		(0.0504)		(0.0236)		(0.0491)
81-85 cohort * large firm		−1.1871***		1.8539***		−0.6668***
		(0.1344)		(0.0630)		(0.1310)
81-85 cohort * public sector		−4.1889***		4.1089***		0.0800
		(0.1731)		(0.0811)		(0.1688)
81-85 cohort * female firm		−0.9634***		0.1574***		0.8061***
		(0.1235)		(0.0579)		(0.1204)
N	459,221	459,221	459,221	459,221	459,221	459,221

Notes. The dependent variable is the duration (in months) of work, leave, and non-employment over the 61 months since first childbirth (from $t = 0$ to $t = 60$). The average is 34.6 months, 8.2 months, 18.1 months, respectively. *81–85 cohort* is an indicator variable that equals 1 for women in the 1981-85 cohort and 0 for those in the 1976-80 cohort. The sample consists of women born between 1976 and 1985 who had their first childbirth between 2005 and 2015, and are employed at $t = -3$. Weights are applied to women in the 1976-80 cohort to match the distribution of age at first childbirth of women in the 1981-85 cohort. Standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

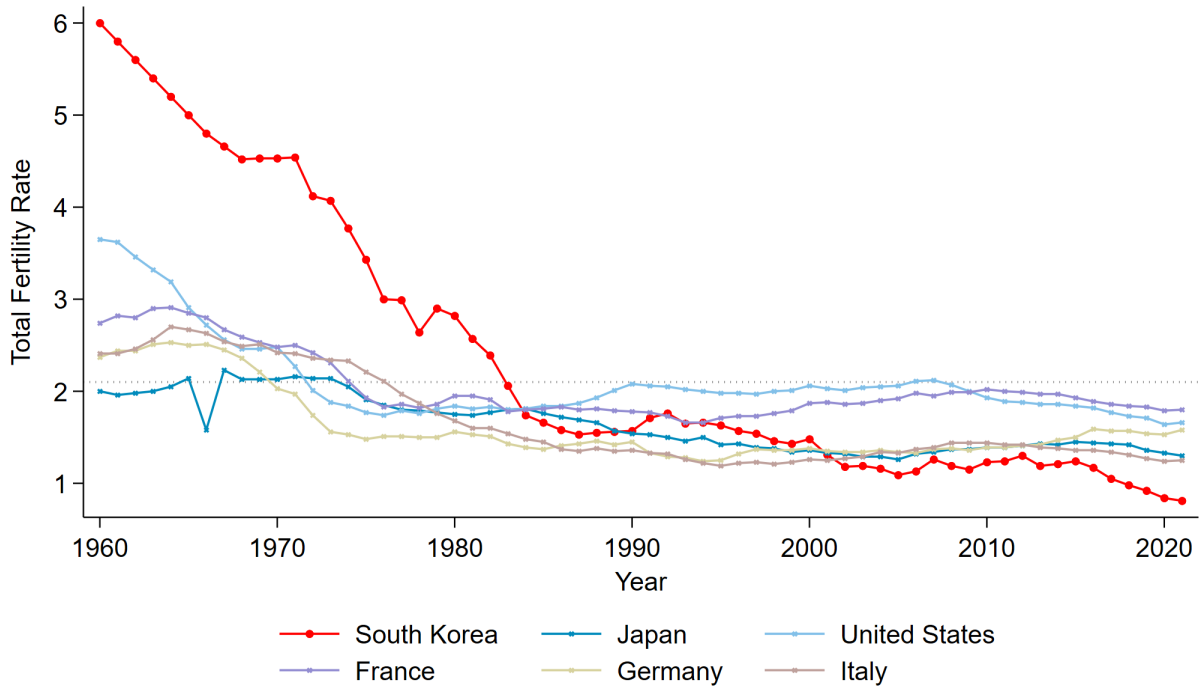


Figure A1: Total Fertility Rate in Selected Developed Countries

Notes. Data from (OECD, 2024). The dotted horizontal line represents the replacement level fertility of 2.1 children per woman.

