The Spillover Effects of Maternity Leave Extensions on Unemployment Insurance*

Francesca Truffa† Ashley Wong‡

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Abstract

This paper presents new evidence on the relationship between motherhood, maternity leave policies, and unemployment insurance (UI) participation. Using German administrative data, we show that over 32% of mothers received UI benefits, concentrated in the months after the expiration of paid maternity leave. We show that extensions of maternity leave in Germany reduce mothers' UI take-up by 19%. The timing of the reduction suggests mothers use UI as income replacement in the absence of paid leave. Importantly for our welfare calculations, the reduction in UI benefits is substantial and represents 68% of the increase in maternity leave benefits.

JEL Classifications: J16, J18

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†Northwestern University, 2211 Campus Dr, Evanston, IL 60208. E-mail: francescatruffa2021@u.northwestern.edu

‡Northwestern University, 2211 Campus Dr, Evanston, IL 60208. E-mail: ashleywong2021@u.northwestern.edu

1 Introduction

In recent decades, there has been widespread adoption of government-funded maternity leave programs throughout the OECD countries. While a large literature has focused on the effects of maternity leave polices on child development and women's employment outcomes, less is known about the interaction of maternity leave with other social insurance programs. In regimes with less generous maternity leave policies, do mothers utilize alternative social programs as a source of income replacement after they have exhausted their maternity leave entitlements? How do maternity leave reforms affect the take-up of these alternative social programs? Understanding the fiscal externalities of maternity leave reforms is critical for evaluating the welfare consequences of these policies.

In this paper, we focus on the spillover effects of maternity leave on a key program of the social insurance system: unemployment insurance (UI). Despite limited attention from researchers, unemployment insurance benefits can be an important component of mothers' income portfolio after childbirth in many countries. First, childbirth may lead to changes in job separation rates of mothers, potentially affecting UI participation. Second, in addition to eligibility through involuntary displacement, mothers in 22 OECD countries who voluntarily quit their jobs after childbirth are eligible for UI benefits, allowing them to use UI as income replacement (Venn, 2012).[1] In the United States, 24 states have provisions that allow family caregivers that voluntarily quit their employment to access UI. Given that job-protected paid leave may affect future job separation rate and can be a more attractive option for mothers who wish to return to their previous employer, extensions of maternity leave may affect UI participation and generate important fiscal externalities on UI payments.

[1]Sanctions for voluntary quits can vary. In 17 countries, including Germany, workers who resign are eligible for UI after a waiting period of less than 14 weeks. Workers in Canada, Estonia, Greece, Italy, Korea, Luxembourg, the Netherlands, Portugal, Romania, Spain, Turkey and the United States are not eligible if they resign. Note that many countries also require UI recipients to demonstrate they are actively searching for a new job.

Using administrative German social security data that links detailed information on individual working history to the receipt of social security benefits (including unemployment insurance transfers), we document novel evidence on the strong relationship between motherhood and unemployment insurance take-up. We find that more than 32% of mothers that gave birth between 1975 and 2017 received UI benefits within the first five years after birth. UI take-up is concentrated in the months immediately following the expiration of maternity leave benefits, suggesting that mothers strategically time UI take-up to increase paid leave duration. Importantly, we show descriptively that extending job-protected paid leave tends to reduce take-up of UI, suggesting a potentially significant interaction between maternity leave and UI.

To empirically test the hypothesis that maternity leave extensions have spillover effects on UI participation, we exploit a 1979 German maternity leave reform. Effective on May 1, 1979, mothers who gave birth on or after that date were eligible for an increase in job-protected paid leave from two to six months. Using a difference-in-differences approach, we compare women who gave birth before and after May 1979 to women who gave birth in non-reform years. Building on the existing literature (Schönberg and Ludsteck, 2014; Dustmann and Schönberg, 2012) that studies the impact of this reform on mothers' employment and children's outcomes, we analyze the effect on unemployment insurance participation and its implications for welfare calculations. In doing so, we contribute to this literature by providing causal evidence on the spillover effects of maternity leave reforms on UI.

We document four sets of results. First, we show that after the extension of maternity leave to six months, there is an 82% increase in the time out of the labor force during months 3 to 6 after childbirth. This increase comes from both mothers switching from employment and unemployment insurance. In fact, we find a 57% reduction in employment and a 100% reduction in UI participation during months 3 to 6 after the reform.

Second, we show that the effect of the reform extends beyond the maternity leave period. We

find that the 1979 policy leads to a 19% decrease in mothers' probability of ever receiving UI and a 21% reduction in cumulative UI benefits up to five years from childbirth. This reduction is substantial, amounting to 68% of the direct cost of the program. We show that the timing of the reduction in UI participation coincides with the increase in maternity leave take up with limited impacts on long-run UI receipt. This suggests that the decline in UI benefits is driven by mothers who use UI as a form of income replacement in the absence of paid leave. Given that mothers are trading off UI benefits with a replacement rate of 67% to receive the additional maternity leave benefits that are around 33% of average pre-birth earnings, these results highlight that mothers may value maternity leave beyond their monetary value. For example, mothers may assign a positive value to the job protection associated with maternity leave, as well as on its potential health benefits on mothers and children. Instead, consistent with the literature (Schönberg and Ludsteck, 2014), we do not find a significant effect on employment and employment earnings.

Third, we find evidence of substantial differential effects by pre-birth earnings. A priori, potential redistributional effects are ambiguous. On one hand, the extension of job protection may be especially beneficial for mothers with high levels of firm-specific human capital, such as those with higher earnings. These mothers may be more willing to trade off UI benefits for maternity leave with job protection, leading to a decline in UI benefits. The policy may also increase the labor market attachment of this group, which can have longer-run implications on UI participation through a reduction in job separation rates. On the other hand, high-skilled women are more likely to have occupations in which career gaps can have more negative consequences for career progression (Bertrand et al., 2010; Goldin, 2014). Therefore, the extension in maternity leaves may reduce their labor market attachment and lead to future increases in UI benefits. Our results suggest that the first channel dominates. We find that the reduction in UI benefits is the largest among mothers with the highest pre-birth earnings. Specifically, mothers in the top earnings quartile reduce UI receipt by €1.23 for every € 1 increase in maternity leave benefits. Unlike other income quartiles,

these mothers' careers also benefited from the extension of maternity leave. They experience a large and persistent increase in employment earnings within the ten years after childbirth. This result is partially driven by an increase in the employment rate of these mothers in the first years after childbirth. On the contrary for mothers in the first three quartiles of the earning distribution, we find null effects on long run employment earnings and a smaller reduction in UI benefits.

Finally, in the last part of the analysis, we explore how accounting for the fiscal externality on UI can alter the implied costs and social benefits of the maternity leave policy. We conduct a welfare analysis using the Marginal Value of Public Funds (MVPF) approach (Hendren and Sprung-Keyser, 2020; Hendren, 2016). We find that, when we do not account for the fiscal externality, the policy has a positive MVPF of 0.48, implying that for every € 1 in social cost, € 0.48 in social benefits is generated. Taking into account the effect of the policy on UI benefits, we find that the MVPF more than doubles to 1.19, implying that for every € 1 in social cost, mothers receive € 1.19 in benefits. Compared to other policies that target adults such as cash transfers programs like the EITC and AFDC (MVPF = .74), an MVPF greater than 1 is considerable (Hendren and Sprung-Keyser, 2020). Hendren and Sprung-Keyser (2020) show that typically only policies that target children have an MVPF higher than 1.

Building on our heterogeneity results, we then explore differences in welfare implications by quartiles of pre-birth earnings. We find that, for mothers in the top of the earnings distribution, the policy is associated with an MVPF of infinity and is, in fact, self-financing for these mothers. Due to the positive impacts on employment earnings and reduction in UI benefits, the policy generated substantial cost savings such that the extension of maternity leave more than pays for itself. Instead, for mothers in the first three quartiles of the earning distribution, the policy has a positive MVPF, although smaller than 1. These results highlight that incorporating UI in welfare analyses has important policy implications. Moreover, they provide potential useful evidence for policymakers who may want to target specific segments of the earnings distributions in future maternity leave

policies.

Our paper contributes to the literature in four ways. First, this paper adds to the extensive literature on the effect of motherhood on women's labor market outcomes.[2] We provide new evidence on how mothers utilize unemployment insurance at the end of paid maternity leave as a source of income replacement.

Second, we build on the extensive literature studying the effect of maternity leave policies. These studies have focused on outcomes including mothers' careers[3], maternal health[4], and children's outcomes[5]. A related literature also considers the unintended consequences of maternity leave reforms on firms and coworkers (Brenøe et al., 2020; Gallen, 2018; Ginja et al., 2020). In a related paper, Schönberg and Ludsteck (2014) study five maternity leave expansions in Germany, one of which is the 1979 reform, on mothers' labor market outcomes. They find a short-term reduction in the employment rate of mothers post birth, but no evidence of longer term effect on outcomes. Relative to their study, we provide new evidence on impacts on unemployment insurance participation and document new findings on the heterogeneous responses to the maternity leave reform. By investigating the relationship between maternity leave and UI, our paper also highlights the trade-off mothers are making between potentially higher UI benefits and lower maternity leave benefits with job replacement.

Third, this paper complements a large literature on the existence of spillover effects between different social policies. Social support substitution has been documented widely in the context of UI and disability insurance (Mueller et al., 2013; Lindner and Nichol, 2012), UI and means-tested welfare programs (Leung and O'Leary, 2020), supplemental social security income and AFDC (Garrett and Glied, 2000), disability insurance and other social assistance programs (Borghans

[2]See Kleven et al. (2018); Kleven et al. (2019); Bičáková and Kalíšková (2019).

[3]Lalive and Zweimüller (2009); Lalive et al. (2014); Gregg et al. (2007); Olivetti and Petrongolo (2017); Stearns (2018); Schönberg and Ludsteck (2014); Dahl et al. (2016); Ejrnaes and Kunze (2013); Bailey et al. (2019); Thomas (2020)

[4]Bütikofer et al. (2020); Rossin-Slater and Uniat (2019)

[5]Pihl and Basso (2019); Rossin-Slater (2018); Dustmann and Schönberg (2012)

et al., 2014), Social Security retirement benefits and disability insurance (Duggan et al., 2007), as well as many other programs. In the context of maternity leave reforms, much less work has been done on the relationship between maternity leave schemes and other social insurance programs. One exception is a recent paper by Zurla (2022) that studies how unemployment insurance reforms in Italy can affect the maternity leave decisions of mothers. In line with the results of our paper, this paper shows that mothers utilize unemployment insurance to extend leave duration after the expiration of maternity leave. Our paper builds on this by exploring the impact of an increase in maternity leave duration while holding fixed the generosity of UI. This allows us to speak to the welfare impacts of maternity leave reforms. In the German context, Arntz et al. (2017) use a competing risks analysis to show that mothers are more likely to register for unemployment after the exhaustion of maternity leave benefits. This paper, however, does not study the causal effect of an extension in maternity leave on UI participation.

Finally, our paper provides new welfare estimates of maternity leave extensions. We contribute to a smaller strand of the maternity leave literature that studies the benefit-cost ratio of maternity leave policies. Specifically, Dahl et al. (2016) provided estimates of the total social benefits and costs of a series of paid leave extensions in Norway, but these extensions only provided extensions in benefits receipt with no change to the job-protected period. We build on this study by calculating the MVPF (Hendren and Sprung-Keyser, 2020; Finkelstein and Hendren, 2020) for a paid leave policy that extended benefits duration and job protection concurrently. This feature of the reform is comparable to most of the maternity leave policies currently in place (OECD, 2018). In our calculations, we incorporate effects on maternity leave benefits, UI benefits and employment earnings. We also add to the previous literature by studying how welfare implications differ across the income distribution. We show that the overall welfare impact of maternity leave extensions masks substantial heterogeneity. Specifically, the policy more than pays for itself for mothers in the top earnings quartile due to positive impacts on long-run earnings, but it has negative benefits

for mothers in the middle of the income distribution.

The remainder of this paper is structured as follows. Section 2 discusses the background on maternity leave, unemployment insurance and other social programs in Germany. Section 3 presents the data we use in our analysis. Section 4 documents new descriptive evidence on the relationship between motherhood and unemployment insurance. Section 5 describes our empirical strategy. Results appear in Section 6. Section 7 conducts the welfare analysis and describes the distributional welfare impacts. Finally, Section 8 provides a final discussion and concludes.

2 Institutional Background

2.1 Maternity Leave Reform

Germany has a long history of maternity leave policies. Since the 1950s, mothers in Germany have been entitled to paid leave six weeks before and eight weeks after childbirth. This 14-week period is considered the Mother's Protection Period, "*Mutterschutz*" (MP) and employment during this period is prohibited. While the mother is on leave, the firm cannot dismiss the mother and the mother has the right to return to her job. Additionally, the mother receives full salary, specifically, a payment that is equal to her average income over the three months prior to childbirth.

In May 1979, the entitlement to job protection was increased from 2 months to 6 months and mothers continued to receive full salary for the first two months. For months 3 to 6, mothers received around €383 (750 DM) per month or about 1/3 of pre-birth average monthly earnings (Dustmann and Schönberg, 2012).[6] Only mothers who were employed prior to childbirth were entitled to the benefits.

After the 1979 policy change, a series of additional reforms extended the job-protected paid leave. In January 1986, it was extended from six to ten months. Then, in July 1989 and July

[6] We use the official DM to Euro exchange rate: €1 = DEM 1.95583.

1990, the maternity benefit and job protection periods were further increased to 15 and 18 months, respectively. After these reforms, more recent changes extended the duration of job protection stepwise to 36 months and the duration of benefits to 24 months after childbirth (Merz, 2004). In Section 4, we will provide descriptive evidence on how each subsequent extension of job-protected paid leave affected UI participation, but for the empirical analysis, we will focus specifically on the 1979 reform.

2.2 Unemployment Insurance

We focus on participation in unemployment insurance as our key outcome of interest. During the sample period, unemployment compensation consists of two main parts: "Arbeitslosengeld", regular unemployment insurance and "Arbeitslosenhilfe", unemployment assistance. Workers can also receive unemployment "maintenance" benefits while receiving additional education or skills training. In this paper, we will refer to these programs collectively as unemployment insurance (UI).

Regular unemployment insurance ("Arbeitslosengeld") payments are provided to any unemployed person who is actively searching for a job. Before 1987, all workers who have worked for at least one year out of the previous four years and registered at the employment office are eligible for UI (Hunt, 1995). The unemployment benefits are equivalent to 67% of the previous net monthly wage with a maximum limit.[7] The duration of the benefits depend on the length of the employment spell prior to unemployment, subject to a maximum that increases depending on the claimant's age. For individuals younger than 46, such as the mothers in our sample, the maximum duration is 12 months.[8] There is a penalty of three months if the worker quits her job without good cause or is fired for misconduct. After the first four months of benefit receipt, workers may be

[7]The limit is only binding for less than 1% of the unemployed people (Hunt, 1995).

[8]During the sample frame, workers aged younger 45 are entitled to 12 months of unemployment insurance. Workers between 45 and 46 are entitled to 18 months. Workers between 47 and 51 are entitled to 22 months. Workers between 52 and 57 are entitled to 26 months, and all older workers are entitled to 32 months.

sanctioned for not accepting offers through the job placement services but these sanctions are very rarely enforced (Wilke, 2004).

For those who have some experience but not enough for regular UI, or who have exhausted their benefits, unemployment assistance is available, but it is means-tested. The payments are up to 58% of previous net wages for an indefinite period until the recipient reaches the statutory retirement age. Payments are also reduced by the amount of income of the other household members.

