# How Should We Design Parental Leave Policies? Evidence from Two Reforms in Italy

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**Abstract**

This paper studies the design of parental leave policies by analyzing how different policy instruments address the incentive-insurance trade-off that characterizes parental leave policies. Using Italian administrative data on the universe of working mothers, I implement a difference-in-differences design around two unemployment insurance reforms that increased, respectively, the level of benefits and the duration of benefits, without offering job protection. I provide novel insights on the trade-offs that mothers face in making their parental leave decisions, the value of job protection after childbirth, and the incentive costs associated with parental leave benefits. I find that both reforms increased separations from the pre-birth employer and delayed mothers' return to work, suggesting that mothers are willing to give up the certainty of returning to their pre-birth employer for more generous benefits in the short-run. I estimate the costs of changing the generosity of unprotected benefits in terms of women's earnings, labor force participation, and benefits from other social programs. Taking up unprotected benefits has a large cost in terms of future income for mothers, suggesting that the insurance value of short-term benefits is much higher than the value of job protection. I develop a conceptual framework to evaluate the welfare effects of parental leave policies in terms of the estimated values and costs. The analysis demonstrates the key role of job protection to reduce the incentive costs of providing parental leave benefits while showing that mothers highly value insurance in the short-term. Extending the duration of benefits while at the same time extending job protection would improve mothers' welfare.

# 1 Introduction

Despite women narrowing the gap with men in labor force participation and surpassing them in educational attainment, gender differences in labor market outcomes persist. Recent research shows that the bulk of labor market gender inequality can be attributed to the unequal impacts of parenthood on men and women (Kleven, Landais, and Søgaard 2019; Kleven et al. 2020): the effects of children on the careers of women relative to men are large and have not fallen over time. This fact has spurred an increasing interest in how government interventions can mitigate the adverse effects of childbirth on women's labor market outcomes. The time right around childbirth is of particular vulnerability for mothers that might face important income losses. It is also a *salient* period for mothers' decisions to return to work and incentives can have long-run effects on labor market outcomes and gender inequality. Parental leave programs have therefore become central to most countries social insurance networks with the double objective of insuring women against income losses when temporarily out of work and keeping them engaged in the labor force.

Evidence on how to *optimally* design leave policies is, however, scarce. Parental leave policies are a bundle of three core features: the duration of benefits, the replacement rate of benefits and the provision of job protection. While a sizable literature has studied partial elements of the parental leave system, such as the length of benefits (Dahl et al., 2016; Kleven et al., 2020) and the presence of job protection (Schönberg and Ludsteck, 2014; Lalive et al., 2014), we still lack a general understanding on how the effectiveness of parental leave policies depends on these different design features. Isolating the effects of these different policy instruments poses a real challenge as most of the evidence in the literature comes from reforms in which multiple of these features are tied together in the same policy change.

Understanding how different policy instruments address the incentive-insurance trade-off that characterizes parental leave policies is crucial to evaluate their welfare consequences. For example, providing longer benefits without offering job protection can lead to utility gains for women by insuring them for longer in a period of vulnerability, but it can also have detrimental effects on labor market attachment, which could exacerbate gender differences and increase the fiscal costs associated with the reform.

In this paper, I study the effects of providing *increased benefits without job protection* on women's decisions to return to work, labor market outcomes, and welfare. I do so by taking advantage of the uniqueness of the Italian social insurance network that grants special unemployment insurance eligibility to women who decide to resign before their child's first birthday. After childbirth, Italian

mothers are compelled to take a maternity leave which usually ends three months after birth. Once that ends, women can choose to take up the standard parental leave program, which replaces pre-birth earnings at a 30% rate for 6 months, or to go back to work and arrange for childcare. The special unemployment insurance eligibility adds an additional option: it allows mothers to resign before their child turns one years old and take up unemployment insurance. Unemployment insurance thus effectively acts as *paid parental leave* without the key element of job protection.

I consider two different policy experiments that exogenously changed the generosity of unemployment insurance benefits keeping job protection constant. The first reform, introduced in 2013, increased the generosity of unemployment insurance by increasing its replacement rate from 60 to 75%. The second reform, introduced in 2015, increased unemployment insurance generosity by increasing its duration from 8 months to a maximum of 24 months. Both reforms changed the generosity of the transfers that women could receive after childbirth without offering job protection.

Studying how changes in unemployment insurance generosity affects women's choices in the short-run and their labor force attachment in the long-run provides an opportunity to disentangle the effects of cash transfers from the effects of job protection on the incentive-insurance trade-off. The use of variation in unemployment insurance allows to overcome one of the main challenges in the literature, since cash benefits and job protection usually change simultaneously in parental leave reforms. Moreover, by exploiting two different reforms that changed, respectively, the level of benefits and the duration of benefits, this setting provides an opportunity to study the differential welfare effect of different policy instruments, while being able to keep constant the other parameters characterizing parental leave policies.

Using novel and rich administrative data on the universe of mothers working in the private sector before childbirth, their complete work histories and overall benefits' histories provided by the Italian Social Security Institute (*INPS*), I conduct a causal analysis of the effects of the two unemployment insurance reforms on separations from pre-birth employer, decisions to return to work, take-up of other social programs and long-term labor market outcomes. I implement a difference-in-differences design that compares birth cohorts differentially exposed to the unemployment insurance reforms, before and after childbirth. Since mothers have the possibility to quit their jobs and be eligible for unemployment insurance in the time window between the end of their compulsory maternity leave and their child's first birthday, the treatment and control group are defined as a function of the end of their compulsory maternity leave date. Identification of the effects comes from comparing the evolution of outcomes over time relative to the end of maternity leave of cohorts of mothers who gave birth in the year of the reform to cohorts of mothers who gave birth in the year before.

The empirical analysis provides novel insights on the trade-offs that mothers face in making their parental leave decisions, the value of job protection after childbirth, and the incentive costs associated with parental leave benefits. I find that increasing the generosity of unprotected benefits generates significant behavioral responses: women are more likely to take up unemployment insurance, which results in a significant increase in separations from their pre-birth employer. Increasing the *replacement rate* of unprotected benefits by 10% increases separations by 4% between the end of compulsory maternity leave and the child's first birthday. This increase mostly comes from a crowding-out of parental leave benefits right at the end of compulsory maternity leave suggesting that the insurance value of increasing the level of benefits is highest right at the end of maternity leave.

Increasing the *duration* of unprotected benefits by 10% increases resignations by almost 2%. While the increase in unemployment insurance take-up partially comes from crowding-out of parental leave benefits, most of the behavioral responses are concentrated around the time of parental leave exhaustion. This suggests that the increase in *duration* of unemployment insurance allows marginal mothers to move closer to their optimal choice of paid leave and extend the subsidized time they spend not working. Overall, both reforms significantly delay women's return to work.

I find compelling evidence that mothers are willing to give up the certainty of returning to their pre-birth employer for more generous benefits in the short-run. What are the implications of giving up job protection in terms of labor market outcomes? This question is crucial to evaluate both the incentives effects of the reforms in terms of fiscal externalities and the private trade-off that mothers face when making their leave decisions. I find that both reforms have a negative and significant effect on labor force participation in the medium- and long-run. Mothers exposed to higher levels of unprotected benefits are 1% less likely to work four years after the end of compulsory maternity leave. Mothers exposed to longer unprotected benefits are also less likely to work in the medium run, but the effect almost disappears four years after the end of compulsory maternity leave. Both reforms have a negative and significant effect on earnings one year after childbirth, with child penalties increasing by around 4% in both cases, and the negative effects persisting up to four years after childbirth. In terms of magnitude, mothers exposed to higher *levels* of unprotected benefits lose, on average, 493 EUR in cumulative earnings over the four years after the end of maternity leave. Mothers exposed to *longer* unprotected benefits lose, on average, 662 EUR in cumulative earnings. These results suggest that taking up unprotected benefits has a large cost in terms of future income for mothers. They confirm the key role of job protection in reducing the incentive costs associated with parental leave reforms and keeping women attached to the labor force.

These effects also speak to the private trade-off that women face when making parental leave choices. If we assume that mothers are forward looking and have rational expectations, the effects of the reforms on labor market outcomes are informative of how much women are willing to give up in terms of future earnings for an increase in benefit level or duration in the short-run. I find that one percentage point increase in replacement rate of unprotected benefits decreases cumulative earnings over the next four years by 33 EUR. One month increase in duration decreases cumulative earnings by 82 EUR. If women are forward looking and have rational expectations, these results suggest that the insurance value of short-term benefits is much higher for women than the value of job protection. The assumption that women are able to perfectly predict the effects of their leave choices on labor market outcomes is unlikely to hold in practice. For example Kuziemko et al. (2018) show that women significantly underestimate the employment costs of motherhood and are not able to correctly predict the effects of childbirth on labor force participation.

In the last part of the empirical analysis, I perform an heterogeneity analysis to shed light on the drivers of behavioral responses and to investigate the potential mechanisms behind the large effects of unprotected benefits take-up on labor market outcomes. I first perform a simple complier analysis and look at the heterogeneity in responses to the reforms in terms of UI take-up. I find that compliers to the replacement rate reform are on average younger, less likely to be working full-time, more likely to work in "low-quality" establishments and earn less than both always-takers and never-takers. They are also significantly less likely to work in regions with a high unemployment rate. These findings are overall in line with the idea that individuals induced to take up UI by the replacement rate reform are less likely to value job protection and more likely to associate high insurance value to short-term benefits. Increases in unemployment duration are valued by a wider population of mothers who are less likely to be identified off their pre-birth characteristics in a clear-cut way. The one characteristic that stands out is childcare availability. This suggests that increases in UI duration are highly valued by mothers who do not have access to formal childcare options. The high cost of childcare is a plausible potential explanation for why women are willing to give up future earnings for longer benefit duration.

In the last part of the analysis, I develop a conceptual framework to evaluate the welfare effects of changes to parental leave policies in terms of empirically measurable sufficient statistics. I apply a simple model based on Baily (1978); Chetty (2008); Schmieder, Von Wachter, and Bender (2012); Schmieder and Von Wachter (2016) to parental leave policies to study the welfare effects of benefit levels and benefit durations and how different policy instruments address the incentive-insurance trade-off. Using the estimated costs and benefits from the analysis above, I derive the Marginal

Value of Public Funds (MVPF, Hendren and Sprung-Keyser, 2020) associated with each of the two changes in unemployment insurance benefits. While the two reforms analyzed here were not targeted to mothers, they are useful to estimate the welfare effects of directional changes to benefit levels or duration, while keeping the other relevant parameters fixed. I find that both reforms are associated with a MVPF lower than 1, reflecting the fact that the net costs of providing these benefits are higher than the value of providing them. Interestingly, the MVPF of the duration reform is higher (0.7) than the MVPF of the replacement rate reform (0.5). This is likely to be due to the fact that the duration reform has a higher insurance value for mothers and, in relative terms, a lower impact on cumulative earnings. Overall, the analysis demonstrates the key role of job protection to reduce the fiscal externalities of providing parental leave benefits while showing that mothers highly value insurance in the short- term. Extending the duration of benefits while at the same time extending job protection would improve mothers' welfare.

This paper contributes to different strands of literature. First, it contributes to the rich literature on the effects of parental leave policies on employment and earnings (Dahl et al., 2016; Olivetti and Petrongolo, 2017; Kleven, Landais, and Søgaard, 2019; Kleven et al., 2020). While there is plenty of evidence on the effects of family policies on labor market outcomes, not much is known about the effects of particular features of parental leave policies on women's incentives, decisions to return to work and labor market outcomes. This paper contributes to this literature by disentangling the effects of different policy instruments on employment and earnings. Secondly, this paper contributes to the literature on how to design parental leave policies (Lalive et al., 2014; Schönberg and Ludsteck, 2014; Jørgensen and Søgaard, 2021). It is closest in spirit to Lalive et al. (2014) and Schönberg and Ludsteck (2014) which study the relative importance of job protection and duration of cash benefits for parental leave policies in Austria and Germany. This paper contributes to this literature by analyzing the importance of the level of benefits in addition to the duration of benefits. Moreover, while the literature has analyzed the effects of different policy instruments on return-to-work and labour market outcomes of mothers, the evidence on the value that mothers assign to parental leave policies and on the overall welfare effects of different policy changes is scarce. This paper contributes to this literature by providing novel insights on the trade-offs that mothers face in making their parental leave decisions, the value of job protection after childbirth, and the incentive costs associated with parental leave benefits. Finally, this paper contributes to the recent literature on program interactions and their implications for individual outcomes and welfare. The main focus of these papers has been the interaction between unemployment and disability insurance (Inderbitzin, Staubli, and Zweimüller, 2016; Borghans, Gielen, and Luttmer, 2014; Lawson, 2017; Leung and

O'Leary, 2019), while the evidence in other public policy contexts has been scarce. This paper contributes to this literature by showing the importance of program interactions in the context of family leave policies.

The paper is structured as follows. Section 2 describes the institutional background and the conceptual framework. Section 3 describes the data used in the empirical analysis and presents the empirical strategy. Estimates of the behavioral responses to the changes in generosity of unprotected benefits are presented in Section 4. Section 5 estimates the costs of the changes in generosity of unprotected benefits in terms of labor market outcomes and the fiscal impact of the reforms on the government budget. Section 6 documents heterogeneity in responses and explores potential mechanisms. Section 7 performs welfare analysis and explores the policy implications of the findings. Section 8 concludes.

# 2 Institutional Background and Conceptual Framework

## 2.1 Institutional Background

In Italy, social insurance for working mothers is divided into a period of compulsory maternity leave and into a period of parental leave. Compulsory maternity leave (ML) starts 2 months before the estimated date of birth of the child and lasts for 5 months[1]. During the compulsory maternity leave period, mothers cannot work and get a government transfer that replaces 80%[2] of the average daily wage in the last month before the start of the compulsory maternity leave.

After the compulsory maternity leave, mothers are entitled to optional parental leave (PL). Each household is entitled to a total of 10 months of optional parental leave which can be used up to the child's 8th birthday. The first 6 months are paid at a 30% replacement rate if used before the child's 6th birthday, while the remaining months are unpaid. Each parent can take up at most 6 months of parental leave. If the father uses at least 3 months of PL, the household is entitled to an additional month (for a total of 11 months). While this clause was introduced to increase the take-up of parental leave by fathers, parental leave is used almost exclusively by mothers which represent over 90% of the beneficiaries. Moreover, paid parental leave benefits are usually exhausted in the first 6 months after birth.

[1]The start of ML can be anticipated if the mothers' occupation is deemed risky for the pregnancy or if the pregnancy is considered at risk. In these cases, the compulsory ML lasts more than 5 months. Also, women are entitled to some degree of flexibility regarding the start date of the compulsory maternity leave: they can also choose to use one month of leave before the estimated date of birth and the remaining 4 months afterwards.

[2]Some CBAs dictate that the employer is responsible to integrate the difference between the transfer from the social security institute and the pre-birth wage so that in many cases the replacement rate is effectively 100%.

Between 300 days before the expected birth date and the child's first birthday, mothers are entitled to *job protection*, irrespective of whether they take up parental leave or not. During that period they cannot be fired and have the right to maintain the same pre-birth working conditions in terms of role, tasks and salary.

In addition to the maternity leave and parental leave benefits, the Italian social insurance system grants special unemployment insurance eligibility to women who *voluntarily* resign before their child's first birthday. This is a key exception to the unemployment insurance (UI) system, as in normal circumstances workers who quit their jobs are not entitled to UI benefits. This provision implies that the unemployment insurance program can effectively work as *paid unprotected leave*: if a woman decides to resign before her child's first birthday she loses the right to job protection, but she receives cash transfers from the government in the form of unemployment insurance. This option has become really popular in recent years and has been advertised as an alternative (to use as a substitute or complement) to standard parental leave policies (Figure A1).

I exploit this peculiar feature of the Italian system to study the effects of increasing the level and duration of benefits without offering job protection. I take advantage of two unemployment insurance reforms that changed the generosity of benefits and thus changed the set of policy choices available to women after the end of compulsory maternity leave. Figure 1 shows the timeline of women's decisions. I will focus on choices of mothers between $t = 3$ and $t = 12$, the "choice period", where mothers can choose between returning to work, taking up PL, taking up UI or both. The analysis investigates how providing different incentives to mothers' in the time window right after childbirth impacts the incentive-insurance trade-off of parental leave policies.

**The Unemployment Insurance Reforms of 2013 and 2015** Until 2012, the main unemployment insurance subsidy available to Italian workers was the Ordinary Unemployment with Normal Requirement (*Disoccupazione Ordinaria a Requisiti Normali, OUNR*). This UI subsidy covered all employees in the non-agricultural sector. The potential benefit duration was fully determined by the age at layoff with a threshold mechanism: workers fired before turning 50 were eligible to 8 months of unemployment benefits while workers fired after turning 50 received up to 12 months of subsidy. The amount of subsidy was proportional to the average wage in the 3 months preceding the layoff. Workers received 60% of their average wage for the first 6 months of the subsidy, 50% for the following 2 months and 40% for the remaining 4 months, if still eligible. The amount of subsidy was capped by law and the threshold changed every year. To be eligible, workers needed to meet two main requirements: the worker should have contributed for the first time to social security at

least 2 years before the start of the unemployment benefit spell; the worker should have worked for at least 52 weeks in the last 2 calendar years. The relative strictness of these requirements implied that not all workers were eligible for UI after a separation.

In 2013, the unemployment insurance system was completely reformed with the main goal of increasing its coverage. The reform affected all terminations after January 1st, 2013, and it brought about two main changes. First, the *Aspi* subsidy substituted the *OUNR*: while the eligibility requirements were kept constant, the initial replacement rate was increased from 60 to 75%. The potential benefit duration of the subsidy was increased for older workers but remained constant to 8 months for our sample of interest (mothers who just gave birth, who are presumably younger than 50 years old). Secondly, the replacement rate reform introduced an additional UI subsidy, the *MiniAspi,* with less strict eligibility criteria: to be eligible, workers needed only 13 weeks of contribution in the year before the start of the unemployment spell. The potential benefit duration of the *Miniaspi* was equal to half of the weeks of contribution in the last year and the replacement rate was 75%. Figure 3 shows the changes in UI generosity after the replacement rate reform. Panel A reports the average daily UI benefit by month-of-end-of-termination bin for women less than 50 years old with a permanent contract around the introduction of the replacement rate reform. It shows that, after the reform, the daily benefit increased by around 4 EUR. Panel B reports the average potential unemployment insurance duration before and after the replacement rate reform and confirms that the reform did not change the duration of the UI subsidy. Figure A2 shows that the introduction of the *Miniaspi* resulted in around 300,000 extra claims, an increase of 50% relative to the baseline before the reform.

Not long after the replacement rate reform, the unemployment insurance system was reformed again. In 2015, the government combined the *Aspi* and *MiniAspi* subsidies into one insurance subsidy, the so-called *Naspi*. The reform kept the initial replacement rate unchanged while modifying the rules determining the potential benefit duration making it dependent on the number of weeks of contribution in the 4 years before the start of the UI spell. The potential benefit duration was equal to half of the weeks of contribution in the 4 years before the start of the UI spell, with a maximum of 2 years. This implied an average increase in potential benefit duration, particularly for workers with relatively long and stable contribution histories. Panel C of Figure 3 shows that the average daily UI benefit by month-of-end-of-termination bin did not significantly change after the duration reform. Panel D clearly shows that the reform had a significant impact on duration. The average potential unemployment insurance duration for women younger than 50 years old increased by around 250 days jumping to around 500 days on average. This corresponds to a 100% increase

in average potential duration. Figure A11 shows the distribution of potential benefit duration for mothers who decided to use unemployment insurance after the duration reform: on average the reform increased the potential benefit duration from 8 months to around 16 months.