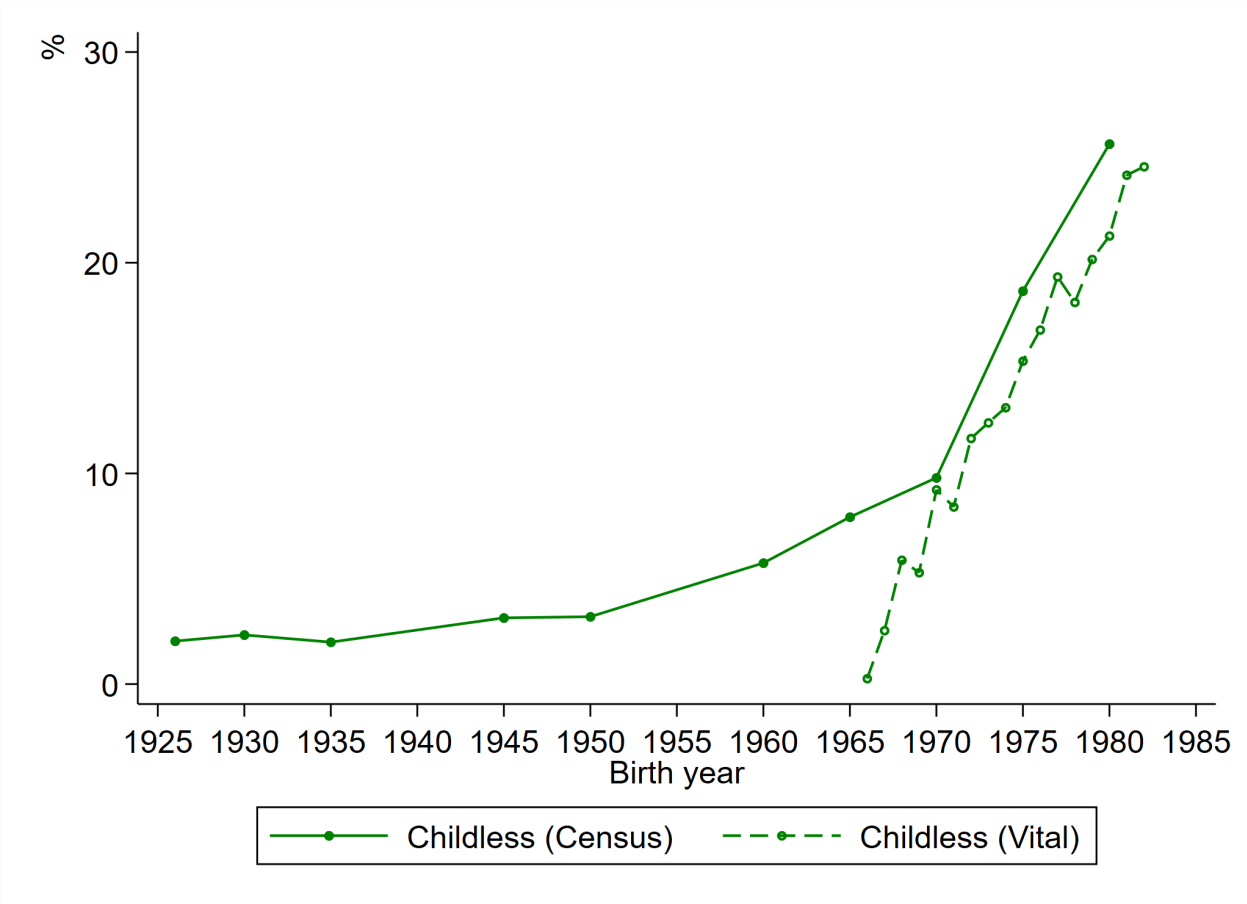


Figure A2: Share of Women Childless at Age 40

Notes. Data from the 1966–2020 census 1% sample (Census) and 1981–2022 vital statistics merged with the Resident Population (Vital). Source: Hwang (2023).

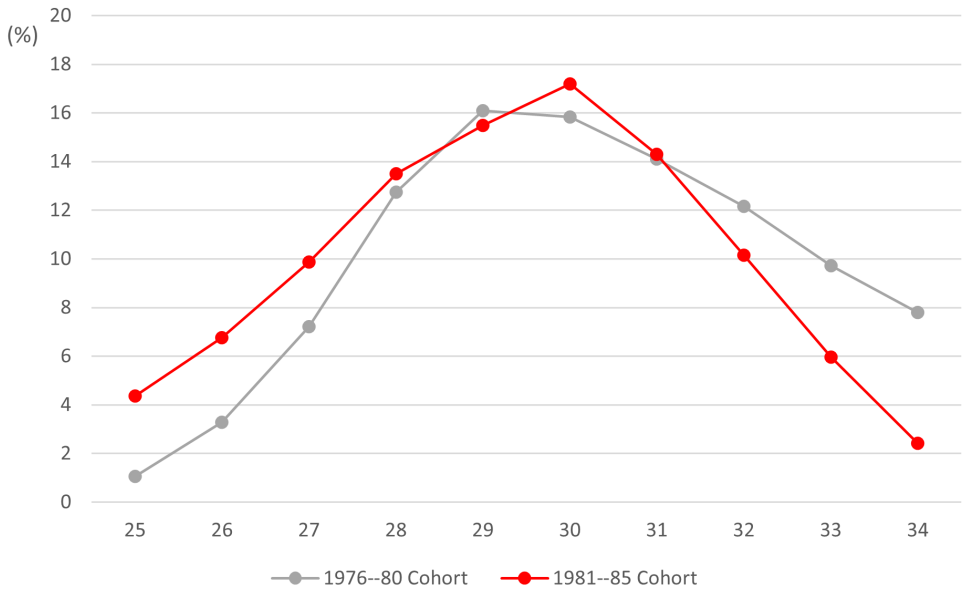
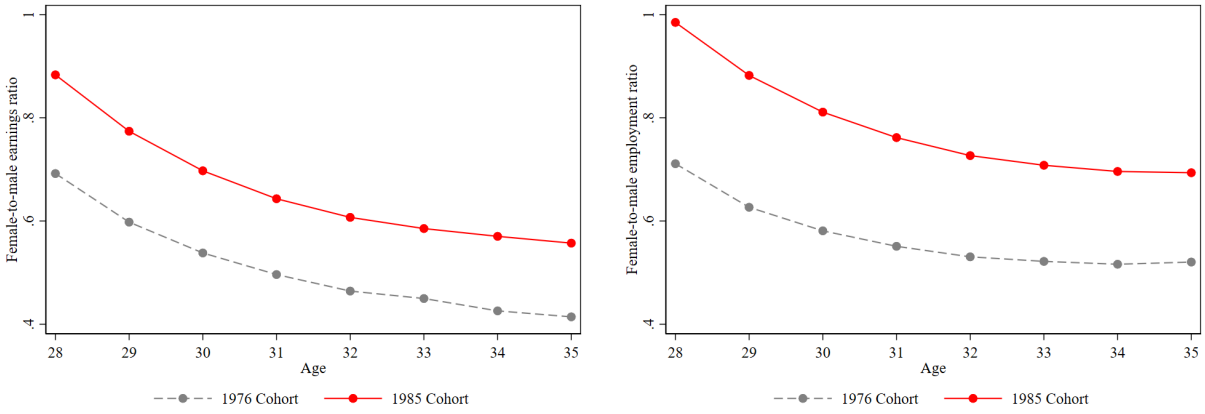


Figure A3: Distribution of Age at First Childbirth in the NHIS Data by Cohort

Notes. The distribution of age at first childbirth observed in the 2002–2020 NHIS data among women born between 1976-80 and 1981-85, who had their first childbirth between 2005 and 2015.

