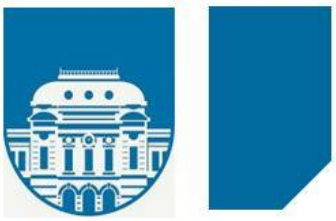

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Motherhood penalties: the effect of childbirth on women's employment dynamics in a developing country

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Resumen

La literatura económica ha identificado a la maternidad como un factor explicativo de la persistencia de las brechas laborales de género. La llegada de niños al hogar intensifica los roles tradicionales de género que afecta las brechas de género en el trabajo remunerado y no remunerado. Sin embargo, la evidencia empírica disponible refiere mayoritariamente a países desarrollados y poco se conoce de estas dinámicas para países en desarrollo. En este trabajo estimamos el impacto de la maternidad en el empleo formal y los salarios de las mujeres para Uruguay, uno de los países Latinoamericanos con mayores tasas de participación laboral femenina. A través de la metodología de estudio de eventos, y con base en registros administrativos de historias laborales para los años 1996 a 2015, encontramos una importante penalización por maternidad: los salarios mensuales se reducen 19% un año después del nacimiento del primer hijo y dicho efecto no logra revertirse alcanzando 36% luego de 10 años. Esto se explica por una reducción en el empleo formal y, en menor medida, también por la reducción en el salario por hora. A su vez, encontramos que las mujeres de menores salarios enfrentan las mayores penalizaciones.

Palabras clave: desigualdades de género, maternidad, empleo formal, estudio de eventos, Uruguay.

Abstract

The economic literature has pointed to motherhood as an explanation for the persistence of labor gender gaps. The arrival of children intensifies the traditional gender roles that affect gaps in paid and unpaid work. However, the evidence is mostly for developed countries, and little is known about these dynamics in developing contexts. We estimated the impact of motherhood on women's formal employment and wages for Uruguay, one of the Latin American countries with the highest female labor force participation rates. Through an event-study approach, we used administrative records on labor histories for the period 1996-2015 and found an important motherhood penalty: monthly wages reduce by 19% a year after childbirth, and this drop continues to increase, reaching 36% after 10 years. This is explained by a reduction in formal employment and, to a lesser extent, also a reduction in hourly wages. We also showed that low-wage women face unquestionable higher penalties.

Keywords: gender inequality, motherhood, formal employment, event-study, Uruguay.

JEL classification: J13, J16, J22, J31.

1 Introduction

During the last century, women were the focus of important changes in the labor market, due both to a strong increase in female labor force participation and qualitative changes of their labor market insertion (Goldin, 2006). There was also a reduction -and even a total reversion- in education gender gaps (Blau & Kahn, 2017), but gender gaps in participation rates and wages persist. Particularly in developing countries, the efforts in closing the gender gap in labor force participation have not been successful (Klasen, et al., 2019). In Latin America, gender gaps narrowed sharply until the 2000s, followed by a period of stagnation (Gasparini & Marchionni, 2015).

Evidence reveals the importance of motherhood and family responsibilities as an explanatory factor in the persistence of gender gaps in the labor market. Empirical work has consistently found negative effects of motherhood on women's employment and income trajectories but mostly the absence of substantive changes in men's work dynamics (Angelov, et al., 2016; Berniell, et al., 2018; 2021; Kleven, et al., 2019; Kleven, et al., 2019) (Kunze, 2020). Thus, the arrival of children intensifies traditional gender roles in the household, which have direct implications in labor gender gaps.

The mechanisms through which motherhood could affect female employment are diverse (Rönsen & Sundström, 1996; Lundberg & Rose, 2000; Budig & England, 2001; Kunze, 2016). The arrival of a child affects the reservation wage in two opposite senses: it increases the demand for care (increasing the reservation wage) and increases the demand for income (decreasing the reservation wage). Besides, the expected market wage may be affected: the career interruption due to maternity can lead to a loss of experience and human capital depreciation, while the anticipation of the wage penalty can affect investment decisions in human capital even before motherhood (Mincer & Polachek, 1974). In addition, social norms are an important ingredient to model decisions of time assignment between childcare and the labor market.

In this work, we analyze the impact of the first child on women's employment and wages in the formal sector in Uruguay. Uruguay is among the Latin American countries with the highest female labor force participation rates (Gasparini & Marchionni, 2015). However, gender equality is still far off. In the last decade, the male employment rate was 70% whereas the female rate was less than 40%. This gap is related to the behavior of women

with children; indeed, women without children register similar employment rates than men.

The estimation of a causal relationship between motherhood and labor market outcomes is challenging because unobservable characteristics may simultaneously affect both dimensions. Besides, motherhood may be the result of poor labor market outcomes. To deal with endogeneity we follow Kleven et al. (2019) and Berniell et al. (2021), who apply the quasi-experimental approach of events methodology.

We use administrative records of labor histories of the Social Security Institute (BPS by its Spanish initials) between April 1997 and April 2015. The event is defined as the month of the first labor interruption due to maternity leave. This program covers private workers in the formal sector, allowing them to receive a benefit during 12 weeks around childbirth.[2] We restrict the sample to women employed in the private formal sector who benefited from the program at an age between18 and 40 and who contributed to the social security system at least two months before the use of maternity leave.

The results indicate that there is an important negative impact of maternity on wages. Monthly wages drop 19% a year after childbirth, and this penalty not only fails to reverse in the medium and long term but continues to increase, reaching 36% after 10 years. This is explained by a reduction in formal employment and, to a lesser extent, a reduction in hourly wages. These penalties over monthly wages are quite similar to those found by Kleven et al. (2019) for developed countries (20-60%), as well as for developing countries as evidenced by Berniell et al. (2021) for the Chilean case (20-30%). We also found that low-wage women face unquestionable higher penalties on monthly wages and formal employment compared to high-wage women.

Our study contributes to the empirical literature on family and employment through a case-study approach that uses a novel source of information not common in developing countries, the administrative records on labor histories. Additionally, this work adds to the only existing study for Latin America that provides evidence for Chile (Berniell et al., 2021) by providing rigorous empirical evidence of significant motherhood penalties in Uruguay. This case study is relevant as Uruguay is among the Latin American countries

[2] Since November 2013 the program entitles a 14-week leave.

with the highest female labor force participation rates (Gasparini & Marchionni, 2015) but still with persistent gender gaps. In particular, both countries exhibit different gendered patterns, and the gender gaps in labor market outcomes are more pronounced in Chile than in Uruguay (Amarante, et al., 2016). Finally, we aim to contribute to better evidence-based policies in developing countries aimed at the redistribution of childcare and the reduction of gender gaps in the labor market. This study will allow a better understanding of women's employment dynamics by generating evidence about whether maternity leave has the desired effect of job protection. This is a widely used policy instrument that seeks to balance work and family life, but empirical evidence indicates that it is not gender-neutral and it may have negative consequences on the labor outcomes of mothers (Ruhm, 1998; Lalive & Zweimüller, 2009; Ejrnæs & Kunze, 2013; Thévenon & Solaz, 2013; Grimshaw & Rubery, 2015; Evertsson, 2016). In Uruguay, this is a current political issue since parental leaves have recently been modified to promote co-responsibility between fathers and mothers, although the effects are still under study.