**Child Care Availability** When thinking about mothers' return to work choices around childbirth, it is not possible to abstract from the role played by institutional child care. Formal child care in Italy is divided into nursery care (*Asili Nido*) covering children from 0 to 2 years old, and pre-school care (*Scuola dell'Infanzia*) for 3 to 5 years old children. Pre-school care is prevalently public and regulated by the Ministry of Education. Pre-schools are considered the first level of the school system: they are almost free (with the exception of a relatively low lunch fee) and largely available. Indeed, they are used by over 95% of 3-5 years old children. While pre-school availability and attendance is almost universal, the situation is significantly different for nursery schools which are in short supply and considerably more expensive than pre-schools. As reported in Carta and Rizzica (2018), in Italy, a family composed by two working adults and one child with yearly household income of 44,200 EUR pays on average 311 EUR per month for a full time seat in a *public* nursery (CittadinanzaAttiva, 2015). *Private* nurseries, which in some regions outnumber public ones, cost on average 487 EUR per month (IstitutoDegliInnocenti, 2011). Together, public and private nurseries accommodate only 24% of children from 0 to 2 years old, with public nurseries accounting fro less than half of this share. There is pronounced heterogeneity at the regional level, with some regions able to accommodate less than 10% of children in nursery care.

## 2.2 Conceptual Framework

A parental leave benefit system consists of the following policy parameters: *(i)* the benefit level identified by a replacement rate as a share of pre-birth earnings $b = \alpha w_0$, *(ii)* the duration of benefits, i.e. the number of months cash benefits last $B$, *(iii)* the duration of job protection $P$, i.e. the number of months mothers can return to their pre-birth job at wage $w_0$.

As illustrated in Section 2.1, in the Italian social insurance system, unemployment insurance is effectively a paid parental leave without job protection since it provides cash benefits $b$, for a period of time $B$. This feature allows to consider the unemployment insurance reforms described above as policy changes to one design feature of parental leave policies, keeping constant the other parameters. The replacement rate reform can be parametrized as a change in $b$ ($db$) keeping $B$ and $P$ constant. The duration reform can be parametrized as a change in $B$ ($dB$) keeping $b$ and $P$ constant.

I now consider the expected effects of changes in $db$ and $dB$ on the underlying incentives faced by mothers. I take advantage of the fact that mothers can choose between three different options: unprotected benefits, protected benefits and returning to work.

Consider a setting in which mothers give birth at $t = 0$ and end their compulsory maternity leave at $t = 3$, approximately 3 months after giving birth. At that point, they have different options. They can go back to work at $t = 3$, earn their pre-birth wage $w_0$ and arrange for childcare formally or informally, with a cost $c_t$. They can take up parental leave, which pays a monthly benefit equal to $b_{PL} = \alpha_{PL} w_0$, where $\alpha_{PL}$ indicates the parental leave replacement rate, equal to 30%. Parental leave lasts for a number of period $B_{PL} = 6$. At the end of parental leave, mothers can go back to their pre-birth job. Mothers that are not ready to get back to work at $t = 3$ can also choose to quit their job and take up unemployment insurance instead of parental leave. Unemployment insurance pays a monthly benefit $b_{UI} = \alpha_{UI} w_0$, where $\alpha_{UI} > \alpha_{PL}$ lasts for $B_{UI}$ months but is associated with a cost $e$, which can be interpreted as the search cost to find a new job when UI benefits are exhausted due to the absence of job protection. The last option is to take up parental leave and UI in combination and receive benefits for $B_{PL} + B_{UI}$ months.

Figure 2 describe how the reforms changed the choice set of women after the end of their compulsory maternity leave. To simplify, I assume that mothers who decide to take up UI either do so at $t = 3$ or at $t = 9$, so either completely substitute between UI and PL or complement by exhausting their PL benefits first. This assumption seems reasonable and aligned with the patterns observed empirically (Figure A3).

Both reforms increased the generosity of UI making it more attractive for women to separate from their pre-birth employers either at $t = 3$ or at $t = 9$. We expect an increase in separations after the reform. In a setting with multiple counterfactual treatments (going back to work, taking up PL) understanding the "source" of the increase is important to interpret the effects of the reforms. In particular, it is crucial to define marginal mothers (women who take up UI under the more generous regime, not under the less generous) relative to their own counterfactual choices.

Consider marginal mothers who decide to take up UI at $t = 9$, after they exhaust their parental leave benefits. In this case, there is only one counterfactual outcome: mothers who decide to take up UI at $t = 6$ under the more generous regime would have gone back to work under the less generous regime. We expect that mothers decide to take up UI instead of going back to work if their reservation wage (which is now higher because of the increase in UI generosity) is higher than their pre-birth wage $w_0$.

Now consider marginal mothers who take up UI at $t = 0$. These mothers, in the counterfactual

framework, could have either taken up parental leave or gone back to work. Compliers who switch to unemployment insurance from parental leave are effectively trading off more generous *unprotected* paid leave with less generous *protected* paid leave. This is due to the fact that the duration of the two programs are similar and that the replacement rate of UI is always higher than the replacement rate of parental leave. Given these rules, the parameter capturing the trade-off between parental leave and unemployment insurance is $e$, which can be interpreted as the value of job protection. Marginal mothers could have also gone back to work at $t = 0$ under the less generous regime. We expect that for these mothers, under the more generous regime, the value of taking up UI is higher than the value of returning to work at $t = 0$ and arranging for childcare. The trade-off in this case will be between the cost of childcare and the value of job protection.

# 3 Data and Empirical Strategy

## 3.1 Data

I use novel, confidential administrative data from the Italian Social Security Institute (*INPS*) on the universe of private sector employees. My main source of data is the matched employer-employee records. I use monthly data for the period 2009-2020. For each worker-firm record, the following information is available: beginning and end date of the contract, alongside the underlying motivation for termination (e.g. layoff, resignation); type of contract (permanent vs temporary, full-time vs part-time); broad occupation group (blue-collar, white-collar or manager); earnings, wage and number of days worked, and a unique firm and worker identifier. I link these records to workers' and firms' registers containing baseline information, such as gender and age of employees as well as opening date, sector and location of businesses.

Importantly, these records also contain information on any event that might lead to the entitlement to a benefit for a given worker at the monthly level. These events include, among others, maternity leave, parental leave and sickness leave. I identify maternity and parental leave events supplementing the information on events from the employer-employee records with information from the registers on maternity leave and parental leave applications. These records contain more detailed information about maternity and parental leaves, such as the exact beginning and end date of each leave period, the date of application, the expected birth date and the actual birth date of the child, the type of leave (e.g. standard or anticipated for medical reasons in the case of maternity leave applications), a child identifier and spouse identifier. This level of detail allows me to pinpoint the exact leave periods as well as the exact beginning and end of the protected period.

I link these records to information on unemployment insurance claims from the *Sistema Percettori* database (*SIP*), which collects information on the universe of income support measures administered by INPS as a consequence of job separations. For every claim I observe the scheme type (e.g. *Aspi* vs *Naspi*), its start date, potential duration, actual duration, and total amount paid.

Combining the archives described above, I build up a panel of mothers' working and benefit histories at monthly frequency. The final dataset is a balanced panel containing information on all mothers who gave birth to their *first* child (parity one) between 2012 and 2016. The panel spans from 2 years before the end of their compulsory maternity leave to 5 years after and comprises of approximately 640,000 mothers employed in the private sector before giving birth. I focus on mothers giving birth to their *first* child for a number of reasons. First, the labour market history of first-time mothers before birth is more informative about their skills and earnings capacity than for higher-parity mothers. Second, the decision of whether to take up unemployment insurance or parental leave and in general the return-to-work decision is likely to be influenced by total fertility as there might be selection of higher-parity mothers into participating in the labor market. Lastly, unemployment insurance eligibility is likely to be higher for parity one mothers since they are more likely to have worked continuously prior to giving birth. Parity one mothers are also less likely than higher-parity mothers to have experienced significant periods of interruptions from work before childbirth. My main sample also excludes mothers whose temporary contract expires around the time of the end of their maternity leave. This is because mothers with a temporary contract ending during the protected period are not entitled to job protection or parental leave benefits and therefore face a different set of incentives than other mothers[3].

Table A3 reports the mean and standard deviation of a set of individual characteristics for the main sample. Mothers working in the private sector and giving birth to their first child in the sample period are on average 33 years old and have consistently worked for their pre-birth employer in the two years before giving birth. The vast majority of them are employed with a permanent contract (93%), 65% are employed full-time, 60% of them are employed in white-collar occupations while 30% of them are employed in blue-collar occupations. Their contracted monthly wage is 1,417 EUR and their monthly earnings are slightly higher at 1,521 EUR. In terms of characteristics of firms in which they work, 40% of them are employed in small firms (with less than 15 employees) and 65% of them are employed in "high quality" firms. "High quality" firms are measured by whether the firm is above the median AKM firm fixed effects estimated from AKM two-way fixed effects regressions

[3]Details on the construction of the dataset and on the selection of the sample are reported in Appendix Section B.

(Abowd, Kramarz, and Margolis, 1999)[4].

### 3.2 Empirical Strategy

The main goal of the empirical analysis is to estimate the effects of having access to more generous unemployment insurance subsidies after the end of compulsory maternity leave on different outcomes of interest. I define *treatment* as having the possibility to quit and be eligible for the more generous unemployment insurance regime between the end of their compulsory maternity leave and when the child turns one year old (between $t = 3$ and $t = 12$ in Figure **??**).Using this definition, the reforms naturally define a treatment and a control group as a function of the end of compulsory maternity leave date: mothers who based on their date of maternity leave *had the option* to resign with the more generous unemployment insurance benefits and mothers who based on their end of maternity leave did not.

The possibility of unemployment take-up within a *time window* needs to be taken into account in the estimation of the effects of the reforms. Taking the replacement rate reform as an example, while the reform was effective from January 2013 onwards, women who ended their maternity leave *before* January 2013 were also eligible for the more generous UI benefit for a subset of the time period $t \in [3, 12]$. This is exemplified in Table A1 which shows the eligibility status of mothers for the more generous UI regime by their end of maternity leave date and by the timing of their resignations. The table highlights the fact that women who ended their maternity leave from January 2013 onwards were eligible for the new UI regime regardless of the timing of their resignations. On the other hand, women who ended their maternity in July 2012 were eligible for the old regime if they decided to resign at $t = 3$ but for the new UI regime if they resigned at $t = 9$. Table A2 reports the same information for the duration reform. I refer to the subsample of mothers eligible for the more generous UI regime only for a portion of their protected period as *partially treated* mothers. Figure A4 illustrates the three groups mothers can be divided into based on their end of maternity leave date.

While the reforms would create a natural setting for a regression discontinuity design, the presence of partially treated mothers complicates the use of this empirical strategy. Instead, I will use, as my **main empirical strategy,** a difference-in-differences approach similar to Kleven et al. (2020),

[4]When estimating AKM regressions I restrict the sample to the largest connected set of workers and firms that contains all workers that have ever been employed at one of the firms in the group and all the firms that have ever hired one of the workers in the group. Specifically, I estimate the following regression: $log(w_{it}) = \alpha_i + \psi_{J(i,t)} + \varepsilon_{it}$, where $log(w_{it})$ is the log weekly wage of worker $i$ in year $t$, $\alpha_i$ and $\psi_{J(i,t)}$ are worker and firm fixed effects. Although the analysis focuses on mothers, for the estimation I consider both men and women workers in my sample period.

that compares cohorts of mothers over time. I compare the outcomes of women fully eligible for the new UI regime to women fully ineligible on the basis of their date of end of compulsory maternity leave (Figure A4). I estimate the following equation:

$$Y_{it} = \alpha + \sum_{k=-L}^{R} \delta_k D_{it}^k + \sum_{k=-L}^{R} \beta_k D_{it}^k \cdot T_i + \gamma T_i + \lambda_i^m + \mathbf{X_i'}\eta + \varepsilon_{it} \tag{1}$$

where $t$ denotes event time ($t = 0$ corresponds to the month of end of compulsory maternity leave)[5], $D_{it}^k$ is an event study indicator for each month relative to the month before the end of compulsory maternity leave, $\lambda_i^m$ are month of end of maternity leave fixed effects, to control for seasonality of births and $\mathbf{X_i'}$ contains a set of pre-birth individual-level controls such as age fixed effects, average earnings in the two years before the end of maternity leave and occupation. $T_i$ is an indicator for whether the mother is in the treatment group, namely for whether she has the option to resign with the more generous unemployment benefits. For the replacement rate reform, $T_i = 1$ if a mother ended her compulsory maternity leave between January and May 2013 and $T_i = 0$ if a mother ended her compulsory maternity leave between January and May 2012. For the duration reform, $T_i = 1$ if a mother ended her compulsory maternity leave between May and September 2015 and $T_i = 0$ if a mother ended her compulsory maternity leave between May and September 2014[6]. Standard errors are clustered at the individual level. Depending on the outcome considered, I estimate the specification above on different relative time windows (up to 12, 48 or 60 months from the end of ML). I omit the event time indicator at $t = -1$, implying that the coefficients $\beta_k$ measure the differential impact of the reforms in the treatment group relative to the control group with respect to the month before the end of compulsory maternity leave.

The causal interpretation of the results relies on the assumption that there is no confounding trend in outcomes by birth cohort. To validate this assumption, I consider a number of identification checks. First, I show that the treatment and control groups for both reforms are very similar in terms of pre-birth characteristics and pre-birth labor market outcomes. Table 1 shows that the treatment and control group samples defined by the replacement rate reform are balanced across a variety of characteristics, including pre-birth age, type of contract (permanent vs temporary, part-time vs full-time), type of occupation, gross monthly earnings, tenure in the last two years and days worked. Table 2 reports the same balance table for the treatment and control group samples defined by the

[5]Figure 1 and 2 defined $t = 0$ as the month of birth of the child. Since I am interested in estimating the effects of the unemployment insurance reforms on women's choices and since the choice period for mothers starts from the end of maternity leave, from now onwards I will define $t = 0$ as the month of end of maternity leave.

[6]All results are robust to both narrower and broader definitions of the treatment and control groups for both reforms.

duration reform. While the characteristics are in general balanced, there are two instances in which the treatment and control group have slightly significantly different means. Control group mothers are somewhat more likely to be full-time workers and slightly more likely to have a permanent contract. As a robustness check, I estimate specification 1 using as dependent variable the predicted values of my outcomes of interest calculated from a regression on observable characteristics.

Second, I show placebo results from specification 1 using sample of mothers who gave birth in 2009 vs 2010, 2010 vs 2011, 2011 vs 2012. The placebo results, shown below in more detail, support the identifying assumption by showing that there are no significant differences in take-up of unemployment insurance benefitsacross birth cohorts.

Note that the use of the preceding year to a reform as the control group is common in the literature (Schönberg and Ludsteck 2014; Kleven et al. 2020). However, it is important to recognize that the identified causal effect is the effect of having been potentially exposed to the more generous UI system. For all outcomes measured at 12 months or more after birth, the control group could also become eligible for the more generous UI regime if they have another child. As a robustness check, I investigate the role of subsequent fertility by estimating the dynamic effects of the UI reforms on the restricted sample of mothers with only one child (with a completed fertility of one). I also consider the effects of the reform on average completed fertility. As an additional robustness check, I also use the regression discontinuity design described in Appendix Section C as alternative empirical strategy with the main goal of checking the robustness of the results to different specifications and to the inclusion of partially treated mothers.

Recent econometric literature has raised concerns about the validity of difference-in-differences designs that use variation in treatment timing (De Chaisemartin and d'Haultfoeuille, 2020; Sun and Abraham, 2020; Callaway and Sant?Anna, 2020; Goodman-Bacon, 2021). My empirical strategy is not likely to be subject to these concerns for different reasons. First of all, my design is not staggered in calendar time, which implies I do not use already-treated units as controls. Second, my design relies on a balanced panel in relative event time, where the treatment is centered at the same "relative treatment date" and this allows me to estimate a conventional TWFE model controlling for group and event time fixed effects.

## 4 Behavioral Responses to Unprotected Benefits

This section analyzes mothers' behavioral responses to changes in the generosity of unprotected benefits. I document how the take-up of unemployment insurance changes when the level and

duration of benefits change. I take advantage of the fact that I observe how women's choices between different alternatives change to relate the estimated behavioral responses to underlying changes in incentives and to investigate the insurance value of unprotected benefits for women after childbirth.

I start the analysis by plotting the share of women taking up unemployment insurance during their protected period (between $t = 0$ and $t = 9$) by month-of-end-of-maternity-leave bin. Figure A5, Panel A reports the results for the replacement rate reform while Panel B reports the results for the duration reform. The red vertical lines indicate the month of end of maternity leave from which women become to be partially exposed to the more generous unemployment insurance regime (Table A1), while grey points represent partially treated mothers. After both reforms, there is a clear increase in take-up of unemployment insurance, which corresponds to almost 20% of the baseline mean for the replacement rate reform and to a 10% increase for the duration reform.

I complement the graphical evidence above with the estimation of specification 1 using as dependent variable the probability that a mother separates from her pre-birth employer through resignation or contract termination at relative time $t$[7]. This is important to understand how much of the increase in UI take-up is actually driven by active *choices* of mothers to separate from their pre-birth employer. A potential concern is that separations recorded as voluntary might reflect pressure from employers to resign rather than real choices. I believe this is unlikely for two reasons. First, women who decide to resign around the time of childbirth have to follow a specific process that involves an interview with the governmental office of labor where they have to declare that they are voluntarily quitting their job. Second, survey evidence suggests that the vast majority of mothers who resigned between 2010 and 2016 decided to do so voluntarily.

Figure 4 Panel A shows the dynamics of separations in the treatment group relative to the control group after the replacement rate reform. There is a significant increase in separations at $t = 0$ of around 0.25 percentage points and an additional increase of 0.18 percentage points at $t = 9$. Figure 4 Panel B reports the results for the duration reform. In this case, there is an even sharper increase in $t = 0$ of around 1 percentage point followed by an additional increase in separations between $t = 5$ and $t = 7$ of around 0.6 percentage points.

To better interpret the magnitude of these effects, Table 3 reports the coefficients $\beta_k$ (for $k = 0$, $k = 6$, and $k = 12$) estimated from equation 1 using as dependent variable the probability of taking up UI at time $k$ and the probability of separations at time $k$, while Table 4 reports the reduced-form estimates (over the period $t \in [0, 12]$) scaled by the amount by which the generosity of unprotected

[7] I expect these two types of separations to reflect active choices of mothers to leave their pre-birth employer, unlike for example separations due to firm closures or mass layoffs.

benefits increases due to the reforms, in terms of replacement rate and duration respectively. A one percentage point increase in the replacement rate of unprotected benefits increases separations by 0.03 percentage points. On the other hand, a one month increase in benefit duration increases separations by 0.2 percentage points. In order to be able to compare the effects of the two reforms, I also report the elasticity of separations with respect to benefit level $\varepsilon_b = \frac{\delta y}{\delta b}\frac{b_0}{\bar{y_0}}$ and duration $\varepsilon_B = \frac{\delta y}{\delta B}\frac{B_0}{\bar{y_0}}$, where $y$ refers to the share of separations, $b_0$ refers to the pre-reform UI benefits, $B_0$ refers to the pre-reform UI duration and $\bar{y_0}$ indicates the baseline level of separations before the reforms. According to the evidence, a 1% increase in the level of unprotected benefits increases separations by 0.4% while a 1% increase in the duration of unprotected benefits increases separations by 0.16%.