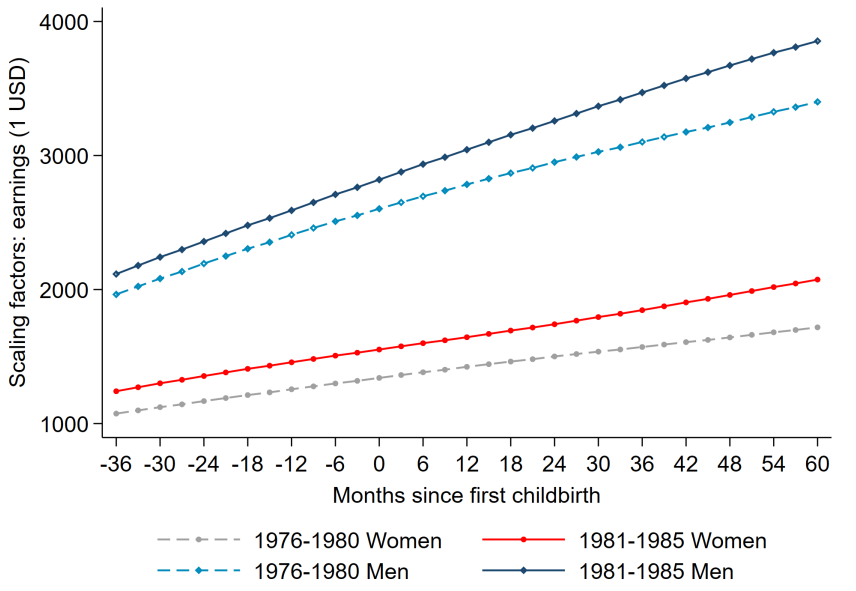


(a) Earnings

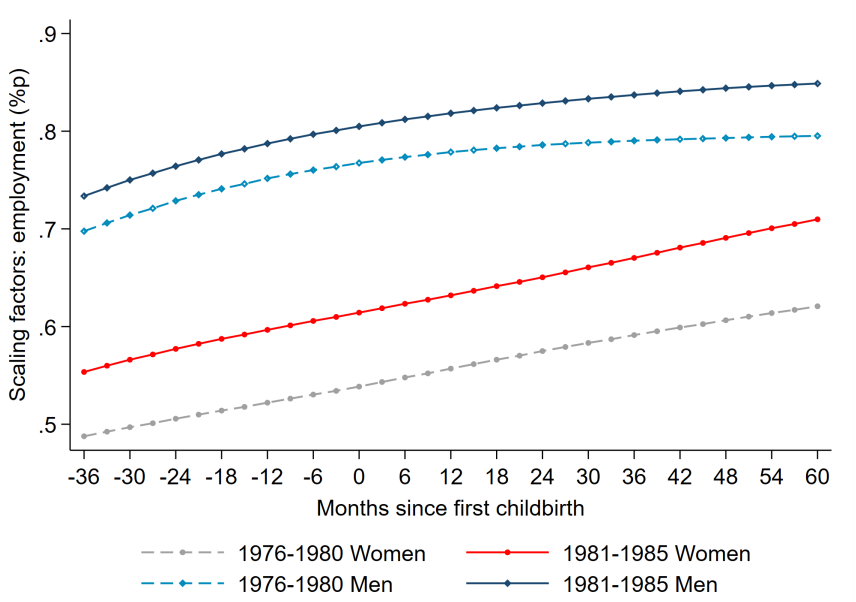
(b) Employment

Figure A4: Female-to-Male Ratios in Earnings and Employment by Cohort

Notes. The figure shows female-to-male earnings and employment ratios at each age by cohort using the NHIS data. The sample includes all men and women born in 1976 and 1985. For those who are not employed, earnings equal zero.



