



Maria Oaquim de Medeiros

**Motherhood Penalty in Labor Market:
Evidence from Brazil**

Dissertação de Mestrado

Thesis presented to the Programa de Pós-graduação em Economia, do Departamento de Economia da PUC-Rio in partial fulfillment of the requirements for the degree of Mestre em Economia.

Advisor : Prof. Gustavo Gonzaga

Co-advisor: Prof. Claudio Ferraz

Rio de Janeiro
April 2022



Maria Oaquim de Medeiros

**Motherhood Penalty in Labor Market:
Evidence from Brazil**

Thesis presented to the Programa de Pós-graduação em Economia da PUC-Rio in partial fulfillment of the requirements for the degree of Mestre em Economia. Approved by the Examination Committee:

Prof. Gustavo Gonzaga

Advisor

Departamento de Economia – PUC-Rio

Prof. Claudio Ferraz

Co-advisor

Departamento de Economia – PUC-Rio

Prof. Camille Landais

LSE

Prof. Cecília Machado

FGV-EPGE

Rio de Janeiro, April the 13th, 2022

All rights reserved.

María Oaquim de Medeiros

B.A. in Economics, Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio), 2019

Bibliographic data

Medeiros, Maria Oaquim de

Motherhood Penalty in Labor Market: Evidence from Brazil / Maria Oaquim de Medeiros; advisor: Gustavo Gonzaga; co-advisor: Claudio Ferraz. – 2022.

52 f: il. color. ; 30 cm

Dissertação (mestrado) - Pontifícia Universidade Católica do Rio de Janeiro, Departamento de Economia, 2022.

Inclui bibliografia

1. Economia – Teses. 2. Economia do Trabalho – Teses. 3. Gênero. 4. Filhos. 5. Mercado de Trabalho.. 6. Brasil. I. Gonzaga, Gustavo. II. Ferraz, Claudio. III. Pontifícia Universidade Católica do Rio de Janeiro. Departamento de Economia. IV. Título.

CDD: 331.4

To my parents, Sérgio and Olívia

Acknowledgments

I thank my advisor Gustavo Gonzaga, for being my mentor throughout my academic journey. He was one of the first to believe in my potential, and I am very grateful for all the opportunities he gave me during my PUC-Rio period. I am also grateful to my co-advisor, Claudio Ferraz, for all his support in my thesis elaboration and guiding me in my academic life. His research inspired me to be an applied microeconomist. In addition, I thank committee members, Camille and Cecilia, for their valuable comments.

I thank my parents, Olivia and Sergio, for all the love, care, and support. They are the most important people in my life. I thank my grandparents, Sheila and Walter. My grandma always helps me with her joy. Grandpa is one the biggest responsible for making me a person that cares about combating social inequality. I thank my sister, Eloisa, and brother, Bernardo, who encouraged me in my academic path and to study abroad. I thank Ana Maria for being such an important person in my life. I thank Bernardo for love and companionship.

I thank all my friends from PUC-Rio. I am fortunate to be part of a fantastic cohort. I made friends for life. All our moments of joy made up for the stress of these pandemic years.

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001

Abstract

Medeiros, Maria Oaquim de; Gonzaga, Gustavo (Advisor); Ferraz, Claudio (Co-Advisor). **Motherhood Penalty in Labor Market: Evidence from Brazil**. Rio de Janeiro, 2022. 52p. Dissertação de Mestrado – Departamento de Economia, Pontifícia Universidade Católica do Rio de Janeiro.

I investigate how motherhood impacts women in the Brazilian labor market. Social norms that regard women's role as more "family-oriented," unequal division of non-market work, and the lack of accessible free childcare for all working mothers could impact their labor supply, wages, and career path. Using an administrative linked employer-employee dataset, I estimate children's impact on several labor market outcomes through an event-study methodology comparing mothers and non-mothers. While a child's birth is associated with a decline in the mother's earnings, participation in the formal labor market, and the probability of holding a managerial position, it is also associated with an increase in participation in the public sector and part-time jobs. In addition, I found that employment penalties are reduced if women are wealthier, college-graduated, and public sector employees. Further, I use household survey data to investigate short-run gender differences in child penalties. I find a decrease in mothers' wages, employment, and an increase in the probability of holding an informal job after the stability period in the formal labor market. Men do not present changes in labor market outcomes due to parenthood.