Taken together, these findings indicate that women are willing to give up the certainty of returning to their pre-birth employer for more generous benefits. Both the level and the duration of benefits play an important role in the trade-off between insurance and labor force attachment. The comparison between $\varepsilon_b$ and $\varepsilon_B$ suggests that increasing the generosity of benefits by increasing the duration of benefits has a smaller effect on separations than increasing the level of benefits.

The increase in take-up of unemployment insurance after the end of compulsory maternity leave must correspond to a decrease in one of two margins: the probability of returning to work or the probability of taking up standard parental leave. To investigate the dynamics behind the behavioral responses, I estimate specification 1 on three different dependent variables: an indicator equal to 1 if a mother is taking up unemployment insurance in relative month $t$ ($UI$), an indicator equal to 1 if a mother is on parental leave ($PL$) in relative month $t$ and an indicator equal to 1 is working in month $t$ ($Work$). I define a mother to be working in month $t$ if she has positive earnings and is not on leave nor unemployed.

Figure 5 shows the dynamic evolution of these three outcomes. Panel A shows the results for the replacement rate reform. The figure shows a very clear pattern: in the first 6 months after the end of compulsory maternity leave, the increase in UI take-up induced by the reform is compensated by a decrease in take-up of standard parental leave of similar magnitude. This evidence is suggestive that women that take up unemployment insurance after the reform would have taken up parental leave in the absence of the reform. This implies that the increase in generosity of unemployment insurance induces a significant share of women to choose unprotected benefits instead of protected benefits of similar duration. A consequence of the switch from protected benefits to unprotected benefits is that from $t = 6$ onwards, while the difference in the probability of being on parental leave between the treatment and control group disappears (since $t = 6$ corresponds to the time

of PL benefit exhaustion), women in the treatment group are less likely to return to work. As expected, the decrease in the share of women returning to work is of the same magnitude of the decrease in take-up of PL benefits between $t \in [0, 6]$. Note that the decrease in the share of mothers returning to work is partially mechanical: UI benefits have a duration of 8 months while PL benefits have a duration of 6 months. However, even after the exhaustion of UI benefits (at $t = 9$), while some women return to work, the share of women returning to work is still significantly lower in the treatment group relative to the control group. This result highlights the importance of job protection in incentivizing women to go back to work earlier.

Figure 5 Panel B shows the same results for the duration reform. When the duration of unprotected benefits increases, the increase in take-up UI is partially compensated by a decrease in take-up of standard parental leave in $t \in [0, 6]$, suggesting that the increase in duration of unprotected benefits leads to some crowding out of standard parental leave benefits. Most of the behavioral responses to the increase in unprotected benefits duration are, however, concentrated around $t = 6$. The figure shows that the increase in duration induces a significant share of mothers in the treatment group to not return to work at $t = 6$ but to take-up unemployment insurance instead. This is consistent with the evidence on separations shown in Section 4 and suggests that mothers respond to the increase in UI duration by taking up parental leave benefits and UI benefits in combination in order to maximize the total subsidized time women can spend out of the labor force. To better understand the magnitude of the effects, Table 5 reports the coefficients $\beta_k$ from model 1 for $k = 0$, $k = 6$ and $k = 12$ on the share of women taking up UI, the share of women taking up PL and the share of women working.

It is useful to look at the timing and dynamics of the estimates in Figure 4 and Figure 5 and compare them across reforms. The increase in replacement rate induces women to separate from their pre-birth employers right after the end of compulsory maternity leave. On the other hand, mothers respond to the increase in duration by separating both at $t = 0$ but also at $t = 5, 6, 7$ when parental leave benefits are exhausted.

This suggests that increasing the *level* of benefits without offering job protection is more valuable right after the end of compulsory maternity leave. If choices of mothers reflect actual preferences, this would imply that the insurance value of transfers is higher at $t = 0$. At $t = 6$ increasing the *level* of benefits without offering job protection does not have any impact on separation rates. Increasing the *duration* of unprotected benefits is particularly valuable at the time of exhaustion of parental leave. This suggests that the increase in duration of unemployment insurance allows marginal mothers to move closer to their optimal choice of paid leave and extend the subsidized

time they spend not working.

Finally, Figure 6 illustrates how the interactions between social programs affect the total subsidized time women spend not working. This is an important part of the insurance-incentive trade-off and translates into fiscal externalities for the government. Panel A and B show that the replacement rate reform does not have a significant effect on the total subsidized time mothers spent out of work but only on the type of leave taken up by mothers. On the other hand, the duration reform effectively results in an increase in the total subsidized non-work time, as shown in Figure 6 Panel C and D. Despite these differences, Appendix Figure A10 show that both reforms have a positive and significant effect on the total non-participation time after childbirth[8]. I investigate this more in detail in Section 5.

**Robustness** As mentioned in Section 3.2, the key identification assumption for the difference-in-differences model in 1 is that there are no confounding trends in outcomes by birth cohort. In a standard difference-in-differences model, this assumption could usually be validated by looking at the evolution of pre-trends. In my specific case, it is not possible to look at pre-trends when considering UI take-up as an outcome, since mothers are, by construction, employed before birth. I therefore take advantage of a different set of overidentifying restrictions and perform different placebo tests estimating equation 1 comparing mothers who ended their maternity leave in 2010 ($T_i = 1$) to mothers who ended their maternity leave in 2009 ($T_i = 0$), mothers who ended their maternity leave in 2011 ($T_i = 1$) to mothers who ended their maternity leave in 2010 ($T_i = 0$) and mothers who ended their maternity leave in 2012 ($T_i = 1$) to mothers who ended their maternity leave in 2011 ($T_i = 0$). Results are reported in Figure A7 and support the identifying assumption by showing that there is no significant trend in UI take-up across birth cohorts.

Another potential concern is that the increase in resignations and separations is driven by factors other than the increase in generosity of unemployment insurance (differences in macroeconomic conditions, differences in unemployment rates, or differences in firms' behaviors). If this is the case, we would expect to see differences in separations that are not impacted by workers' decisions (layoffs, firm closures, separations for just cause[9]). Figure A8 shows that this is not the case and provides suggestive evidence that the increase in UI take up is driven by women's choices.

One important thing to notice is that the magnitude of the effect of the replacement rate reform

[8]This is defined as the total time spent not working and not on parental leave. Using as alternative measure, the total time spent not working (including months spent in parental leave) leads to similar qualitative results.

[9]Note that these types of separations are exempt from the job protection rule: mothers can be fired even during the protected period for one of these reasons.

on separations is significantly smaller than the magnitude of the effect on UI take-up, particularly around $t = 6$. Table 3, which reports the coefficients $\beta_k$ (for $k = 0$, $k = 6$, and $k = 12$) estimated from equation 1 using as dependent variable the probability of taking up UI at time $k$ and the probability of separations at time $k$, confirms this finding. This pattern is driven by the fact that the replacement rate reform also expanded the pool of eligible mothers, as shown in Figure A9, which decomposes the effect of the reform on UI take-up into the effect driven by the increase in replacement rate and the effect driven by the expansion in eligibility. At least a portion of newly eligible mothers are inframarginal: they would have exited the labor force even in the absence of the reform but are now eligible to take up UI.

# 5 The Labor Market Costs of Increasing Unprotected Benefits

Section 4 provides compelling evidence that when the generosity of unprotected benefits increases, women are more likely to separate from their pre-birth employer. The findings indicate that women are willing to give up the certainty of returning to their pre-birth employer for more generous benefits, both in terms of *level* and in terms of *duration*. In this section, I investigate the long-term effects of this change in choices on women's labor market outcomes.

I start the analysis by estimating the effects of the reform on long-term labor force participation patterns. I estimate specification 1 using as dependent variable the probability that a mother is working at relative time $t$. I consider a woman working at a given point in time if: *(i)* I observe her matched with an employer in the data at time $t$, *(ii)* she has positive earnings at time $t$, *(iii)* she is not on leave at time $t$. Figure 7 shows the evolution of the share of mothers working in the treatment group relative to the control group up to 48 months after the end of compulsory maternity leave. The solid red line represents the time of exhaustion of parental leave benefits, while "End of UI" indicates the time window of exhaustion of UI benefits if women resign in $t \in [0, 6]$[10]. Panel A shows the results for the replacement rate reform. There are no differences in participation between the treatment and control group in the first 6 months after the end of compulsory maternity leave. This is consistent with the idea that women in the treatment group who take up unemployment insurance would have used parental leave in the absence of the reform (Figure 5). The share of working women significantly decreases from $t = 6$ onwards, consistent with the higher share of

[10]While the replacement rate reform did not affect the UI duration, which was constant at 8 months, after the duration reform the potential benefit duration of unemployment benefits for each mother is equal to half of the weeks of contribution in the 4 years before the start of the UI spell, with a maximum of 24 months. The time window reported in the figure assumes a potential benefit duration of 24 months. Appendix Figure A11 shows the distribution of potential benefit duration for mothers who take up UI after the duration reform.

people taking up unemployment insurance in the treatment group and with the relatively longer duration of unemployment insurance than standard parental leave. While the gap in participation temporarily narrows around the exhaustion of UI benefits, the difference is overall negative and persistent: four years after the end of compulsory maternity leave, the share of mothers working in the treatment group is still 1% lower than in the control group. This suggests that giving up job protection has persistent negative effects on labor force participation.

Figure 7 Panel B shows the dynamic of participation for the duration reform. There are no significant differences in the share of mothers working between $t = 0$ and $t = 6$. From $t = 6$ onwards the coefficients $\beta_k$ from specification 1 become negative and significant, with the gap between the treatment and control group reaching almost 2% in $t = 8$. The gap in participation clearly starts to narrow around the time of UI benefits exhaustion, suggesting that some women are able to go back to work when benefits ends. While also in this case the negative effect of the reform is relatively persistent, the gap between the treatment and control group almost completely closes by $t = 48$. It is worth noticing that although both reforms increased the share of people giving up job protection, increasing benefit generosity has worse long-term effects in terms of participation than increasing the duration of benefits. One potential explanation for this result is that longer unemployment benefits allow mothers to search for better jobs while at the same time keeping some attachment to the labor force.

How do these patterns translate into earnings losses? I estimate specification 1 using as dependent variable monthly gross labor earnings, specified in levels in order to keep the zeros from non-participation. Figure 7 Panel C and D report the evolution of the $\beta_k$ coefficients normalized by the predicted earnings in the treatment group in the absence of children: $\frac{\hat{\beta}_k}{E[\tilde{Y_{ik}}|k,T=1]}$, where $\tilde{Y_{ik}}$ is the predicted outcome when omitting the contribution of the event time dummies (Kleven, Landais, and Søgaard 2019, Kleven et al. 2020). This normalization allows to interpret the earnings results in terms of impact on child penalties for women eligible to more generous unprotected benefits[11]. Panel C reports the results for the replacement rate reform, while Panel D reports the results for the duration reform. The patterns are roughly similar to those in participation. The replacement rate reform increased child penalties by almost 4% in $t = 9$. The gap between the treatment and control group subsequently narrows but remains stable at around 2% even four years after the end of compulsory maternity leave. The duration reform had an even larger impact on child penalties in the short-run, with the gap between the two groups peaking around $t = 24$ reaching 4%, then progressively closing as UI benefits start to expire. Table 6 summarizes the results on labor market

[11] Figure A13 reports the $\beta_k$ from Figure 7 without the normalization.

outcomes at $t = 12$, $t = 24$ and $t = 48$ as well as the average effect between during the sample period.

The results presented so far clearly show that taking up unprotected benefits has large negative effects on mothers' future earnings. To get a better sense of the magnitude, Table 7 reports the difference-in-difference estimates for the effect of the expansions in unemployment insurance on mothers' cumulative earnings through month 48 after the end of maternity leave. Mothers exposed to higher *levels* of unprotected benefits lose, on average, 493EUR in cumulative earnings over the four years after the end of maternity leave. Mothers exposed to *longer* unprotected benefits lose, on average, 662 EUR in cumulative earnings.

**The Value of Job Protection** Understanding the effects of these reforms on labor market outcomes is crucial to understand the welfare implications of changing the generosity of unprotected benefits. While it is the first step to understand the implications of the reforms on government revenue, which is a key part of welfare analysis, it is also informative of the private trade-off that mothers face when making these choices. If we assume that mothers are forward looking and have rational expectations, the effects of the reforms on labor market outcomes are informative of how much women are willing to give up in terms of future earnings for a short-term increase in the level or duration of unprotected benefits.

Results in Table 7 show that the effects of increasing the generosity of unprotected benefits on losses in terms of future earnings are large and significant. This implies that taking up unprotected benefits, and therefore giving up *job protection*, has a large cost in terms of future income for mothers. To better interpret the magnitude of these effects, I scale the coefficients by the amount by which the generosity of unprotected benefits increases due to the reforms, in terms of replacement rate and duration, respectively. I find that one percentage point increase in replacement rate of unprotected benefits decreases cumulative earnings by 33 EUR. One month increase in duration decreases cumulative earnings by 82.75 EUR. Overall, mothers seems to assign a high value to short-term benefits. To be able to compare the effects of the reforms on cumulative earnings, Table 7 also reports the elasticity of earnings with respect to benefit levels $\varepsilon_b$ and with respect to duration $\varepsilon_B$. A 10% increase in benefit level decreases cumulative earnings by 0.3% while a 10% increase in duration decreases earnings by 0.1%.

**Other Outcomes and Robustness** The effect on gross labor earnings can be decomposed along three margins: the participation margin, the intensive margin, and the wage rate. After having

examined the effect on the participation margin, I check whether the reforms had an impact on the intensive margin of labor supply and on the wage rate. Since the administrative data do not provide information on hours worked, I use days worked conditional on employment as a measure of the intensive margin of employment. The wage rate is defined as earnings per day worked conditional on employment. The results are reported in Table 6 which reports the $\beta_k$ coefficients from equation 1 at $k = 12$, $k = 24$, and $k = 48$ for different outcomes. Panel A reports the results for the replacement rate reform. The effects on days worked, albeit small, are positive and significant at $t = 12$ and $t = 24$. This is likely to be explained by selection into working since, in the short-run, working mothers in the treatment group are likely to be positively selected. There are no significant differences in days worked four years after the end of compulsory maternity leave. The table also reports the effects on the daily wage rate. While there is a small negative effect at $t = 12$, there is no indication of significant differences at $t = 24$ and $t = 48$. Panel B of Table 6 reports the results for the duration reform. Again, we observe a positive and significant effect on days worked at $t = 12$ but zero effects at $t = 24$ and $t = 48$. There are no significant differences in wage rate 4 years after the end of compulsory maternity leave.

As mentioned in Section 3.2, subsequent fertility might have an impact on the evolution of child penalties, particularly in the long-run. Appendix Figure A14 reports the dynamic effects of the UI reforms on child penalties, restricting the sample to mothers with only one child (with a completed fertility of one). It is worth noticing that the results for the replacement rate reform remain almost unchanged. On the other hand, the results for the duration reform show that the gap in child penalties between the treatment and the control group closes earlier in the sample of mothers with only one child. This suggests that the duration reform, by increasing the subsidized time mothers can spend without working, might have a positive impact on fertility. Moreover, it confirms that, at least for this subsample, the duration reform has almost no effects on women's long-run outcomes, while the replacement rate reform has a persistent negative effects on child penalties even four years after the end of compulsory maternity leave.

## 6 Heterogeneity and Mechanisms

The assumption that women are able to perfectly predict the effects of their leave choices on labor market outcomes is a strong one. For example Kuziemko et al. (2018) show that women significantly underestimate the employment costs of motherhood and are not able to correctly predict the effects of childbirth on labor force participation. In this section, I perform an heterogeneity analysis to shed

light on the drivers of behavioral responses and to investigate the potential mechanisms behind the large effects of unprotected benefits take-up on labor market outcomes.

### 6.1 Heterogeneity in Behavioral Responses

The results in Section 5 suggest the insurance value of short-term benefits is much higher for women than the value of job protection. As a first step to shed light on the drivers behind the differential behavioral responses after the two reforms, I conduct a simple complier analysis. The goal is to trace out some persistent observable attributes that characterize mothers who respond to the two reforms and distinguish them from mothers who do not. In generalizing the findings, it is useful to describe the demographic and labor-market characteristics of marginal women. Finally, investigating the characteristics of compliers, always-takers (women who would have taken up unemployment insurance in the protected period both under the less generous and more generous UI system) and never-takers (women who would not take up unemployment insurance under either the more generous or the less generous system) for the different reforms can provide policy-relevant insights on who responds to different changes in incentives.

Because compliers are defined based on a counterfactual (I never simultaneously observe the outcome for any given mother under both the more generous and the less generous UI system), I infer their characteristics of compliers by comparing the demographic characteristics of the cohort of mothers ineligible for the more generous UI regime (control group, to the left of the cutoff in Figure A5) to the characteristics of the cohort of mothers eligible for the more generous UI regime (treatment group). The comparison is based on a simple intuition: ineligible mothers who take up UI are, by definition, always-takers. Eligible mothers who take up UI are a mix of always-takers and compliers. Assuming monotonicity – i.e. mothers who would take up UI under the less generous system would certainly do so under the more generous system - we expect the demographic characteristics of always-takers to be the same in expectation before and after the policy change. This fact allows us to back out the demographic characteristics of compliers, as described in detail in Appendix Section D.

Results of the complier analysis are reported in Table 8, which provides an overview of the pre-birth characteristics of the three groups for the replacement rate reform. A clear pattern emerges: women that are induced to take up UI in response to an increase in replacement rate are on average younger, less likely to be working full-time, more likely to work in "low-quality" establishments (measured by whether the firm is below or above the median AKM firm effect, low- and high-wage firms, respectively) and earn less than both always-takers and never-takers. Compliers are also

less likely to hold permanent jobs and to live in regions with significantly less childcare availability than never-takers. Finally, compliers are significantly less likely to work in regions with a high unemployment rate than always-takers. Job protection is valuable only in a labor market with search frictions therefore is likely to be more valuable when the unemployment rate is higher. These findings are overall in line with the idea that individuals induced to take up UI by the replacement rate reform are less likely to value job protection and more likely to associate high insurance value with short-term benefits.

Table 9 reports the results for the duration reform. Women that are induced to take up UI after an increase in UI duration are less likely to be identified off their pre-birth characteristics in a clear-cut way. Compliers are more likely to have permanent jobs, work in blue-collar occupations, and work part-time than both always- and never-takers. On the other hand, compliers earn significantly more than always-takers but still less than never-takers. Overall, this suggests that the duration reform affected a wider population of mothers. Interestingly, compliers are significantly less likely to live in regions with high childcare availability. This suggests that increases in UI duration are particularly appealing to mothers who do not have access to formal childcare options. The high cost of childcare is a plausible potential explanation for why women are willing to give up future earnings for longer benefit duration. I complement the analysis by presenting estimates of treatment effect heterogeneity of the UI reforms on UI take-up. For each covariate, I separately estimate equation 1 splitting the sample according to the pre-birth value of the characteristic. Results are reported in Figure 8. Panel A reports the results for the replacement rate reform while Panel B reports the results for the duration reform. Overall, the results largely reflect the conclusions of the complier analysis. Dynamic results of UI take-up by characteristics are reported in the Appendix.