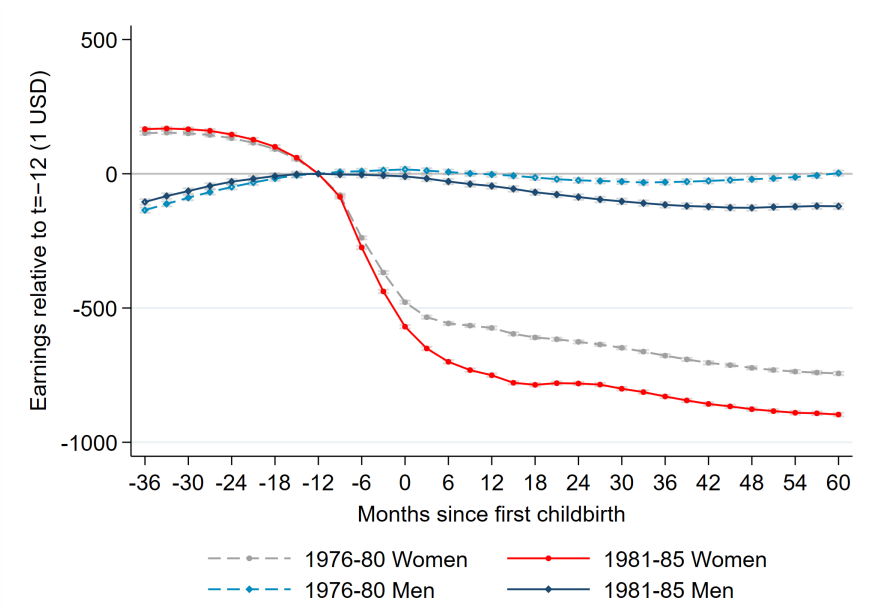
(a) Counterfactual Earnings



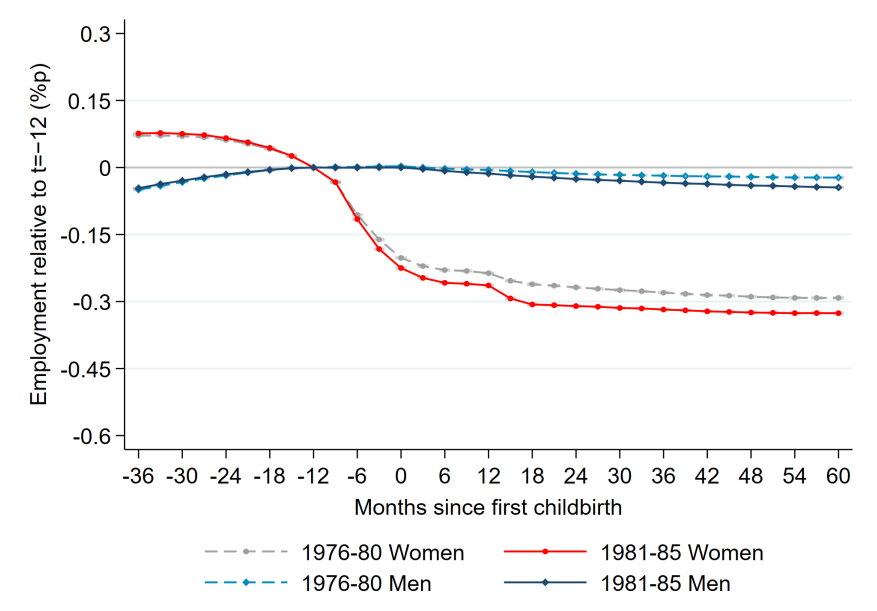
(b) Counterfactual Employment

Figure A5: Counterfactual Outcomes if Childbirth had Never Occurred ($\tilde{Y}$) by Cohort

Notes. The figure shows the counterfactual outcome absent children, i.e., $\tilde{Y}^g_{ism} = \hat{\beta}^g_{age_{is}} + \hat{\gamma}^g_s$ as defined in equation (1) for each group separately. The sample consists of a balanced panel of women born between 1976 and 1985 who gave first childbirth between 2005 and 2015, and their husbands, as defined in subsection 2.2.



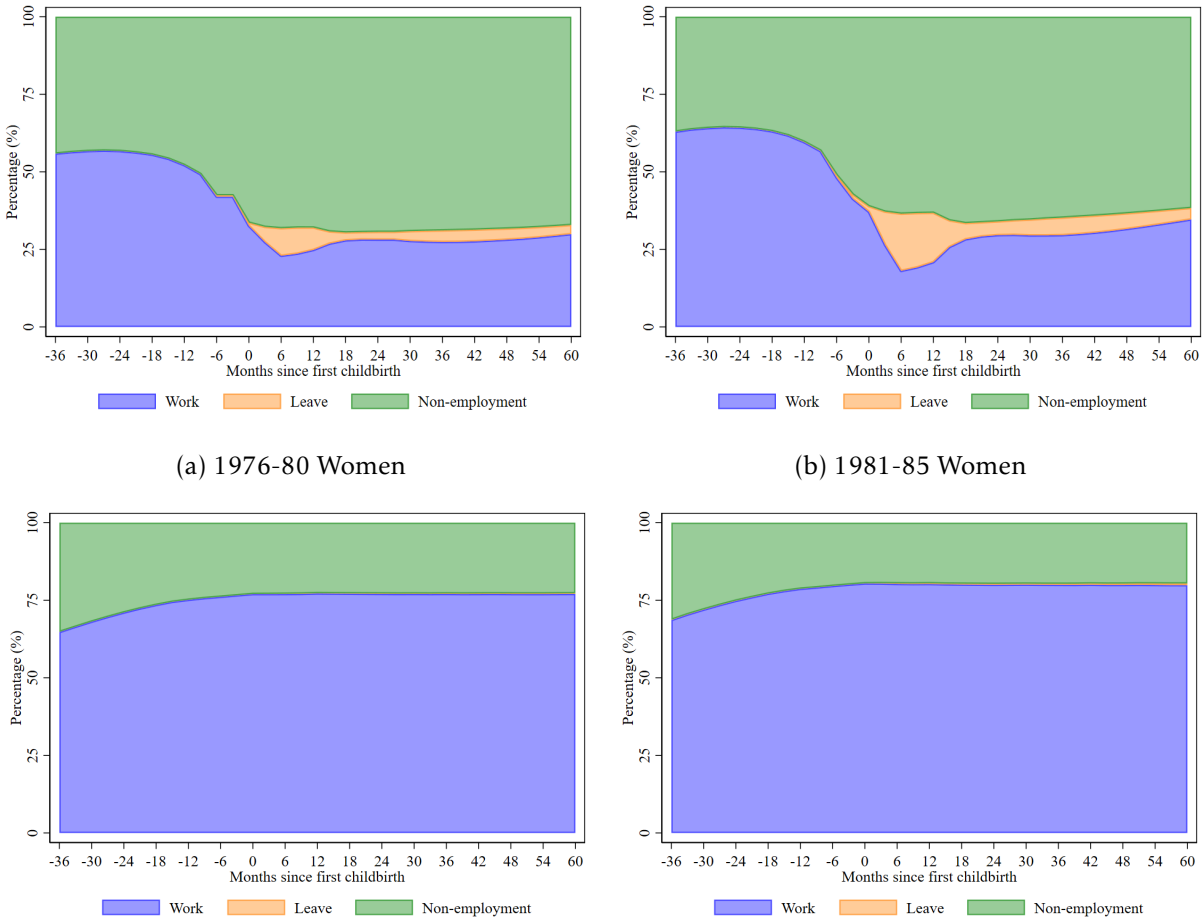
(a) Earnings



(b) Employment

Figure A6: Impacts of Children on Levels of Earnings and Employment ($\hat{\alpha}$) by Cohort

Notes. The figure shows the event time coefficients estimated from equation (1) for each group separately. The sample consists of a balanced panel of women born between 1976 and 1985 who gave first childbirth between 2005 and 2015, and their husbands, as defined in subsection 2.2. 95% confidence intervals are shown in light gray.