Keywords

Gender; Children; Labor Markets; Brazil.

Resumo

Medeiros, Maria Oaquim de; Gonzaga, Gustavo; Ferraz, Claudio. **A Penalidade da Maternidade no Mercado de Trabalho: Evidência para o Brasil**. Rio de Janeiro, 2022. 52p. Dissertação de Mestrado – Departamento de Economia, Pontifícia Universidade Católica do Rio de Janeiro.

Essa dissertação investiga como a maternidade impacta as mulheres no mercado de trabalho brasileiro. Normas sociais que consideram o papel das mulheres mais “orientado para a família”, a divisão desigual do trabalho não remunerado e a falta de creches gratuitas acessíveis para todas as mães podem afetar sua oferta de trabalho, salários e carreira. Usando dados administrativos com vínculo empregador-empregado, eu estimo o impacto das crianças em vários resultados do mercado de trabalho por meio da metodologia de estudo de eventos comparando mães e não mães. Além do nascimento do filho estar associado à queda nos rendimentos da mãe, na participação no mercado de trabalho formal e na probabilidade de ocupar um cargo gerencial, ele também está associado ao aumento da participação no setor público e em empregos em tempo parcial. Além disso, encontra-se que as penalidades são mitigadas se as mulheres forem mais ricas, tiverem completado a graduação e forem funcionárias do setor público. Ademais, dados de pesquisas domiciliares são utilizados para investigar diferenças de gênero de curto-prazo na penalidade por ter filhos. Encontra-se uma diminuição do salário das mães, do emprego e aumento da probabilidade de ocupar um emprego informal após o fim do período de estabilidade no mercado de trabalho formal. Os homens não apresentam mudanças nos resultados do mercado de trabalho devido à paternidade.

Palavras-chave

Gênero; Filhos; Mercado de Trabalho.; Brasil;.

Table of contents

1	Introduction	12
2	Motherhood Penalty in Formal Labor Markets	17
2.1	Data	17
2.2	Empirical Strategy	18
2.3	Results	19
2.3.1	Employment	19
2.3.2	Wages	24
2.3.3	Managerial Positions, Part-Time Job and Public Sector	25
2.3.4	Discussion	28
3	Gender Differences in Child Penalty	29
3.1	Data	29
3.2	Empirical Strategy	30
3.3	Results	31
3.3.1	Employment	31
3.3.2	Wages and Earnings	33
3.3.3	Informality	34
4	Mechanisms	37
5	Conclusion	39
	Bibliography	41
A	Appendix	44
A.1	Descriptive Statistics RAIS	45
A.2	Variables Construction	46
A.2.1	<i>Relação Anual de Informações Sociais</i>	46
A.2.2	<i>Pesquisa Nacional por Amostra de Domicílios Contínua</i>	46
A.3	Survival Rates	47
A.4	Robustness Check: RAIS Wages	48
A.5	Balanced Sample- Public Sector	49
A.6	Descriptive Statistics PNAD-C	50
A.7	Robustness Check: Balanced Sample PNAD-C	51
A.8	First Child PNAD-C	52

List of figures

Figure 2.1	Employment	21
Figure 2.2	Heterogeneity in Employment	23
Figure 2.3	Wages	25
Figure 2.4	Managerial Positions, Part-Time Job and Public Sector	27
Figure 3.1	Employment	32
Figure 3.2	Wages and Earnings	33
Figure 3.3	Informality	35
Figure 3.4	Margins of Informality	36
Figure 4.1	Non-market work and Child Penalties	38
Figure A.1	Survival Rates- Brazilian Formal Labor Market	47
Figure A.2	Robustness Checks- Wages	48
Figure A.3	Transition to Public Sector	49
Figure A.4	Robustness- Balanced Sample	51
Figure A.5	First-Child Birth	52

List of tables

Table A.1	Summary Statistics at $\tau = -1$	45
Table A.2	Summary Statistics at $\tau = -4$	50