In the following section, a review of the main literature regarding motherhood effects on wages is presented along with a brief context on gendered labor patterns in Uruguay. The empirical strategy and the description of the data are developed in the third section, and in the fourth section, the main results are presented. Finally, the fifth section concludes.

2 Motherhood and the labor market: background

2.1 Literature review

Empirical studies that aim to estimate the causal effects of motherhood on labor market outcomes have to deal with problems of unobservable heterogeneity. Indeed, if there are unobservable characteristics that simultaneously affect the propensity of becoming a mother and labor market outcomes, then motherhood is endogenous and causality cannot be inferred. We can track in the international literature three identification strategies based on longitudinal data. Most of the studies, whatever the methods, conclude that motherhood has negative effects on mothers' labor outcomes, but the effect of fatherhood is negligible. In this section, we focus on studies that use the same methodological approach like this work.

One of the empirical strategies followed in this literature is the estimation of fixed effects and random effects models (Waldfogel, 1997; 1998; Lundberg & Rose, 2000; Budig &

England, 2001; Bertrand, et al., 2010; Wilde, et al., 2010). Fixed effect models fail to completely mitigate the unobservable bias. If unobservables affect the outcome not only directly but also indirectly through other personal characteristics that affect employment, then the bias is not entirely eliminated. Additionally, if motherhood occurs in anticipation of a fall in employment, these models also fail to eliminate bias.

Another strand of studies uses instrumental variables to overcome endogeneity (Angrist & Evans, 1998; Lundborg, et al., 2017). But the use of instrumental variables is not without criticism, highlighting the difficulty of finding an instrument that meets all the requirements.

More recently, new evidence has used the event-study approach. Angelov, Johansson, and Lindahl (2016) study couples in Sweden before and after the birth of the first child; they find that 15 years after childbirth, there is an income gap of 35 percentage points (pp), mainly explained by women's maternity leave exit. Moreover, the hourly wage gap between couples increases on average 10 pp, and the penalty is greater the larger the pre-birth gap. The results are consistent with home-based negotiation models, based on comparative advantages where the spouse with the lowest opportunity cost faces the highest cost of parenthood.

Kuziemko et al. (2018) study the effect on women's employment in the US and UK. They find negative effects in both countries but of a different magnitude: a reduction that ranges from 25% to 40% in the US and a drop of 40% in the UK. These effects are almost entirely completed in the year after childbirth.

Kleven et al. (2019) compare motherhood's penalties in Denmark, Sweden, Germany, Austria, the UK, and the US. Denmark and Sweden face the lowest long-term penalties (7–13%), while the UK and the US have the largest (43–44%). For Denmark, they perform a decomposition analysis and find that the gender labor gap component attributable to the first child has increased considerably, going from 40% in 1980 to 80% in 2013 (Kleven, Landais, & Søgaard, 2019). They also find an hourly wage penalty in Denmark, Sweden, Germany, and Austria, but this penalty is not important in the UK and US.

Evidence for other countries is scarcer than for developed countries. Chen, Zang and Zou (forthcoming) study the evolution and mechanisms behind the high within-firm gender

wage differential in China. The authors find that although the gap between male and female employees is small in the early career stages, it increases with marriage and childbearing. Two studies for Latin America follow the proposal by Angrist and Evans (1998), consisting of estimating the effect of third birth by exploiting the variation in sex of the first two children as an instrumental variable. Tortarolo (2014) conducts a study for 14 Latin-American countries and does not find significant effects on female employment; however, he finds a negative effect on married women's employment. Instead, Cruces and Galiani (2007) find negative effects on female employment for Argentina and Mexico, of similar magnitude to those found for the US. Finally, Berniell et al. (2018, 2021) analyze the Chilean case using an event-study approach. They find a 17% reduction in female employment 10 years after the birth of the first child, and an increase in the likelihood of part-time and informal work. Though they do not find significant effects on hourly wages, changes in employment lead to a drop in labor income of 20–30%.

2.2 Gendered patterns of labor outcomes in Uruguay

Gender gaps in the Uruguayan labor market have declined steadily since the 1980s (CIEDUR, 2017). Female participation has increased considerably, from 41.4% in 1986 to 54.9% in 2019, whereas male participation looks relatively flat. However, the gender gap in labor force participation continues at high levels, being 15.2 pp in favor of men in 2019. Similar patterns characterize the employment rate: female employment grew 14 pp between 1986 and 2019 whereas male employment accompanied the business cycle. This gender gap is explained to a greater extent by demand factors -gender stereotypes, labor market characteristics- than by observable characteristics on the supply side (Espino, et al., 2014).

At the same time, the evolution of labor outcomes has been favorable also regarding job quality. Labor informality, defined as noncontribution to social security, has decreased 10 pp since 2006. This improvement occurred more strongly among women so that the gender gap in informality has currently vanished (OIT-MTSS, 2019).

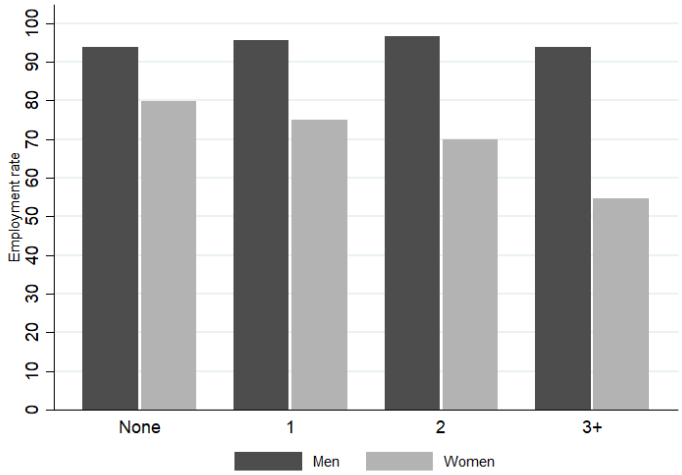
Although women's involvement in the labor market increased, women still face wage discrimination and occupational segregation (Espino, 2013). These disadvantages are more severe for high- than low-educated women (Borraz & Robano, 2010; Azar, et al., 2015).

Moreover, the incidence of informality is higher among less-educated women than among more educated ones (40% and 10% of female employment in 2013, respectively).

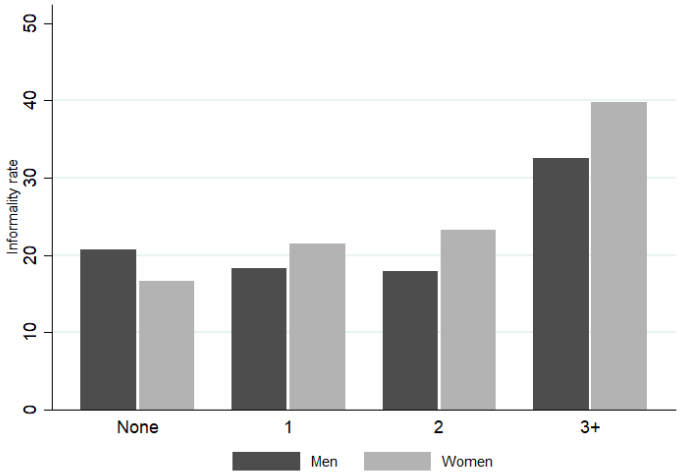
In this context, Uruguay is positioned as one of the Latin American countries with the highest female labor force participation rates (Gasparini & Marchionni, 2015). However, there is strong heterogeneity in women's work behavior according to the presence of children, as verified by international evidence (Kunze, 2016). Indeed, female participation growth has been more intense among married than nonmarried women (Espino, et al., 2009). In Fig. 1 we show the employment rate of household heads and spouses by the number of children under 12 years of age. The childless women's employment rate is lower than men's, and this gap increases with the number of children due to a reduction of female employment. Meanwhile, informality is slightly higher among men than women when there are no children. But the gender gap reverses when there are children and increases with their number.