Use of UI as Income Replacement for Mothers

The institutional details of the German UI system allow mothers to receive unemployment compensation after the end of maternity leave if she does not wish to return to her original employer. If she registers as unemployed before the end of the job protection period, she can receive UI benefits as soon as maternity leave benefits expire, thereby extending her leave period with income replacement from UI for up to twelve additional months (Arntz et al., 2017). From the point of view of the mother who uses UI as income replacement after childbirth, UI differs from job-protected paid maternity leave in two ways. First, the replacement rate of UI is generally higher: while UI benefits represent 67% of the wage earned in the year prior to birth (Arntz et al., 2017), maternity leave benefits are a flat payment that corresponds to around 33% of the average pre-birth earnings. Second, maternity leave provides job protection. Therefore, a mother that switches from UI to maternity leave is trading off higher benefits for the guarantee of employment at her pre-birth employer after the maternity leave period.

3 Data

The data used in this paper come from the scientific use version of the Sample of Integrated Labour Market Biographies (SIAB) for the years 1975 - 2017. This dataset comes from the German administrative social security records provided by the Institute for Employment Research (IAB). The

SIAB is a 2% random sample drawn from the full population of German workers.The key advantages of this dataset are the large sample size and the detailed labor market information. It allows us to track mothers over their entire work history and contains detailed information on worker characteristics such as age, gender, education, wages, occupation, full-time/part-time status, and benefit receipt history. The types of benefits that can be identified in this dataset are those administered by the Federal Employment Agency and consist of the regular unemployment insurance, unemployment assistance, and unemployment maintenance. We infer the maternity leave benefits mothers received based on the time they were out of the labor force after the childbirth.

One shortcoming of the dataset is the lack of exact dates of childbirths. However, childbirths can be inferred from the information on benefit receipt available in the data. We follow the procedure described in Muller and Strauch (2017) and provide additional details in Appendix B.[9] Note that due to the construction of the SIAB, we can only capture mothers who were employed at the time of birth and subject to social security. In their paper, Muller and Strauch (2017) show their methodology can identify about 60% of all births in Germany. In Section 6.4, we will conduct a series of exercises to show that our results are robust to potential misclassification of births.

4 Descriptive Evidence

Before turning to our empirical analysis, we present novel descriptive evidence on UI participation of mothers as well as the relationship between maternity leave extensions and UI take-up.

In Figure 1, we show the probability of ever receiving UI and the average cumulative UI benefits received by each month since childbirth. The sample consists of all mothers who gave birth between 1975 and 2017 in Germany. The graphs show that a significant share of mothers receive unemployment insurance after childbirth. In the five years after birth, 32% of mothers have participated in UI and on average mothers received €2,520 in cumulative benefits. These findings

[9] Schönberg and Ludsteck (2014) uses a similar procedure to infer births in their analysis.

highlight the important role of unemployment insurance for mothers.

We next turn to how unemployment insurance take-up varies with maternity leave duration. Figure 2 plots the probability of receiving UI in the months after the birth of a child for mothers of children born within six months before (blue lines) and after (red lines) four maternity leave reforms in 1979, 1986, 1989 and 1990. The two vertical lines in the figures represent the maximum number of months of maternity leave before and after each reform. As described in Section 2.1, the four reforms successively increased both maternity leave payments and job protection from two to eighteen months.[10]

The figures reveal two important features. First, in the months after childbirth, there is a substantial increase in the likelihood of UI participation. Between 15 to 30% of mothers received UI benefits in the immediate months after the end of maternity leaves. This indicates that mothers strategically time their UI participation to align with the expiration of the maternity leave benefits. The increase in likelihood of UI after maternity leaves also suggests that mothers are using UI as a form of income replacement during extended leaves.

Second, the graphs show that extensions in maternity leave both delay and reduce UI participation. Because mothers tend to take up UI after the end of maternity leave, an increase in maternity leave duration shifts the entry timing into UI by a similar duration. However, the likelihood of UI after the reform tends to be lower. This means some mothers that otherwise would have taken up UI benefits either return to employment or drop out of the labor force, implying that a portion of mothers view maternity leave and UI as substitutes. It is important to note that because UI replacement rate is on average generally higher than maternity leave payments, mothers that substitute between the two policies likely value the job protection that maternity leave provides. Furthermore, this reduction in UI participation implies potential cost reduction for the state.

In the remainder of the paper, we will empirically examine this relationship, focusing specifically on the first reform in 1979 for three main reasons. First, unlike the reforms in 1989 and

[10]Later reforms such the reform in 1992 extended job protection, but not maternity leave payments.

1990, the 1979 reform was unanticipated and the draft bill for this reform was proposed after the children born within six months of the reform date were conceived (Dustmann and Schönberg, 2012). Dustmann and Schönberg (2012) showed that newspapers did not mention the reform prior to two months before the implementation. This helps alleviate concerns related to the selection of mothers into the treatment. Second, this reform has the advantage of extending the duration of maternity leave benefits and job protection by an equal amount, making it comparable to the vast majority of maternity leave reforms. Moreover, the duration of the maternity leave is similar to the current average duration of maternity leaves in most of the OECD countries (average 18.1 weeks).[11] Lastly, the reform was implemented prior to a series of unemployment insurance reforms that took place beginning in 1985 which may affect the interpretation of the 1986 maternity leave reform (Hunt, 1995).

5 Empirical Strategy

In order to estimate the causal impact of maternity leave expansion in 1979, we utilize a difference-in-differences strategy in which we compare mothers who gave birth within six months after the reform date to those who gave birth within six months prior to the reform. Given that the treated and control mothers give birth in different halves of the year, seasonality of birth could give rise to differences in outcomes that are not the causal effect of the policy (Buckles and Hungerman, 2013). Following the strategy in Schönberg and Ludsteck (2014), we utilize mothers who gave births in the same calendar month, but in non-reform years from 1976 and 1979 as an additional control group. The sample includes births of any order.[12] In particular, we estimate the following regression:

[11] See OECD Family Database (`http://www.oecd.org/els/family/database.htm`)

[12] As a result, it is feasible for a mother to be assigned to both the treatment and control group of a reform if one of her children was born in a non-reform year and another in a reform year. In these special cases, we always assign the mother to the treatment group.

$$
\begin{aligned}
y_{it} = & \sum_j \beta_j TimeSinceBirth_{it=j} \cdot Treated_i \cdot ReformYear_i + \\
& + \sum_j \alpha_j TimeSinceBirth_{it=j} + \sum_j \omega_j TimeSinceBirth_{it=j} \cdot Treated_i + \\
& + \sum_j \psi_j TimeSinceBirth_{it=j} \cdot ReformYear_i + \theta_t + \gamma_i + \epsilon_{it} \qquad (1)
\end{aligned}
$$

where y_{it} is the outcome variable for a woman i at event time t. In our analysis, we will use both annual and monthly data. $TimeSinceBirth_{it=j}$ denotes the month or year relative to childbirth. $Treated_i$ is an indicator for mothers whose child was born between May and October and 0 if they gave birth in any other month. $ReformYear_i$ is an indicator that takes value 1 if mothers gave birth six months before or after the reform (between November 1978 and October 1979) and 0 otherwise (between January 1976 and October 1978). θ_t are time fixed effects. We include mother individual fixed effects γ_i to account for selection based on time-invariant unobserved mother characteristics and increase the precision of our results.[13]

If the analysis is at the month level, for each mother, we utilize all observations from three years before the month of birth to five years after ($-36 \leq t \leq 60$). The omitted month is one year prior to birth at $t = -12$. Instead, if the analysis is at the year level, we use all observations from three years before the month of birth to ten years after ($-3 \leq t \leq 10$). Analogously, the omitted year is the year prior to birth at $t = -1$. For outcomes that are cumulative and measured after the birth of the child, the regressions only include observations from $t = 0$. In these cases, $t = 0$ is the omitted time. The coefficients, β_j, are the key parameters of interest and represent the change in the outcome as a result of the extension of the maternity leave in each time j since child birth. It is important to note that we do not restrict the sample to only mothers that are eligible for UI (i.e., those who have worked at least one year out of the past four years). As a result, β_j captures the

[13]Note that we do not need to control for month and year of childbirth when we include individual fixed effects in our specification.

average treatment effect for all mothers.

5.1 Identifying Assumption

In order for our estimates to be causal, the identifying assumption is that mothers that give birth in the same calendar month would have followed the same trends in UI participation and employment outcomes absent the reform. In our results, we will show that there are no systematic "pre-trends" in the time periods leading up to the month of birth.

One potential confounder is that certain women may time the birth of their children in response to the extension in maternity leave. In our analysis, we take several steps to mitigate this concern. First, recall that our treatment group is composed of mothers who gave birth within 6 months after the reform. In order for our treated mothers to be able to manipulate the timing of birth, this requires knowledge about the policy at least 3 months before the reform took place. In their papers, Schönberg and Ludsteck (2014) and Dustmann and Schönberg (2012) study the same reform using the same definition of treated and control mothers. These studies show that the draft bill of the reform was proposed after the children were conceived in the treatment group. Searching through two leading German newspapers for articles about the reform, they find that the first articles about the reform typically appeared no more than two months before the reform was finally implemented.

Second, we present in Table 1 summary statistics that show treated mothers are not selected based on pre-birth characteristics. Mothers that gave birth before and after the reform date are not different in terms of age, education, or employment outcomes at the time of childbirth.

6 Results

6.1 Effects on Maternity Leave Take-Up and Duration

We start by investigating the effect of maternity leave extensions on mothers' maternity leave duration. We infer the duration of leave based on the total months the mother is out of the labor force prior to returning to employment or unemployment. For this outcome, we estimate the following specification at the individual level:

$$y_i = \beta_{DID} Treated_i \cdot ReformYear_i + age_i + BirthYear_i + BirthMonth_i + \epsilon_i \quad (2)$$

where we include age at birth fixed effects, age_i, year of birth fixed effects, $BirthYear_i$, and month of birth fixed effects, $BirthMonth_i$, to control for seasonality.[14] The outcomes are total months out of the labor force before returning to employment in the first 40 months and the share of months 3 to 6 on leave, i.e. the four months affected by the maternity leave extension. Table 2 reports the coefficients (β_{DID}) from estimating equation (2).

Column (1) shows that increasing paid maternity leave from two to six months leads mothers to increase the time out of the labor force by 3.59 months on average. This effect corresponds to a 28% (=3.59/12.81) increase in the time out of the labor force compared to the control mothers who gave birth prior to May in the reform year. This estimate also corresponds closely to the results found by Schönberg and Ludsteck (2014) and Dustmann and Schönberg (2012) using a different version of the social security dataset. Column (2) shows that, after the maternity leave reforms, there is a substantial 38.4 percentage points or 82% (=.384/.47) increase in the share of time out of the labor force in the months 3 to 6 after childbirth. Because each mother under the new policy

[14] Note that in our baseline specification, we do not include these controls as we have individual fixed effects.

is eligible for an additional €383 in benefits per month, this implies that mothers on average receive an additional €1,271.70 in total maternity leave benefits discounted to the year prior to childbirth.[15] In Appendix Table A2, we find largely similar effects across different subgroups of mothers based on their pre-birth earnings.

Who switched to maternity leave as a result of the reform? To answer this question, we explore the change in employment status during months 3 to 6. In Appendix Table A3, we show the corresponding causal estimates for share of month 3 to 6 employed and on UI. In Column (1), we find that the reform reduced employment by 57% (=-.187/.327) compared to the control mothers. At the same time, UI participation was reduced by more than 100% (control mean 20.6%). This indicates that during the extended maternity leave period, mothers switched to maternity leave from unemployment insurance.

6.2 Effects on Employment and Unemployment Insurance Participation

What are the policy impacts on employment and unemployment insurance beyond the first six months? In the previous section, we showed that the increase in maternity leave crowded out both employment and UI participation within the first six months of childbirth. However, in the long term, mothers may be more likely to be employed, for example, due to increased job attachment. Similarly, the reduction in UI participation in the first six months may not necessarily translate to an overall decrease in UI participation. It may simply reflect mothers delaying their UI takeup until after the end of the maternity leave extension.

In Figure 3, we explore the impact of the maternity leave extension on monthly employment outcomes. We plot the coefficients β_j and their 95% confidence intervals from estimating equation

[15] From Table 2, we observe that mothers in the treated group spend 85.4% of the four additional months (i.e., 3.42 months) on maternity leave. Hence, the total maternity leave benefits are given by €383 $\times$ 3.42 = 1,309.86. We then discount this value to the year prior to childbirth using a 3% discount rate.

(1). The lack of pretrends in our flow outcome variables provides strong supporting evidence for our identification strategy.

We find that increasing maternity leave by four months did not have a significant effect on mothers' probability to be employed (Figure 3a) or probability of ever becoming employed (Figure 3b) in the months after childbirth. There is a suggestive, but imprecise, increase in cumulative total working earnings (Figure 3d).[16] Figures 3a and 3c show that monthly probability of being employed and employment earnings fall during the extended maternity leave period (indicated by the dashed grey vertical lines in the figures), but this drop is compensated by an increase in both probability of being employed and employment earnings in the immediate months after the end of the job protection. After five years, however, there are no significant effects on employment. Table 3 summarizes the impact of maternity leave extension on cumulative employment outcomes in column (1) and (2) by presenting the coefficients at the end of five years ($t = 60$). We document null effects for probability of ever being employed and cumulative employment earnings. These results suggest maternity leave affected the timing of when mothers worked but ultimately did not increase mothers' employment.

These patterns are confirmed when we extend the analysis to 10 years after childbirth using annual data (see Figure 4). The corresponding coefficients are presented in Table 4. Beyond the reduction in earnings in the first year when mothers extended their maternity leave, we find limited evidence of an effect on earnings in ten years after the reform. These results are consistent with prior work on maternity leave reforms in Germany (Dustmann and Schönberg, 2012; Schönberg and Ludsteck, 2014), which also did not find any long-term effects on employment for mothers.

Figure 5 investigates the effects of the reform on UI takeup and UI benefits. As indicated by the descriptive graphs in Section 4, the reduction in UI receipt occurs in the short run and coincides exactly with the extension in maternity leave. This suggests that mothers who would have taken up

[16] We report in Table 3 the respective coefficients at the end of five years. Note that the increase in SE is driven by increasing variation in post-birth earnings as some mothers leave the labor force while others remain throughout the sample period.

unemployment insurance in the first few months after the previous maternity leave regime switched to maternity leave. At the end of maternity leave at $t = 6$, the coefficients start increasing and converging towards zero. This convergence implies that a fraction of mothers return and take up UI almost immediately, closing the gap in UI participation with the control group. We then observe a higher level in the monthly probability of receiving UI and UI benefits after month 14. Because mothers are eligible for a maximum of 12 months of UI benefits, month 14 coincides with the month in which the control mothers would have exhausted their UI benefits had they taken up UI right at the end of the maternity leave. Instead, treated mothers are eligible until the end of month 18, which also coincides with the spike in UI participation relative to the control group. However, it is important to note that the higher UI participation in these months does not compensate for the reduction in unemployment transfers in the first few months, as implied by the persistent negative coefficients for ever receiving UI post childbirth (Figure 5b) and cumulative total UI benefits received (Figure 5d). Because the decline in UI benefits occurs almost immediately after the end of the maternity leave, this suggests that much of the reduction in UI participation can be attributed to the use of maternity leave extensions as a substitute for UI.

In Table 3, we summarize the effects on UI participation over the first five years since childbirth in columns (3) and (4). The maternity leave reform led to a 9 percentage points or a 18% (=-.08/.44) decrease in UI participation and a 21% (=665.2/3160.2) reduction in UI total benefits five years after childbirth.[17]

Extending our analysis to ten years, Figure 6 and Table 4 show that there are no significant long run effects on UI benefits. Over the ten years, total annual UI benefits reduced by €862.98.[18] This represents a substantial benefit substitution of maternity leave on UI; for every €1 increase in maternity leave benefits, mothers are reducing their UI benefits by €0.68.[19] The magnitude of

[17] In Appendix Figures A1a and A1b, we show that the reduction in UI is concentrated in regular unemployment insurance as opposed to unemployment assistance or maintenance.

[18] We sum together significant coefficients at the 10% level and use a discount rate of 3% to discount back to year prior to birth.