List of Abbreviations

IBGE – Instituto Brasileiro de Geografia e Estatística

PNAD-C – Pesquisa Nacional por Amostra de Domicílios Contínua

RAIS – Relação Anual de Informações Sociais

1 Introduction

Despite considerable progress over the last decades, Brazil is ranked 130th among 153 countries in terms of gender wage gaps and 90th over labor force participation (WEF, 2020). Recent research highlights that women may present different observable behavior in the labor market because they need to reconcile paying work with family responsibilities. This phenomenon could be prevalent in Brazil, where women work more than twice as many hours in household activities and family's care compared to men (IBGE, 2018). In addition, there are social norms against working mothers (Inglehart et al., 2014) and insufficient availability of public childcare (Anazawa et al., 2020). Therefore, the arrival of the first child could be associated with some stylized facts for Brazilian labor markets such as women presenting more career interruptions (Fraga et al., 2017), working in more flexible and lower-paying occupations (Gonzaga et al., 2020) and being concentrated in lower-paying firms (Morchio & Moser, 2019).

In this paper, I analyze the impact of motherhood on several labor markets outcomes. First, I use very detailed employer-employee data to estimate medium-run motherhood penalties. I take advantage that this database informs the exact date women take maternity leave. Then, I employ an event-study estimation around the time of child arrival to show how mothers' wages and employment rates evolve compared to women that do not take the maternity leave. If motherhood is associated with a high demand for women's time within the household or if the employer discriminates against mothers, one would expect to see a decline in women's earnings and labor force participation after they become mothers compared to childless women. Although I cannot identify the underlying mechanisms, I find evidence of a decrease in both outcomes after childbirth.

Moreover, I also find evidence that children impact women's career in other dimensions. Mothers experience an increase in the probability of working in public-sector and part-time jobs. Also, there is a decrease in the likelihood of being a manager. This evidence aligns with mothers being penalized in promotions, valuing more jobs that provide greater flexibility and job stability as positions in the public sector. Furthermore, reducing hours worked may

allow women to reconcile their careers with childcare.

These results relates to an extensive literature on child penalties, especially analyzing developed countries (Kleven et al., 2019a,b; Kuziemko et al., 2018; Kleven et al., 2019a). I add to this literature by studying a developing economy characterized by high informality rates, gender inequalities, and income inequality. In this context, one may expect that child penalties vary by socioeconomic status due to disparities in the access to child rearing services. I find the fall on employment after childbirth is less severe for more privileged groups as women in the top 10% of wages distribution and college graduated women. This heterogeneity analysis may indicate that wealthier women can protect themselves against the motherhood penalty.

I also find that more flexible and amenable workplaces can penalize mothers less. The fall in employment for mothers working in the public sector is narrower than for mothers working in the private sector. I argument that this finding relates to public sector's jobs two main characteristics. First, statutory contracts in the public sector grants more job stability, which leads to fewer dismissal occurrences. Also, public sector's mothers may want to keep their formal job more than mothers in the private sector, since the public sector provide more amenities.

Moreover, through household survey data, I investigate short-run gender differences in the child penalty. In particular, I employ the same event study methodology but take advantage of the data providing family information to compute men's labor outcomes. I find that women experience a fall in wages and employment after childbirth, while men's outcomes are not affected by the event.

Furthermore, I take advantage of information on the informal sector to investigate whether women resort to informality after childbirth. I find an increase in informality in the last quarter, the period after the end of job stability in the formal sector. One possible reason for this is the informal sector's greater flexibility, which could be valuable for mothers that need to reconcile paid jobs and child care. Moreover, I also find evidence that this result is mainly led by an increase in self-employment jobs, which are in general even more flexible than working as an informal employee.

Finally, I investigate the mechanisms behind the child penalties. To this end, I use household survey data to explore how child penalties are related to inequality in couple's time use. I analyze how the household division of home production and family member's care is associated with employment. I find that mother's fall in employment is more severe in households where the division of hours dedicated to non-market activities is more unequally

distributed between spouses.

Related Literature This paper contributes to the literature of family-related impact on women's labor outcomes. Theoretical approaches explore how wife and husband choose labor supply based on a sexual division of labor: men specialize in paid work while women dedicate their hours to childcare and household chores. Incorporating identity into their model, Akerlof & Kranton (2000) framework account for social norms imposing a penalty on men's utilities if he does household chores or if his wife's wages are higher than his. This theoretical framework is in line with Bertrand et al. (2015) who find that when a woman earns more than her husband, she dedicates more hours to household chores. Furthermore, they find that when a women's potential earnings are more likely to be higher than her husband's, she earns less than predicted and the likelihood that she will be out of the labor force increases.