Fig. 1 Labor outcomes by sex and number of children, 2019

a) Employment rate



b) Informality rate



Source: Own calculation based on microdata of the ECH/INE 2018. Notes: The employment rate is calculated as the ratio between the number of people employed and people of working age. Only men and women between 14 and 49 years of age who report being the household head or spouse are considered. Children are defined as the number of sons and daughters of head and/or spouse under 12 years of age in the household.

Several indicators suggest that motherhood is an event that is experienced at a life cycle stage in which women are already working in the labor market, and seems to have effects on future employment dynamics. Indeed, according to data from the 2013 National Youth Survey, the female age of entrance in the labor market was on average 18.2; estimates for 2011 indicate that the average age at the time of the first child was 24.7 (Nathan, 2015). In

turn, according to data from the 2015 Reproductive Behavior Survey, approximately 40% of women were not working at the time of the birth of their first child, 40% were employed and continued to be employed, and 20% were employed but stopped working for more than one year after childbirth.

Unsurprisingly, gender gaps in employment are accompanied by gender gaps in home production that intensifies with motherhood. In a life cycle analysis, Bucheli, González, and Lara (2019) point out that the gender gap in time spent in household activities exists within the single population but increases when couples move to live together and widens sharply with the arrival of the first child. In fact, the care of children is a task mostly assumed by women. In Uruguay, according to data from the 2013 Time Use Survey, women perform 70% of unpaid work (Batthyány, et al., 2015). Among people involved in care tasks, the weekly workload is 22 hours per week for women and 17 for men. These inequalities deepen within the population of those with fewer resources.

Public allowances to support maternity leave date back to 1958, but the program that covers most of our period of study entered into force in 1980. The law provided that female dependent workers in the private sector had to leave their job six weeks before the due date of childbirth and six weeks after birth with 100% of wages replaced. In 2013, the maternity leave was extended from 12 to 14 weeks and to some self-employed. The benefit is paid by BPS, and there are no eligibility requirements. This means that mothers do not need to have contributed to the social security system to access the benefit. In practice, the application begins at the doctor's office, which facilitates widespread coverage.

3 Research design

3.1 Methodology

To study the impact of motherhood on labor dynamics we use the quasi-experimental approach of event-study that exploits the discontinuities around some defined event.[3] In this study, the event is the birth of the first child identified by the first work interruption due to maternity leave.

[3] For a more detailed explanation of the methodology see Borusyak and Jaravel (2017), Abraham and Sun (2020), and Kleven, Landais, and Søgaard (2019).

By analyzing the evolution of the outcome variable before and after the event, this approach allows us to estimate causal effects when all the individuals under analysis receive treatment but at random periods. In this analysis, the identification of causal effects is the individual variation in the age and period (month and year) in which the event is experienced for each woman in the sample. This variation allows us to identify temporal trends and dynamic effects separately by comparing results between those who have experienced motherhood and those who have not yet done so but will do. Thus, assuming that the timing of the child's birth is not determined by the labor outcomes conditional on being a mother allows us to deal with endogeneity problems. While the main assumption in identifying short-run effects is that non-child labor outcomes evolve smoothly over time, the identification of long-run effects relies on further assumptions. On the one hand, the smoothness assumption is no longer sufficient, as we cannot fully control for all non-child components of labor dynamics.[4] On the other hand, for women who have more than one child, we capture the effect of total fertility and not only the first-child effect.

We estimate the following equation for individual i in period t (month/year):

$$Y_{it} = \sum_{\tau \neq -12} \beta_\tau . I(e_{it} = \tau) + \sum_j \gamma_j . I(j = age_{it}) + \sum_y \alpha_y . I(y = \text{month}) + \varepsilon_{it}$$

where Y_{it} is the labor outcome variable (monthly wages, employment, part-time employment, and hourly wages). Each individual i is treated (i.e., experiences the event) at period E_i, and remains treated from then on, with $e_{it} = \text{t} - E_i$ being the number of months between period t and the period when the event takes place. We denote τ as the normalized time variable that takes the value $\tau = 0$ the month of the event in which the woman enters into the maternity leave program. In the estimation we consider the time elapsed between 12 months before the event and up to 120 months after. The series of parameters β_τ are the event study coefficients that indicate the dynamics effects relative to 12 months just before the event (omitted variable: $\tau = -12$); $\tau < 0$ refers to pre-trends and $\tau > 0$ indicates the dynamic effects of motherhood after the event. We also include age dummies to control for life-cycle trends (γ_j coefficients) and period dummies to control for temporal trends (α_y

[4] As explained in Kleven, Landais, and Søgaard (2019), one possible solution to this caveat is to include women who have never had a child as a control group.

coefficients). Individual fixed effects are not included since they synthesize the effects considered above.[5]

As is common, the results are presented as the effect relative to the counterfactual labor outcome of women without children. We interpret the estimated effects obtained for 12 months after the event as short-term effects, results for 60 months as medium-term effects, and results for 120 months as long-term effects.

3.2 Data

The analysis is based on administrative data of labor histories for female workers registered in the social security institute of Uruguay (BPS). The data set consists of people randomly selected from those who contributed to social security for at least one month in the period between April 1996 and April 2015. Although there is no information on the date of birth or the number of children, data allow us to identify the reason for work interruptions. Thus, we can identify women who accessed the maternity leave program and when they did it.

We use the information of women aged between 18 and 40 years old when they accessed maternity leave for the first time. Also, to ensure that for all women we observe the employment status 12 months before the event, we restrict the sample to maternity leaves taken between April 1997 and April 2015. We drop women who retired or died during the analyzed period.

Ideally, we would not impose any additional restrictions to ensure comparability with other studies. However, as there is no requirement of a minimum number of monthly social security contributions to access the benefit, the sample excludes women whose registers correspond uniquely to their maternity leave coverage. Besides, employers may register women working in informality when they become pregnant to shut out suspicious of evasion. In any case, we assess that these behaviors may bias the estimates. Thus, we keep women who contributed to social security at least two months before the maternity leave period began.

[5] The estimation procedure is based on codes by Kleven, Landais, and Søgaard (2019): https://www.openicpsr.org/openicpsr/project/116366/version/V1/view

Women whose first labor interruption occurs after April 2005 cannot be followed over 120 months. Thus, we work with an unbalanced panel of monthly data corresponding to employment records for the period between 12 months prior and up to 120 months after the first maternity leave.

Note that the results from this work should be interpreted in light of the characteristics of the available data that do not include women who were unemployed or employed in informality during first childbirth. Additionally, there is no detailed information on the number of children and the date of delivery, so the event refers to the first use of maternity leave as a proxy for the first child.