[19] In Section 6.1, we show that mothers receive an additional €1,271.70 in discounted maternity leave benefits. We

this effect is larger in comparison to other substitution estimates for other social programs found in the literature. For example, Borghans et al. (2014) finds that a decline in disability insurance payments of €1 leads to an increase of €0.30 in cost to other social assistance programs.

Together, our analysis shows that in addition to the use of UI by mothers after childbirth, maternity leave extensions have meaningful spillover effects for unemployment insurance. We find that the extension in maternity leave induces these mothers to switch from UI participation at the end of two months of maternity leave to receive maternity leave benefit. This suggests that prior to the reform, these mothers use UI as a substitute for income replacement in the months after the maternity protection period. Recall that mothers who switch from UI to maternity leave as a result of the reform are giving up UI benefits with replacement rate of 67% to receive the additional maternity leave benefits that are around 33% of average pre-birth earnings. This is consistent with the hypothesis that, in their decisions, mothers may consider additional potential benefits of maternity leave such as job protection. Consistent with this hypothesis, in Appendix Figure A2, we find that the reform has a positive impact on mothers remaining at their pre-birth employer after the extension of maternity leave.

6.3 Distributional Impacts Across Pre-Birth Earnings

Our results have shown that while maternity leave extensions reduced UI, we do not find longer-run effects on unemployment insurance or employment. However, to fully characterize the welfare implications of these results, it is important to know whether there are any distributional impacts.

In this section, we explore heterogeneity by pre-birth earnings of mothers.[20] In Section 6.1, we show that the take-up of maternity leave is largely uniform across the groups, but UI and employment outcomes may respond differently. Theoretically, the relationship between maternity leave extensions and UI takeup across the income distribution is ambiguous. On one hand, mothers

compare this value with the discounted reduction in UI benefits (862.98).

[20] In Appendix Table A1, we provide the summary statistics by quartiles of the pre-birth earnings distribution.

with higher pre-birth earnings may benefit more from the extension of job protection of maternity leave as they are more likely to have higher levels of firm-specific human capital. A series of papers in the U.S. and in the U.K. have shown that relatively advantaged mothers (e.g. college-educated, high-wage) are more responsive to policies that provide job protection as opposed to wage replacement only (Rossin-Slater, 2018; Stearns, 2018). As a result, these mothers may reduce UI takeup and become more attached to the labor force, leading to a decline in UI benefits and an increase in employment earnings.

On the other hand, high-earning mothers may decide to take more time in unemployment given that they are entitled to higher UI benefits after the maternity leave period, leading to a lower level of earnings and higher UI take up. These mothers may also experience higher levels of skill depreciation during longer maternity leaves as they are more likely to be in occupations that have larger penalties associated with career breaks (Goldin, 2014; Bertrand et al., 2010). As a result, longer leaves may lead to higher rates of job separations leading to higher future UI take-up.

We analyze the heterogeneous impacts on employment earnings and annual UI benefit receipt by including interactions for the quartile of pre-birth earnings in the baseline estimating equation. Pre-birth earnings are computed based on the average monthly earnings between 12 and 36 months prior to childbirth. We report all the implied effects for each income quartile in Table 5 for employment earnings and in Table 6 for UI benefits. Figures 7 and 8 plot the corresponding estimates.[21]

For mothers in the top earnings quartile, we observe a persistent positive impact on long-run earnings and a large decline in UI benefits receipt. Employment earnings increased by 23-37% in annual earnings in the first ten years after childbirth. In total, this represents a cumulative increase in post-tax earnings of €11,600 in the ten years post childbirth.[22] In Appendix Figure A5, we

[21]The analogous results for the monthly analysis are presented in Appendix Figures A3, A4, and Appendix Table A9.

[22]We sum together coefficients that are significant at the 10% level from Table 5 and discounted back to year before childbirth using a 3% social discount rate. We used a tax rate of 34.6% based on average annual income of high earning women in the three years prior to birth. We assume the mother is filing as single as we do not have spousal

show that this result is partially driven by a substantive increase in the employment rate of mothers in the first years after childbirth.[23] This finding is consistent with studies in other countries that find positive longer-term effects of maternity leave entitlements of less than one year on employment outcomes of high-wage women. In a study of two maternity leave reforms in Great Britain, Stearns (2018) finds that positive employment effects are concentrated among women in the top 50% of the income distribution. One explanation is that high-wage mothers have higher firm-specific human capital and extension of job protection allows them to retain these high-value matches with their employers.

In addition to increased earnings, we also find a decline in UI receipt, concentrated in the year of birth. Over the 10 years after childbirth, there is a total cumulative decline in UI receipt of €1,556.58 for these high-income mothers.[24] For every €1 increase in maternity leave benefits, these mothers are reducing UI benefits receipt by €1.23.[25] As we will show in Section 7.1, this reduction in UI benefit receipt as well as the large employment effects generate positive fiscal externalities that more than compensate for the increase in the cost of providing maternity leave benefits.

In contrast, for mothers in the bottom three quartiles, we find a decline in employment earnings and UI benefits in the first year of childbirth. However, unlike mothers in the top quartile, we do not observe any positive change in long-run earnings. These results highlight considerable heterogeneous impacts on both UI benefits and employment earnings. In Section 7.1, we will explore the implications of these results for welfare calculations.

income information. The tax rate is provided by the income tax calculator provided by the German Federal Ministry of Finance `https://www.bmf-steuerrechner.de/`.

[23]Note that the employment outcome is a dummy that takes a value of 1 for having been employed at any time in that year and 0 otherwise. As a result, if mothers return to employment after maternity leave, we would not observe any declines in employment at $t = 0$.

[24]We sum together coefficients that are significant at the 10% level in Table 6 and discounted to the year before childbirth at a discount rate of 3%.

[25]Additional maternity leave benefits are computed based on €383 × (0.848 × 4 months) = €1,299.13 (€1,261.30 once discounted). 0.848 represents the share of months 3 to 6 after childbirth on maternity leave. This is calculated by summing together the causal impact shown in Appendix Table A2 with the control mean shown in Appendix Table A4.

6.4 Robustness Checks

We conduct a series of robustness checks for our results. First, we show robustness of our main results to the length of time mothers are employed prior to childbirth. Because we only observe mothers who are employed at the time of birth, mothers may self-select into the sample after the announcement of the reform. In Appendix Table A5, we restrict the sample to those that were employed at least 6 or 12 months in the year prior to birth. We find consistent and robust results.

Second, one disadvantage of our dataset is that we do not observe directly the exact birth dates of children. As a result, there may be misclassifications of the treatment and control groups for those born closest to the reform date. In Appendix Table A6, we report the results for our main outcomes, but dropping mothers whose children were born in April and May. The results are consistent with the baseline specification.

Next, we utilize an alternative dataset, the Biographical Data of Social Insurance Agencies in Germany (BASiD). This dataset contains a 1% random sample of the population of the German Pension insurance (GRV) with pension account information. This is a smaller sample than the SIAB, but contains the same information as SIAB in addition to birth dates of children. In particular, we have 642 mothers that gave birth in the six months after the reform as opposed to 2,198 in the SIAB. In Appendix Figure A6, we plot the coefficients from estimating the baseline specification using the BASiD for UI benefits and employment outcomes. We find consistent patterns as in the SIAB.

Finally, we conduct a robustness check to mitigate the concern that treated mothers could manipulate the timing of birth. Recall, in our main analysis, the treatment group is composed of mothers who gave birth within six months after the reform. To manipulate the time of birth, this would require knowledge about the policy at least 3 months before the reform took place. In Section 5.1 we justify why it is reasonable to think that this was not the case. However, we can be more conservative in our treatment group definition and restrict the sample of mothers to those who

gave birth within three months before and three months after May 1979. In addition, we also drop mothers whose children were born in April and May to reduce misclassification error. Appendix Table A7 shows that our main results are robust to this sample restriction.

7 Welfare Analysis

7.1 MVPF

In this section, we explore how accounting for the fiscal externality of maternity leave on UI participation affects welfare calculations. We specifically calculate the marginal value of public funds (MVPF) introduced by Hendren and Sprung-Keyser (2020) and Hendren (2016).

The MVPF measures the amount of welfare that policy beneficiaries can receive per dollar of government spending on the policy and is given by the following (Hendren and Sprung-Keyser, 2020):

$$MVPF = \frac{\text{WTP}}{Cost} \tag{3}$$

where WTP is the aggregate willingness to pay and $Cost$ is the net cost to the government. In contrast to the other standard approaches to welfare calculations, the MVPF does not require an adjustment for the deadweight cost of taxation. Instead, the budget constraint is closed by comparing MVPF to the MVPF of another policy (Hendren and Sprung-Keyser, 2020). In the case when the beneficiaries of the two policies are the same, the policy with the higher MVPF is preferred.

In our calculations, we will focus on measuring the MVPF for the first 10 years after the extension of the policy. We will utilize our results on changes in maternity leave take-up, UI benefits and employment earnings. We do not include in these calculations additional impacts on other social welfare programs, because in Appendix Section D, we do not find much evidence to support spillover impacts on other social program participation. All statistics will be discounted to

the year before childbirth using a discount rate of 3%. Table 7 summarizes our MVPF calculations, which we describe in detail in this section.

Willingness to Pay

To construct the WTP, we must consider the two types of beneficiaries in our context: inframarginal and marginal beneficiaries. Inframarginal mothers are those who did not change their behavior in response to the policy change. These are mothers who, in the absence of the policy, were not employed and not on unemployment insurance between month 3 and month 6. Following Hendren and Sprung-Keyser (2020), we assume inframarginal mothers value the additional maternity leave benefits dollar for dollar. Given that mothers prior to the extension spend 47%, or 1.88 months, of months 3 to 6 not in the labor force (Table 2), the increase in transfers to inframarginal mothers is €382 $\times$ 1.88 = €718.16. Discounting to $t = -1$, this is €697.24.

Next, we must account for the willingness to pay of marginal mothers who were induced to change their behavior in response to the reform. In this context there are two potential classes of marginal mothers. First, one class of mothers would have worked in the absence of the reform and with the maternity leave extension, they were induced into taking a longer employment gap. Second, another class of mothers would have taken up unemployment insurance and now switched to maternity leave. From Appendix Table A3, we know that, prior to the policy, mothers were employed 32.7% and on UI 20.6% of the time between months 3 and 6 after the reform. For these mothers, according to the envelope theorem, if mothers were optimizing, marginal mothers are, to the first order, indifferent (Finkelstein and Hendren, 2020). As a result, in our baseline assumption (Assumption 1 in Table 7), WTP is zero for both classes of marginal mothers. This assumption implies perfect optimization at the time of the maternity leave decision.

In Assumption 2, we relax the perfect optimization assumption for the long run. For example, mothers may not incorporate the effect of switching to maternity leave on their human capital accumulation and job attachment in the long run. Therefore, the WTP calculations should incorporate

the effect of the reform on the post-tax earnings and UI benefits in the long run.[26] Note that this assumes changes in income only comes from a change in the returns of human capital and not a change in effort, which would require an adjustment for the disutility of labor.[27] In this alternative specification, we assume the WTP of marginal mothers to be the sum of discounted post-tax earnings and UI benefits. Because control mothers are employed or on UI for 53% of months 3 to 6 after childbirth, we assign WTP of marginal mothers to be $.53 \times (-862.98 - 426.09) = -683.21$, where € -862.98 is the change in UI benefits and € -426.09 is the change in post-tax employment earnings.[28]

Costs

To compute the costs, we sum together the cost of maternity leave benefits and the associated fiscal externalities. Unlike the WTP calculations, the impact on the government's budget from the maternity leave benefits includes the mechanical increase in costs due to the maternity leave expansion as well as costs associated with behavioral responses in employment and UI participation. First, from our estimates in Table 2, we observe an increase in the share of months 3 to 6 on leave of 0.384 percentage points. Because the control mean is .47, the treated mothers take 85.4% or 3.42 additional months after the first two months. As a result, the total cost of maternity leave benefits is € 383 $\times$ 3.42 = 1,309.86. Discounting back to $t = -1$, this is equivalent to € 1,271.71.Second, we include fiscal externalities on UI receipts. Because mothers are substituting maternity leave benefits for UI benefits, there is a reduction in cost. In present discounted terms, this is equivalent to € -862.98. Lastly, we also consider the loss in tax revenues as a result of the declines in employment earnings. This is associated with an increase in cost of € 175.73. Summing together, the total cost to the government is € 736.95 per beneficiary.

[26] This corresponds to examples in Appendix Section B.II of Hendren and Sprung-Keyser (2020).

[27] This assumption is plausible given that we do not find an effect on full-time work (see Appendix Figure A2b).

[28] To calculate the effects, we use Table 4 where we sum together impact on employment earnings and UI benefit receipt. In our calculations, we only include coefficients that are significant at the 10% level. Note, we use the tax rate $\tau = 29.2\%$ which corresponds to the income tax rate in 1975 of a single individual with average pre-birth earnings (€ 20,188.50

MVPF

To calculate the MVPF, we divide the total willingness to pay by the net costs. Under Assumption 1, we find that the MVPF is 1.19 when we account for UI benefits and 0.48 when we do not (see Table 7).

These results imply that for every €1 in social cost, mothers receive €1.19 in benefits, taking into account the fiscal externalities on UI. Compared to other policies that target adults such as cash transfers programs like the EITC and AFDC (MVPF = .74), an MVPF greater than 1 is considerable (Hendren and Sprung-Keyser, 2020). Hendren and Sprung-Keyser (2020) show that typically only policies that target children have an MVPF higher than 1. This is because policies that target adults tend to lead to labor market distortions and reduce labor earnings. In our setting, because marginal mothers who were on unemployment insurance switched to maternity leave in response, the costs to the government are substantially reduced by this fiscal externality. This implies incorporating effects on UI has important consequences for welfare calculations of maternity leave policies.

Under Assumption 2, the MVPF remains positive but is much smaller, 0.02, when we incorporate the effect on UI, and 0.33, when we do not. The decline in MVPF compared to Assumption 1 is because the WTP of marginal mothers is reduced by the change in UI benefits and post-tax earnings. However, this assumption relies on the hypothesis that mothers are not internalizing the long-run effects of the policy in their decision. This is arguably strong because we observe the largest declines in both UI benefits and employment earnings in the first year and there are limited long-run effects on these outcomes.

In the following section, we will consider how heterogeneous responses of mothers to the policy can affect the MVPF calculations.

7.2 Distributional Welfare Impacts

The calculation in Section 7.1 ignores potentially important distributional consequences. As we show in Section 6.3, responses varied substantially in both employment earnings and unemployment insurance across the earnings distribution. These heterogeneous effects may lead to differences in willingness to pay and total social costs across quartiles of pre-birth earnings. For this reason, we replicate the previous MVPF computations by quartiles.

Table 8 presents the willingness to pay, costs, and MVPFs of the maternity extension for each income quartile under Assumption 1.[29] The MVPF is positive for all the quartiles. Specifically, for the first three quartiles the MVPF implies that for every €1 in social cost, mothers receive €0.67, €0.99, and €0.40 in benefits, respectively. This positive estimate is due to the fact that the willingness to pay is positive for inframarginal mothers and zero for marginal mothers, across all quartiles.

Interestingly, for mothers in the top quartile, the MVPF is infinite because they not only benefit from a positive willingness to pay, but the total social costs are negative for this quartile.[30] Because of the increase in employment earnings and subsequent increase in tax revenues, the extension in maternity leave more than pays for itself.

In sum, these results highlight important heterogeneity in program cost effectiveness across the income distribution. The maternity leave extension policy has the "biggest bang for its buck" for mothers at the top of the earnings distribution, who generate substantial cost savings for the government. Instead, mothers in the first three quartiles also benefited through the increase in transfers from the additional maternity leave payments, but with higher social costs.

It is important to note that our welfare calculations may not fully capture the social returns to the maternity leave policy. For example, the extension on maternity leave may have additional ben-

[29]The results for Assumption 2 are given in Appendix Table A8.