(a) 1976-80 Women

(b) 1981-85 Women

(c) 1976-80 Men

(d) 1981-85 Men

Figure A7: Work Status Proportion at Each Event Time by Cohort

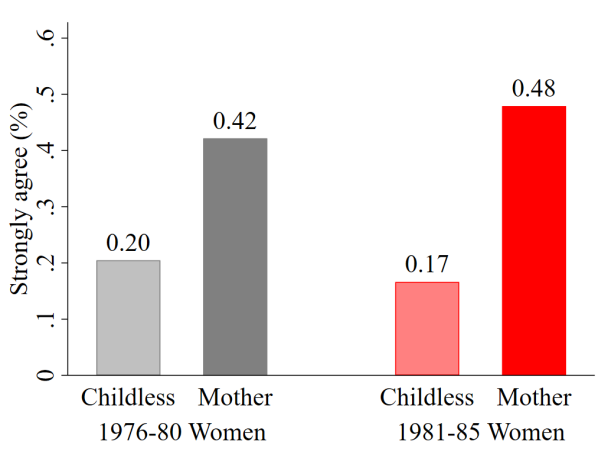
Notes. The figure shows the work status (work, on leave, non-employment) proportion at each event time. The sample consists of a balanced panel of women born between 1976 and 1985 who gave first childbirth between 2005 and 2015, and their husbands, as defined in subsection 2.2.

(a) Share of Mothers on Leave 6 Months after Childbirth

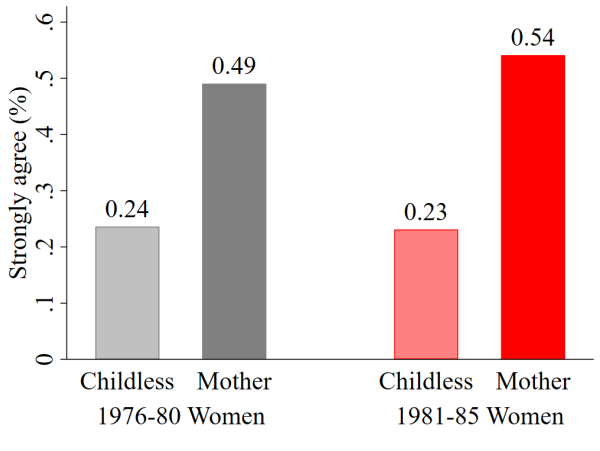
(b) Number of Months on Leave

Figure A8: Heterogeneity in the Take-up and Duration of Leave by Cohort

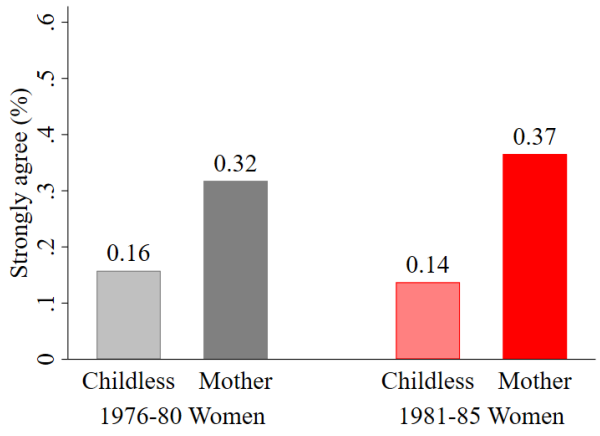
Notes. Panel (a) shows the event time coefficients estimated from equation (1) as in Figure 5(a) at $t = 6$, separately by subgroup and cohort. Panel (b) shows the average number of months on leave over the 61 months since first childbirth (from $t = 0$ to $t = 60$). All subgroups are defined based on characteristics defined at $t = -3$. Earnings and workplace characteristics are defined for employed individuals only. The threshold for high earnings is \$2,200 for women and \$3,000 for men. Large firms are those with 300 or more employees. The sample consists of a balanced panel of women born between 1976 and 1985 who gave first childbirth between 2005 and 2015, as defined in subsection 2.2. 95% confidence intervals are shown in light gray.



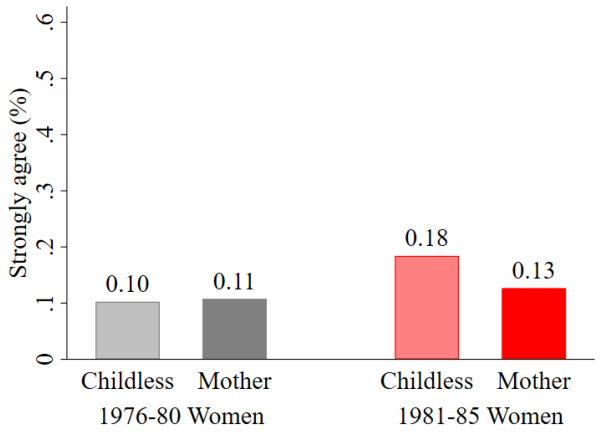
(a) Having children is a source of joy in itself



(b) Having children strengthens family bonds and affection



(c) Having children gives me a sense of being an adult.



(d) Having children places a financial burden on parents

Figure A9: Attitudes Toward Having Children by Cohort

Notes. The data come from the 2021 National Family and Fertility Survey conducted by the Korea Institute for Health and Social Affairs. Each figure presents the percentage of respondents who "strongly agree" with each statement. Possible response includes "strongly agree," "agree," "disagree," and "strongly disagree." Childless women are defined as women without children at the time of the survey (i.e., at least age 36). The sample size is 1,365 individuals for the 1976–80 cohort and 2,127 individuals for the 1981–85 cohort.