We build four variables of outcomes. First, we generate a binary variable of employment that takes the value of 1 the month the woman is employed and 0 if she is not; the variable takes the value of 1 the months in which the woman is covered by the maternity program. Second, we build a monthly wage variable equal to the sum of labor earnings of all occupations. Wages are measured in Uruguayan pesos indexed to the CPI of April 2015. The value variable takes the value of 0 the months the woman does not work, including the period in which she is covered by the maternity program. Third, based on this variable, we calculate the hourly wage for employed women; the variable is missing the months that the woman does not work. Finally, we build a binary variable of part-time employment that takes the value of 1 when the woman works more than 20 hours per week and 0 when she works fewer hours;[6] the variable is missing the months the woman does not work. Thus, estimations of wages are unconditional on employment but estimations of hourly wages and part-time work are conditional on being employed.

Table 1 summarizes some characteristics regarding age and the use of maternity leave. Women in the sample enter the formal labor market with 23 years of age on average, which is higher than that estimated for total young women (18 years of age) on the basis of the 2013 National Youth Survey. This difference may be explained by the fact that our sample is restricted to formal jobs and does not consider informal ones which are important among young workers. The average age at first maternity leave interruption is 28: 28.4% of the

[6] Despite the fact that most of the empirical works consider a threshold of 30 hours per week, for the Uruguay case 20 hours seems more reasonable.

women in the sample were mothers before age 25 and 61.0% before age 30. According to Nathan (2015), in 2011 the average age at first birth in Uruguay was 24.7, and there was evidence for the existence of a bimodal pattern with peaks at 20 years and 30–32 years.

Table 1 Demographic and maternity characteristics

Variable	Average / proportion
Age at first job (years)	23
Age at first use of maternity leave (years)	28
Distribution of age at first use of maternity leave (percentage)	
Less than 25	28.4
25 to 39	32.6
30 to 49	26.1
35 to 40	12.9

Source: Own calculations based on labor histories of BPS. Notes: The sample corresponds to women who made use of maternity leave for private workers for the first time between April 1997 and April 2015, between 18 and 40 years of age, and were formal workers during the two months before the maternity leave period began.

Table 2 shows some characteristics of women's employment for the total sample and according to time to and from motherhood. The analysis is performed by normalizing to zero in the month the maternity leaves begin and considering 12 months before childbirth as well as four, six, 12, 60, and 120 months after birth.

The employment rate grows up to the month the maternity leaves begin when—by construction—100% of women are employed. In the months after childbirth, employment decreases steadily, reaching lower levels than those of 12 months before motherhood. Monthly wages are lower in the 12 months before motherhood and grow up to 120 months later, both for the unconditional and the conditional to employment status. Hourly wages follow the same pattern. Finally, the proportion of women who work part-time slightly increases after motherhood. It is important to note that these figures are not controlled by life cycle trends that affect labor outcomes.

Table 2 Average value of labor outcomes at different months to/from the event

Month	Employment (%)	Monthly wage ($)		Hourly wage ($) (Cond.to employment)	Part-time (%) (Cond. to employment)
		Uncond. to employment	Cond. to employment		
-12	77	15.555	20.086	133	11
0	100	19.433	19.433	136	10
4	83	14.344	17.236	113	10
6	77	14.562	18.923	133	12
12	70	14.797	21.237	146	12
60	60	15.104	25.066	163	11
120	59	18.335	31.077	201	10

Source: Own calculations based on labor histories of BPS. Notes: The sample corresponds to women who made use of maternity leave for private workers for the first time between April 1997 and April 2015, between 18 and 40 years of age, and were formal workers during the two months before the maternity leave period began. Wages measured in Uruguayan pesos indexed to the CPI of April 2015 (1 USD = 26 Uruguayan pesos).

4 Results

In this section, we first analyze the overall results that arise from the estimation of the model. Then we show the findings for women of different income levels, aiming to detect possible heterogeneous effects. Finally, we present some robustness checks.

4.1 Effect on wages and employment

In Fig. 2 we show the dynamic effects on women's careers between 12 months before childbirth and 120 months after birth. The estimates should be interpreted as the percentage change from the year before the event relative to the change for women without children in the same period. We include in the graphs the 95% confidence intervals using robust standard errors, although in some cases they are imperceptible due to the estimation accuracy that arises from working with administrative records with a large number of cases. Table 4 in the Appendix shows a summary of the motherhood effects and their confidence intervals for each year after the event.

In graph (a) at the top and at left we see the monthly wage trajectory. The peak of the curve corresponds to the month in which mothers enter into the maternity leave program since the payment of the allowance is made at a single time. This peak is followed by a steep negative slope which is driven by the fact that many women leave the formal labor market once the maternity leave ends. So, the end of the drop of the curve coincides with the expected end of the coverage period. From then on, the trajectory illustrates a gradual and sustained reduction of wages. In the short-term -12 months- motherhood means a reduction of monthly wages of 19%; in the medium-term -60 months- the fall is 31%; and in the long-term -120 months- it is 36%.

Graph (b) of Fig. 2 shows the estimated effects for formal employment. The peak in the curve corresponds to the sample restrictions mentioned before—all women contributed to social security at least two months before the maternity leave period began—and the fact that during the maternity leave women are included in social security. Thus, the trajectory of monthly wages is driven mainly by employment shifts. Indeed, as we may see, there is a substantial reduction in formal employment after maternity in the first year, and this penalty not only fails to reverse in the medium and long term but continues to increase. We estimate that motherhood reduces formal employment by 13% after 12 months, 29% after 60 months, and 36% after 120 months. These results raise the question regarding whether

the program does effectively achieve its goal of protecting employment or not. A possible lack of time for the care of newborns would mostly fall on women and would harm their employment.

These long-term motherhood effects make Uruguay form part of the group of countries with the largest penalties if we compare those found by Kleven et al. (2019) for the Nordic countries (7–44% depending on the country) and Kuziemko et al. (2018) for the US and the UK (40%). Recall that we are measuring the effects on formal employment, and unlike developed countries, in developing contexts labor informality is important. It is possible that in Uruguay motherhood provokes shifts from formality to informality; if that is the case the effects on employment are overestimated. Studies for the Chilean case give rise to this question. Berniell et al. (2018) estimate the effect on employment whatever the formality condition in Chile and find a penalty of 17%. Interestingly, Berniell et al. (2021) find that after maternity female labor informality rate for women in Chile increases. Unfortunately, this point is beyond the scope of this research due to the availability of information. At this point, it is important to highlight that a shift from formality to informality is also a penalty. Indeed, informality is a barrier to access several social security programs such as unemployment insurance and pensions.

In graph (c) of Fig. 2 we depict the trajectory of part-time employment. In the short run, motherhood increases part-time work. As employment falls, we should interpret that there is a shift from full to part-time formal participation in the labor market, which would help to reconcile market work and child care. This effect may be due either to the reduction of working hours in each job or to the reduction of multiple employment. Overall, the effects on part-time work decline as time passes and vanish in the long-term. As this result could be sensitive to the definition of part-time work, we replicate the estimates with a threshold of 30 hours per week. We obtain similar results but of lower magnitude.[7] This result suggests that women who worked between 20 and 30 hours per week before motherhood are more likely to reduce their time spent in the labor market than the ones who had higher ties with the labor market (worked less than 30 hours).