[30]Hendren and Sprung-Keyser (2020) defined a policy as having an infinite MVPF when the policy has negative social costs and positive WTP.

efits such as positive effects on children's outcomes (Rossin-Slater and Uniat, 2019) and maternal health (Baker and Milligan, 2008). Under Assumption 1, we hypothesize that women account for these additional benefits when deciding to switch to maternity leave. However, mothers may not anticipate the full set of benefits at the moment of the switch. Moreover, our results are based on the intention-to-treat effect on mothers who were unaware of the policy and gave birth around the birth cutoff in May 1979. These estimates may not hold if the policy changes the selection of future mothers. For later cohorts of mothers under these policies, the results also may not generalize if firms alter hiring or promotion practices that alter employment outcomes of mothers as a result of the policy. Finally, these results do not account for potential additional social welfare programs. However, as discussed in Appendix Section D, these programs are unlikely to play a major role in this context. Despite these limitations, our analysis presents evidence that the sizable fiscal externalities on UI participation are influential in determining welfare implications of maternity leave policies.

8 Conclusion

This paper explores the relationship between motherhood, maternity leave policies and unemployment insurance. This paper has three main contributions. First, using German administrative data, we establish the strong positive relationship between motherhood and unemployment insurance participation. More than 32% of mothers that gave birth between 1975 and 2015 received UI benefits within the first five years after birth. The increase in participation coincides with the end of paid maternity leave, indicating that mothers utilize UI as a source of income replacement.

Second, using a difference-in-differences design, we show that maternity leave policies have large spillover effects on unemployment insurance. Extensions of paid job-protected maternity leave from two to six months reduced UI participation by 19% in the five years after childbirth, offsetting 68% of the total increase in maternity leave costs for the state. The reform also leads to a

significant reduction in employment earnings in the year of childbirth, but with limited impacts on long run employment or earnings. We document that the overall impact of maternity leave extension masks large heterogeneous responses across the pre-birth earnings distribution. Specifically, mothers at the top of the distribution experienced a persistent increase in employment earnings.

Third, we show how accounting for the fiscal externality on UI can substantially alter the implied costs and social benefits of the maternity leave policy. When we include the effect of the policy on UI benefits in our computation, the MVPF more than doubles to 1.19, suggesting that for every €1 spent, the benefits to the recipient is €1.19. Moreover, we show that the welfare implications differ considerably across the income distribution. Accounting for the impacts on employment and UI, the policy more than pays for itself for mothers in the top quartile, while it exhibits positive returns lower than 1 for mothers in the first three quartiles. These calculations suggest that the inclusion of the fiscal externalities on UI plays an essential role in determining the welfare implications of maternity leave policies in this setting. While our estimates are only applicable to the specific reform we study, this paper provides strong evidence that spillover effects between maternity leave and other social support programs can be substantial.

One natural direction for future research is to analyze the trade-off mothers are making between job-protected maternity leave and UI benefits to understand the value mothers place on job protection. Exploring the relationship between job protection and the choice to substitute maternity leave for UI may inform potential interesting underlying mechanisms at play.

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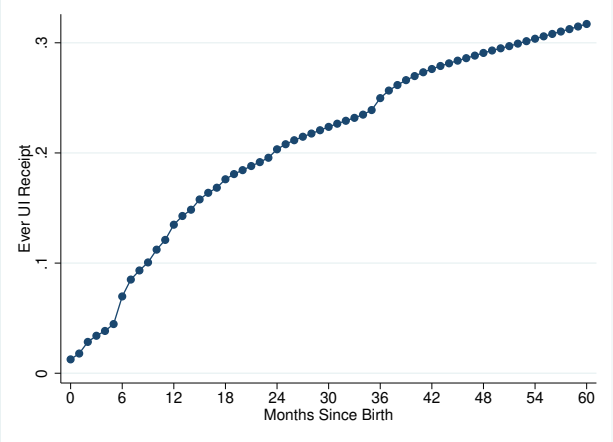
Figures and Tables

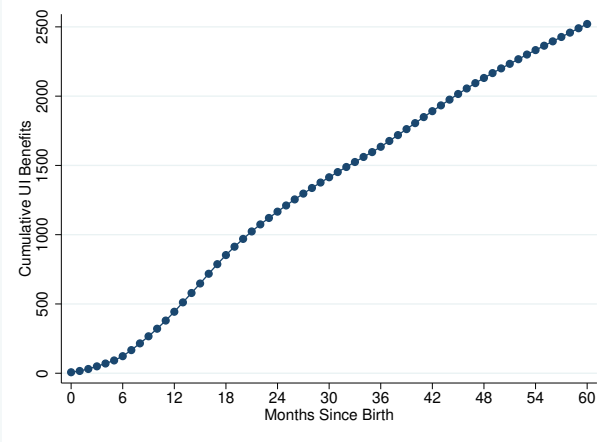
Figures

Figure 1: Unemployment Insurance Participation Post Childbirth

(a) Probability of Ever Receiving UI



(b) Cumulative UI Benefit Receipts

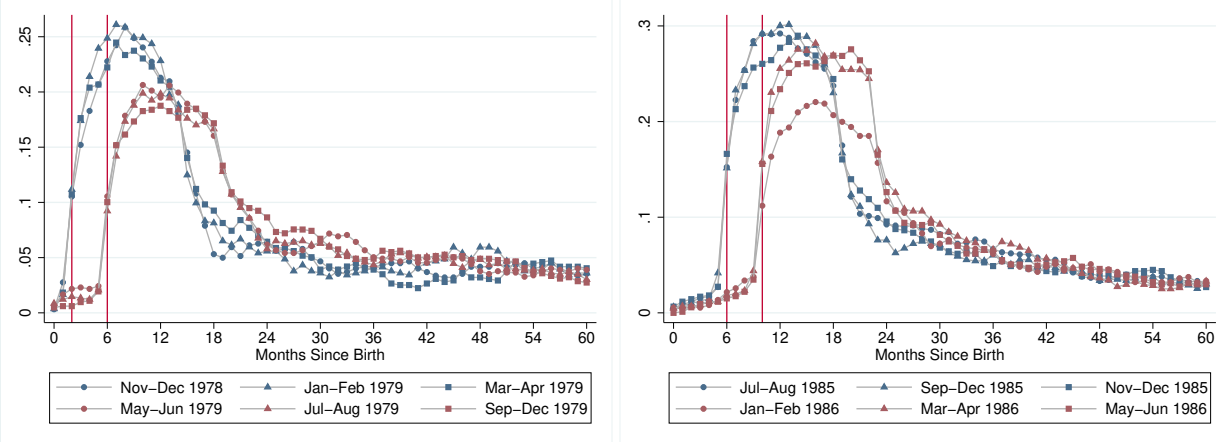


Notes: Figures 1a and 1b plot the probability of ever receiving UI and the cumulative total UI benefits each month after childbirth for first-time mothers who gave birth between 1975 and 2017.

Figure 2: Maternity Leave Extensions and Unemployment Insurance Participation Post Childbirth

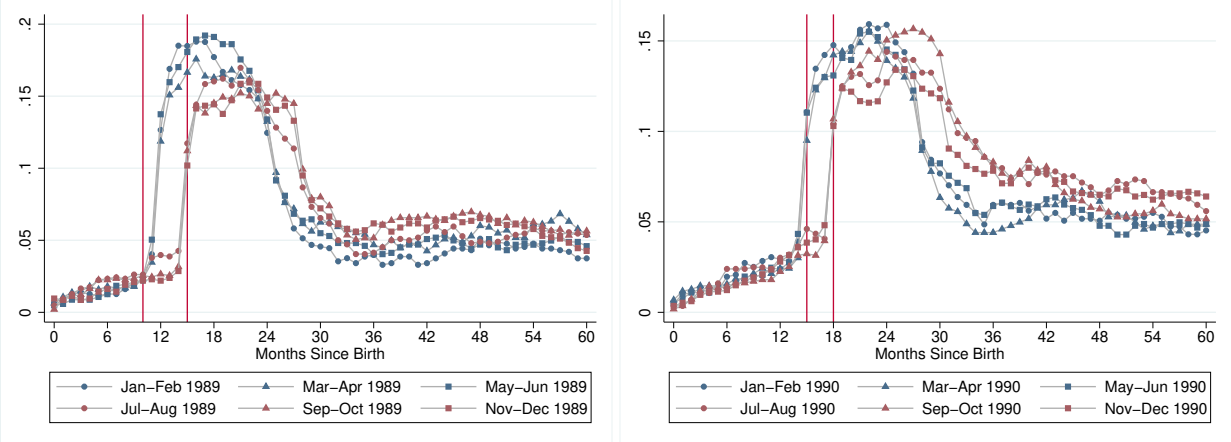
(a) May 1979 Reform (2 to 6 Months)

(b) Jan 1986 Reform (6 to 10 Months)



(c) July 1989 Reform (10 to 15 Months)

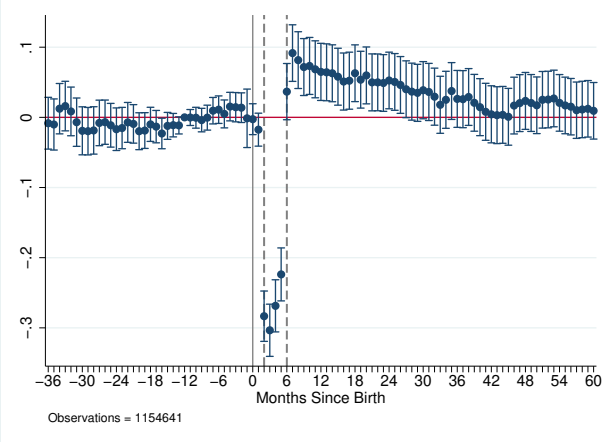
(d) July 1990 Reform (15 to 18 Months)



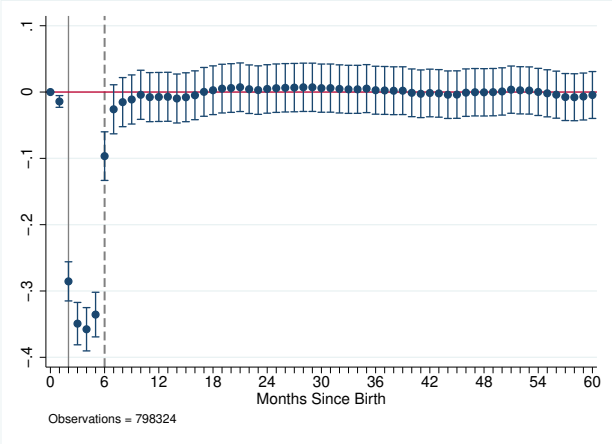
Notes: Figure 2 plots the probability of receiving UI after the birth of a child for mothers of children born within six months before (control mothers) and after each maternity leave reform (treated mothers). The two vertical lines in the figures represent the maximum number of months of maternity leave before and after the reforms.

Figure 3: Employment

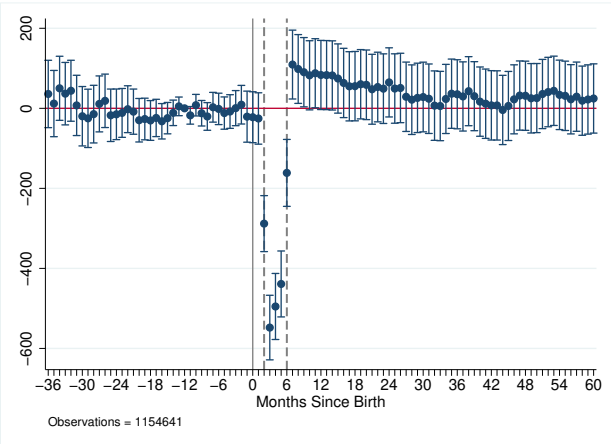
(a) Monthly Probability of Being Employed Post Birth



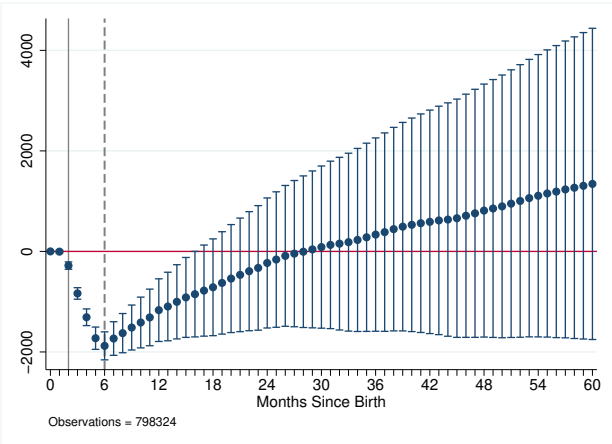
(b) Ever Employed Post Birth



(c) Monthly Employment Earnings

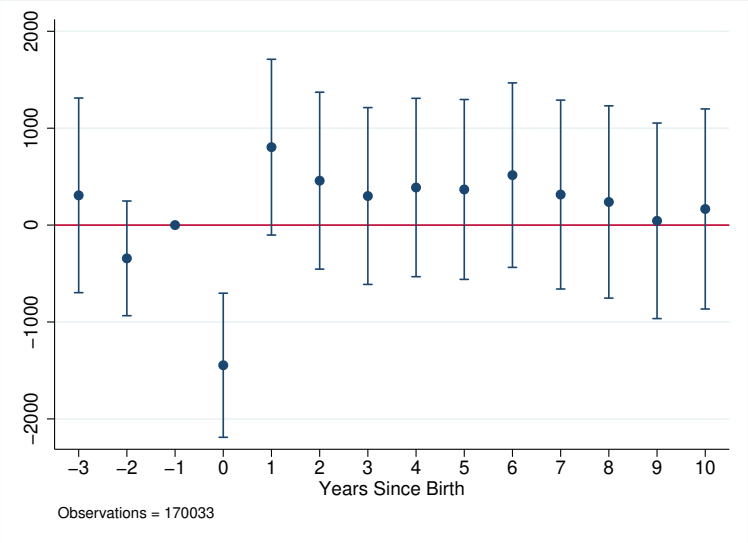


(d) Cumulative Employment Earnings



Notes: Figure 3 plots the coefficients β_j and their 95% confidence intervals from estimating equation (1) for the outcomes: probability of being employed (Figure 3a), ever employed (Figure 3b), monthly employment earnings (Figure 3c), and cumulative employment earnings (Figure 3d). Standard errors are clustered at the individual level.

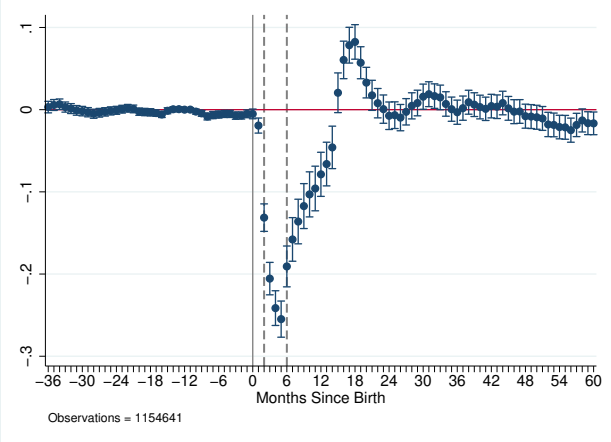
Figure 4: Annual Employment Earnings



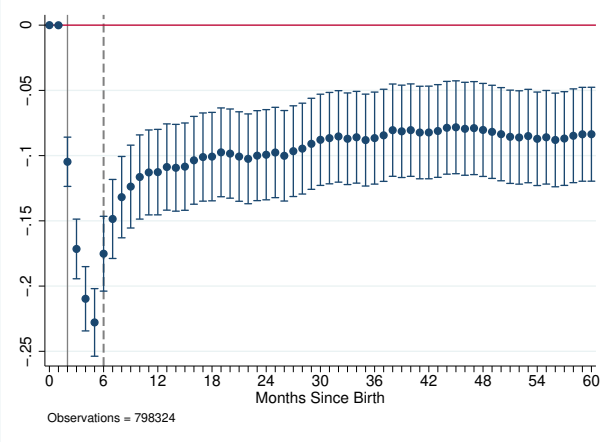
Notes: Figure 4 plots the coefficients β_j and their 95% confidence intervals for the outcomes annual employment earnings. Standard errors are clustered at the individual level.