The empirical papers studying the child impact in maternal labor market outcomes use two main methodologies: instrumental variables approach and event-study methodology. The IV approach's main advantage is using an exogenous variation source of fertility to comprehend the causal impact of children on labor supply. Angrist & Evans (1998) explore the gender of the first two children as an instrument for childbearing an additional child as parents have a preference for siblings' sex mix. They find that fertility cause a reduction in the female labor supply. Lundborg et al. (2017), using In-Vitro Fertilization as an instrument for parenthood, find that children's impact on earnings is negative and persistent. Further, they find the primary mechanism in play when the child is young is a reduction in hours worked. When the child grows old, changing to lower-paying jobs closer to home is responsible for the persistence of child penalties.

Several recent papers use event-study methodology to investigate how women's trajectories in labor markets diverge compared to men's after the arrival of the first child (Kleven et al., 2019a,b; Cortes & Pan, 2020; Kuziemko et al., 2018; Berniell et al., 2019). One of the advantages of this strategy compared to several IV approaches is that it recovers the impact of the first childbirth (when the major changes in labor supply occurs), not only the effect of additional children (Angrist & Evans, 1998).

Kleven et al. (2019b) find that the trajectories of wages, employment and hours worked of men and women in Denmark are very similar before childbirth and then diverge significantly after the event: women present a sharp fall while men are unaffected. In addition, they present evidence that these effects are

persistent even 20 years after childbirth. This divergence is related to women favoring occupational and firm amenities over wages. Women change to more "family-friendly" firms, the probability of becoming a manager decreases, and the probability of working in the public sector - where there is greater flexibility of hours worked - increases. This result is in line with Hotz et al. (2017) who find that Sweden women switch to more family-friendly workplaces after parenthood.

Some recent work investigates child penalties in developing economies. Berniell et al. (2019) find employment, hours and wages penalties for Chilean mothers. Moreover, they find that, after the childbirth, there is a substantial increase in labor informality for mothers, whereas the same does not occur to fathers. This relates to the literature which argues that informal markets can provide greater flexibility of working hours, therefore being attractive for women that need to dedicate more time to non-market activities as raising children (Maloney, 2004). They also estimate that employment penalties would be higher if there was no informal sector in the economy. Informality acts as a buffer to women who would otherwise leave the workforce after childbirth due to formal sector's rigidities. Aguilar-Gomez et al. (2019) study child penalties for Mexico. They found that childbirth is associated with a decline in labor market participation for women, but an increase in hours dedicated to unpaid work. Mexican women are also penalized in wages, earnings and hours.

The underlying reason for gender differences in child penalties have also been subjected to investigation (Kleven et al., 2019a, 2021; Nix & Andresen, 2019). Kleven et al. (2021) investigate if nature could drive motherhood gaps. Comparing child penalties between biological and adoptive families, they find there is a short-run differential penalty, but the long-run child penalties are identical for both types of parents. This indicates that more explanations besides biology are in play, especially in the long run. Analyzing same-sex female couples, Nix & Andresen (2019) find that the short-run penalty is greater for the mother that gives birth, but after two years, there is no difference in penalties between partners. Also, nature does not explain why there is a significant difference in child penalties across countries (Kleven et al., 2019a).

Using the same estimation approach as Kleven et al. (2019b), Kleven et al. (2019a) estimate child penalties for Germany, Austria, the US, the UK and Sweden. The pattern found in Denmark is also documented in these other countries: labor market outcomes of men and women present a similar path before the first childbirth and then diverge strongly after the event. However, there is a substantial cross-country difference in the magnitude of

these penalties: Scandinavian countries feature the lower penalties, followed by English-speaking countries and the German-speaking present the higher penalties. The authors find correlational evidence that social norms condemning working mothers of young children are related to the magnitude of child penalties.

There is an extensive literature linking labor supply, fertility and social norms. Fogli & Fernandez (2009) investigate how female labor supply and fertility of second-generation American immigrants are closely linked to patterns of their parent's country of origin, highlighting the role of culture on labor participation. Kleven et al. (2019b) find an intergenerational transmission of child penalties: in families where there is a sizable gap in mother's labor supply compared to father's, their daughter will present a larger child penalty during motherhood. This evidence is in line with nurture driving female labor supply. Stereotypical beliefs on gender roles could also impact women in labor markets through discrimination. Charles et al. (2018) study internal migrants in the US and find that gender wage gaps and gender disparities in employment rates are higher the more sexist the place where the woman was born. They also find that a sexist place of origin is associated with women marrying and having children at a young age. This evidence suggests that exposure to traditional gender norms alters women's preferences, even in the long run.