[7] Estimation available upon request. A previous version of this study (Querejeta, 2020) shows a decline in part-time work using a threshold of 30 hours per week, a more restricted sample (women who were formal workers during the 12 months before the maternity leave), and hours worked in the main occupation. Thus, the result is sensitive to the sample and/or consideration of main or all jobs.

Finally, graph (d) illustrates the evolution of the hourly wage. There is also evidence of a motherhood penalty on this variable, although of smaller magnitude. It declines 4% in the short-term, 10% in the medium-term, and 13% in the long-term.

Fig. 2 Motherhood effects

Source: Own calculations based on labor histories of BPS. Notes: The sample corresponds to women who made use of maternity leave for private workers for the first time between April 1997 and April 2015, between 18 and 40 years of age, and were formal workers during the two months before the maternity leave period began. The figure shows the effect relative to the year before childbirth ($\tau = -12$) as a percentage of the counterfactual outcome of women without children. Fixed effects by age and period (month and year) are included as control variables. The effects on monthly wages and formal employment are unconditional on employment status, and the effects on part-time employment and hourly wages are conditional on being employed. 95% confidence intervals based on robust standard errors.

Table 3 Summary of motherhood effects

Outcome variable	Short-term (12 months)	Medium-term (60 months)	Long-term (120 months)
Monthly wages	-19%	-31%	-36%
Formal employment	-13%	-29%	-36%
Part-time employment	17%	4%	-2%
Hourly wages	-4%	-10%	-13%

Source: Own calculations based on labor histories of BPS. Notes: The sample corresponds to women who made use of maternity leave for private workers for the first time between April 1997 and April 2015, between 18 and 40 years of age, and were formal workers during the two months before the maternity leave period began. The table shows the effect relative to the year before childbirth ($\tau = -12$) as a percentage of the counterfactual outcome of women without children. Fixed effects by age and period (month and year) are included as control variables. The effects on monthly wages and formal employment are unconditional on employment status, and the effects on part-time employment and hourly wages are conditional on being employed. The estimated long-term effect on part-time employment is not statistically significant.

4.2 Heterogenous effects

In this section, we analyze possible heterogeneous effects according to the wage level. We split women into two groups according to whether their average hourly wage in the observed period—12 months before and up to 120 months after motherhood—is above or below the median of those hourly wages. The same model is estimated separately for each group. The dynamic effects are depicted in Fig. 3.

In the short and medium-terms, the low-wage women face unquestionable higher motherhood penalties over monthly wages and formal employment compared to high-wage women. Their negative short-term effect is more than double the penalty suffered by high-wage women, and these gaps widen in the medium-term. Instead, in the long-term, the differential effect on the monthly wage vanishes. But the heterogeneous effect on formal employment remains: 10 years after childbirth the drop is 20% for high-wage women and 40% for low-wage women.[8]

Meanwhile, the response in terms of the intensity of work is similar for both groups. As illustrated in graph (c), the trajectories of low- and high-wage women regarding part-time work move jointly in the same range of values.

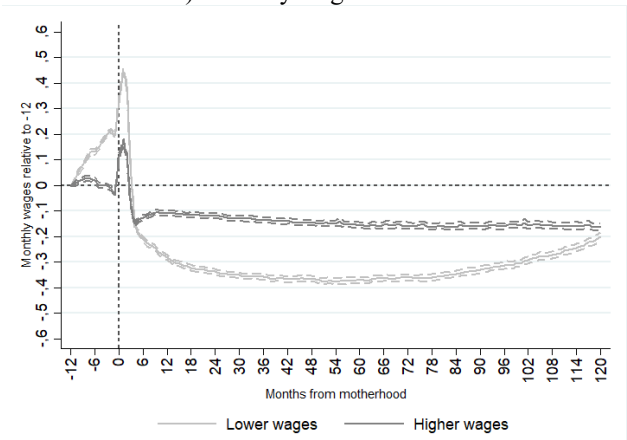
Finally, graph (d) shows the effect on hourly wages. Once again, we appreciate different effects. There is no impact on hourly wages of high-wage women, whereas low-wage

[8] Previous versions of this study (Querejeta, 2020) show different patterns for the heterogeneous effects. This is for two reasons: i) categories are defined relative to the median of average hourly wage for the entire period, and in the aforementioned study it was done with hourly wages in the year prior to maternity; and ii) here we consider the wages of all jobs, while in the previous version only the wages of the main occupation were considered.

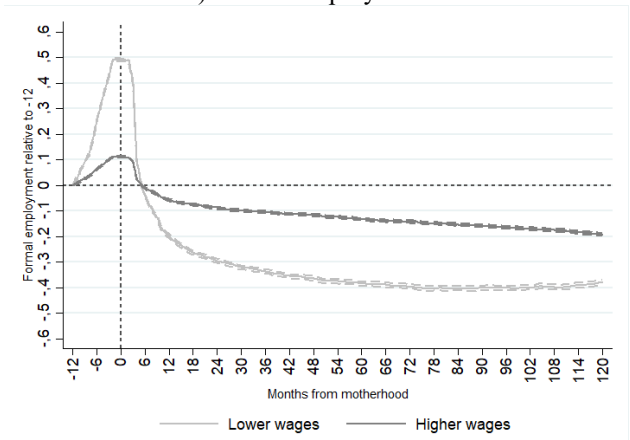
women benefit from a positive effect in the long-term. These apparently surprising results may be due to the fact that women who exit the labor market are the worse paid, especially among low-wage women.

Fig. 3 Motherhood effects, by wage level

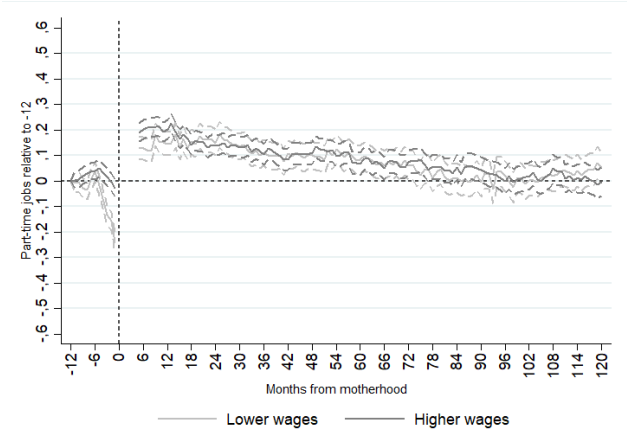
a) Monthly wages



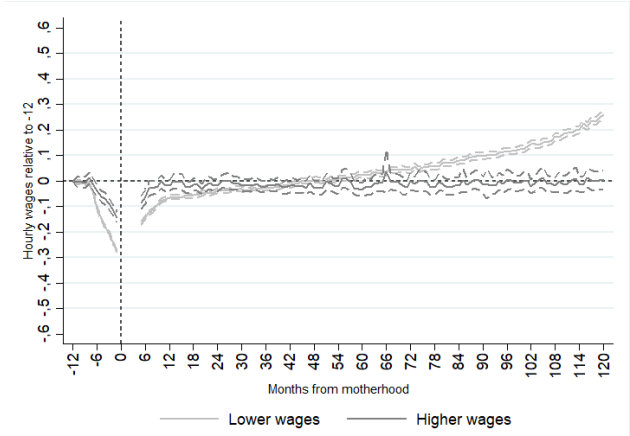
b) Formal employment



c) Part-time employment



d) Hourly wages



Source: Own calculations based on labor histories of BPS. Notes: The sample corresponds to women who made use of maternity leave for private workers for the first time between April 1997 and April 2015, between 18 and 40 years of age, and were formal workers during the two months before the maternity leave period began. The figure shows the effect relative to the year before childbirth ($\tau = -12$) as a percentage of the counterfactual outcome of women without children. Fixed effects by age and period (month and year) are included as control variables. The effects on monthly wages and formal employment are unconditional on employment status, and the effects on part-time employment and hourly wages are conditional on being employed. 95% confidence intervals based on robust standard errors. "Lower wages" corresponds to women whose average hourly wages are below the median, and "Higher wages" to those whose average hourly wages are above the median.