### 6.2 Heterogeneity in Labor Market Costs of Increasing Unprotected Benefits

Mean effects on labor market outcomes mask substantial heterogeneity across subgroups. In this section, I conduct an heterogeneity analysis to understand the possible mechanisms behind the effects of the reforms on labor market outcomes. I focus on three main dimensions of heterogeneity: occupation, regional unemployment rate, and childcare availability.

I start by investigating whether the effects of the reforms are different for blue-collar workers and white-collar workers. This distinction can be informative on the role of *human capital depreciation*, as experience effects have been estimated to be smaller for blue-collar occupation than for white-collar ones. Figure 9 Panel A and B reports the results of the estimation of specification 1, splitting the sample by occupation, on the probability of working at time $t$. There does not seem to be

significant differences in the evolution of participation after the reforms by occupation category. The results look very similar when we focus on earnings instead of participation (Appendix Figure A15). This seems to suggest that human capital depreciation does not play a significant role in explaining the long-term effects of increasing UI generosity on labor market outcomes. However, there is one important caveat to this analysis: the occupation categories reported in the data are very broad and do not provide much details on the type of occupations other than the distinction between blue and white collar. Experience effects are likely to be small also in many white-collar occupations and this might explain the lack of significant differences in labor market outcomes by occupation.

Another interesting dimension of heterogeneity is the unemployment rate in the region of residence. I test whether the effects on participation are significantly different by different levels of the regional unemployment rate (above the median or below the median). This distinction can be informative on the importance of search frictions on the role of job protection in influencing labor market outcomes. Results are reported in Figure 9 Panel C and D. As expected, the long-term effects of the reforms on participation are significantly smaller in regions with lower unemployment rates. After the duration reforms, women in low unemployment regions are able to return to work as soon as they exhaust their unemployment benefits (around $t = 24$). This is not the case for women in high unemployment regions. Looking at the results for the replacement rate reform, we see that in regions with low unemployment rates we observe no significant effects in the long-run. This suggests that job protection is especially important in the presence of search frictions.

Finally, I test whether the effects on labor market outcomes are different by childcare availability. The results confirm that the lack of formal childcare is one of the main drivers of the take-up of unemployment insurance. Moreover note that, after the duration reform, the gap in participation between the treatment and control group starts to close at around $t = 30$, which roughly corresponds to the age at which the child can start pre-school.

# 7 Welfare Effects and Policy Implications

## 7.1 Welfare

In this section, I take advantage of the empirical results described above to derive normative implications on how to optimally design parental leave policies. While estimating the welfare effects of these specific unemployment insurance reforms might have low external validity, it can be helpful to estimate the welfare effects of directional changes to different policy parameters while keeping the

others relevant parameters fixed.

I start by adapting the standard Baily-Chetty formula to the parental leave context. I present a very simplified version that allows to think about the different role of benefit level and benefit duration without offering job protection.

**Setup** The model centers on a worker who has a child at time $t = 0$. Following Schmieder and Von Wachter (2016), the model is set in continuous time and the horizon is assumed to last until time $T$. Each mother chooses how much time to spend on leave. While on leave she has a probability to returning to work of $s_t$ at each point in time. The survival probability of remaining on leave at time $t$ is given by $S_t = exp\left(-\int_0^t s_t dt\right)$. Search effort $s_t$ results in a search cost $\psi_t(s_t)$. This cost can be interpreted in the standard way if we assume no job protection but also more broadly to include the cost of childcare, the value of home production or human capital depreciation.

While on leave, the worker receives benefits $b_t$ and consumes $c_{l,t} = b_t + y_l$ where $y_l$ may be income from other sources such as home production. The corresponding flow utility is given by $u(c_{l,t})$. If she returns to work, the worker receives a fixed wage $w$ and pays taxes $\tau$, resulting in consumption $c_e = w - t$ and utility $v(c_e)$. Different utility functions when employed and when on leave capture the possible effort cost of working or the valuation of staying at home with the child.

The lifetime expected utility of a mother is given by:

$$W = \int_0^T \left\{S_t u(c_{l,t}) + \left[1 - S_t\right] v(c_e) - S_t \psi_t(s_t)\right\} dt \tag{2}$$

Note that this equation captures the basic trade-off in the mother's decision problem. Higher search effort results in faster exit rate from leave and higher utility, but it comes at a cost.

**Government Problem** The government sets the parental leave benefit path to maximize social welfare while taking into account that the mother will adjust her decisions in response to the path of parental leave benefits (by returning to work later,...). The government has to set the tax level $\tau$ to finance PL benefits. I restrict the government choice set to benefit paths with constant benefit levels up to a finite horizon $B$ so that $b_t = b$ for $t \leq B$ and $b_t = 0$ for $t > B$. Consumption during parental leave is then $c_{l,t} = b + y_l$ for $t \leq B$ and $c_{l,t} = y_l$ for $t > B$. In this case, equation 2 becomes:

$$W = \int_0^B S_t u(c_{l,t \leq B}) dt + \int_B^T S_t u(c_{l,t>B}) dt + \int_0^T \left[1 - S_t\right] v(c_e) dt - \int_0^T S_t \psi_t(s_t) dt \tag{3}$$

The government has the following budget constraint:

$$(T - D)\tau = Bb + E \tag{4}$$

where $E$ is some level of exogenous per capita spending, $L = \int_0^B S_t dt$ is the expected duration of receiving parental leave benefits and $D = \int_0^T S_t dt$ is the expected duration of non-participation.

It is shown in Appendix E that the optimal level of parental leave benefits are determined by the following trade-off

$$\frac{dW}{db}\frac{1}{Lv'(c_e)} = \frac{u'(c_{l,t\leq B}) - v'(c_e)}{v'(c_e)} - \left(\eta_{L,b} + \eta_{D,b}\frac{D}{L}\frac{\tau}{b}\right) \tag{5}$$

where $\eta_{L,b} = \frac{dL}{db}\frac{b}{L}$ is the elasticity of the duration of receiving PL benefits with respect to the monthly benefit level and $\eta_{D,b} = \frac{dD}{db}\frac{b}{L}$ is the elasticity of non-participation with respect to the monthly benefit level. The first term on the right hand side represents the value of increasing the transfer by 1 EUR which depends on the gap between the marginal utility of leave recipients relative to the marginal utility of the employed. The second term represents the behavioral cost of increasing the transfer by 1 EUR to the government budget.

The marginal effect of increasing transfers by 1EUR through a duration extension on welfare can be written as:

$$\frac{dW}{dB}\frac{1}{S_B v'(c_e)} = \frac{\tilde{u}'(c_{l,t\leq B}) - v'(c_e)}{v'(c_e)} - \frac{1}{S_B}\left(\int_0^B \frac{dS_t}{dB}dt + \frac{dD}{dP}\frac{\tau}{b}\right) \tag{6}$$

where $\tilde{u}'(c_{l,t\leq B}) = \frac{1}{b}\int_{y_l}^{y_l+b} u'(c)dc$ is the average marginal utility for an individual with consumption between $y_l$ and $y_l + b$. Again, the first term on the right hand side represents the value of increasing the transfer by 1 EUR, while the second term represents the behavioral cost of increasing benefit duration to the government.

Both formulas show that the welfare trade-off for parental leave policies is conceptually the same as unemployment insurance: it compares individuals' willingness to pay for the policy change to the net cost of additional benefits, inclusive of the fiscal externalities on government revenue generated by behavioral responses to the policy change.

### 7.2 The Welfare Effects of Increasing Unprotected Benefits

Using the framework derived above, I now follow Hendren and Sprung-Keyser (2020) and analyze the welfare effects of the two policy changes by estimating the Marginal Value of Public Funds (MVPF). The MVPF is defined as:

$$MVPF = \frac{WTP}{Net\,Costs}$$

The denominator of the MVPF is relatively straightforward to calculate as I can directly estimate the reduced-form estimates of the costs of increasing unprotected benefits presented. Estimating the WTP of mothers for different policy changes is more complicated and entails estimating the first term on the right hand side of equations 5 and 6. Note that the calculation of the WTP in the MVPF (as the derivation of equations 5 and 6) relies heavily on the envelope theorem, which implies that individuals who change their behavior in response to the policy change are making privately optimal decisions and are therefore indifferent to changing their behavior. Because of the envelope theorem, behavioral responses to policies have first-order effects on policy costs, because of fiscal externalities, but only second-order effects on welfare. The two key assumptions for the envelope theorem to hold is that the policy change is small and that individuals are making privately optimal decisions. I first calculate the MVPF assuming that mothers are forward looking and have rational expectations. I then consider the case in which women do not optimize.

**Costs** I start by assessing the effects of the reforms on the net costs for the government. I estimate the effects of the reforms on three components of government costs. The first component of the costs is the increase in unemployment insurance spending, which is partially mechanical (driven by the increased generosity of benefits for mothers who do not change behavior in response to the policy change) and partially behavioral (driven by the fiscal externalities on government revenue of behavioral responses to the policy change). The second component of the costs is parental leave benefits. In Section 4, I document significant program interactions between parental leave and unemployment insurance that need to be taken into account when calculating the net costs of the policy change. For example, the fact that more generous unprotected benefits lead to crowding out of parental leave benefits is a saving for the government that needs to be taken into account. The last component of the costs is the effect of the policy changes on labor force participation and earnings and therefore on tax revenues. Evidence from Section 5 shows that the behavioral responses to the increased generosity of unprotected benefits have negative and persistent income on labor force participation and earnings that need to be taken into account in the calculation of the net costs. Figure 10 shows the results of the estimation of equation 1 on individual-level monthly unemployment insurance benefits, individual-level monthly parental leave benefits and monthly gross

earnings.

Table 10 reports the net cost for the government of the reforms up to 48 months from the end of compulsory maternity leave. For the replacement rate reform, the net cost for the government of increasing the level of benefits on UI benefits corresponds is 228 EUR, which is the cumulative increase in monthly UI spending between $t = 0$ and $t = 48$. This cost is comprehensive of the mechanical cost of the policy change and the behavioral cost of the policy change. Because of program substitution, increasing unprotected benefits generate savings for the government in the form of lower parental leave spending, which is equal to 67 EUR. The reform generates long-term losses in earnings of 497 EUR, assuming a tax rate of 27%, this translates in a loss in tax revenue of 134 EUR. Taken together, the total net costs of changing the level of benefits is equal to 295 EUR.

I estimate the costs of the duration reform in a similar way. The increase in UI spending driven by the increase in benefit duration is equal to 898 EUR, a much higher effect than the replacement rate reform given the higher generosity of the duration reform. Increasing the duration of benefits generates parental leave savings of 25 EUR. Finally, the reform generates long-term losses in earnings of 647 EUR, which, assuming a tax rate of 27%, translate into a loss in tax revenue of 175 EUR. Taken together, the total net costs of changing the duration of benefits is equal to 1048 EUR.

**WTP** The first term on the right hand side of equation 2 and 3 shows individuals' willingness to pay for parental leave benefits. I follow the optimal unemployment insurance literature and approximate individuals' WTP for 1 EUR of additional unemployment insurance by $1+\gamma\frac{\Delta c}{c}$ where $\gamma$ is a coefficient of risk aversion and $\Delta c$ is the impact of unemployment on consumption. As I do not observe the impact of parental leave benefits on consumption, I use estimates of $\gamma\frac{\Delta c}{c}$ reported in Schmieder and Von Wachter (2016). Conveniently Schmieder and Von Wachter (2016) and Hendren and Sprung-Keyser (2020) provide estimates of $\gamma\frac{\Delta c}{c}$ for both changes in benefit levels and changes in benefit duration. Assuming $\gamma = 2$, the estimates for $1+\gamma\frac{\Delta c}{c}$ are equal to 1.17 for benefit increases and to 1.30 for duration increases. I construct the WTP as the mechanical increase in benefits for inframarginal mothers times $1+\gamma\frac{\Delta c}{c}$. For an increase in replacement rate of 15 percentage point, considering that the average monthly wage for inframarginal mothers is equal to 1227 EUR, we have that: $WTP = \pi^{AT}\left[(1227 * 0.15) * 8 * 1.17\right] = 155\, EUR$.

Following the same reasoning, the WTP for the duration reform is equal to the increase in benefits due to the change in duration for always-takers times $1+\gamma\frac{\Delta c}{c}$. On average, the potential benefit duration increases by 8 months after the reform. Considering that the monthly wage of

always-takers is 1253 EUR, the WTP is equal to: $WTP = \pi^{AT}[4661 * 1.30] = 727\,EUR$[12].

Taken together, these estimates imply a MVPF of 0.5 for the replacement rate reform and 0.7 for the duration reform.

**MVPF when Optimality Fails** A large literature in behavioral economics suggests that individuals commonly make mistakes and do not make privately optimal decisions. Given the evidence from Section 5 that shows that mothers are willing to incur into large losses in long-term earnings to get higher short-term benefits, it is not obvious that this assumption holds. Mothers might not be able to perfectly forecast the effects of their leave decisions on labor market outcomes or may be myopic. If we do not assume that women are forward looking and have rational expectations, we can no longer rely on the envelope theorem and assume that the welfare impact of the policy change for marginal recipients is zero. It is therefore necessary to take into account private benefits of marginal individuals. This implies that the WTP is equal to $\pi^{AT} WTP_{inframarginal} + \pi^{C} WTP_{marginal}$, where $\pi^{C}$ is the share of compliers. Considering the extreme case in which marginal mothers do not take into account the future earnings losses from taking up unprotected benefits[13] we would get an MVPF for the replacement rate reform of 0.49 and of 0.68 for the duration reform.

### 7.3 Policy Implications

From the analysis above, I find that the MVPF for the replacement rate reform is equal to 0.5, while the MVPF for the duration reform is equal to 0.7. They are both lower than 1 reflecting the fact that the net costs of providing these benefits are higher than the value of providing them. This is mainly due to the fact that spending on these policies significantly reduce labor earnings.

Interestingly, the MVPF of the duration reform is higher than the MVPF of the replacement rate reform. This is likely to be due to the fact that the duration reform has a higher insurance value for mothers and, in relative terms, has a lower impact on cumulative earnings (as shown in Section 5). This is likely to be due to the fact that longer benefits, even without job protection, allow mothers to search for better jobs while at the same time keeping some attachment to the labor force.

Overall, the analysis demonstrates the key role of job protection to reduce the fiscal externalities of providing parental leave benefits while showing that mothers highly value insurance in the short-term through higher or longer benefits.Extending the duration of benefits while at the same time extending job protection would improve mothers' welfare.

[12] See Appendix Section E.1 for details on the construction of this WTP and for different estimates of the WTP under different assumptions.

[13] See Appendix E.1for details.

# 8 Conclusions

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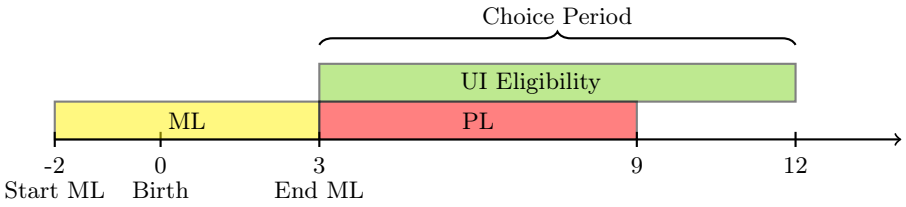
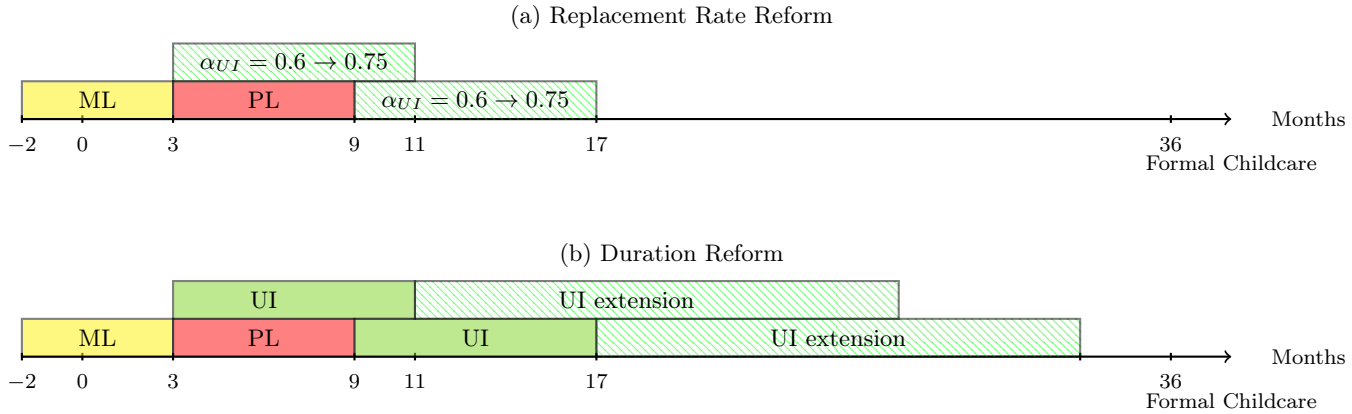
# Figures

Figure 1: TIMELINE




**Notes:** Timeline of mothers's choices and decisions around childbirth.

Figure 2: IMPACT OF REFORMS ON POLICY SPACE



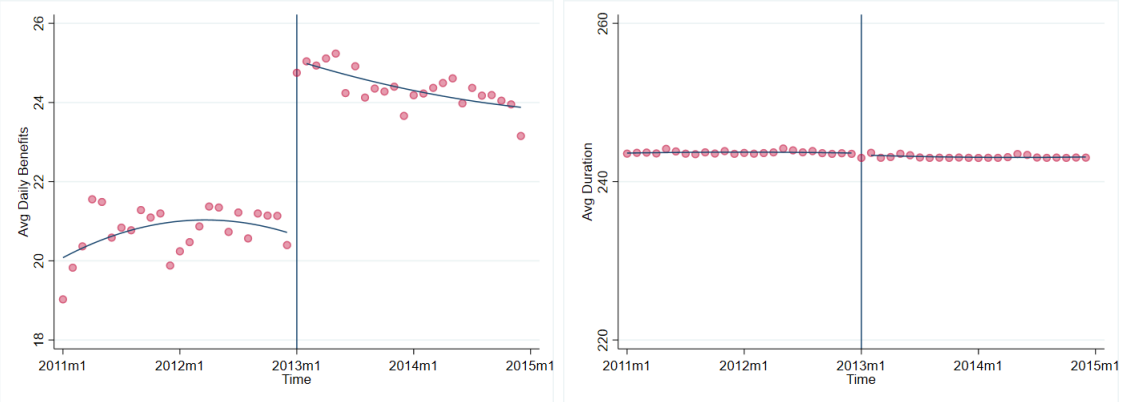

**Notes:** The graphs illustrate how the unemployment reforms impacted the policy space for women after childbirth. $t = 0$ corresponds to the time of childbirth. From $t = 3$ onwards women can choose to go back to work, take-up PL or take-up UI. The graph shows the impact of the reforms under the assumption that women take up PL at $t = 3$ and UI either at $t = 3$ or at $t = 9$, after the exhaustion of PL benefits.