Figure 5: Unemployment Insurance Participation

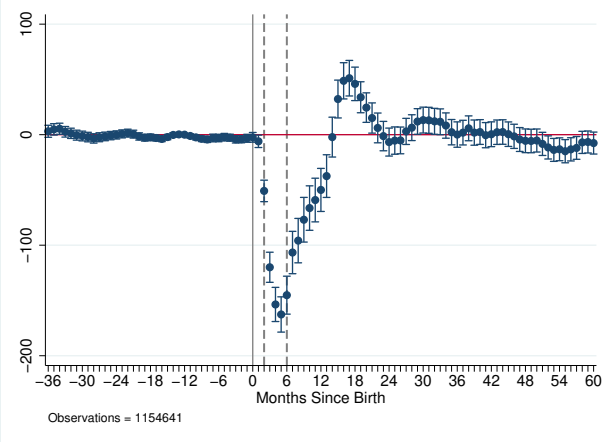
(a) Monthly Probability of Receiving Any UI Benefit



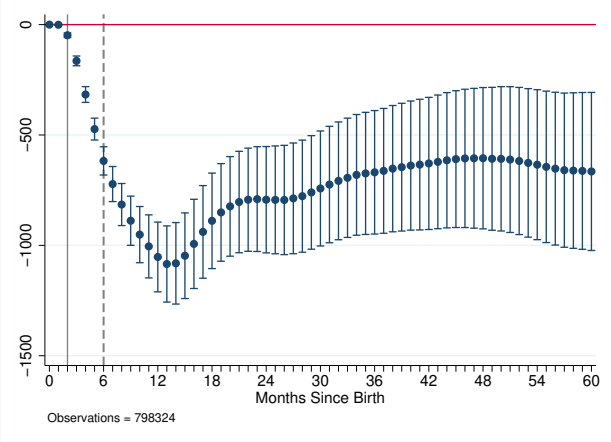
(b) Ever Receiving UI Post Birth



(c) Monthly UI Benefits

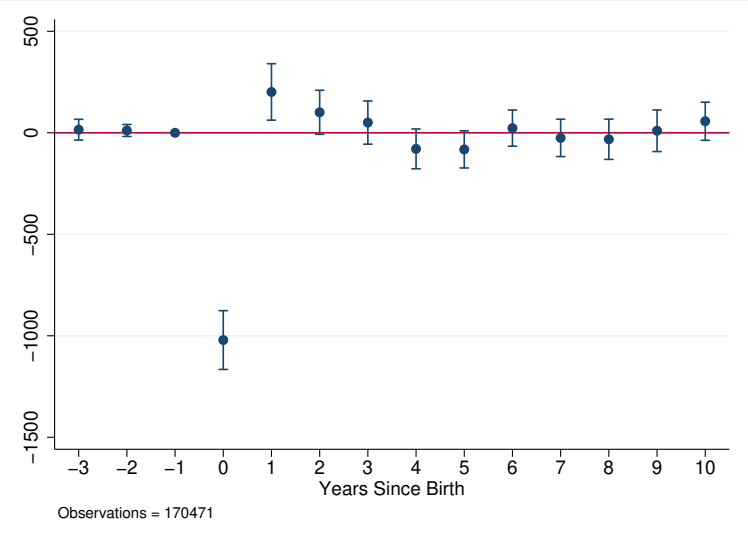


(d) Cumulative Total UI Benefits Post Birth



Notes: Figure 5 plots the coefficients β_j and their 95% confidence intervals from estimating equation (1) for the outcomes: monthly probability of receiving UI (Figure 5a), ever receiving UI (Figure 5b), monthly UI benefits (Figure 5c), and cumulative total UI benefits receipt (Figure 5d). Standard errors are clustered at the individual level.

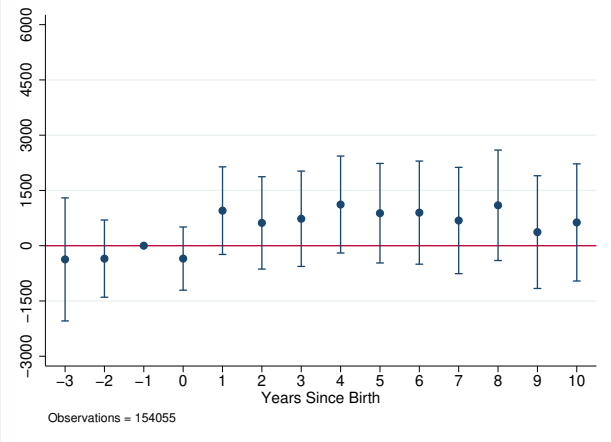
Figure 6: Annual UI Benefits



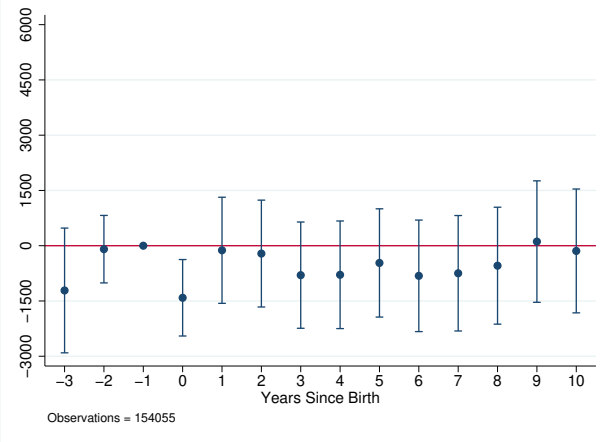
Notes: Figure 6 plots the coefficients β_j and their 95% confidence intervals for the outcome annual UI benefits received. Standard errors are clustered at the individual level.

Figure 7: Distributional Impacts Across Pre-Birth Earnings on Annual Employment Earnings

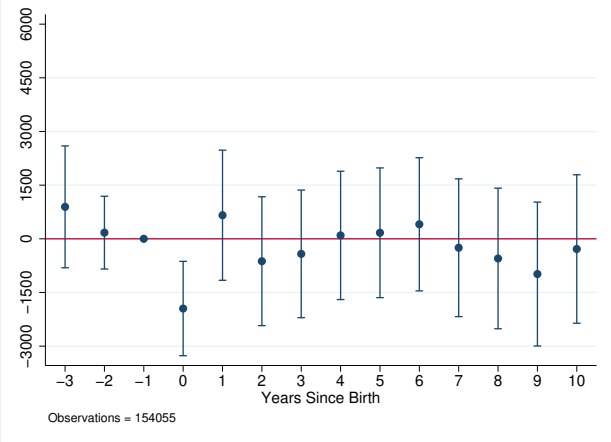
(a) Quartile 1



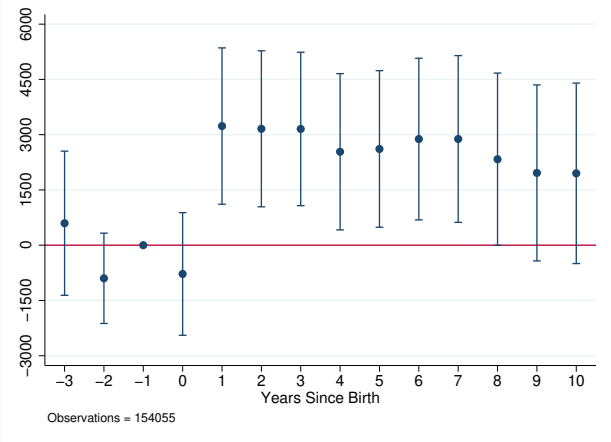
(b) Quartile 2



(c) Quartile 3



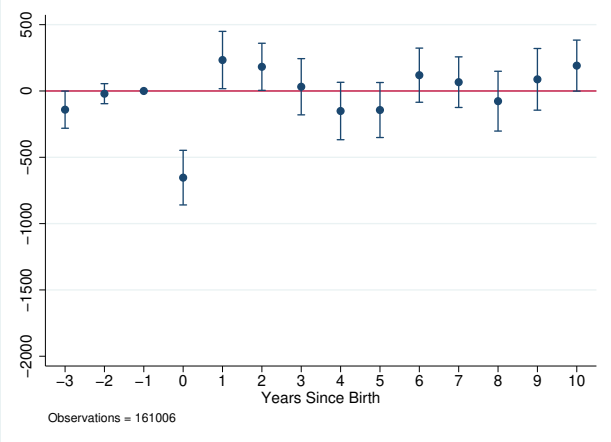
(d) Quartile 4



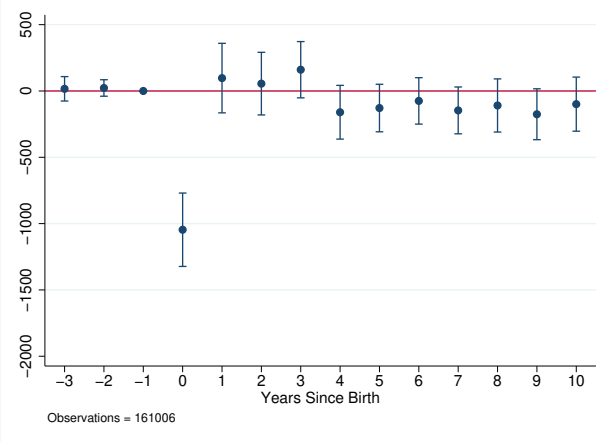
Notes: Figure 7 plots the implied effects and their 95% confidence intervals for each quartile of the pre-birth earnings distribution for annual employment earnings. Standard errors are clustered at the individual level.

Figure 8: Distributional Impacts Across Pre-Birth Earnings on Annual UI Benefits

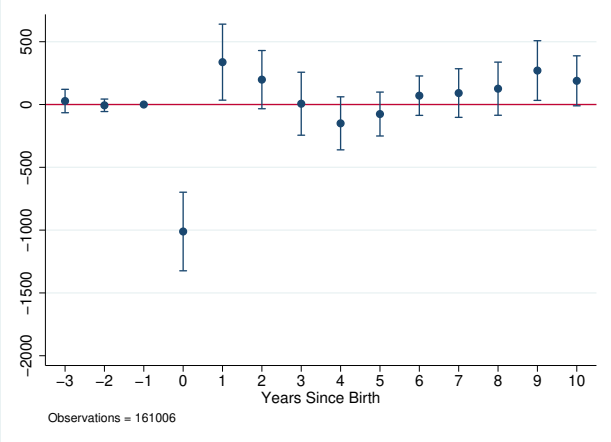
(a) Quartile 1



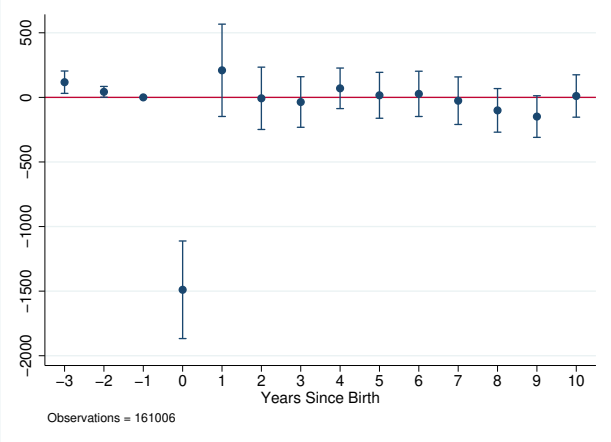
(b) Quartile 2



(c) Quartile 3



(d) Quartile 4



Notes: Figure 8 plots the implied effects and their 95% confidence intervals for each quartile of the pre-birth earnings distribution for annual UI benefits received. Standard errors are clustered at the individual level.

Tables

Table 1: Summary Statistics

	(1) Treated Mothers May 1979 - Nov 1979	(2) Control Mothers Nov 1978 - Apr 1979	(3) Difference p-value in parentheses
Age	26.39	26.49	0.09
	(4.62)	(4.68)	(0.52)
Number of Children	0.12	0.11	-0.01
	(0.37)	(0.37)	(0.46)
Monthly Wage Prior to Child Birth	1623.40	1613.07	-10.33
	(727.19)	(700.49)	(0.64)
Annual Earnings	20188.50	20211.05	22.55
	(8114.35)	(8348.10)	(0.93)
Full-time	0.89	0.89	-0.00
	(0.31)	(0.32)	(0.68)
Skilled	0.73	0.73	0.00
	(0.44)	(0.44)	(1.00)
Observations	2341	1806	4147

Notes: Statistics are measured at 12 months prior to reform and are calculated using all mothers with children born 6 months before and 6 months after the reform date, May 1979. Column (1) and (2) show the mean and standard deviations in parentheses for the treated and control mothers, respectively. Column (3) shows the difference in means and the p-value from the two sample t-test. Monthly wage prior to childbirth is average monthly employment earnings in the three years prior to birth. Full-time is an indicator for whether the mother was working full time in 3 months prior to childbirth. Skilled is an indicator for whether the mother has completed any vocational training or higher qualifications. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 2: Maternity Leave Duration and Benefits

	(1) Total Maternity Duration	(2) Share of Month 3 to 6 on Leave
Treated × Post	3.594***	0.384***
	(0.462)	(0.0150)
Control Mean	12.81	0.47
R-squared	0.012	0.070
Observations	12910	12910

Notes: The table reports the difference-in-difference estimates from equation (2) for the outcomes: total maternity leave duration and share of months 3 to 6 on leave. Total maternity leave duration is defined as the number of months not in the labor force in the first 40 months prior to returning to employment or unemployment. The control mean is the mean of the dependent variable calculated for the control mothers who gave birth in the same reform year but before the reform date. Standard errors are clustered at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Effect of Maternity Leave Extension on UI and Employment Outcomes

	(1) Ever Employed	(2) Cumulative Employment Earnings	(3) Ever UI	(4) Cumulative Unemployment Benefits
Treated $\times$ Post $\times 1(t = 60)$	-0.00446	1343.4	-0.0836***	-665.2***
	(0.0180)	(1579.6)	(0.0184)	(182.7)
Control Mean	0.66	31577.40	0.44	3160.17
R-squared	0.309	0.316	0.177	0.134
Observations	798324	798324	798324	798324

Notes: The table reports the coefficient on $t = 60$ from estimating equation (1) for the outcomes: probability of ever receiving UI, cumulative UI benefits, probability of ever being employed, and cumulative employment earnings after birth of the child. The control mean is the mean of the dependent variable calculated for the control mothers who gave birth in the same reform year but before the reform date. Standard errors are clustered at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Effect of Maternity Leave Extension on Annual Employment Earnings and UI Benefits

	(1) Annual Employment Earnings	(2) Annual UI Benefits
Year 0	-1427.591***	-1021.011***
	(381.513)	(73.916)
Year 1	831.947*	201.182***
	(465.369)	(70.964)
Year 2	434.199	100.938*
	(468.214)	(55.356)
Year 3	291.010	50.387
	(467.636)	(54.321)
Year 4	417.527	-79.252
	(471.962)	(49.985)
Year 5	420.773	-81.846*
	(476.152)	(46.649)
Year 6	600.594	22.988
	(488.191)	(45.500)
Year 7	409.440	-25.208
	(499.773)	(46.967)
Year 8	348.934	-31.868
	(509.502)	(50.588)
Year 9	155.337	10.037
	(517.945)	(52.268)
Year 10	252.464	56.786
	(529.917)	(47.887)
Control Mean	7237.426	327.742
Observations	170471	170471

Notes: The table reports the coefficients from estimating equation (1) at the annual level. Control mean is calculated at 1 year prior to birth for the control mothers who gave birth in the same reform year but before the reform date. Standard errors are clustered at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Effects of Maternity Leave Extensions on Employment Outcomes on Earnings