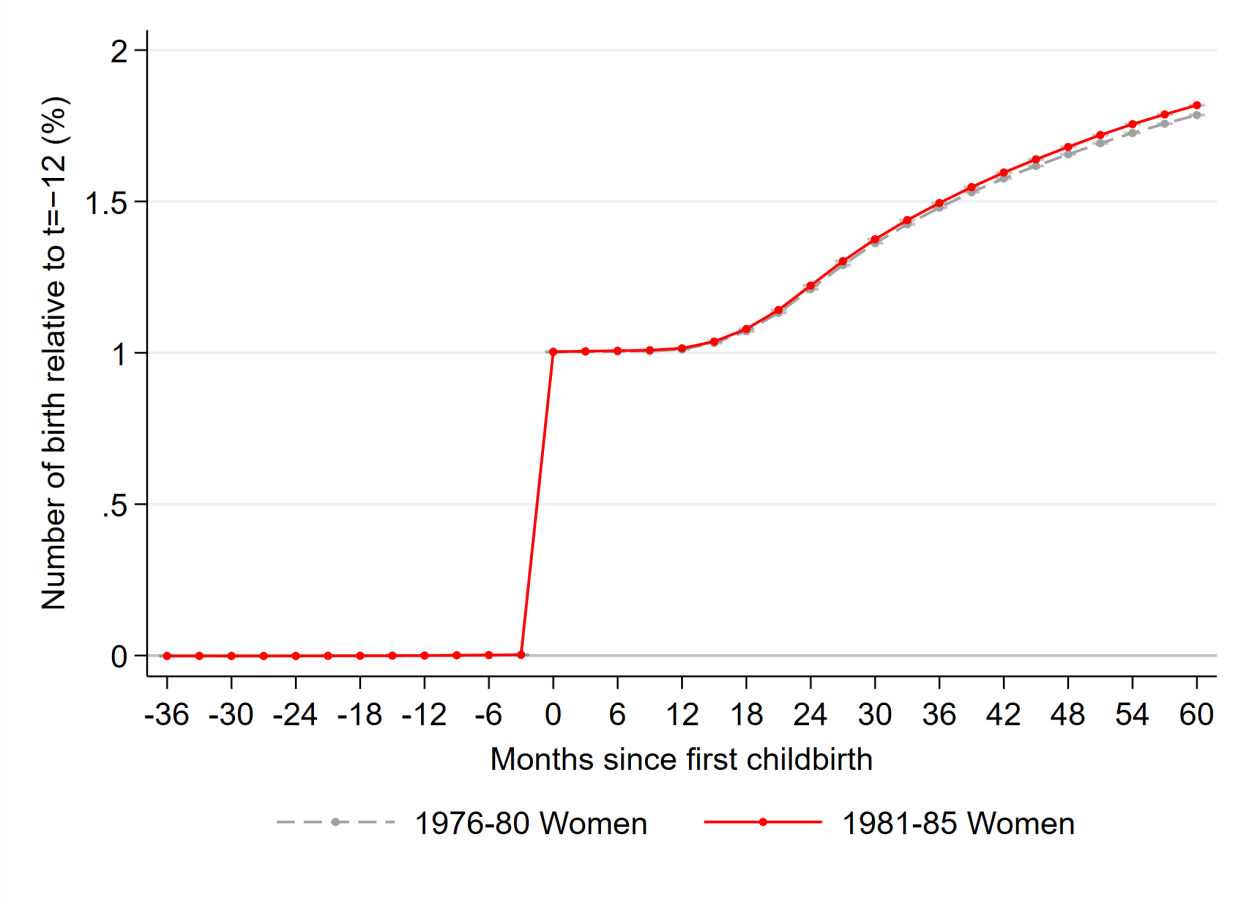
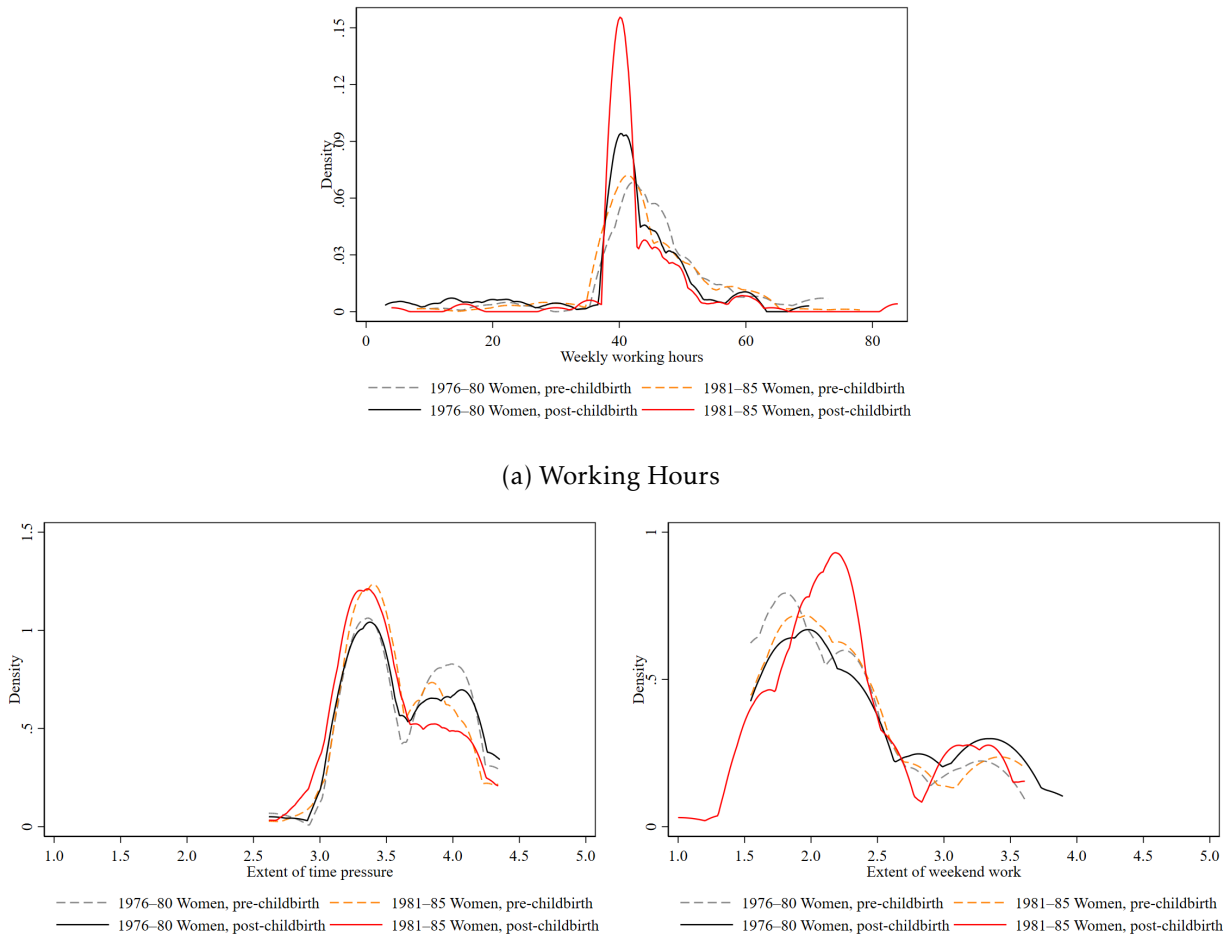