Figure 3: Changes in Unemployment Insurance Generosity

Replacement Rate Reform

(a) Benefit Level

(b) Duration




Duration Reform

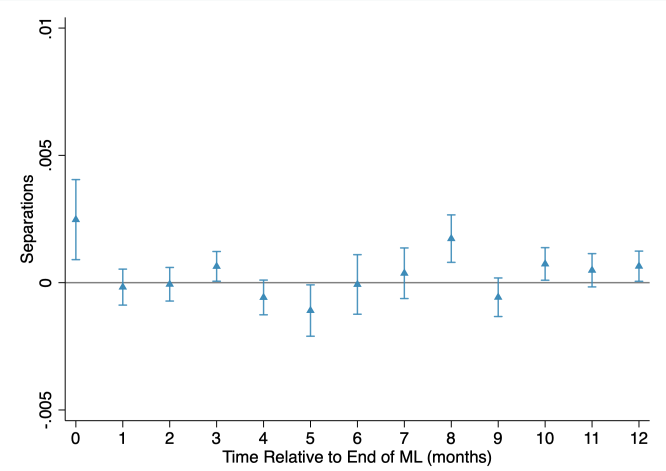
(c) Benefit Level

(d) Duration

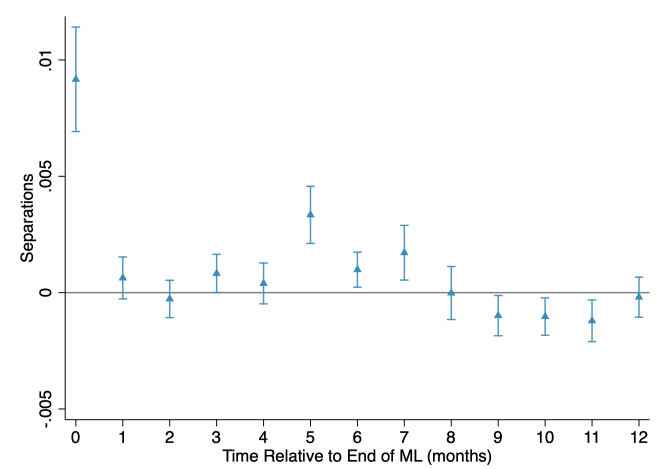

**Notes:** The graphs show the average daily unemployment insurance benefits and the average potential benefit duration (in days) by month-of-start of unemployment spell bin for women younger than 50 years old with a permanent contract. Panel A and B show the effects of the introduction of the replacement rate reform . Panel (c) and (d) show the effects of the introduction of the duration reform.

Figure 4: Effects of the Reforms on Separations from Pre-Birth Employer

(a) Replacement Rate Reform



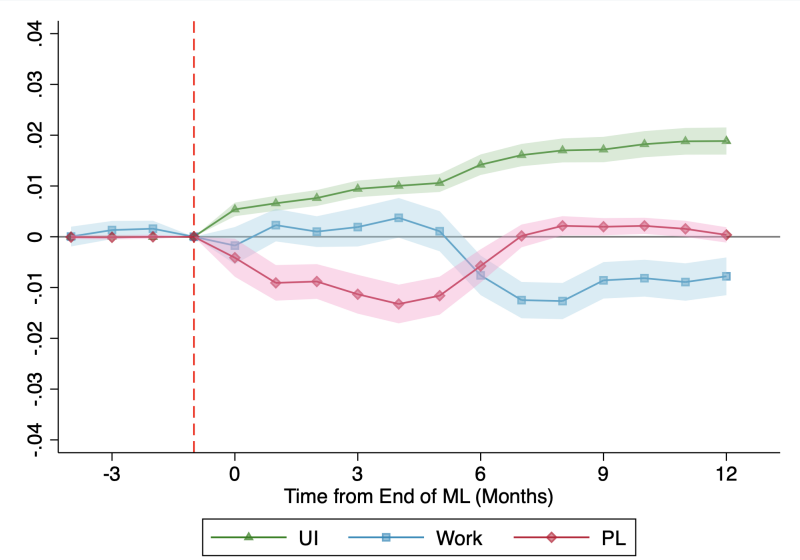

(b) Duration Reform



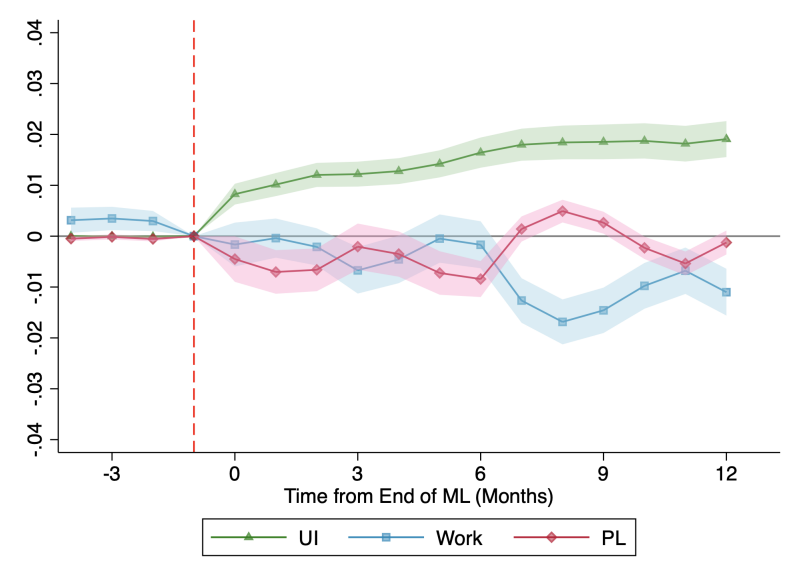

**Notes:** The figures reports difference-in-differences estimates of the coefficients $\beta_k$ from 1 where the dependent variable is the probability that a mother resigns or separates from the pre-birth employer through a contract termination at relative time $t$ (where $t = 0$ corresponds to the time of end of compulsory maternity leave). The figure reports the 95% confidence intervals. Standard errors are clustered at the individual level. Panel A reports results for the replacement rate reform while panel B reports results for the duration reform.

Figure 5: Effects of the Reforms on Women's Choices

(a) Replacement Rate Reform




(b) Duration Reform

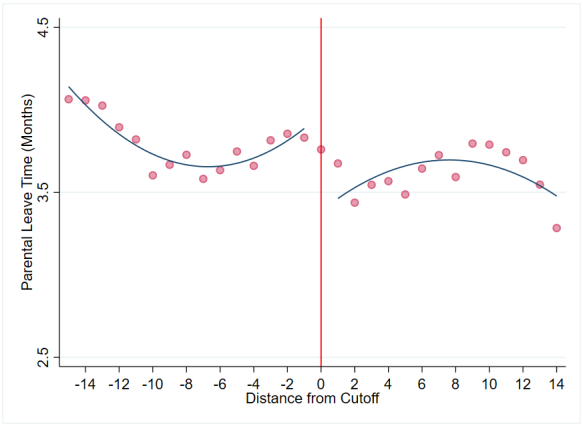



**Notes:** The figures reports difference-in-differences estimates of the coefficients $\beta_k$ from 1 estimated on three different dependent variables: the probability that a mother is on UI at relative time $t$(green series), the probability that a mother is working at relative time $t$(blue series) and the probability that a mother is on parental leave at relative time $t$. $t = 0$ corresponds to the time of end of compulsory maternity leave). Shaded areas correspond to 95% confidence intervals. Standard errors are clustered at the individual level. Panel A reports results for the replacement rate reform while panel B reports results for the duration reform.

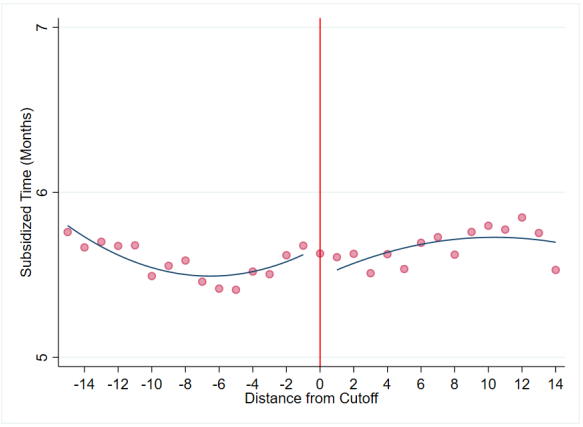
Figure 6: Effects of the Reforms on Insured Time

Replacement Rate Reform

(a) Non-Work Time Subsidized by Parental Leave

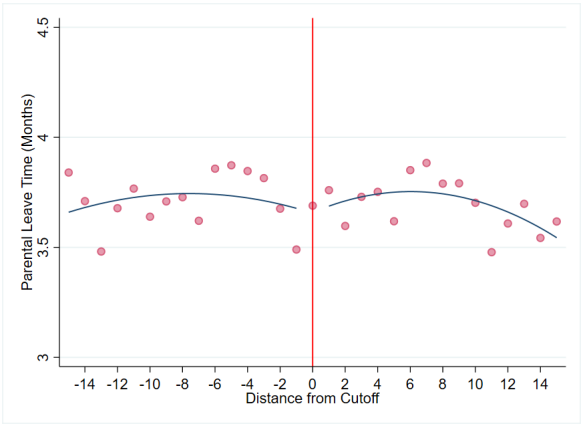



(b) Total Subsidized Time

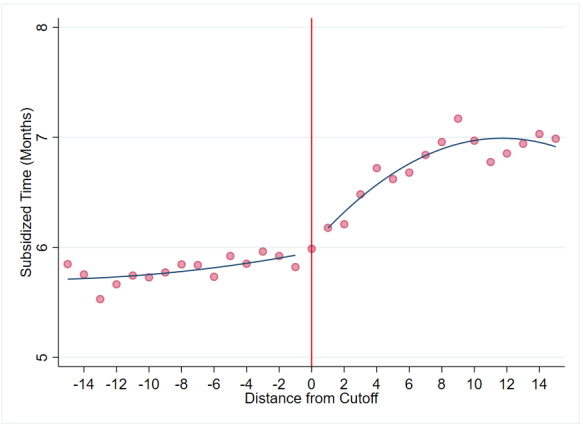



Duration Reform

(c) Non-Work Time Subsidized by Parental Leave




(d) Total Subsidized Time

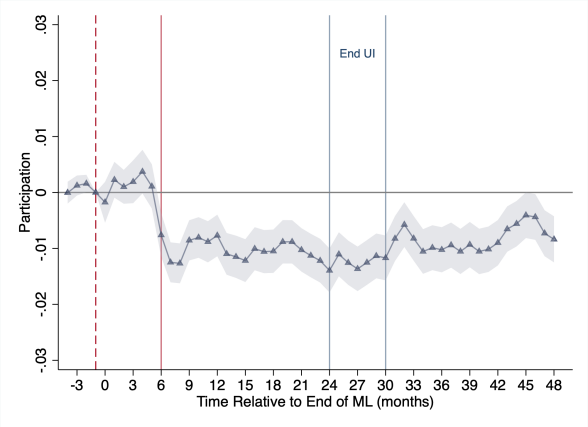



**Notes:** The graphs shows the mean value of different outcome variables for the two reforms by month-of-end-of-compulsory-maternity-leave bin. Panel A and C refers to the time spent on parental leave during the protected period. Panel B and D refers to the total subsidized time women spend out of the labor force (combining UI and PL benefits). The solid blue lines display quadratic spline estimates. The cutoffs refer to the cutoff date separating the *not treated* and the *partially treated* group as shown in Figure A4.

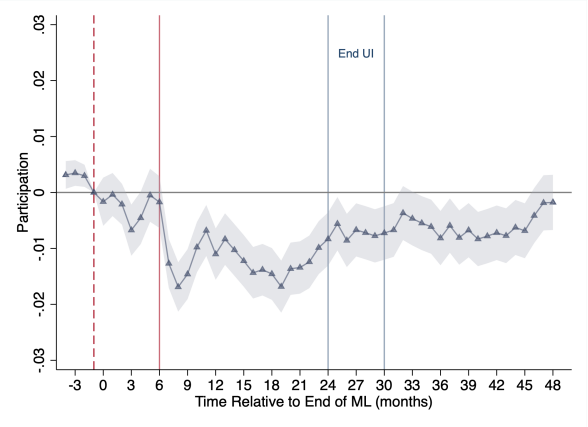
Figure 7: Effects of the Reforms on Labor Market Outcomes

**Participation**

(a) Replacement Rate Reform

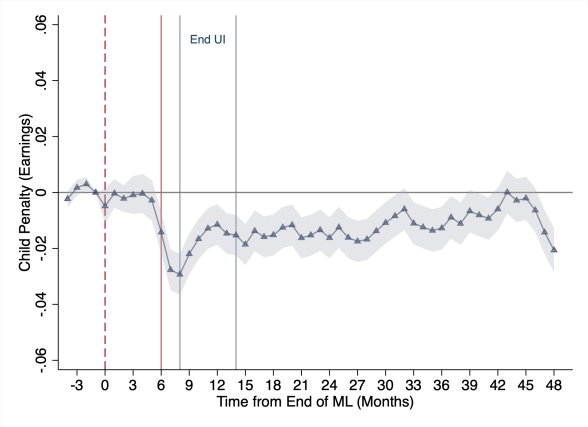



(b) Duration Reform

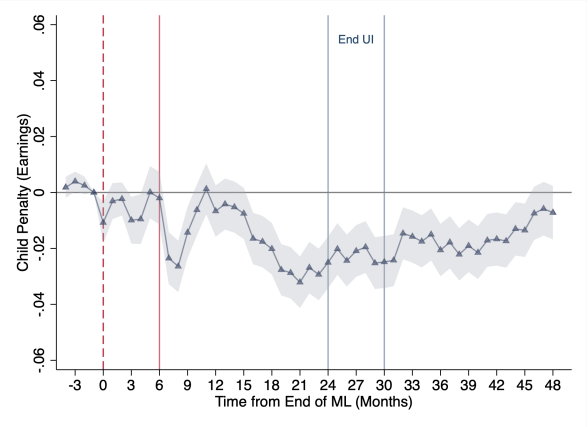



**Child Penalties in Earnings**

(c) Replacement Rate Reform



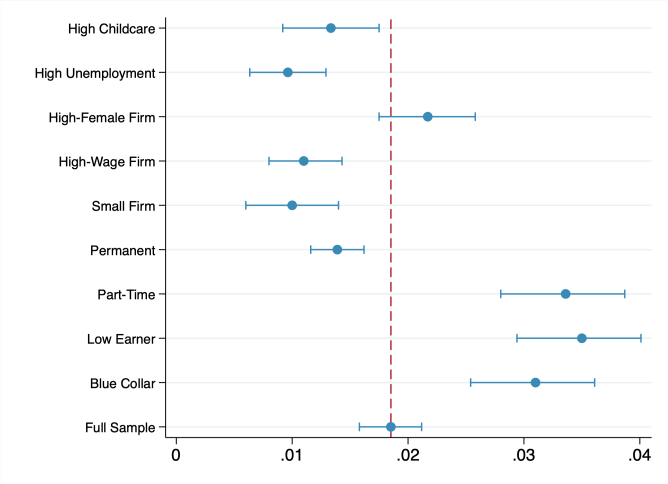

(d) Duration Reform



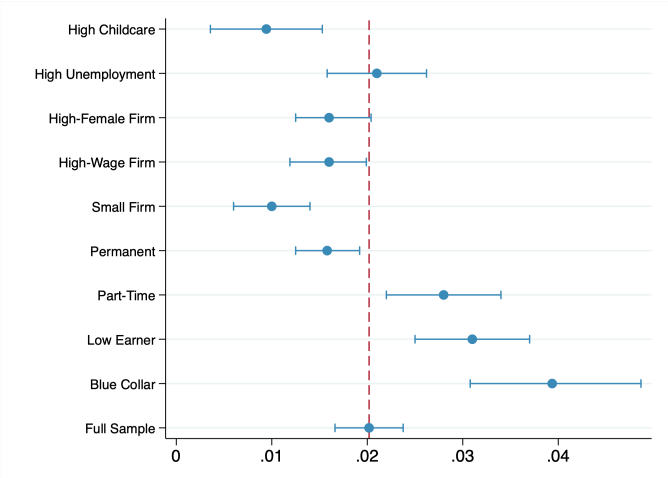

**Notes:** The figures shows the estimated effects of increasing unemployment insurance generosity reform on the dynamics of female labor force participation for both reforms. Each panel reports estimates of $\beta_k$ coefficients from specification 1 on the probability of working (defined as having positive earnings and not being on leave or on unemployment) at time $t$. Panel A reports the results for the replacement rate reform while Panel B reports the results for the duration reform. Shaded areas correspond to 95% confidence intervals.

Figure 8: Treatment Effect Heterogeneity: UI Take-Up

(a) Replacement Rate Reform




(b) Duration Reform

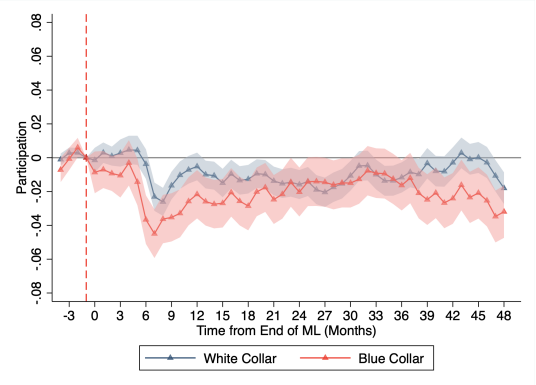



**Notes:** The figures show the heterogeneity in the treatment effect of UI reforms on UI take-up across different characteristics. For binary characteristics (e.g., Blue Collar), the treatment effect for the group is reported. For continuous variables (earnings, childcare availability, unemployment rate), I report the treatment effect on the sample above the median (e.g., High Unemployment). The estimated treatment effect on the full sample is reported at the bottom and coincides with the vertical dashed line.