4.3 Robustness checks

In this section we summarize the results of some alternative estimations to provide robustness checks on the results. All estimations are shown in the Appendix.

First, we re-estimate the main model using different balanced subsamples. In the main estimation, in which we used an unbalanced panel, the number of months observed after

the event depends on the calendar month of the entrance into the maternity leave program. The use of balanced subsamples, in which persons are observed over the entire period, mitigates possible biases due to changes in the composition of the sample. We check the results with three subsamples: one includes the cases for which there are registers at least up to 12 months after childbirth (we called it Subsample 12); a second includes cases with registrations at least up to 60 months (Subsample 60); and the third subsample includes cases with 120 months of registers after the event (Subsample 120).[9] The results are presented in Fig. 4. The trajectories up to month 12 are similar for the three subsamples and the unbalanced sample. Though there are statistically significant differences, their magnitude is negligible. In the case of Subsample 60, the trajectory overlaps with that obtained in the main results. However, for monthly wages and formal employment, the long-term effects obtained with Subsample 120 and the unbalanced panel are different. As mentioned, the estimates with the unbalanced panel indicated that motherhood reduced monthly wages and employment by 36%. Meanwhile, now the drop in monthly wages is close to 40% and the decline in employment is more than 40%. Thus, the estimations of dynamic effects are robust to changes in the composition of the sample for the identification of short- and medium-term effects, but not for long-term effects. In particular, the results would indicate that the women who make up the 120-month subsample (those who had their first child before April 2005) face higher maternity penalties than the total of analyzed women.

Second, a robustness analysis is performed by using a placebo for the starting date of the maternity leave. That is, entrance to the program (first birth) is randomly modified, so we expect to find no effects after the occurrence of this false event. The horizontal curves at 0 shown in Fig. 5 indicate there are no significant impacts of placebo maternity.

Finally, we estimate the model for a sample of women with more attachment to the formal labor market than in the main sample. In this case, we restrict the sample to women who were formal workers during the 12 months before the maternity leave period began. The results are presented in Fig. 6. Although the patterns are similar, the estimates are of quite greater magnitude.

[9] That is, for the construction of Subsample 12 we consider only those births that occur before April 2014; for Subsample 60, births that occur before April 2010; and for Subsample 120, only births that occur before April 2005.

5 Final comments

Despite increasing female labor force participation and decreases in the gender gap since the 1980s, there is still strong heterogeneity in women's work behavior according to the presence of children in the household. This study investigates the causal effect of maternity on the career of women in Uruguay based on administrative data of labor histories. Our results indicate a significant drop in formal labor outcomes after maternity, in particular, after the fourth month, which corresponds with the end of the maternity leave benefit. Results show that in the short-term motherhood reduces monthly wages by 19%, employment by 13%, and hourly wages by 4%. This motherhood penalty not only fails to reverse in the medium and long terms but continues to increase. At a point 10 years after the event, effects reach 36% for monthly wages and employment, and 13% for hourly wages. Meanwhile, though part-time work increases in the short-term, the effect diminishes as time passes and vanishes in the long-term.

The negative effect of motherhood on employment is around twice the level for low-wage than for high-wage women during all the studied trajectories. We also find a gap among women in the short-term effect on monthly wages that disappears in the long-term. But this vanishing may be explained by a change in the composition of women stemming from the exit from formal employment.

These results are robust to various tests. However, one of the disadvantages of the data is that it does not allow the study of informal work or births that occur outside formality. They also do not provide information on the number of children. Thus, we do not know how much of the reduction in formal employment is due to exiting the labor market or entering the informal labor market. As mentioned, this is an important issue in developing countries. Despite this, both effects are considered a penalty over the work trajectory of women. Indeed, informality is a barrier to access several social security programs such as unemployment insurance and pensions.

In summary, this study provides robust evidence of the importance of motherhood in the persistence of gender gaps in the labor market. We also found that motherhood penalties are stronger for low-wage women. In this context, the design of policies for the care of newborns that promote the redistribution of care's costs is a key consideration to achieve balance in work and family responsibilities that would enable women's economic

autonomy and labor development, and also to generate improved allocation of resources that would promote economic and social development (Salvador, 2013). In turn, the increase in female employment would positively affect poverty reduction and income concentration (Parada, 2016).

We expect these findings to contribute to the empirical literature on family and employment by analyzing the case of Uruguay in the context of scarce evidence for developing countries. Additionally, this study provides relevant evidence to contribute to better evidence-based policies in developing countries aimed at the redistribution of childcare and the reduction of gender gaps in the labor market.

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Appendix

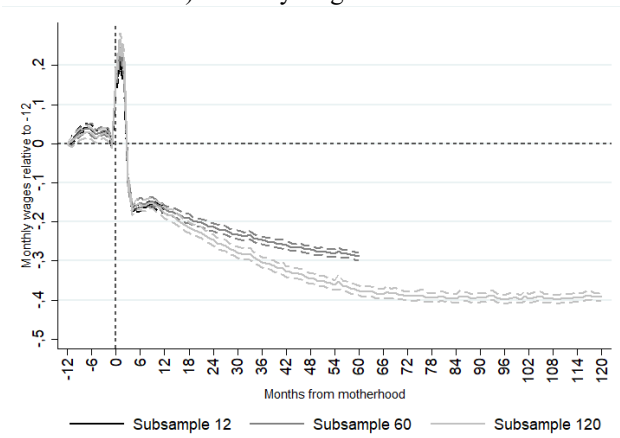
Table 4 Motherhood effects, selected months