	(1)	(2)	(3)	(4)
	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Year 0	-646.26	-1837.89***	-1832.80***	-595.09
	(452.92)	(546.15)	(676.92)	(868.91)
Year 1	480.77	-409.15	840.16	3253.27***
	(611.96)	(736.19)	(912.50)	(1091.61)
Year 2	384.57	-371.57	-441.57	3169.24***
	(642.74)	(738.48)	(904.20)	(1082.67)
Year 3	433.31	-1094.34	-272.04	3233.17***
	(661.11)	(736.50)	(903.25)	(1067.85)
Year 4	811.31	-1210.45	534.84	2598.02**
	(668.98)	(749.62)	(909.75)	(1086.25)
Year 5	624.25	-1011.79	521.02	2674.47**
	(688.37)	(758.47)	(919.14)	(1090.94)
Year 6	622.78	-1244.64	694.84	2851.31**
	(709.05)	(784.48)	(946.25)	(1124.51)
Year 7	324.71	-1123.57	101.12	2726.33**
	(735.49)	(807.38)	(973.00)	(1157.78)
Year 8	856.99	-1030.01	-176.95	2245.45*
	(761.45)	(818.10)	(988.70)	(1199.05)
Year 9	204.21	-351.42	-692.00	2023.08*
	(773.89)	(846.72)	(1010.62)	(1217.72)
Year 10	307.57	-652.31	113.14	2033.55
	(807.63)	(861.71)	(1040.70)	(1251.81)
Control Mean	5139.17	6233.51	8688.29	8750.20
Observations	160002	160002	160002	160002

Notes: The table reports the implied effects and their 95% confidence intervals for each quartile of the pre-birth earnings distribution for annual employment earnings. The control mean is the mean of the dependent variable calculated for the control mothers who gave birth in the same reform year but before the reform date. Standard errors are clustered at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Effects of Maternity Leave Extensions on UI

	(1) Quartile 1	(2) Quartile 2	(3) Quartile 3	(4) Quartile 4
Year 0	-653.38***	-1046.27***	-1011.01***	-1489.46***
	(105.03)	(141.16)	(159.61)	(192.73)
Year 1	233.26**	97.10	337.28**	209.55
	(110.22)	(133.78)	(154.39)	(182.34)
Year 2	182.24**	55.33	198.11*	-7.25
	(90.58)	(120.45)	(118.24)	(123.09)
Year 3	31.79	160.33	6.33	-35.87
	(108.11)	(108.20)	(127.92)	(99.88)
Year 4	-151.07	-160.30	-149.76	70.06
	(110.42)	(103.36)	(107.72)	(80.09)
Year 5	-143.60	-128.67	-75.84	16.06
	(105.83)	(91.40)	(89.19)	(90.67)
Year 6	119.02	-74.94	70.46	27.21
	(104.15)	(89.28)	(80.07)	(89.42)
Year 7	66.38	-146.58	91.26	-25.71
	(97.35)	(90.08)	(98.76)	(93.90)
Year 8	-76.90	-109.32	125.99	-100.64
	(115.07)	(102.25)	(107.90)	(86.09)
Year 9	87.77	-175.54*	270.48**	-148.50*
	(118.59)	(97.87)	(121.20)	(82.19)
Year 10	191.07*	-99.30	188.73*	10.72
	(98.15)	(104.03)	(101.53)	(83.69)
Control Mean	340.10	375.03	312.95	280.61
Observations	161006	161006	161006	161006

Notes: The table reports the implied effects and their 95% confidence intervals for each quartile of the pre-birth earnings distribution for annual UI benefits received. The control mean is the mean of the dependent variable calculated for the control mothers who gave birth in the same reform year but before the reform date. Standard errors are clustered at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Marginal Value of Public Funds of Maternity Leave Extension

	Present Discounted Value (€) at $t = -1$	
	(1)	(2)
	Assumption 1	Assumption 2
1. WTP (Inframarginal Mothers)	**697.24**	**697.24**
a. Maternity Leave Benefits	697.24	697.24
2. WTP (Marginal Mothers)	**0**	**-683.21**
a. Maternity Leave Benefits	0	0
b. UI Benefits	0	-457.38
c. Post-Tax Earnings ($\tau = 29.2\%$)	0	-225.83
3. Costs	**584.45**	**584.45**
a. Maternity Leave Costs	1,271.70	1,271.70
b. UI Benefits	-862.98	-862.98
c. Loss in Tax Revenues ($\tau = 29.2\%$)	175.73	175.73
MVPF	**1.19**	**0.02**
MVPF (No UI)	**0.48**	**0.33**

Notes: The table reports the willingness to pay, government costs and marginal value of public funds of the maternity leave reform within the first ten years from the policy (Hendren and Sprung-Keyser, 2020). All values are discounted to year prior to birth ($t = -1$) using a 3% social discount rate. To compute the net cost of the policy, we include the total cost of the maternity leave payments and also the fiscal externalities on tax revenues and UI transfers. τ denotes the tax rate used in the calculations. Details on the calculations are provided in Section 7.1.

Table 8: Marginal Value of Public Funds of Maternity Leave Extension by Pre-Birth Earnings Quartiles

	Quartile 1 ($\tau = 21.2\%$)	Quartile 2 ($\tau = 26.5\%$)	Quartile 3 ($\tau = 30.4\%$)	Quartile 4 ($\tau = 34.6\%$)
1. WTP (Inframarginal Mothers)	**803.18**	**669.32**	**639.57**	**669.32**
a. Maternity Leave Benefits	803.18	669.32	639.57	669.32
2. WTP (Marginal Mothers)	**0**	**0**	**0**	**0**
a. Maternity Leave Benefits	0	0	0	0
b. UI Benefits	0	0	0	0
c. Post-Tax Earnings	0	0	0	0
3. Costs	**1,201.88**	**677.87**	**1,579.63**	**-6,432.28**
a. Maternity Leave Costs	1,307.41	1,302.94	1,204.78	1,261.30
b. UI Benefits	-105.53	-1,146.41	-144.74	-1,556.58
c. Loss in Tax Revenues	0.00	521.03	519.59	-6,137
MVPF	**0.67**	**0.99**	**0.40**	∞
MVPF (No UI)	**0.61**	**0.37**	**0.37**	∞

Notes: The table reports the willingness to pay, government costs and marginal value of public funds of the maternity leave reform within the first ten years from the policy by quartiles of the pre-birth earnings distribution (Hendren and Sprung-Keyser, 2020). All values are discounted to year prior to birth ($t = -1$) using a 3% social discount rate. To compute the net cost of the policy, we include the total cost of the maternity leave payments and also the fiscal externalities on tax revenues and UI transfers. τ denotes the tax rate used in the calculations. The willingness to pay for inframarginal mothers is given by the mechanical increase in maternity leave payment. To calculate the WTP, we multiply calculate number of months mothers would have been on leave in months 3 to 6 (based on control mothers, see Appendix Table A4) by monthly maternity leave payments, €383.

Appendix

A Additional Social Welfare Programs for Mothers

To provide a full accounting of the welfare implications of the 1979 maternity leave reform, it is important to also consider changes in mothers' participation in other social assistance programs in addition to unemployment insurance. In Germany during the time period of interest, mothers are eligible for three other social welfare programs.[31] In this section, we describe these programs and how we will account for potential fiscal externalities on them as a result of the increase in maternity leave duration.

First, mothers may be entitled to social assistance ("*sozialhife*"). This is a means-tested benefit for all residents without sufficient entitlements to other social benefits. The means test includes income of (wider) family members (spouses, children and parents), and alimony payments in full. In 2002, the assets limits are € 1,278 for the claimant, € 614 for his/her spouse and € 256 for each child (Adema et al., 2003). If the applicant owns a house, its value is usually disregarded as long as the claimant lives in "reasonable" comfort. No time limit applies as long as the eligibility requirements are satisfied. While we do not observe social assistance receipts in our dataset and hence cannot include this program as part of our welfare calculations, it is important to note that mothers that receive social assistance are not eligible for additional maternity leave payments as these benefits are credited against social assistance payments. Combined with the low asset threshold for eligibility, it is highly unlikely that we would observe benefit substitution along this margin.

Second, parents of all income levels are entitled to child allowance, which is the most widely paid benefit. Benefits ("*Kindergeld*") are generally paid until the child reaches the age of sixteen or until the age of twenty-seven if the child is receiving an education. In 1979, parents receive

[31] While additional social assistance programs have been implemented in more recent years, we describe here only the programs for which mothers in our sample are eligible in 1979.

€25.56 (50 DM) per month for the first child, €40.9 (80 DM) for the second and €76.69 (150 DM) for higher order children (Hener, 2017). Parents with higher income receive smaller amounts and these child benefits are tax exempt. Since 1983, taxpayers have also received a child allowance of €222.88 (432 DM) for each dependent child (Deutscher Bundstag, 2018). If the maternity leave extension changes fertility decisions of mothers, the reform may also generate fiscal externalities by changing the total amount of child allowances and tax deductions provided to families. As a result, in our analysis, we will also explore changes in fertility to account for this effect in our welfare calculations.

Finally, a single parent raising a child and receiving inadequate financial support from the other parent is eligible to receive support payments for children below the age of six.[32] In 1980, the amount was €55.22 (108 DM) per month. Unfortunately, we do not observe families or child support payments in our dataset. However, we will be able to impute potential changes to these benefit receipts through changes in fertility. Our welfare calculations may be biased if maternity leave extensions lead to changes in marital stability, but analyzing these effects is beyond the scope of this paper given our data limitations.[33]

B Identification of Mothers

The SIAB does not contain information on the exact child birth dates. To identify mothers, we follow the procedure described in Muller and Strauch (2017), a methodological paper provided by the Research Data Centre (FDZ). The identification strategy relies on using the information from employers' notifications regarding employment interruptions (Muller and Strauch, 2017).

[32]BGBl. I S. 1184. More information can be found at `https://splash-db.eu/policydocument/law-to-secure-the-subsistence-of-children-of-single-mothers-and-fathers-from-1945-1990-we`

[33]The relationship between divorce and maternity leave has been studied in other countries (e.g. Forde (2018), Petts et al. (2020), Olafsson and Steingrimsdottir (2020), and Margolis et al. (2021)) and suggests that, if anything, divorces are less likely to occur with the increase in maternity leave extension. For a more complete discussion see Appendix Section D.

Because maternity allowance is paid by the health insurance, maternity leaves can be inferred from interruptions to employment spells that are coded as due to "entitlement to other compensation by the statutory health insurance provider." We classify births only if the woman is under the age of 40 and is absent from employment for at least 14 weeks, which is the length of maternity protection period during which mothers are prohibited from working. This methodology does not perfectly identify all births for three main reasons. First, the notification used to identify maternity leave is also used for employment interruptions due to illnesses that last longer than six weeks.[34] As a result, it is possible that some women who have long-term illnesses may be mistakenly classified as giving birth, but the proportion of women with long-term illness is low for the population under 40 (Muller and Strauch, 2017). Second, only mothers who are employed at the time of birth and subject to social security are captured. This means that we do not capture births of mothers who were self-employed, civil servants or marginally employed at the time of birth and we do not observe births before 1975.[35] Lastly, the number of births will be inaccurate if there are twin births. Relative to the national statistics on the number of births, Muller and Strauch (2017) show that they can identify around 60% of all births.

C Effects on Labor Force Participation

The reduction in UI participation but null effects on employment suggests that the extension in maternity leave leads to a decrease in labor force participation after childbirth.[36] Figure A7a shows that there is a large decrease in labor force participation during months of additional maternity leave. Labor force participation is higher for the treated group after month 14, which coincides with the increase in unemployment insurance participation (see above). The increase, however, is

[34] Specifically, sickness allowance is paid by the provider when a person is absent due to illness for more than six weeks.

[35] Marginal jobs are a specific category of part-time jobs with earnings below €450 per month that enjoy special tax privileges.

[36] Time on maternity leave counts as time out of the labor force.

not persistent and after five years from childbirth, there is not a significant difference in labor force participation between the treated and control groups.

Figure A7b shows that overall, mothers are 6.9 percentage points less likely to have ever participated in the labor force and after five years, there remains a gap between the treated and control group. Because there is no difference in the probability of ever being employed, this effect can be explained by the reduction in UI takeup after childbirth. This is because there is no effect on ever employed and ever in the labor force is the sum of ever employed and ever UI participation.

D Effects on Participation in Alternative Social Programs and Fertility

In this section, we analyze potential impacts on participation in alternative social programs other than unemployment insurance.

First, mothers may change their participation in the social assistance program ("*sozialhife*"). However, as discussed in Section A, this is unlikely because of the low asset threshold for eligibility and the fact that maternity leave benefits are accredited against social assistance payments.

Second, if fertility decisions are affected by the reform, we may observe changes in the receipt of child-related benefits. These include both child benefit payments and child tax allowances that depend directly on the number of children. To analyze the impact on fertility, we estimate equation (1) on the number of children for each year after the birth of the child in 1979. Appendix Figure A8 shows little to no evidence of an impact on fertility as a result of the maternity leave extension.[37] As a result, mothers are unlikely to receive additional child benefits through these programs as a result of the reform.

Finally, mothers may also receive additional benefits through child support for single moth-

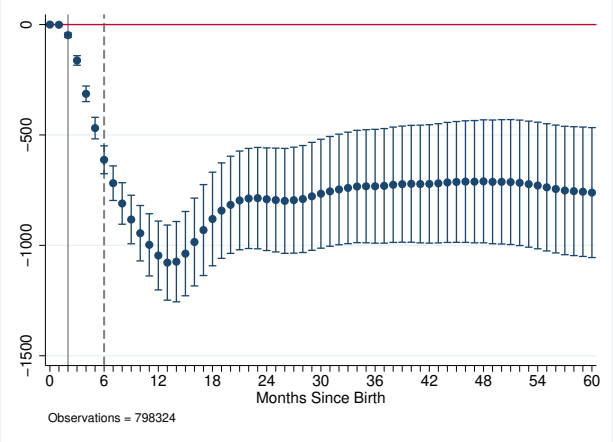
[37]The analogous results by quartiles of pre-birth earnings are presented in Appendix Figure A9.

ers. Our data however does not allow us to observe child support payments directly. Based on the previous results on fertility, it is unlikely that mothers will receive additional payments as a result of having more children in response to the policy. However, maternity leave extensions may affect marital stability and change the likelihood of separations. To the best of our knowledge, the relationship between divorce and maternity leave has not been studied in the German context but results from other countries show that divorces are less likely to occur with the increase in maternity leave extension.[38] This suggests that our welfare calculations may underestimate the full benefit increase and cost reduction generated by changes in marital stability.

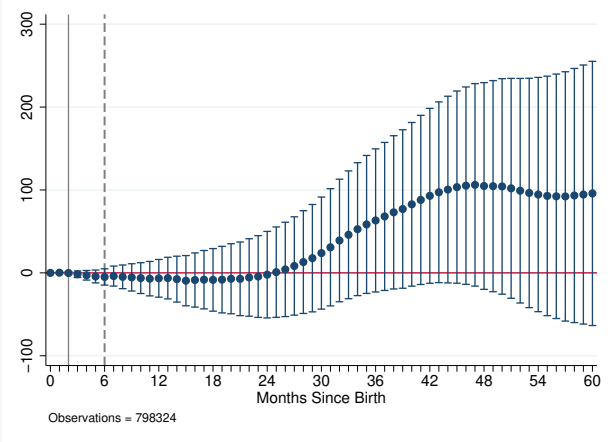
E Additional Figures

Figure A1: UI Components

(a) Total Regular UI Benefits



(b) Total Other Unemployment Benefits

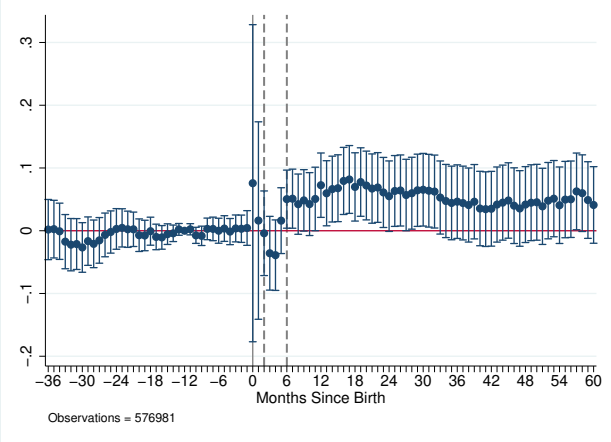


Notes: This figure plots the coefficients β_j and their 95% confidence intervals for the outcomes: total regular unemployment benefits (Figure A1a), and total benefits from unemployment assistance and unemployment maintenance (Figure A1b) as explained in Section 2.2. Standard errors are clustered at the individual level.