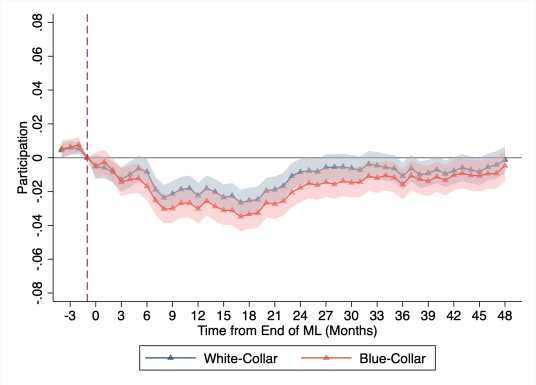
Figure 9: Effects of the Reforms on Participation: Heterogeneity

**Occupation**

(a) Replacement Rate Reform

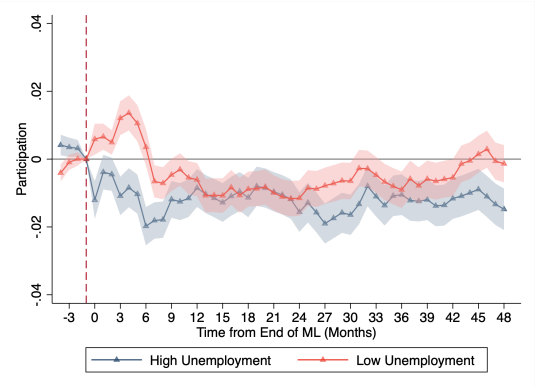



(b) Duration Reform

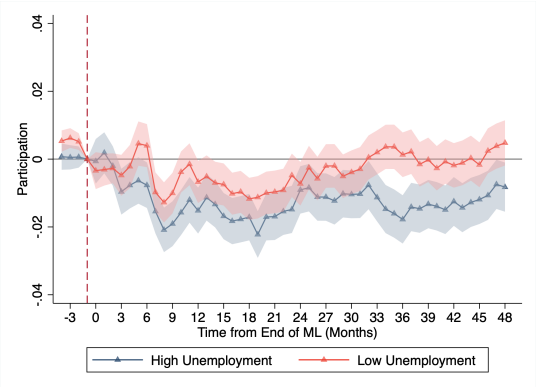



**Unemployment Rate**

(c) Replacement Rate Reform

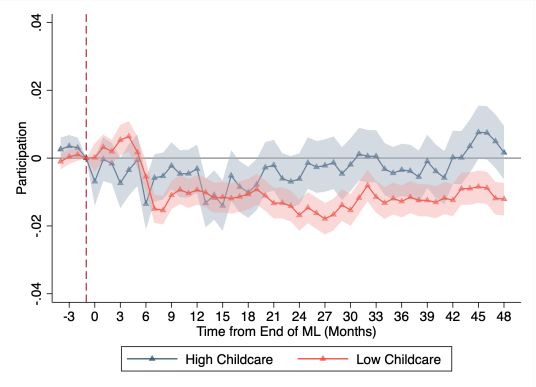



(d) Duration Reform

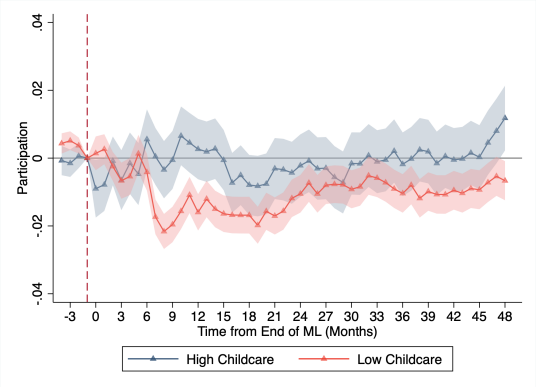



**Childcare Availability**

(e) Replacement Rate Reform



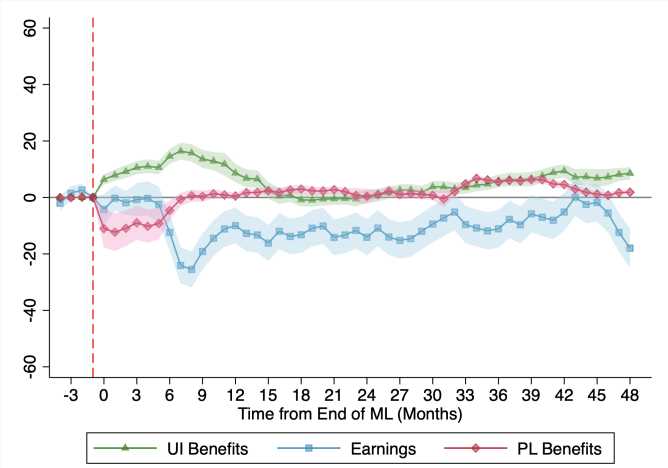

(f) Duration Reform



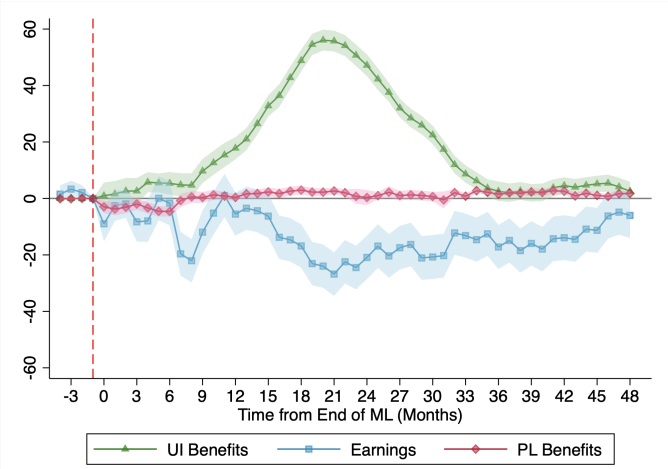

**Notes:** The figures shows the estimated effects of increasing unemployment insurance generosity reform on the dynamics of female labor force participation for both reforms. Each panel reports estimates of $\beta_k$ coefficients from specification 1 on the probability of working (defined as having positive earnings and not being on leave or on unemployment) at time $t$ for different subgroups of workers. Panel A and B reports the results splitting the sample by occupation. Panel C and D reports the results by unemployment rate in the region of residence. Panel E and F reports the results by childcare availability. Shaded areas correspond to 95% confidence intervals.

Figure 10: Effects of the Reforms on Fiscal Costs

(a) Replacement Rate Reform




(b) Duration Reform




**Notes:** XXX

# Tables

Table 1: Pre-birth Characteristics: Replacement Rate Reform

| Variable | (1) Control Mean/SE | (2) Treatment Mean/SE | Difference (1)-(2) |
|---|---|---|---|
| Age | 33.425 | 33.432 | -0.007 |
| | (0.019) | (0.021) | |
| Tenure | 22.497 | 22.471 | 0.025 |
| | (0.022) | (0.024) | |
| Full Time | 0.668 | 0.659 | 0.008 |
| | (0.004) | (0.004) | |
| Permanent | 0.936 | 0.934 | 0.001 |
| | (0.001) | (0.001) | |
| White Collar | 0.602 | 0.600 | 0.002 |
| | (0.002) | (0.002) | |
| Blue Collar | 0.316 | 0.315 | 0.001 |
| | (0.002) | (0.002) | |
| Monthly Wage | 1419.824 | 1424.736 | -4.912 |
| | (2.421) | (2.598) | |
| Monthly Earnings | 1507.693 | 1510.473 | -2.780 |
| | (3.843) | (4.084) | |
| Days Worked | 24.589 | 24.556 | 0.033 |
| | (0.018) | (0.019) | |
| Small Firm | 0.390 | 0.393 | 0.003 |
| | (0.002) | (0.002) | |
| Observations | 67,437 | 59,857 | |

**Notes:** The table reports summary statistics of pre-birth characteristics and labour market performance of mothers who gave birth for the first time between January and May 2012 (Control) and January and May 2013 (Treatment). Column (3) report differences in means between treatment and control group mothers. All variables are measured before the start of compulsory maternity leave (t = −5). Monetary quantities are expressed in 2010 prices. ***, **, and * indicate significant at 1,5 and 10% level.

Table 2: Pre-birth Characteristics Duration Reform

| Variable | (1) Control Mean/SE | (2) Treatment Mean/SE | Difference (1)-(2) |
|---|---|---|---|
| Age | 33.497 | 33.490 | -0.007 |
| | (0.023) | (0.024) | |
| Tenure | 22.613 | 22.552 | 0.059 |
| | (0.028) | (0.030) | |
| Full Time | 0.641 | 0.631 | 0.009* |
| | (0.003) | (0.003) | |
| Permanent | 0.913 | 0.910 | 0.003* |
| | (0.001) | (0.001) | |
| White Collar | 0.594 | 0.591 | 0.003 |
| | (0.002) | (0.002) | |
| Blue Collar | 0.308 | 0.308 | 0.000 |
| | (0.002) | (0.002) | |
| Monthly Wage | 1429.027 | 1425.064 | 3.962 |
| | (3.003) | (3.083) | |
| Monthly Earnings | 1468.003 | 1466.662 | 1.340 |
| | (4.740) | (4.822) | |
| Days Worked | 24.521 | 24.541 | -0.019 |
| | (0.022) | (0.022) | |
| Small Firm | 0.409 | 0.414 | -0.005 |
| | (0.002) | (0.002) | |
| Observations | 47,044 | 44,209 | |

**Notes:** The table reports summary statistics of pre-birth characteristics and labour market performance of mothers who gave birth for the first time between May and September 2014 (Control) and May and September 2015 (Treatment). Column (3) report differences in means between treatment and control group mothers. All variables are measured before the start of compulsory maternity leave (t = −5). Monetary quantities are expressed in 2010 prices. ***, **, and * indicate significant at 1,5 and 10% level.

Table 3: UI Take-Up and Separations

| **Panel A** | *Replacement Rate Reform* | | |
|---|---|---|---|
| | Months since End of ML | | |
| | t=0 | t=6 | t=12 |
| UI take-up in t | 0.004*** | 0.003*** | -0.0001 |
| | (0.0007) | (0.0006) | (0.0004) |
| Separations in t | 0.0025*** | -0.00006 | 0.0006** |
| | (0.0008) | (0.0005) | (0.0003) |
| Observations | 127,294 | | |
| **Panel B** | *Duration Reform* | | |
| | Months since End of ML | | |
| | t=0 | t=6 | t=12 |
| UI take-up in t | 0.006*** | 0.003*** | -0.002** |
| | (0.001) | (0.0007) | (0.001) |
| Separations in t | 0.009*** | 0.003*** | -0.0001 |
| | (0.001) | (0.0006) | (0.0004) |
| Observations | 91,253 | | |

**Notes:** The tables shows the estimated effects of increasing unemployment insurance generosity reform on the probability of taking up UI and separating from the pre-birth employer. Specifically, it reports the estimates of $\beta_k$ coefficients from specification 1 for $k = 0$, $k = 6$ and $k = 12$. Standard errors clustered at the individual level are reported in parentheses.

Table 4: Magnitudes of Increase in Separations

| | |
|---|---|
| **Replacement Rate Reform** | |
| Cumulative Separations | 0.03*** |
| | () |
| Elasticity | 0.4 |
| Observations | 127,294 |
| **Duration Reform** | |
| Cumulative Separations | 0.2*** |
| | () |
| Elasticity | 0.16 |
| Observations | 91,253 |

**Notes: I need to access the data to calculate this standard errors so I might end up omitting this table.**

Table 5: Sources of Increase in UI Take-Up

| **Panel A** | *Replacement Rate Reform* | | |
|---|---|---|---|
| | Months since End of ML | | |
| | t=0 | t=6 | t=12 |
| Share in UI | 0.005*** | 0.014*** | 0.018*** |
| | (0.0007) | (0.001) | (0.0013) |
| Share in PL | -0.004*** | -0.006*** | 0.0003 |
| | (0.0019) | (0.0016) | (0.0007) |
| Share Work | -0.0017 | -0.0076** | -0.008*** |
| | (0.0018) | (0.0019) | (0.0018) |
| Observations | 127,294 | | |
| **Panel B** | *Duration Reform* | | |
| | Months since End of ML | | |
| | t=0 | t=6 | t=12 |
| Share in UI | 0.008*** | 0.016*** | 0.019*** |
| | (0.0010) | (0.0015) | (0.0018) |
| Share in PL | -0.005*** | -0.008*** | -0.0012 |
| | (0.0022) | (0.0018) | (0.0011) |
| Share Work | -0.0016 | -0.012*** | -0.011*** |
| | (0.0022) | (0.0022) | (0.0023) |
| Observations | 91,253 | | |

**Notes:**

Table 6: Effects on Labor Market Outcomes

| **Panel A** | *Replacement Rate Reform* | | |
|---|---|---|---|
| | Months since End of ML | | |
| | t=12 | t=24 | t=48 |
| Share Working | -0.007*** | -0.011*** | -0.006** |
| | (0.0029) | (0.0026) | (0.0026) |
| Share Working for Pre-Birth Employer | 0.0003 | -0.005* | -0.005* |
| | (0.0026) | (0.0028) | (0.0027) |
| Gross Labor Earnings | -7.98*** | -10.87** | -14.27*** |
| | (2.94) | (4.55) | (4.55) |
| Days Worked | 0.10*** | 0.18*** | 0.05 |
| | (0.038) | (0.035) | (0.031) |
| Daily Wage Rate | -1.48*** | -0.60 | -0.09 |
| | (0.51) | (0.41) | (0.344) |
| Observations | 125,469 | | |
| **Panel B** | *Duration Reform* | | |
| | Months since End of ML | | |
| | t=12 | t=24 | t=48 |
| Share Working | -0.013*** | -0.011*** | -0.003 |
| | (0.003) | (0.003) | (0.003) |
| Share Working for Pre-Birth Employer | -0.014*** | -0.016*** | -0.013*** |
| | (0.003) | (0.003) | (0.003) |
| Gross Labor Earnings | -8.35 | -23.78*** | -8.38 |
| | (5.31) | (5.35) | (5.44) |
| Days Worked | 0.11*** | -0.032 | -0.009 |
| | (0.044) | (0.041) | (0.041) |
| Daily Wage Rate | -0.165 | -1.68*** | -0.53 |
| | (0.482) | (0.411) | (0.401) |
| Observations | 91,312 | | |

**Notes:** The table shows the estimated effects of increasing unemployment insurance generosity reform on labor market outcomes. Specifically, it reports the estimates of $\beta_k$ coefficients from specification 1 for $k = 12$, $k = 24$ and $k = 48$. Standard errors clustered at the individual level are reported in parentheses.

Table 7: Magnitudes of Earnings Losses

| | |
|---|---|
| **Replacement Rate Reform** | |
| Cumulative Earnings Losses | -493.5*** |
| | (125.18) |
| Elasticity | -0.03 |
| Observations | 127,294 |
| **Duration Reform** | |
| Cumulative Earnings Losses | -662*** |
| | (167.84) |
| Elasticity | -0.01 |
| Observations | 91,253 |

**Notes:** XXX

Table 8: Complier Analysis: Duration Reform

| | Compliers C | Always-Takers AT | Never-Takers NT | Difference C-AT | Difference C-NT |
|---|---|---|---|---|---|
| *Worker Characteristics* | | | | | |
| Age | 28.54 | 32.34 | 33.76 | -3.85*** | -5.28*** |
| | (0.625) | (0.059) | (0.021) | | |
| Permanent | 0.917 | 0.903 | 0.966 | 0.0132 | -0.049*** |
| | (0.03) | (0.004) | (0.001) | | |
| Full Time | 0.426 | 0.611 | 0.676 | -0.185*** | -0.249*** |
| | (0.054) | (0.006) | (0.002) | | |
| Blue Collar | 0.285 | 0.441 | 0.295 | -0.161*** | -0.011*** |
| | (0.05) | (0.006) | (0.002) | | |
| Pre-Birth Wage | 1026 | 1227 | 1503 | -200.9*** | -476.5*** |
| | (56.1) | (6.25) | (5.82) | | |
| *Firms Characteristics* | | | | | |
| Small (<15) | 0.80 | 0.64 | 0.36 | 0.15*** | 0.436*** |
| | (0.05) | (0.006) | (0.002) | | |
| High Quality Firm | 0.344 | 0.609 | 0.678 | -0.257*** | -0.324*** |
| | (0.059) | (0.006) | (0.0021) | | |
| High Share Female Firm | 0.658 | 0.596 | 0.479 | 0.062*** | 0.178*** |
| | (0.055) | (0.006) | (0.002) | | |
| *Environment Characteristics* | | | | | |
| High Childcare Availability | 0.271 | 0.239 | 0.335 | 0.03*** | -0.064*** |
| | (0.044) | (0.005) | (0.002) | | |
| High Unemployment Rate | 0.531 | 0.718 | 0.47 | -0.187*** | 0.061*** |
| | (0.059) | (0.006) | (0.0022) | | |

**Notes:** This table reports characteristics of compliers, never-takers, always-takers as well as the difference between the groups based on the methodology described in Section D. Compliers are those mothers who take up UI when under the more generous regime but would not have taken up UI under the less generous regime. For each of the variables and groups, the table reports means as well as standard errors (in parentheses) based on 5,000 bootstrap replications. All variables are measured before childbirth ($t = -5$). Monetary quantities are expressed in 2010 prices. High quality firm is an indicator equal to 1 if the worker is employed in a firm whose AKM firm effect is above the median. High unemployment rate is an indicator equal to 1 if the worker is employed in a region with unemployment rate above the pre-birth year median. High childcare availability is an indicator equal to 1 if the worker lives in a region where the availability of formal childcare (for 0-3 years old children) is above the median.

Table 9: Complier Analysis: Duration Reform

| | Compliers C | Always-Takers AT | Never-Takers NT | Difference C-AT | Difference C-NT |
|---|---|---|---|---|---|
| *Worker Characteristics* | | | | | |
| Age | 31.941 | 31.541 | 33.963 | 0.401*** | -2.021*** |
| | (1.099) | (0.068) | (0.025) | | |
| Permanent | 0.981 | 0.914 | 0.966 | 0.085*** | 0.015*** |
| | (0.059) | (0.004) | (0.001) | | |
| Full-Time | 0.364 | 0.560 | 0.654 | -0.195*** | -0.290*** |
| | (0.11) | (0.006) | (0.002) | | |
| Blue Collar | 0.628 | 0.401 | 0.283 | 0.226*** | 0.344*** |
| | (0.114) | (0.007) | (0.002) | | |
| Pre-Birth Wage | 1425 | 1253 | 1696 | 171.64*** | -270.9*** |
| | (192.5) | (10.8) | (6.24) | | |
| *Firms Characteristics* | | | | | |
| Small (<15) | 0.46 | 0.68 | 0.36 | -0.216*** | 0.096** |
| | (0.11) | (0.006) | (0.002) | | |
| High Quality Firm | 0.499 | 0.552 | 0.671 | -0.052*** | -0.171*** |
| | (0.095) | (0.007) | (0.003) | | |
| High Share Female Firm | 0.306 | 0.631 | 0.479 | -0.325*** | -0.181*** |
| | (0.124) | (0.006) | (0.003) | | |
| *Environment Characteristics* | | | | | |
| High Childcare Availability | 0.188 | 0.260 | 0.281 | -0.072*** | -0.094*** |
| | (0.09) | (0.006) | (0.003) | | |
| High Unemployment Rate | 0.551 | 0.621 | 0.473 | -0.074*** | 0.078*** |
| | (0.09) | (0.006) | (0.003) | | |

**Notes:** This table reports characteristics of compliers, never-takers, always-takers as well as the difference between the groups based on the methodology described in Section D. Compliers are those mothers who take up UI when under the more generous regime but would not have taken up UI under the less generous regime. For each of the variables and groups, the table reports means as well as standard errors (in parentheses) based on 5,000 bootstrap replications. All variables are measured before childbirth ($t = -5$). Monetary quantities are expressed in 2010 prices. High quality firm is an indicator equal to 1 if the worker is employed in a firm whose AKM firm effect is above the median. High unemployment rate is an indicator equal to 1 if the worker is employed in a region with unemployment rate above the pre-birth year median. High childcare availability is an indicator equal to 1 if the worker lives in a region where the availability of formal childcare (for 0-3 years old children) is above the median.