Months from motherhood	Monthly wages			Formal employment		
	Estimated effect	Lower bound	Upper bound	Estimated effect	Lower bound	Upper bound
-6	0,0303	0,0189	0,0418	0,1402	0,1365	0,1438
0	0,1351	0,1255	0,1447	0,2620	0,2590	0,2649
12	-0,1858	-0,1944	-0,1772	-0,1343	-0,1386	-0,1299
24	-0,2224	-0,2312	-0,2137	-0,2002	-0,2047	-0,1957
36	-0,2578	-0,2666	-0,2490	-0,2373	-0,2418	-0,2327
48	-0,2857	-0,2944	-0,2769	-0,2655	-0,2701	-0,2608
60	-0,3116	-0,3204	-0,3027	-0,2920	-0,2967	-0,2872
72	-0,3282	-0,3384	-0,3180	-0,3110	-0,3158	-0,3061
84	-0,3459	-0,3549	-0,3369	-0,3280	-0,3330	-0,3230
96	-0,3530	-0,3621	-0,3438	-0,3414	-0,3465	-0,3363
108	-0,3570	-0,3664	-0,3476	-0,3513	-0,3565	-0,3460
120	-0,3615	-0,3714	-0,3516	-0,3584	-0,3638	-0,3530
Months from motherhood	**Part-time employment**			**Hourly wages**		
	Estimated effect	**Lower bound**	**Upper bound**	**Estimated effect**	**Lower bound**	**Upper bound**
-6	0,0312	0,0063	0,0560	-0,0898	-0,1093	-0,0704
0	-0,4521	-0,4743	-0,4299	-0,2548	-0,2713	-0,2382
12	0,1657	0,1369	0,1946	-0,0423	-0,0611	-0,0236
24	0,1215	0,0914	0,1517	-0,0412	-0,0608	-0,0215
36	0,0807	0,0496	0,1119	-0,0590	-0,0786	-0,0393
48	0,0749	0,0426	0,1071	-0,0771	-0,0985	-0,0557
60	0,0382	0,0051	0,0713	-0,0997	-0,1213	-0,0780
72	0,0325	-0,0019	0,0668	-0,0882	-0,1156	-0,0607
84	0,0010	-0,0346	0,0366	-0,1129	-0,1390	-0,0868
96	-0,0308	-0,0678	0,0061	-0,1082	-0,1393	-0,0771
108	-0,0016	-0,0406	0,0374	-0,1348	-0,1560	-0,1136
120	-0,0157	-0,0561	0,0247	-0,1297	-0,1552	-0,1042

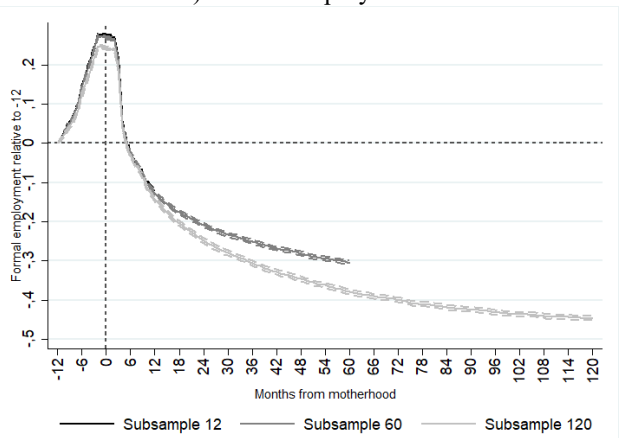
Source: Own calculations based on labor histories of BPS. Notes: The sample corresponds to women who made use of maternity leave for private workers for the first time between April 1997 and April 2015, between 18 and 40 years of age, and were formal workers during the two months before the maternity leave period began. The figure shows the effect relative to the year before childbirth ($\tau = -12$) as a percentage of the counterfactual outcome of women without children. Fixed effects by age and period (month and year) are included as control variables. The effects on monthly wages and formal employment are unconditional on employment status, and the effects on part-time employment and hourly wages are conditional on being employed. 95% confidence intervals based on robust standard errors.

Fig. 4 Motherhood effects, by different balanced samples

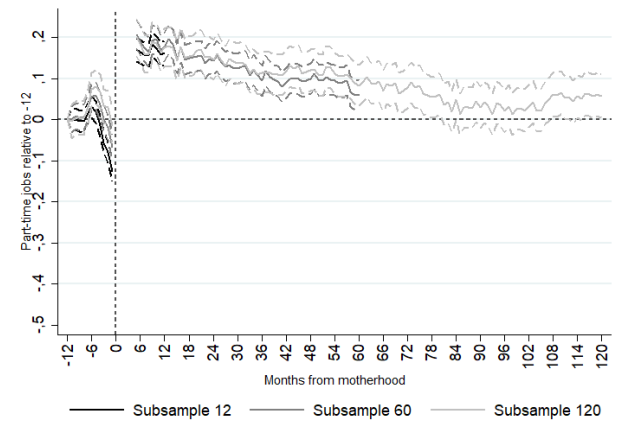
a) Monthly wages



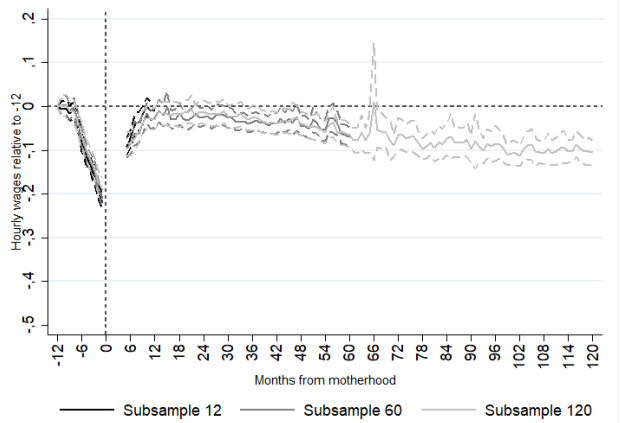
b) Formal employment



c) Part-time employment



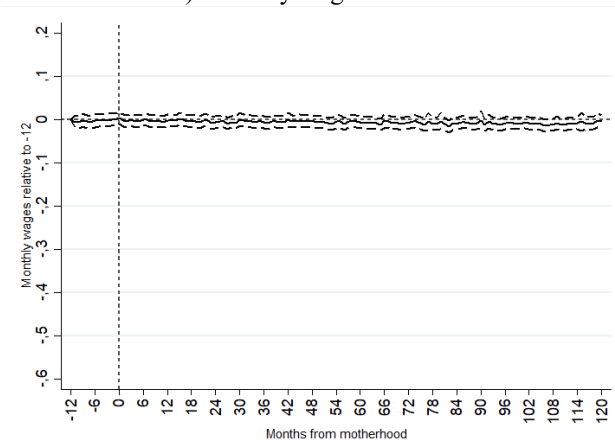
d) Hourly wages



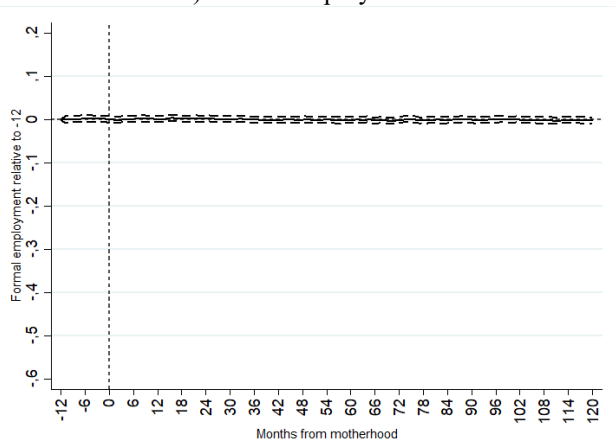
Source: Own calculations based on labor histories of BPS. Notes: The sample corresponds to women who made use of maternity leave for private workers for the first time between April 1997 and April 2015, between 18 and 40 years of age, and were formal workers during the two months before the maternity leave period began. The balanced subsamples correspond to those women for whom information is available in the 12, 60, and 120 months after the start of the subsidy. The figure shows the effect relative to the year before childbirth ($\tau = -12$) expressed in percentage terms with respect to the counterfactual outcome of women without children. Fixed effects by age and period (month and year) are included as control variables. The effects on monthly wages and formal employment are unconditional on employment status, and the effects on part-time employment and hourly wages are conditional on being employed. 95% confidence intervals based on robust standard errors.