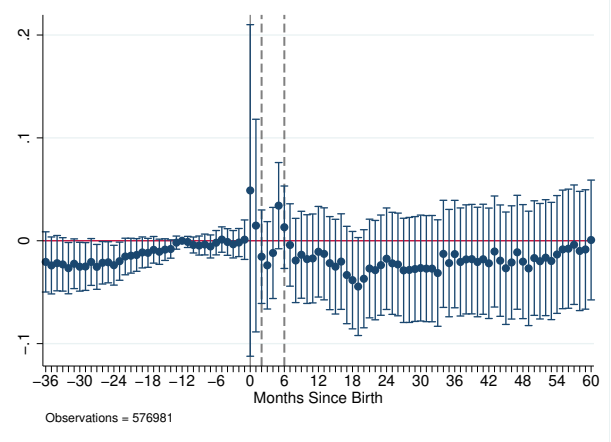
[38] See, for example, Forde (2018), Petts et al. (2020), Olafsson and Steingrimsdottir (2020), and Margolis et al. (2021).

Figure A2: Additional Employment Outcomes

(a) Probability of Working at Pre-Birth Employer



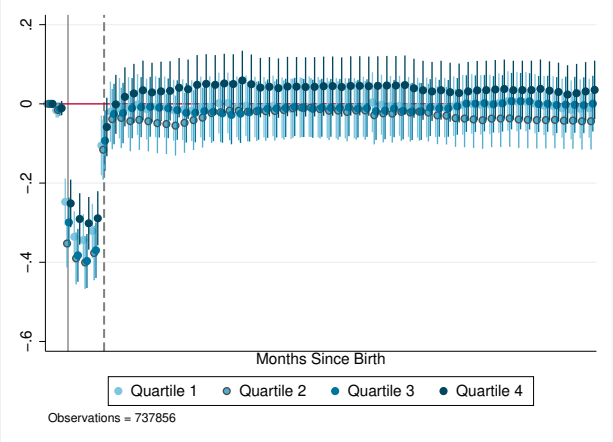
(b) Probability of Working Full Time



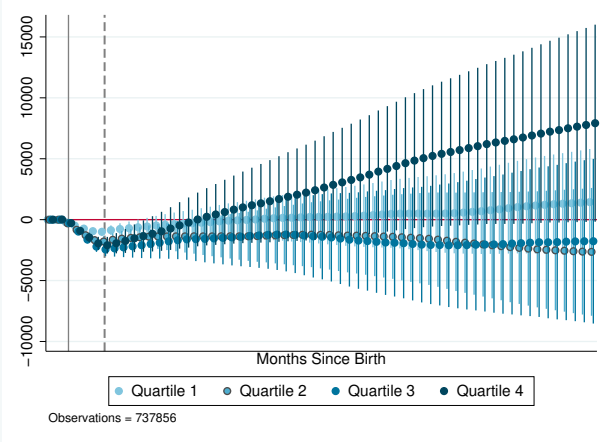
Notes: Figure A2 plots the coefficients β_j and their 95% confidence intervals from estimating equation (1) for the outcomes: monthly probability of working at the pre-childbirth employer (Figure A2a), and monthly probability of working full-time (Figure A2b). Standard errors are clustered at the individual level.

Figure A3: Employment Outcomes: Heterogeneity by Pre-Birth Earnings

(a) Probability of Ever Being Employed



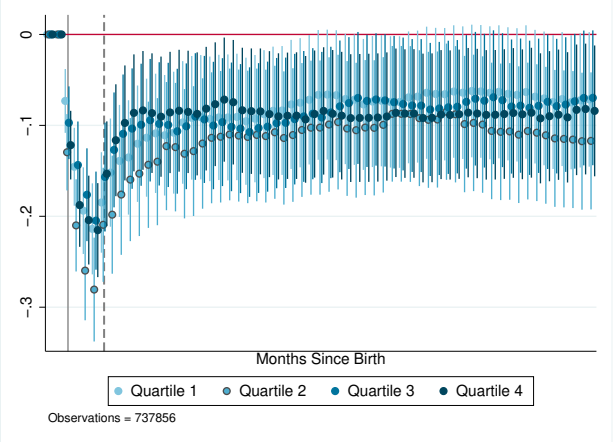
(b) Cumulative Employment Earnings



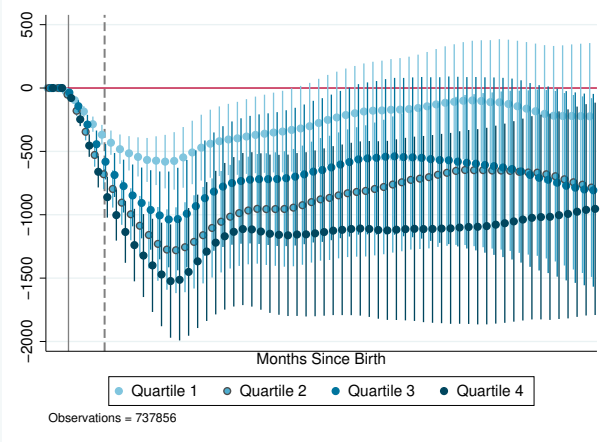
Notes: Figure A3 shows the coefficients and their 95% confidence intervals from estimating equation (1) interacted with dummies for each quartile. The pre-birth earnings distribution is from one year prior to birth. The outcomes are: probability of ever being employed (Figure A3a), and cumulative employment earnings (Figure A3a). Standard errors are clustered at the individual level.

Figure A4: UI Outcomes: Heterogeneity by Pre-Birth Earnings

(a) Ever Receiving UI Post Birth



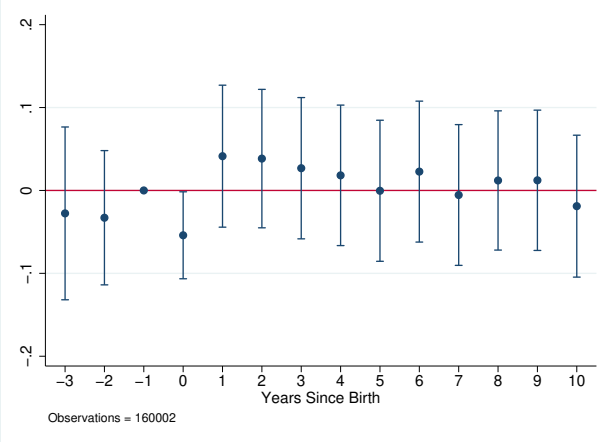
(b) Cumulative Total UI Benefits Post Birth



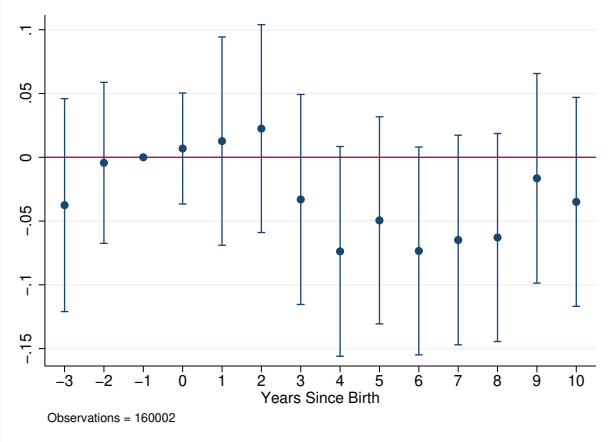
Notes: Figure A4 shows the coefficients and their 95% confidence intervals from estimating equation (1) interacted with dummies for each quartile. The pre-birth earnings distribution is from one year prior to birth. The outcomes are: probability of ever receiving UI (Figure A4a), and cumulative total UI benefits (Figure A4b). Standard errors are clustered at the individual level.

Figure A5: Distributional Impacts Across Pre-Birth Earnings on Employment Rate

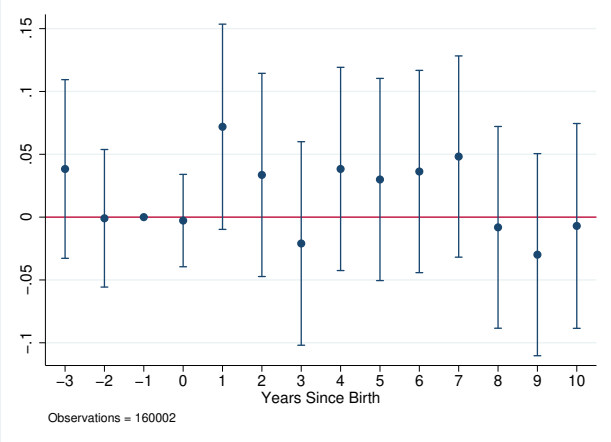
(a) Quartile 1



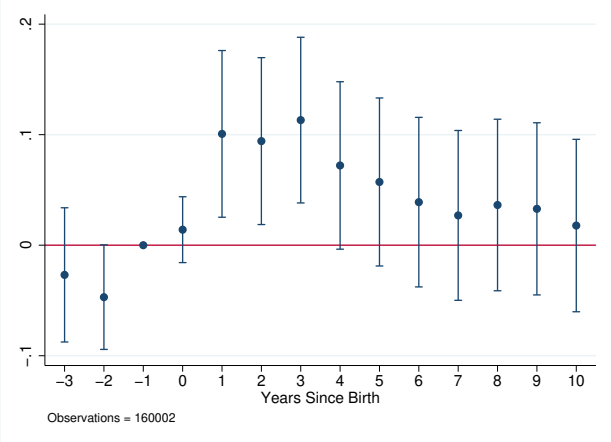
(b) Quartile 2



(c) Quartile 3



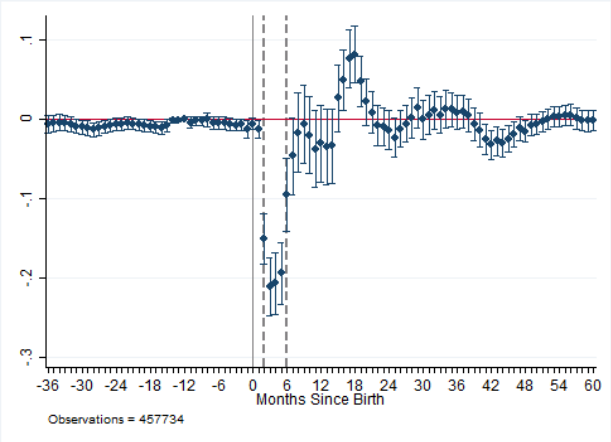
(d) Quartile 4



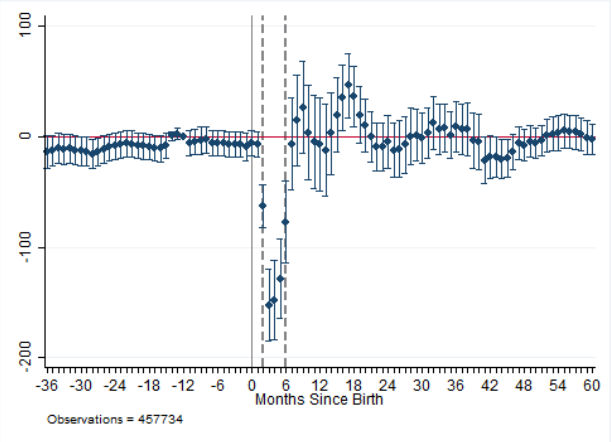
Notes: Notes: The figure reports the implied effects and their 95% confidence intervals for each quartile of the pre-birth earnings distribution for probability of being employed. Standard errors are clustered at the individual level.

Figure A6: Main Analysis Using BASiD

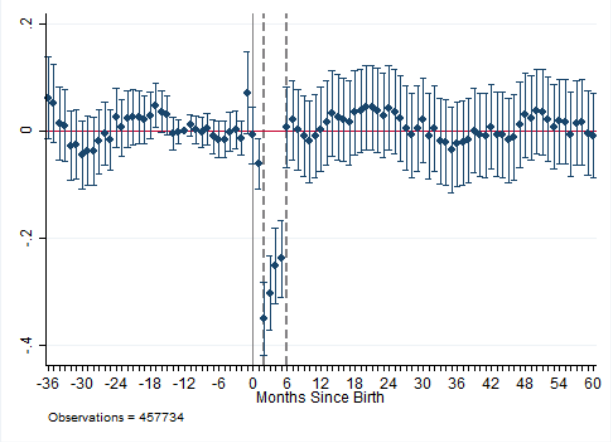
(a) Monthly Probability of Receiving Any UI Benefit



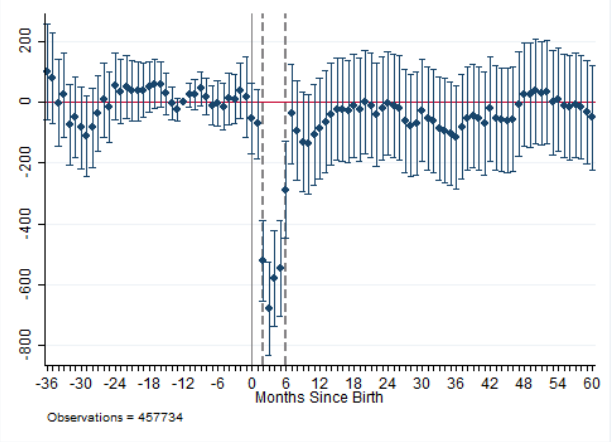
(b) Monthly UI Benefits



(c) Monthly Probability of Being Employed



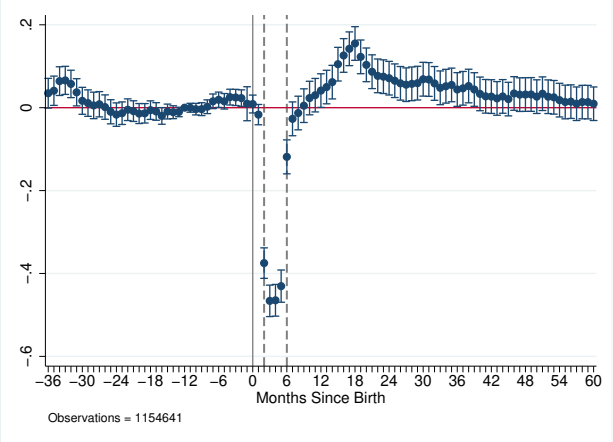
(d) Monthly Employment Earnings



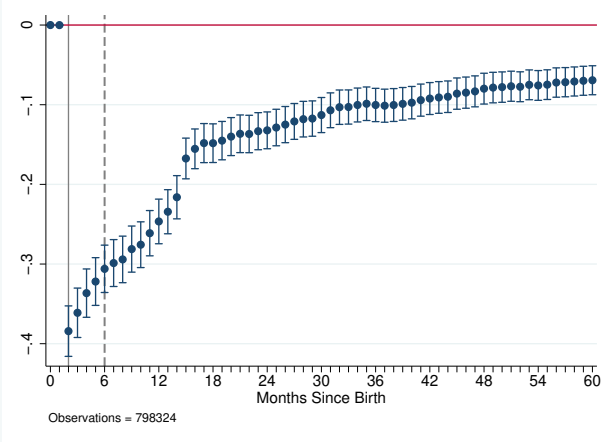
Notes: Figure A6 plots the coefficients β_j and their 95% confidence intervals from estimating equation (1) using the BASiD dataset instead of the SIAB, as a robustness check. The outcomes shown are monthly probability of receiving any UI benefit (Figure A6a, monthly total UI benefits (Figure A6b), monthly probability of being employed (Figure A6c), and monthly employment earnings (Figure A6d). Standard errors are clustered at the individual level.