Figure A10: Total Number of Births by Cohort

Notes. The figure shows the event time coefficients estimated from equation (1) for each group separately. Twins are counted as a single birth. The sample consists of a balanced panel of women born between 1976 and 1985 who gave first childbirth between 2005 and 2015, as defined in subsection 2.2. 95% confidence intervals are shown in light gray.



(a) Working Hours

(b) Time Pressure

(c) Weekend Work

Figure A11: Working Hours and Job Characteristics by Cohort

Notes. The figure uses data from the 2002–2017 waves of the Korean Labor and Income Panel Study (KLIPS). The sample includes women with at least one non-missing working hours observation within three years before or after childbirth, and we use the closest observation to the year of first childbirth ($N = 646$). For panels (b) and (c), we merge job characteristics information from the Korea Network for Occupations and Workers (KNOW) with the KLIPS sample ($N = 357$). Time pressure is derived from the question, "How often does this job require the worker to meet strict deadlines?" Weekend work is based on the question, "How often do you go to work on weekends and holidays while performing your job?" Responses are recorded on a Likert scale (1–5), where higher values indicate a higher frequency. We calculate the average responses to these questions by occupation and merge the variables with the KLIPS sample using occupation codes.

Table A1: Parental Leave Policy Timeline

Year	Policy Details
1987	First introduced as unpaid, one-year leave for mothers with child under age 1.
2001	Paid leave introduced for parents with child under age 1, limited to one parent per child (fixed amount KRW 200,000).
2008	Expanded to parents with child under age 3 (fixed amount KRW 500,000). Both parents of child born after January 2008 can take leave sequentially.
2010	Expanded to include parents of child under age 6.
2011	Fixed amount revised to 40% of monthly wage (range KRW 500,000–1,000,000).
2014	Expanded to include parents of child under age 8. The second parent on leave receives full wage replacement for the first month (range KRW 500,000–1,000,000).
2016	The second parent on leave receives full wage replacement for the first three months (range KRW 500,000–KRW 1,500,000), and 40% of monthly wage after the fourth month (range KRW 500,000–KRW 1,000,000).
2017	The first parent on leave receives 80% wage replacement for the first three months (range KRW 700,000–KRW 1,500,000).
2018	The second parent on leave maximum amount increased (range KRW 500,000–2,000,000).
2019	The first parent on leave receives 50% wage replacement after four months (range KRW 700,000–KRW 1,200,000).
2020	Both parents allowed to take leave simultaneously, receiving 80% wage replacement for the first three months.
2022	Both parents receive 80% wage replacement for a year (range KRW 700,000–KRW 1,500,000).