Fig. 5 Motherhood effects, placebo event

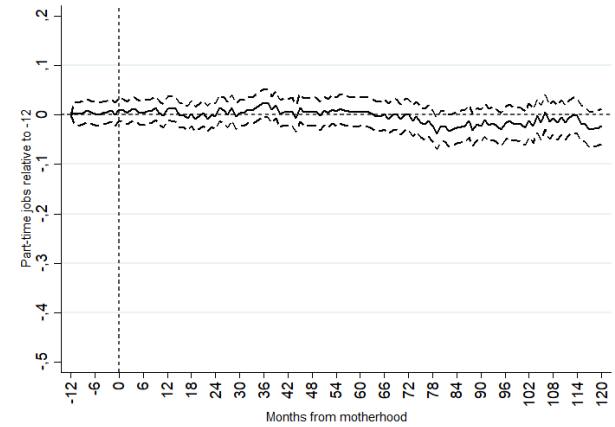
a) Monthly wages



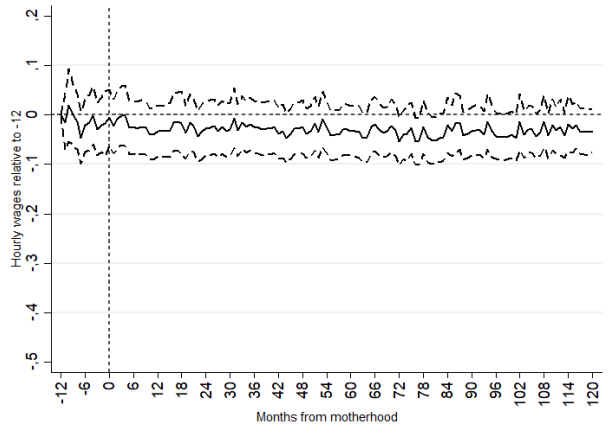
b) Formal employment



c) Part-time employment



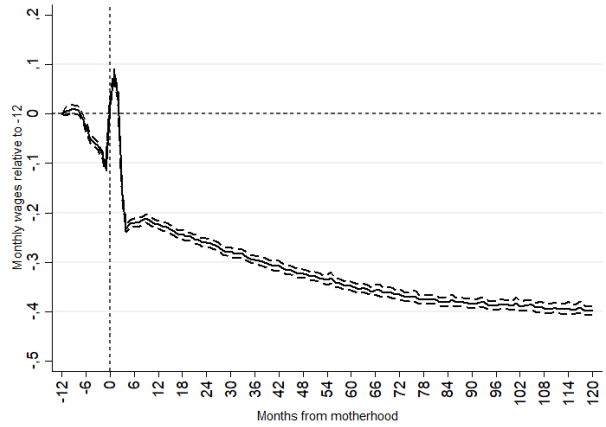
d) Hourly wages



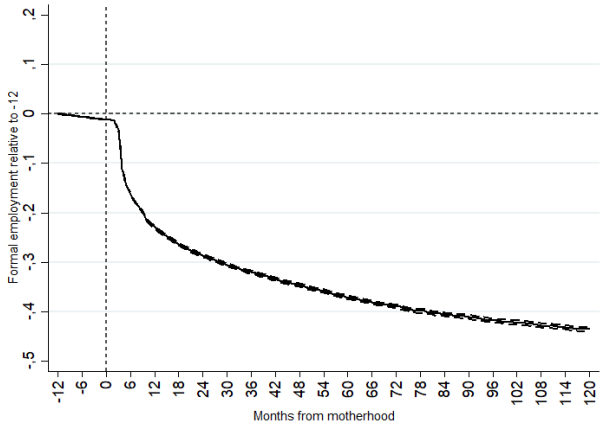
Source: Own calculations based on labor histories of BPS. Notes: The sample corresponds to women who made use of maternity leave for private workers for the first time between April 1997 and April 2015, between 18 and 40 years of age, and were formal workers during the two months before the maternity leave period began. The figure shows the effect relative to the year before placebo childbirth ($\tau = -12$) as a percentage of the counterfactual outcome of women without children. Fixed effects by age and period (month and year) are included as control variables. The effects on monthly wages and formal employment are unconditional on employment status, and the effects on part-time employment and hourly wages are conditional on being employed. 95% confidence intervals based on robust standard errors.

Fig. 6 Motherhood effects for most attached women

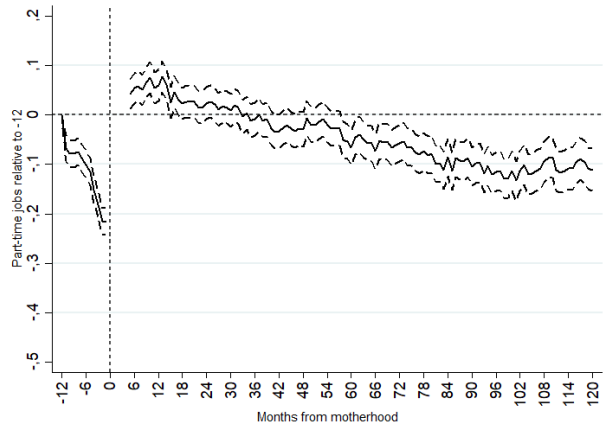
a) Monthly wages



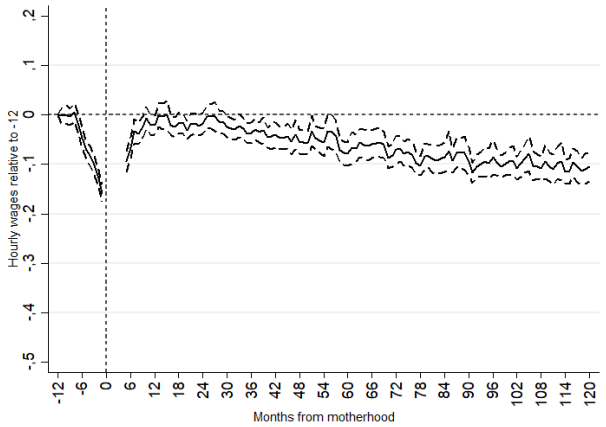
b) Formal employment



c) Part-time employment



d) Hourly wages



Source: Own calculations based on labor histories of BPS. Notes: The sample corresponds to women who made use of maternity leave for private workers for the first time between April 1997 and April 2015, between 18 and 40 years of age, and were formal workers during the 12 months before the maternity leave period began. The figure shows the effect relative to the year before childbirth ($\tau = -12$) as a percentage of the counterfactual outcome of women without children. Fixed effects by age and period (month and year) are included as control variables. The effects on monthly wages and formal employment are unconditional on employment status, and the effects on part-time employment and hourly wages are conditional on being employed. 95% confidence intervals based on robust standard errors.