Table 10: Construction of The MVPF

| | Replacement Rate Reform | Duration Reform |
|---|---|---|
| *Net Costs* | | |
| UI Benefits | 228 EUR | 898 EUR |
| PL Benefits | -67 EUR | -25 EUR |
| Tax Revenue | 134 EUR | 175 EUR |
| Total Net Costs | 295 EUR | 1048 EUR |
| *Benefits* | | |
| $1 + \gamma \frac{\Delta c}{c}$ | 1.17 | 1.30 |
| WTP | 155 EUR | 727 EUR |
| MVPF | 0.52 | 0.7 |

**Notes:** XXX

# Appendix

## A Family Policies in Italy: Details

## B Data Construction

### B.1 Construction of the Dataset

### B.2 Sample Selection

## C Alternative Empirical Strategy: Regression Discontinuity Design

Given these issues, to estimate the causal effect of these reforms, I will use two empirical strategies. First, I can use a standard regression discontinuity design. Because of the presence of partially treated mothers, there is likely to be no clear discontinuity at the exact cutoff which implies that this RD design is not identified non-parametrically. I follow Deshpande 2016, and estimate the RD parametrically. The estimating equation is:

$$Y_i = \alpha + \beta \mathbb{1}[\tau_i \geq 0] + \sum_{k=1}^{K} \alpha_k \tau_i^k + \sum_{k=1}^{K} \alpha_k \tau_i^k \mathbb{1}[\tau_i \geq 0] + X_i' \delta + \varepsilon_i \tag{7}$$

where $\tau_i$ is the end of maternity leave date of mother $i$ normalized so that $\tau = 0$ at the cutoff date (May 1, 2012 for the Replacement Rate Reform and September 1, 2014 for the duration reform). $\tau_i^k$ is a polynomial of order $k$ in the mother's end of compulsory maternity leave date. $X_i$ is a matrix of covariates. The coefficient of interest is $\beta$, which gives the effect on $Y$ of ending the compulsory maternity leave right before or right after the cutoff.

The key assumption for identification in an RD design is that treatment is as good as randomly assigned in a neighborhood of the cutoff and that counterfactual outcomes are smooth at the cutoff. A potential threat to the RD design is strategic manipulation of the running variable. Manipulation of the running variable is unlikely in this institutional setting. First, the unemployment insurance reforms were unexpected and hard to anticipate. Second, the possibility of UI take up within a time window, the protected period, allowed mothers ending their maternity leave even before the actual introduction of the reform to be eligible for the more generous UI regime making threshold manipulation not necessary. Finally, the end of compulsory maternity leave date is overall hard to manipulate since it is strictly related to the exact date of birth. Unless mothers reacted to

the unemployment insurance reforms by manipulating the timing of births, manipulation of the threshold is unlikely. Appendix Figure A6 shows the distribution of end of maternity leave dates around the cutoff dates (solid blue lines) and around the actual implementation of the reforms dates (dashed blue lines). On average, while there is expected seasonality across different months driven by seasonality in the number of births and an overall decrease in number of births over time, the sample of mothers ending their maternity leave around the introduction of the two reforms are balanced. I formally test for a discontinuity in the density function at the cutoff using the test proposed by McCrary (2008). As shown in Figure The McCrary test do not reject the null hypothesis of no discontinuity at the threshold. I also check for whether covariates are balanced around the cutoff. I perform a test for a number of pre-birth demographic and labor market characteristics and find that covariates are overall balanced.

# D Complier Characteristics

Consider a binary variable $Z \in \{0,1\}$ that captures whether mothers are eligible for the more generous UI regime. $Z$ effectively shifts a component of the mother's outside option $b + Z\Delta b$, by either increasing UI replacement rate or by increasing UI duration. Let $D \in \{0,1\}$ indicate if a mother takes up UI, whether she was treated or not. Let $D_0$ and $D_1$ denote the potential values that $D$ takes fro $Z = 0$ and $Z = 1$ respectively. We can characterize the three groups of mothers described above by their potential outcomes: always-takers (AT) with potential outcomes $(D_0 = 1, D_1 = 1)$ and share $\pi^{AT}$, never-takers (NT) with potential outcomes $(D_0 = 0, D_1 = 0)$ and share $\pi^{NT}$and compliers (C) with potential outcomes $(D_0 = 0, D_1 = 1)$ and share $\pi^{C}$.

In my setting, I compare eligible $(c_1)$ and ineligible $(c_0)$ cohorts, before and after childbirth ($t_0$ and $t_1$) respectively. Therefore, $Z = 1$ for $c_1$ and 0 otherwise.

I first estimate the share of always-takers, compliers and never-takers. This is easily done by running the following simple regression: $Y_i = \alpha + \gamma T_i + \varepsilon_i$ , where $T_i = 1$ if $i$ is eligible for the more generous UI regime and 0 otherwise and $Y_i$ is an indicator equal to 1 if individual $i$ took up UI during the protected period, namely at any $t \in [0, 9]$ from the end of compulsory maternity leave. We have that $\pi^C = \hat{\gamma}, \pi^{AT} = \hat{\alpha}, \pi^{NT} = 1 - \hat{\alpha} - \hat{\gamma}$.

Next, I estimate expected value of a characteristics $x$for the three groups. Estimating the expected value of a characteristic $x$ for *never-takers* is straightforward. All individuals in $c_1$ who do not take up UI in the protected period are never-takers if we assume that the standard monotonicity assumption in the instrumental variable literature, $(D_1 - D_0 \geq 0)$, holds. We can estimate the

characteristic $x$ of a never-taker by the corresponding sample mean $\frac{1}{N_{c_1}^{nt}} \sum_{i \in c_1} x_i 1(D_i = 0)$.

Estimating the expected value of a characteristic for always-takers and compliers is more challenging. The expected value of a characteristic $x$ for mothers in cohort $c_1$ who do take up UI is a weighted average weighted average of the expected value of $x$ for compliers and always-takers, where the weights represent the share of compliers and always-takers. Therefore the expected value of $x$ for compliers is:

$$E^C[x] = E\left[x|D_0 = 0, D_1 = 1, c_1\right] = \frac{\pi^C + \pi^{AT}}{\pi^C} E\left[x|D_1 = 1, c_1\right] - \frac{\pi^{AT}}{\pi^C} E\left[x|D_0 = 1, c_1\right] \tag{8}$$

We can estimate the RHS of equation 8 empirically. $E\left[x|D_1 = 1, c_1\right]$ is the expected value of $x$ for all-takers, namely all mothers taking up UI after the reform. It is possible to estimate this using the corresponding sample mean: $\left(\frac{1}{N_{c_1}^{all-takers}}\right) \sum_{i \in c_1} x_i 1(D_i = 1)$. Calculating $E\left[x|D_0 = 1, c_1\right]$ is more difficult, because we cannot know whether a worker who takes up UI after the reform would have taken up UI before the reform. Because of monotonicity we know that individuals who take up UI before the reform, also take up UI after the reform. Therefore, if trends in $x$ are parallel across cohorts and $Z$ is independent from $D$ and $x$, we have that $E\left[x|D_0 = 1, c_1\right] = E\left[x|D_0 = 1, c_0\right]$. This can be estimated by the corresponding sample mean $\left(\frac{1}{N_{c_0}^{always-takers}}\right) \sum_{i \in c_0} x_i 1(D_i = 1)$.

# E Welfare Effects Derivation

### Welfare Effect of Changes in Benefits

The government maximizes equation 3 subject to the budget constraint 4 and to the condition that the individual chooses her behavior optimally. Individual behavior is a function of PL benefits and durations so we can write: $\tau(b, B) = \frac{L(b,B)}{T - D(b,B)} b + \frac{E}{T - D(b,B)}$.

The government problem is $max_{b.B} W(b, B, \tau(b, B))$. The marginal effect of increasing $b$ on welfare is given by:

$$\frac{dW}{db} = \int_0^B S_t dt u^{'}(c_{l,t \leq B}) - \int_0^T \left[1 - S_t\right] dt v^{'}(c_e) \frac{d\tau}{db}$$

$$\frac{dW}{db} = B u^{'}(b) - (T - D) v^{'} \frac{d\tau}{db}$$

where we use the envelope theorem. With some rearrangements we get:

$$\frac{dW}{db}\frac{1}{v^{'}(c_e)} = L \times \frac{u^{'}(c_{l,t\leq B}) - v^{'}(c_e)}{v^{'}(c_e)} - \left(\frac{dL}{db}b + \frac{dD}{db}\tau\right)$$

Normalizing by $L$, which is how much more it is transferred to women on leave, we get:

$$\frac{dW}{db}\frac{1}{Lv^{'}(c_e)} = \frac{u^{'}(c_{l,t\leq B}) - v^{'}(c_e)}{v^{'}(c_e)} - \left(\eta_{L,b} + \eta_{D,b}\frac{D}{L}\frac{\tau}{b}\right)$$

which corresponds to equation 5.

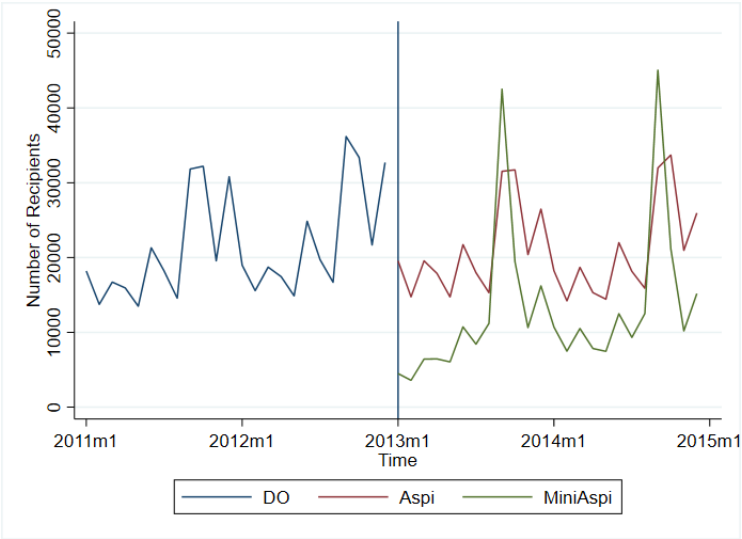
## E.1 Construction of MVPF under Different Assumptions

# F Additional Figures

Figure A1

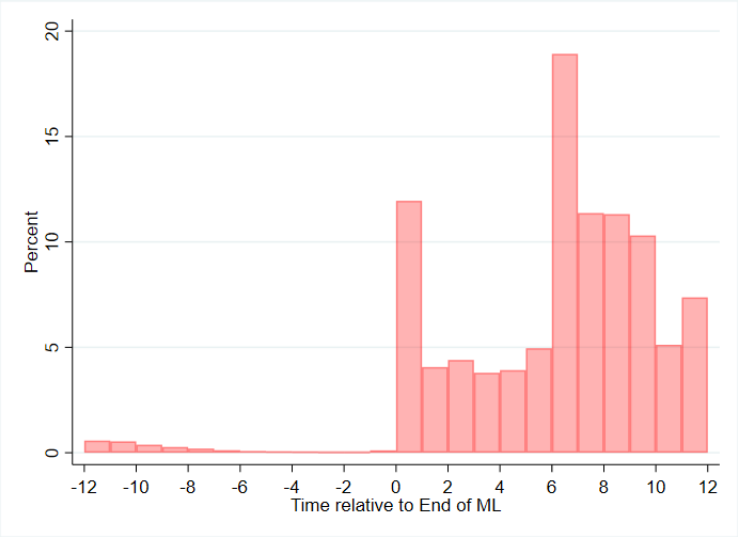

**Notes:** XXX

Figure A2: Changes in UI Eligibility: Replacement Rate Reform



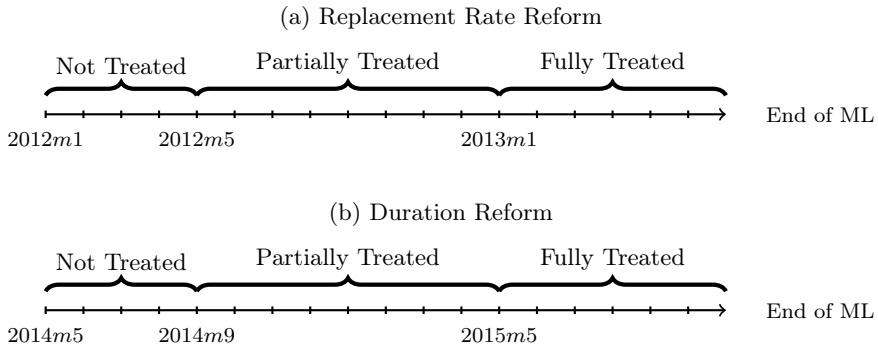

**Notes:** The figures reports the number of UI claims over time by women under the age of 50 before and after the replacement rate reform s distinguishing between *Aspi* and *MiniAspi*. Details on the characteristics of the subsidies are presented in Section 2.

Figure A3: Distribution of UI Take Up by Time Relative to End of ML




**Notes:** The figures reports the distribution of UI take-up by time relative to the end of compulsory maternity leave in 2012.

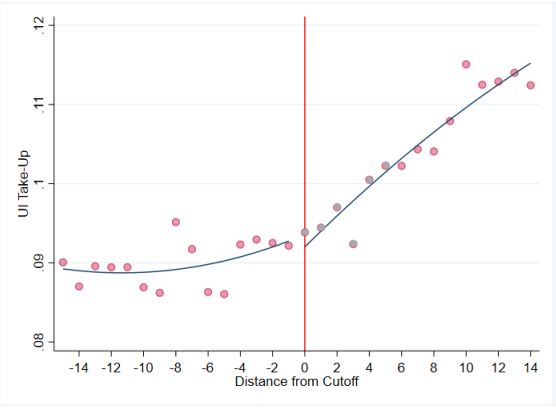
Figure A4: Eligibility for UI Regimes by End of Maternity Leave Date



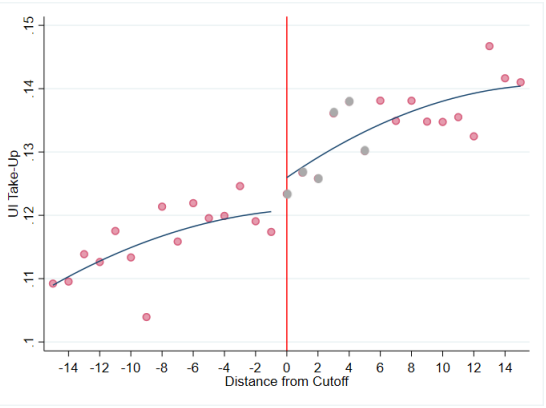

**Notes:** The figure illustrates for which dates the mothers were eligible for different unemployment insurance regimens, depending on the end of their maternity leave. Panel A shows it the dates for the 2013 unemployment insurance reform. Panel B shows the dates for the 2015 unemployment insurance reforms.

## Figure A5: Effect of the Reforms on UI Take-Up After Childbirth

(a) Replacement Rate Reform

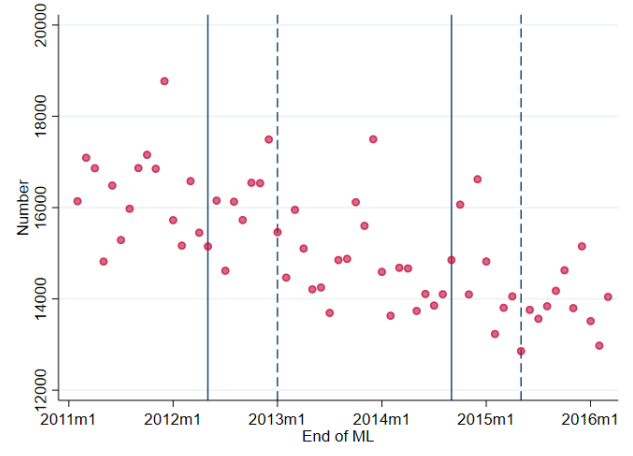



(b) Duration Reform




**Notes:** The plots illustrate the share of mothers taking up unemployment insurance before their child's first birthday by month-of-end-of-ML bin for different UI regimes. The solid blue lines display quadratic spline estimates. The grey dots on the right of the cutoffs represent partially treated mothers (as shown in Figure A4). Panel A presents results for the replacement rate reform while Panel B presents results for the duration reform. The cutoffs refer to the cutoff date separating the *not treated* and the *partially treated* group as shown in Figure A4.

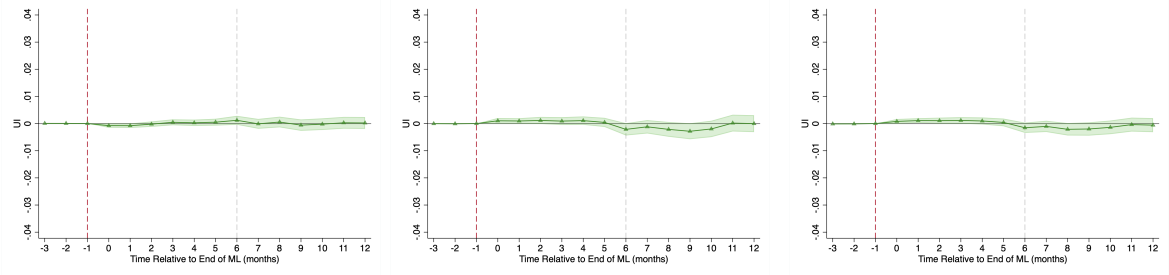
## Figure A6: Frequency of End of Maternity Leave Dates




**Notes:** The figure reports the number of observations in each month-of-end-of-maternity-leave bin for the entire sample ending their compulsory maternity leave between 2011 and 2016. The solid blue lines correspond to the cutoff dates using in the RD design specified in equation 7 (specifically to the cutoff date separating the *not treated* and the *partially treated* group in Figure A4). The dashed blue lines correspond to the actual time of introduction of the reforms (specifically to the cutoff date separating the *partially treated* and the *fully treated* group in Figure A4) for both reforms.

## Figure A7: Placebo Specifications

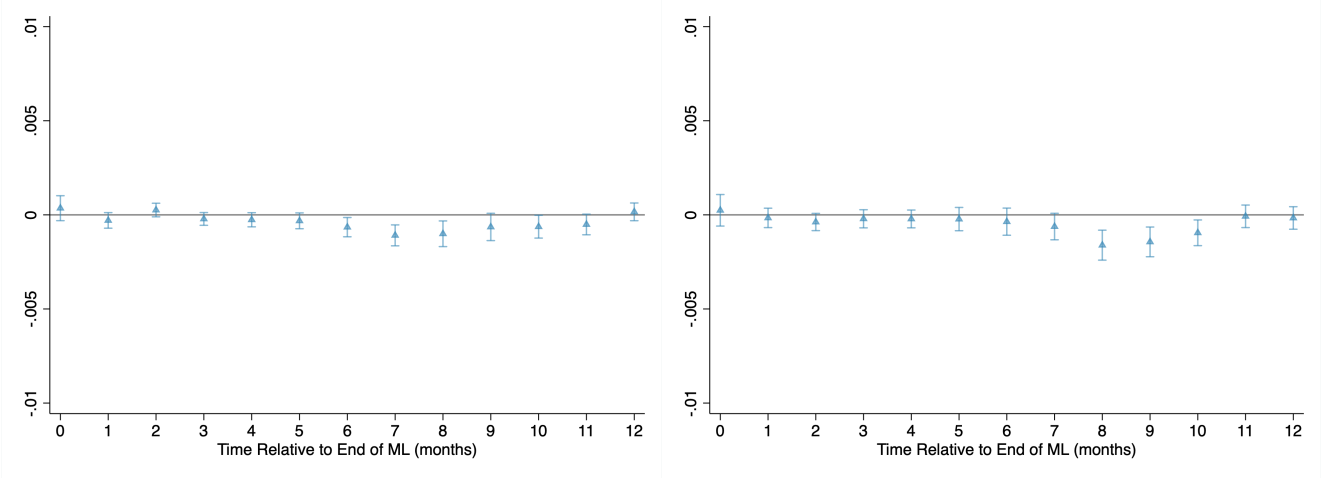
(a) 2009-2010 (b) 2010-2011 (c) 2011-2012




**Notes:** The figures reports difference-in-differences estimates of the coefficients $\beta_k$ from 1 where the dependent variable is the probability that a mother is on unemployment insurance at relative time $t$(where $t = 0$ corresponds to the time of end of compulsory maternity leave) for three placebo cohorts. The figure reports the 95% confidence intervals. Standard errors are clustered at the individual level.