Table A2: Selection into Motherhood Among Married Women

	Dependent variable: selection to motherhood							
Baseline characteristics ($t = -12$)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	0.4938***	0.4919***	0.4975***	0.4960***	0.4492***	0.4484***	0.4520***	0.4514***
	(0.0007)	(0.0007)	(0.0008)	(0.0008)	(0.0007)	(0.0007)	(0.0009)	(0.0009)
81-85 cohort	−0.0102***	−0.0095***	−0.0185***	−0.0186***	−0.0134***	−0.0128***	−0.0196***	−0.0195***
	(0.0007)	(0.0007)	(0.0012)	(0.0012)	(0.0007)	(0.0007)	(0.0013)	(0.0013)
Seoul Metroplitan Area	−0.1031***	−0.1003***	−0.1018***	−0.0991***	−0.1054***	−0.1028***	−0.1050***	−0.1025***
	(0.0007)	(0.0007)	(0.0009)	(0.0009)	(0.0007)	(0.0007)	(0.0009)	(0.0009)
Employee	0.1169***	0.0993***	0.1124***	0.0946***	0.1325***	0.1125***	0.1263***	0.1066***
	(0.0011)	(0.0013)	(0.0016)	(0.0019)	(0.0011)	(0.0013)	(0.0016)	(0.0019)
Employee * monthly earnings (1,000 USD)	0.0115***	0.0069***	0.0093***	0.0043***	−0.0012***	−0.0047***	−0.0029***	−0.0069***
	(0.0004)	(0.0004)	(0.0006)	(0.0006)	(0.0004)	(0.0004)	(0.0006)	(0.0006)
Employee * large firm		0.0155***		0.0153***		0.0139***		0.0138***
		(0.0011)		(0.0016)		(0.0011)		(0.0016)
Employee * public sector		0.1333***		0.1274***		0.1201***		0.1141***
		(0.0017)		(0.0024)		(0.0017)		(0.0024)
Employee * female firm		0.0224***		0.0242***		0.0255***		0.0270***
		(0.0010)		(0.0014)		(0.0010)		(0.0014)
81-85 cohort * Seoul Metroplitan Area			−0.0023*	−0.0021			−0.0007	−0.0005
			(0.0013)	(0.0013)			(0.0013)	(0.0013)
81-85 cohort * employee			0.0099***	0.0106***			0.0128***	0.0128***
			(0.0022)	(0.0026)			(0.0022)	(0.0026)
81-85 cohort * monthly earnings			0.0040***	0.0048***			0.0032***	0.0041***
			(0.0008)	(0.0008)			(0.0008)	(0.0008)
81-85 cohort * large firm				−0.0003				−0.0006
				(0.0022)				(0.0021)
81-85 cohort * public sector				0.0139***				0.0138***
				(0.0034)				(0.0034)
81-85 cohort * female firm				−0.0038**				−0.0033*
				(0.0019)				(0.0019)
Husband's monthly earnings					0.0246***	0.0241***	0.0253***	0.0249***
					(0.0002)	(0.0002)	(0.0002)	(0.0002)
81-85 cohort * husband's monthly earnings							−0.0016***	−0.0016***
							(0.0003)	(0.0003)
N	2,261,664	2,261,664	2,261,664	2,261,664	2,261,664	2,261,664	2,261,664	2,261,664

Notes. The dependent variable equals 1 if a woman gives birth by age 37, and 0 otherwise. *81–85 cohort* is an indicator variable that equals 1 for women in the 1981-85 cohort and 0 for those in the 1976-80 cohort. The sample consists of women born between 1976 and 1985 who had their first childbirth between 2005 and 2015, as well as women who are childless until the age of 37, restricted to cases where their husbands are identified in the matching year. We conduct one-to-one random matching between mothers and married, childless women by their birth year. Childless women who have multiple husbands identified in the same year or whose husband's information is missing at baseline are excluded from the sample, along with their matched mother. The dependent variable mean is therefore 0.5 by construction. We assign the event time (t) of the mother to the matched childless woman as a hypothetical event time. Standard errors are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table A3: Duration of Work, Leave, and Non-Employment, among Mothers who were Employed before Childbirth (including Husband Controls)

	Dependent variable: duration (in months) after first childbirth					
	Work		**Leave**		**Non-employment**	
Baseline characteristics ($t = -3$)	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	28.1599***	26.3422***	−1.0170***	0.2641***	33.8571***	34.3937***
	(0.0924)	(0.1271)	(0.0433)	(0.0594)	(0.0901)	(0.1242)
81-85 cohort	−3.3652***	0.0071	3.7993***	1.4116***	−0.4340***	−1.4187***
	(0.0602)	(0.1743)	(0.0282)	(0.0815)	(0.0587)	(0.1703)
Seoul Metroplitan Area	−1.2135***	−2.0920***	1.0349***	1.2522***	0.1786***	0.8398***
	(0.0618)	(0.0910)	(0.0290)	(0.0425)	(0.0603)	(0.0889)
Monthly earnings (1,000 USD)	4.1214***	4.7488***	0.5872***	0.3471***	−4.7086***	−5.0959***
	(0.0258)	(0.0388)	(0.0121)	(0.0181)	(0.0252)	(0.0379)
Large firm	1.3662***	1.9992***	3.2823***	2.2794***	−4.6484***	−4.2786***
	(0.0670)	(0.0979)	(0.0314)	(0.0458)	(0.0654)	(0.0956)
Public sector	3.0544***	5.1046***	14.5696***	12.5441***	−17.6239***	−17.6487***
	(0.0868)	(0.1225)	(0.0407)	(0.0573)	(0.0847)	(0.1197)
Female firm	−1.1334***	−0.6723***	0.8402***	0.7940***	0.2932***	−0.1217
	(0.0617)	(0.0896)	(0.0289)	(0.0419)	(0.0601)	(0.0875)
Husband's monthly earnings	−0.6246***	−0.6444***	0.4390***	0.4098***	0.1856***	0.2346***
	(0.0145)	(0.0214)	(0.0068)	(0.0100)	(0.0142)	(0.0209)
81-85 cohort * Seoul Metroplitan Area		1.5722***		−0.3678***		−1.2044***
		(0.1239)		(0.0579)		(0.1210)
81-85 cohort * monthly earnings		−1.1278***		0.4286***		0.6992***
		(0.0519)		(0.0243)		(0.0507)
81-85 cohort * large firm		−1.1390***		1.8123***		−0.6733***
		(0.1342)		(0.0627)		(0.1310)
81-85 cohort * public sector		−4.2225***		4.0904***		0.1320
		(0.1735)		(0.0811)		(0.1695)
81-85 cohort * female firm		−0.9797***		0.1816***		0.7981***
		(0.1233)		(0.0576)		(0.1205)
81-85 cohort * husband's monthly earnings		0.0491*		0.0447***		−0.0938***
		(0.0291)		(0.0136)		(0.0284)
N	459,221	459,221	459,221	459,221	459,221	459,221

Notes. The dependent variable is the duration (in months) of work, leave, and non-employment over the 61 months since first childbirth (from $t = 0$ to $t = 60$). Sample and variables are as in Table 3. Standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$