Figure A7: Labor Force Participation

(a) Monthly Probability of Participating in the Labor Force

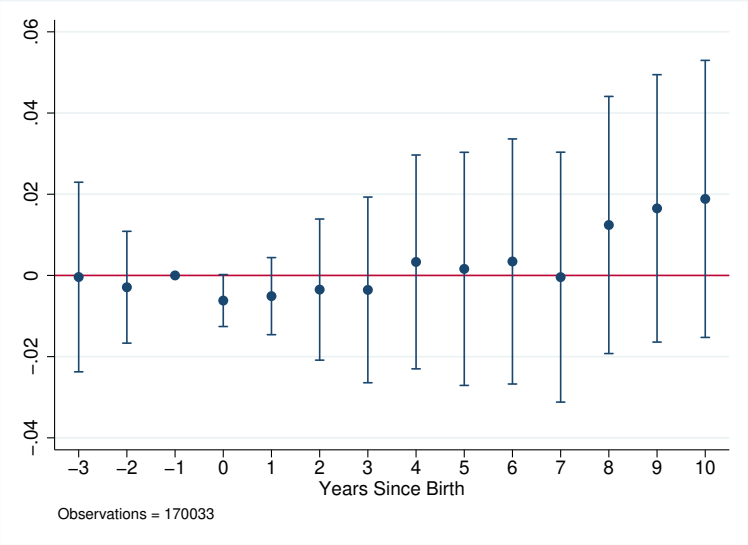


(b) Ever Re-Entering the Labor Force (Starting Two Months After Birth)



Notes: Figure A7 plots the coefficients β_j and their 95% confidence intervals from estimating equation (1) for the outcomes: monthly probability of labor force participation (Figure A7a), and ever participate in the labor force after two months from birth (Figure A7b). Labor force participation is defined as either employed or registered as unemployed. Note that nonparticipation includes mothers on maternity leave. Standard errors are clustered at the individual level.

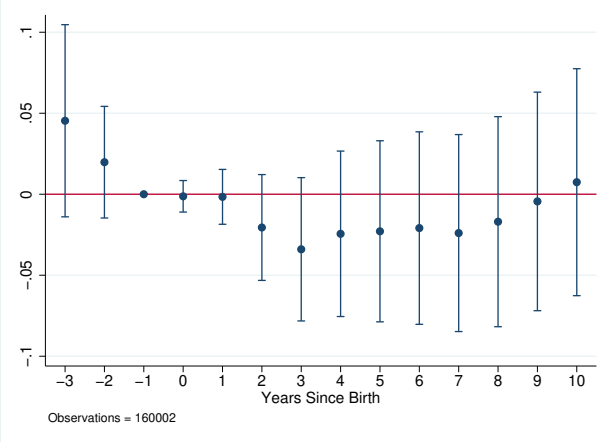
Figure A8: Effect of Maternity Leave Extension on Number of Children



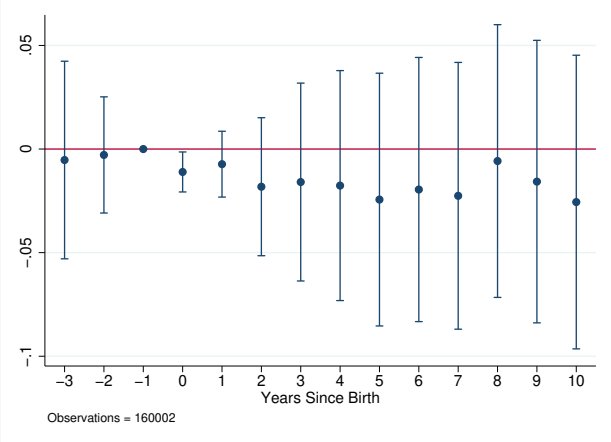
Notes: The figure reports the coefficients and their 95% confidence intervals for current number of children. Standard errors are clustered at the individual level.

Figure A9: Distributional Impacts Across Pre-Birth Earnings on Number of Children

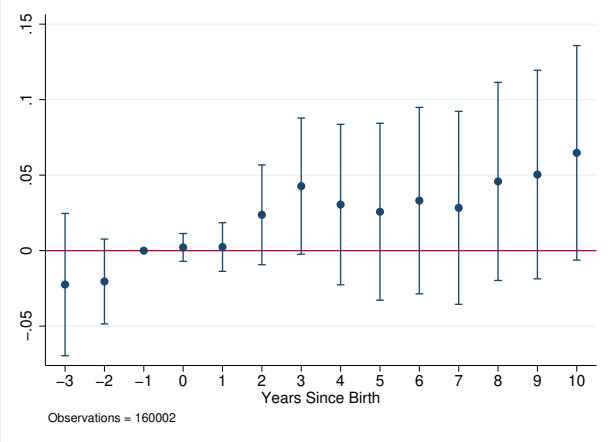
(a) Quartile 1



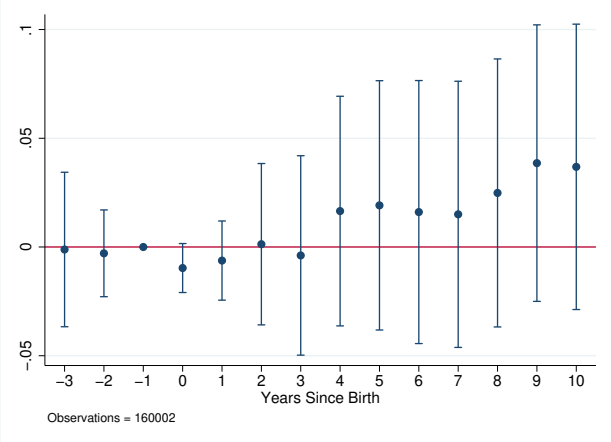
(b) Quartile 2



(c) Quartile 3



(d) Quartile 4



Notes: The figure reports the implied effects and their 95% confidence intervals for each quartile of the pre-birth earnings distribution for the current number of children. Standard errors are clustered at the individual level.

F Additional Tables

Table A1: Summary Statistics for Treated Mothers by Pre-Birth Earnings Quartile

	(1)	(2)	(3)	(4)
	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Age	25.58	25.48	26.34	28.27
	(5.08)	(4.71)	(4.11)	(3.82)
Number of Children	0.15	0.15	0.13	0.06
	(0.39)	(0.43)	(0.40)	(0.24)
Monthly Wage Prior to Child Birth	755.11	1420.40	1914.43	2546.59
	(332.79)	(145.06)	(139.83)	(370.02)
Annual Earnings	12722.52	17618.71	22259.63	29326.31
	(5824.32)	(4634.46)	(4121.72)	(5729.38)
Full-time	0.80	0.87	0.93	0.97
	(0.40)	(0.33)	(0.25)	(0.16)
Skilled	0.73	0.66	0.69	0.84
	(0.44)	(0.47)	(0.46)	(0.37)
Observations	662	569	529	581

Notes: Statistics are measured at 12 months prior to childbirth and are calculated using treated mothers with children born in the 6 months (May 1979 - Nov 1979) after the reform date, May 1979. Each column shows the mean and standard deviations in parentheses for each pre-birth earnings quartile. Monthly wage prior to childbirth is average monthly employment earnings in the three years prior to birth. Full-time is an indicator for whether the mother was working full time in 3 months prior to childbirth. Skilled is an indicator for whether the mother has completed any vocational training or higher qualifications.

Table A2: Effect of Maternity Leave Extensions on Time out of the Labor Force and Maternity Leave Benefits by Mothers' Pre-Birth Earnings Distribution

	(1) Total Maternity Duration	(2) Share of Months 3 to 6 on Leave
Quartile 1	3.421**	0.339***
	(1.347)	(0.030)
Quartile 2	4.474***	0.426***
	(0.910)	(0.029)
Quartile 3	3.731**	0.380***
	(1.467)	(0.044)
Quartile 4	2.560***	0.398***
	(0.624)	(0.023)
p75-p25 Difference	-0.861	0.058*
	(1.535)	(0.032)

Notes: The table reports the implied effects on the duration of maternity leave and total maternity leave benefits by mothers' characteristics. The estimates come from interacting the characteristics listed with the event time dummies in (1). We show the effects by quartiles of the pre-birth earnings distribution, measured at 12 months prior to birth. Standard errors are clustered at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A3: Maternity Leave Duration and Benefits

	(1) Share of Month 3 to 6 Employed	(2) Share of Month 3 to 6 on UI
Treated × Post	-0.187***	-0.220***
	(0.0146)	(0.0157)
Control Mean	0.327	0.206
R-squared	0.037	0.098
Observations	12910	12910

Notes: The table reports the difference-in-difference estimates from equation (2) for the outcomes: share of months 3 to 6 employed and on UI. The control mean is the mean of the dependent variable calculated for the control mothers who gave birth in the same reform year but before the reform date. Standard errors are clustered at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A4: Employment Status of Control Mothers in Months 3 to 6 by Pre-Birth Earnings Quartile

	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Share of Month 3 to 6:				
Out of Labor Force	.54	.45	.43	.45
Employed	.28	.31	.36	.35
UI	.18	.24	.21	.20

Notes: This table reports the share of control mothers that are out of the labor force, employed, or on unemployment during the months 3 to 6 after childbirth. Control mothers refers to mothers who gave birth from November 1978 to April 1979.

Table A5: Effect of Maternity Leave Extension on UI and Employment Outcomes After 5 Years (Varying Pre-Birth Employment Length)

	Over 6 Months		Over 12 Months	
	(1) Cumulative Unemployment Benefits	(2) Cumulative Employment Earnings	(3) Cumulative Unemployment Benefits	(4) Cumulative Employment Earnings
Treated × Post $\times 1(t = 60)$	-685.9***	1904.6	-723.8***	2703.1
	(184.0)	(1591.5)	(188.9)	(1661.4)
Control Mean	3207.03	31579.10	3229.75	31448.49
R-squared	0.137	0.316	0.139	0.316
Observations	779223	779223	723713	723713

Notes: The table reports the coefficient on $t = 60$ from estimating equation (1) for the outcomes, cumulative UI benefits received and cumulative employment earnings after birth of the child. The sample is restricted to those that have worked at least 12 months or 24 months in the last two years. The control mean is the mean of the dependent variable calculated for the control mothers who gave birth in the same reform year but before the reform date. Standard errors are clustered at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A6: Effect of Maternity Leave Extension on UI and Employment Outcomes After 5 Years (No April and May Births)

	(1) Ever UI	(2) Cumulative Unemployment Benefits	(3) Ever Employed	(4) Cumulative Employment Earnings
Treated $\times$ Post $\times 1(t = 60)$	-0.0890***	-788.6***	0.00138	1217.1
	(0.0204)	(200.7)	(0.0201)	(1748.5)
Control Mean	0.44	3190.35	0.66	31427.68
R-squared	0.179	0.138	0.308	0.313
Observations	646699	646699	646699	646699

Notes: The table reports the coefficient on $t = 60$ from estimating equation (1) for the outcome, probability of ever receiving UI, cumulative UI benefits, probability of ever being employed, and cumulative employment earnings after birth of the child. The sample drops births in April and May. The control mean is the mean of the dependent variable calculated for the control mothers who gave birth in the same reform year but before the reform date. Standard errors are clustered at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A7: Effect of Maternity Leave Extension on UI and Employment Outcomes After 5 Years (Within 3 Months of May and No April and May Births)

	(1) Ever UI	(2) Cumulative Unemployment Benefits	(3) Ever Employed	(4) Cumulative Employment Earnings
Treated $\times$ Post $\times 1(t = 60)$	-0.0802***	-897.8***	0.0131	1682.6
	(0.0295)	(284.3)	(0.0291)	(2533.6)
Control Mean	0.43	3324.39	0.65	31212.68
R-squared	0.179	0.146	0.320	0.319
Observations	341055	341055	341055	341055

Notes: The table reports the coefficient on $t = 60$ from estimating equation (1) for the outcome, probability of ever receiving UI, cumulative UI benefits, probability of ever being employed, and cumulative employment earnings after birth of the child. The sample uses the same definition as in Schönberg and Ludsteck (2014); it drops births in April and May and includes only those born within 3 months of the reform month. The mean is calculated for the control mothers who gave birth in the same reform year but before the reform date. Standard errors are clustered at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A8: Marginal Value of Public Funds of Maternity Leave Extension by Pre-Birth Earnings Quartiles: Assumption 2

	Quartile 1 ($\tau = 21.2\%$)	Quartile 2 ($\tau = 26.5\%$)	Quartile 3 ($\tau = 30.4\%$)	Quartile 4 ($\tau = 34.6\%$)
1. WTP (Inframarginal Mothers)	**803.18**	**669.32**	**639.57**	**669.32**
a. Maternity Leave Benefits	803.18	669.32	639.57	669.32
2. WTP (Marginal Mothers)	**-48.08**	**-1,425.36**	**-760.57**	**5,523.88**
a. Maternity Leave Benefits	0	0	0	0
b. UI Benefits	-48.08	-630.53	-82.50	-856.12
c. Post-Tax Earnings	0	-794.83	-678.07	6,380.00
3. Costs	**1,201.88**	**677.87**	**1,579.63**	**-6,432.28**
a. Maternity Leave Costs	1,307.41	1,302.94	1,204.78	1,261.30
b. UI Benefits	-105.53	-1,146.41	-144.74	-1,556.58
c. Loss in Tax Revenues	0.00	521.03	519.59	-6,137
MVPF	**0.63**	**-1.12**	**-0.08**	∞
MVPF (No UI)	**0.61**	**-0.07**	**-0.02**	∞

Notes: The table reports the willingness to pay, government costs and marginal value of public funds of the maternity leave reform within the first ten years from the policy by quartiles of the pre-birth earnings distribution (Hendren and Sprung-Keyser, 2020). All values are discounted to year prior to birth ($t = -1$) using a 3% social discount rate. To compute the net cost of the policy, we include the total cost of the maternity leave payments and also the fiscal externalities on tax revenues and UI transfers. τ denotes the tax rate used in the calculations. The willingness to pay for inframarginal mothers is given by the mechanical increase in maternity leave payment. To calculate the WTP, we multiply calculate number of months mothers would have been on leave in months 3 to 6 (based on control mothers, see Appendix Table A4) by monthly maternity leave payments, € 383. Under assumption 2, we assume marginal mothers have a non-zero willingness to pay that's given by the discounted value of UI benefits and post-tax earnings.

Table A9: Effects of Maternity Leave Extensions on Employment and UI Outcomes by Mothers' Pre-Birth Earnings Distribution

	(1) Cumulative UI Benefits	(2) Cumulative Employment Earnings
Quartile 1	-223.205	1441.280
	(294.921)	(2223.190)
Quartile 2	-785.276**	-2642.952
	(359.766)	(2676.524)
Quartile 3	-806.926**	-1770.112
	(388.119)	(3447.387)
Quartile 4	-953.339**	7917.552*
	(427.447)	(4126.839)
p75-p25 Difference	-730.134	6476.272
	(519.316)	(4687.576)

Notes: The table reports the implied effects on the probability of ever receiving UI, cumulative UI benefits, probability of ever employed after childbirth, and cumulative post-birth employment earnings at $t = 60$ by mothers' characteristics. The estimates come from interacting the characteristics listed with the event time dummies in (1). We show the effects by quartiles of the pre-birth earnings distribution, measured at 12 months prior to birth. Standard errors are clustered at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A10: Effect of Maternity Leave Extension on UI Receipt in Month after Maternity Leave

	(1) Probability of UI Receipt after Maternity Leave
Treated × Post	-0.116***
	(0.0214)
Control Mean	0.32
R-squared	0.063
Observations	12785

Notes: The table reports the difference-in-differences estimates from equation (2) for the outcome, probability of receiving UI at the end of maternity leave. The control mean is the mean of the dependent variable calculated for the control mothers who gave birth in the same reform year but before the reform date. Standard errors are clustered at the individual level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.