## Figure A8: Robustness: Effect on Layoffs

(a) Replacement Rate Reform (b) Duration Reform




**Notes:** The figures reports difference-in-differences estimates of the coefficients $\beta_k$ from 1 where the dependent variable is the probability that a mother resigns or separates from the pre-birth employer through a layoff, firm closure or due to just cause at relative time $t$ (where $t = 0$ corresponds to the time of end of compulsory maternity leave). The figure reports the 95% confidence intervals. Standard errors are clustered at the individual level. Panel A reports results for the replacement rate reform while panel B reports results for the duration reform.

Figure A9: Replacement Rate Reform Decomposition: Eligibility vs Replacement Rate

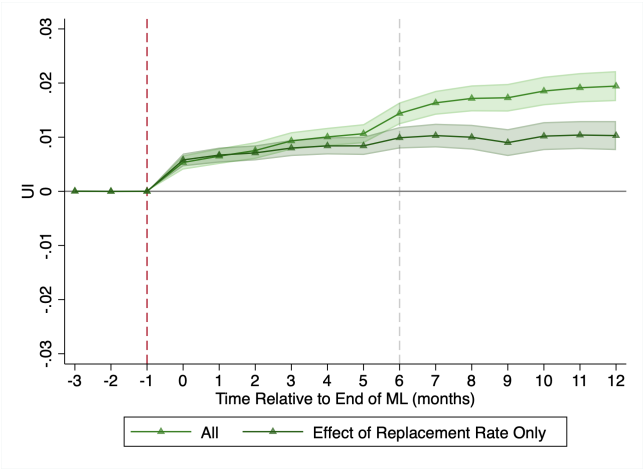
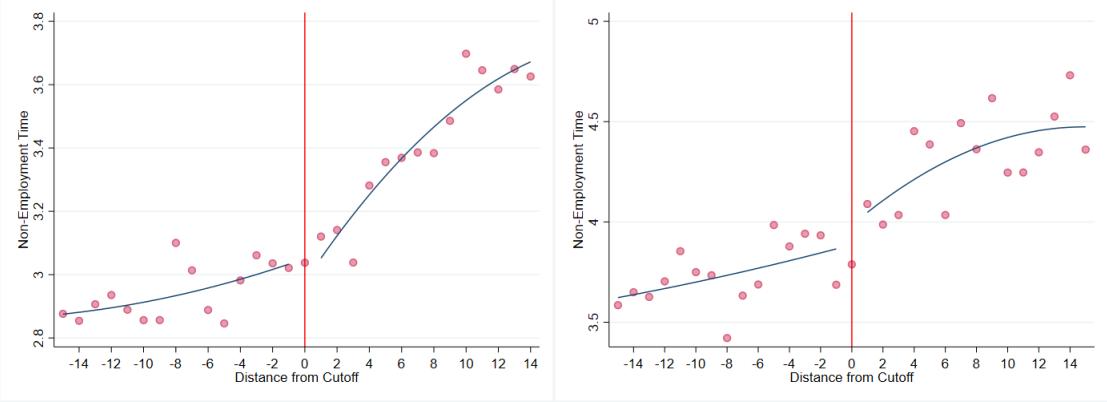



Figure A10: Effect of the Reforms on Non-Participation Time

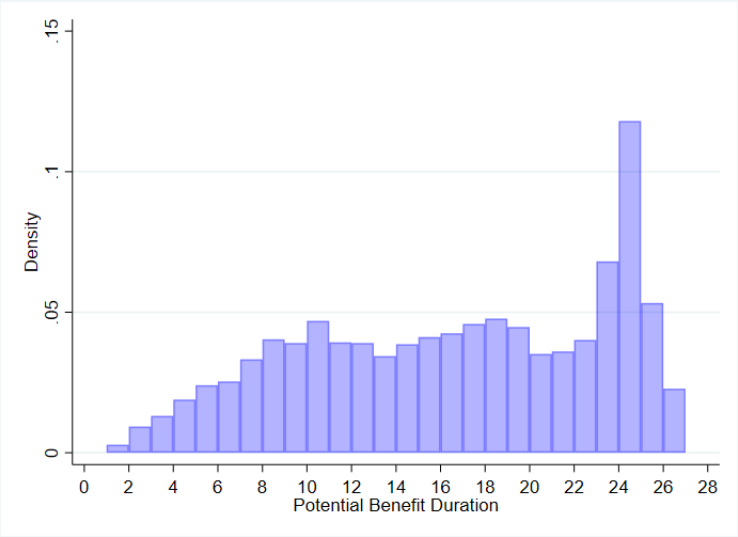
(a) Replacement Rate Reform

(b) Duration Reform




**Notes:** The graphs shows the mean value of the total time spent out of the labor force and not on parental leave after childbirth for the two reforms by month-of-end-of-compulsory-maternity-leave bin. Panel A refers to the replacement rate reform while Panel B refers to the duration reform. The solid blue lines display quadratic spline estimates. The cutoffs refer to the cutoff date separating the *not treated* and the *partially treated* group as shown in Figure A4.

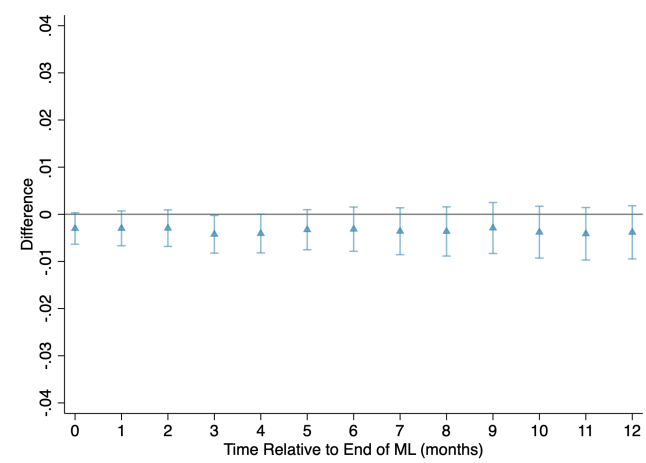
Figure A11: Distribution of UI Potential Benefit Duration After the Duration Reform



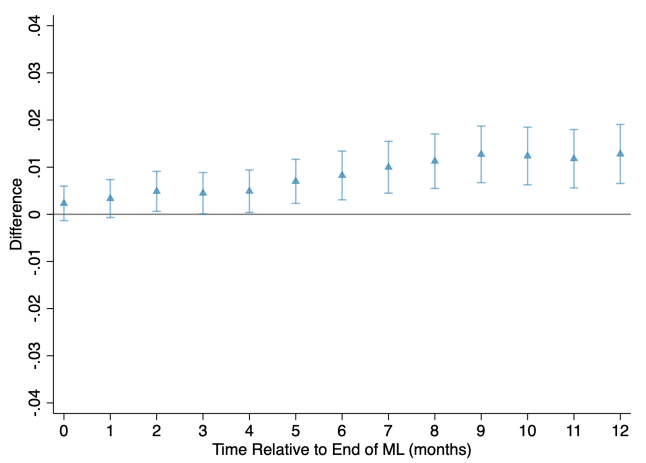

**Notes:** The figure shows the distribution of potential benefit duration for mothers taking up UI after the duration reform.

Figure A12: Statistical Test for Difference in Effects of the Reforms

(a) All

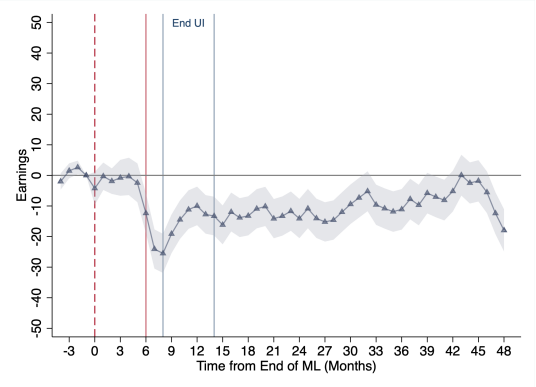



(b) Without Eligibility Effect

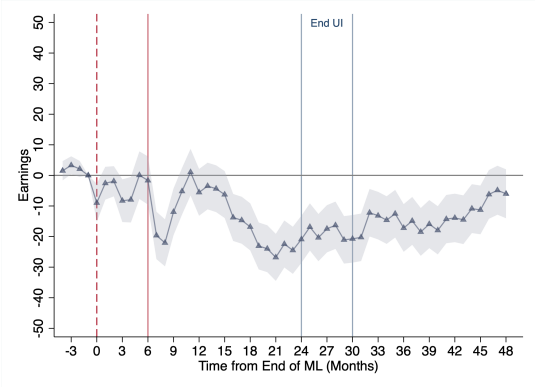


## Figure A13: Effects of the Reforms on Earnings Levels

(a) Replacement Rate Reform



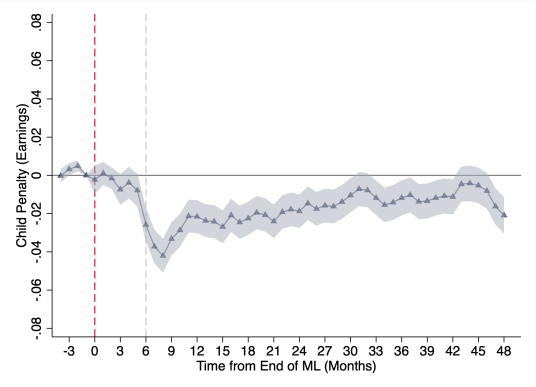

(b) Duration Reform



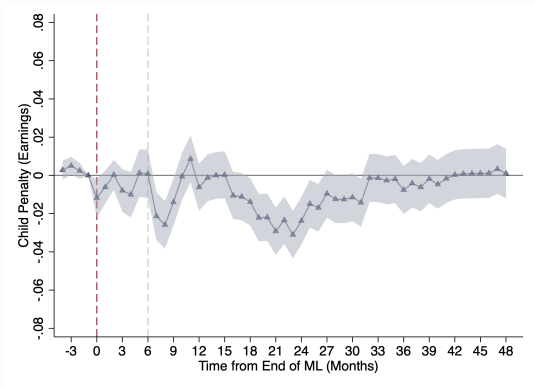

**Notes:** The figures shows the estimated effects of increasing unemployment insurance generosity reform on the dynamics of female earnings for both reforms. Each panel reports estimates of $\beta_k$ coefficients from specification 1, normalized by the predicted earnings in the treatment group in the absence of children, $\frac{\hat{\beta_k}}{E\left[\hat{Y_{ik}}|k,T=1\right]}$, which correspond to the percentage-point change in the child penalty at time $t$ for women exposed to the more generous UI regime. Panel A reports the results for the replacement rate reform while Panel B reports the results for the duration reform. Shaded areas correspond to 95% confidence intervals.

## Figure A14: Effects of the Reforms on Child Penalties: Fertility

(a) Replacement Rate Reform




(b) Duration Reform

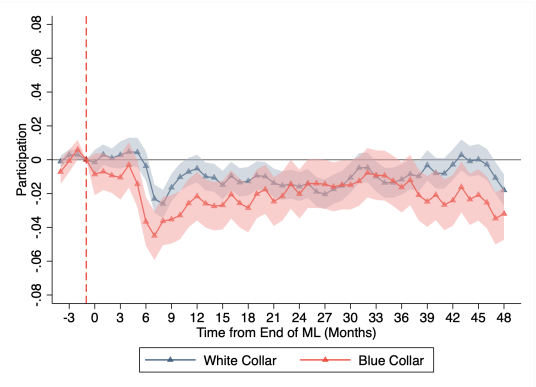



**Notes:** The figures shows the estimated effects of increasing unemployment insurance generosity reform on the dynamics of female earnings for both reforms. Each panel reports estimates of $\beta_k$ coefficients from specification 1, normalized by the predicted earnings in the treatment group in the absence of children, $\frac{\hat{\beta_k}}{E\left[\hat{Y_{ik}}|k,T=1\right]}$, which correspond to the percentage-point change in the child penalty at time $t$ for women exposed to the more generous UI regime. The sample is restricted to mothers with only one child (completed fertility of one). Panel A reports the results for the replacement rate reform while Panel B reports the results for the duration reform. Shaded areas correspond to 95% confidence intervals.

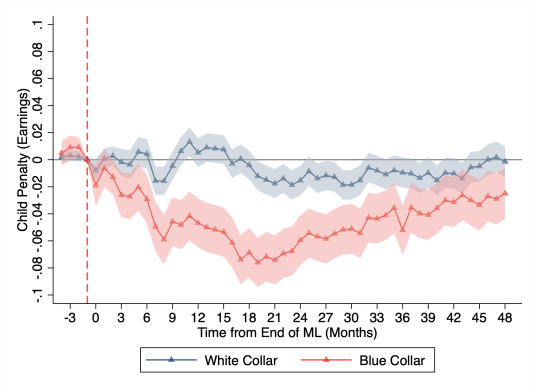
Figure A15: Effects of the Reforms on Participation: Heterogeneity

## Occupation

(a) Replacement Rate Reform

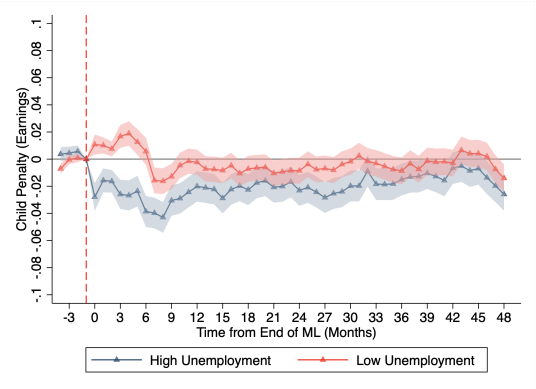



(b) Duration Reform

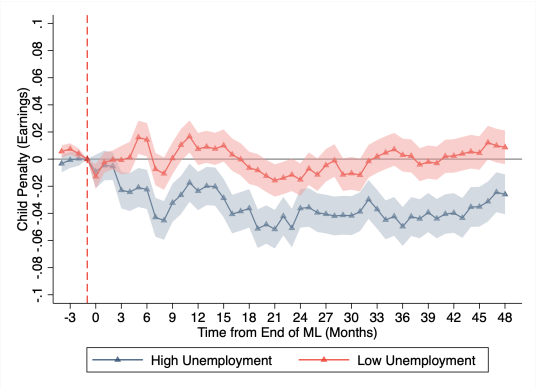



## Unemployment Rate

(c) Replacement Rate Reform




(d) Duration Reform




## Childcare Availability

**Notes:** The figures shows the estimated effects of increasing unemployment insurance generosity reform on the dynamics of female gross labor earnings for both reforms. Each panel reports estimates of $\beta_k$ coefficients from specification 1 on the probability of working (defined as having positive earnings and not being on leave or on unemployment) at time $t$ for different subgroups of workers. Panel A and B reports the results splitting the sample by occupation. Panel C and D reports the results by unemployment rate in the region of residence. Panel E and F reports the results by childcare availability. Shaded areas correspond to 95% confidence intervals.

# G Additional Tables

Table A1: Illustration of Partially Treated Mothers: Replacement Rate Reform

| | Timing of Resignations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Date of End of ML | $t=0$ | $t=1$ | $t=2$ | $t=3$ | $t=4$ | $t=5$ | $t=6$ | $t=7$ | $t=8$ | $t=9$ |
| up to 2012m3 | Old | Old | Old | Old | Old | Old | Old | Old | Old | Old |
| 2012m4 | Old | Old | Old | Old | Old | Old | Old | Old | Old | New |
| 2012m5 | Old | Old | Old | Old | Old | Old | Old | Old | New | New |
| 2012m6 | Old | Old | Old | Old | Old | Old | Old | New | New | New |
| 2012m7 | Old | Old | Old | Old | Old | Old | New | New | New | New |
| 2012m8 | Old | Old | Old | Old | Old | New | New | New | New | New |
| 2012m9 | Old | Old | Old | Old | New | New | New | New | New | New |
| 2012m10 | Old | Old | Old | New | New | New | New | New | New | New |
| 2012m11 | Old | Old | New | New | New | New | New | New | New | New |
| 2012m12 | Old | New | New | New | New | New | New | New | New | New |
| 2013m1 onwards | New | New | New | New | New | New | New | New | New | New |

**Notes:**

Table A2: Illustration of Partially Treated Mothers: Duration Reform

| | Timing of Resignations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Date of End of ML | $t=0$ | $t=1$ | $t=2$ | $t=3$ | $t=4$ | $t=5$ | $t=6$ | $t=7$ | $t=8$ | $t=9$ |
| up to 2014m7 | Old | Old | Old | Old | Old | Old | Old | Old | Old | Old |
| 2014m8 | Old | Old | Old | Old | Old | Old | Old | Old | Old | New |
| 2014m9 | Old | Old | Old | Old | Old | Old | Old | Old | New | New |
| 2014m10 | Old | Old | Old | Old | Old | Old | Old | New | New | New |
| 2014m11 | Old | Old | Old | Old | Old | Old | New | New | New | New |
| 2014m12 | Old | Old | Old | Old | Old | New | New | New | New | New |
| 2015m1 | Old | Old | Old | Old | New | New | New | New | New | New |
| 2015m2 | Old | Old | Old | New | New | New | New | New | New | New |
| 2015m3 | Old | Old | New | New | New | New | New | New | New | New |
| 2015m4 | Old | New | New | New | New | New | New | New | New | New |
| 2015m5 onwards | New | New | New | New | New | New | New | New | New | New |

**Notes:**

Table A3: Summary Statistics for the Full Sample of Mothers

| | Full Sample |
|---|---|
| Age | 33.51 |
| | (5.012) |
| Tenure | 22.49 |
| | (5.944) |
| Full Time | 0.65 |
| | (0.477) |
| Permanent | 0.93 |
| | (0.257) |
| White Collar | 0.60 |
| | (0.490) |
| Blue Collar | 0.31 |
| | (0.463) |
| Monthly Wage | 1417.99 |
| | (2970.3) |
| Monthly Earnings | 1521.19 |
| | (1280.4) |
| Small Firm ($< 15$) | 0.39 |
| | (0.488) |
| High Female Share Establishment | 0.50 |
| | (0.500) |
| High Quality Establishment | 0.65 |
| | (0.477) |
| Observations | 641607 |

**Notes:** The table reports summary statistics for the full balanced sample of mothers giving birth between 2012 and 2016. All variables are measured before the start of compulsory maternity leave ($t = -5$). Monetary quantities are expressed in 2010 prices. High quality establishment is an indicator equal to 1 if the worker is employed in a firm whose AKM firm effect is above the median.