Discrimination against mothers could also be an explanation for the motherhood gap. Correll et al. (2007) present experimental evidence on discrimination against mothers using a lab experiment and resume audit. First, very similar curriculum changing gender and parenthood status were evaluated by students. Mothers, but not fathers, were judged as less devoted to work. Also, lower wages were suggested for them. They confirm the parenthood-status discrimination through a resume audit study: mothers' call-back rates were half of the rate of non-mothers, but there was no significant difference for childless men compared to fathers. For Brazil, Machado & Neto (2018) find that, ending the period of employment stability due to maternity leave, there is a large increase of separation majorly driven by employer's initiative ¹.

Outline This paper proceeds as follows. Section 2 presents the data, empirical strategy and results for the analysis on the motherhood penalty in formal labor markets, while section 3 investigates gender differences in child penalty using household survey data. Section 4 presents the mechanism analysis and, finally, section 5 concludes.

¹Although alarming, this evidence should be seen with caution because workers who want to leave the job could make an agreement with their employers to be fired to have access to certain labor benefits.

2

Motherhood Penalty in Formal Labor Markets

2.1

Data

The data source used in this analysis is *Relação Anual de Informações Sociais* (RAIS), a matched employee-employer dataset that covers the universe of formal labor contracts. I restrict the years of analysis from 2007 to 2017. The construction of the main variables used in this paper is reported on Appendix A.2.1.

RAIS provides various information on contracts (such as hiring and separation dates) and workers' characteristics (such as age, gender and schooling). Particularly relevant for this analysis, RAIS provides information on maternity leave dates. This is the variable that I use to identify childbirth. In Brazil, maternity leave is mandatory to all female formal workers, which makes this variable a good *proxy* for childbirth.

However, some challenges for identifying the first child arrival remain. First, this variable was only available from 2007 onwards. Because of this, I cannot fully identify whether a particular woman is already a mother or not. To alleviate this problem, I restrict to the sample of workers born after 1982 (but workers that had at least 18 years old). This is done to maximize the probability of observing the first childbirth, as the literature supports the effect of becoming a mother is greater than having additional children (Lundborg et al., 2017; Kleven et al., 2019b). To further maximize the likelihood we observe the first childbirth, I define my event starting in 2012 up to 2014 and drop women who had children before 2012. Second, if a woman has children outside the formal labor market, I cannot identify childbirth. To mitigate this possible misspecification, later I will perform a robustness check only with women observed the 11 years of our sample.

There is a high turnover of workers in the Brazilian formal labor market and many workers with a temporary contract. Therefore, for my employment analysis, I restrict to women that had a permanent contract at the event's time. Also, for the employment analysis, I restrict to women working in private firms at the event time, since layoffs in the public sector have a very different

dynamic.

To construct a panel data, I restrict the sample to women whose formal labor contracts were longer than 3 months in a year. For workers observed in more than one firm in a given year, I keep the contract with the highest earnings in the largest job spell. Due to computational challenges of working with a large number of observations, I use a random sample of 25% stratified at the worker's level.

Appendix A.1 presents descriptive statistics for women one year before taking maternity leave and for women not observed taking maternity leave in the sample. More future mothers are employed by the end of the year compared to childless women. Also, they have higher tenure. Women could sort less from a formal job if she plans to take maternity leave next year. Interestingly, the proportion of women that will have children employed in the public sector is lower than childless's, indicating no anticipatory effect in this dimension.

2.2

Empirical Strategy

In order to assess the impact of children on women's labor market outcomes, I will apply an event-study design that uses childless women as a control group. To generate this control group, I use an strategy similar to Kleven et al. (2019b) and assign placebo childbirths to women who are not observed taking maternity leave in our sample. I allocate the control group's women age at the time of the placebo birth using a log-normal distribution within cells of the region this woman mostly worked, birth year and education. Next, I only keep observations where the age of placebo births corresponded to an age at which a worker was at the formal labor market.

I define the first year the women took the maternity leave as $t = 0$. Therefore, if a woman took maternity leave between two years, I define the first as the event year. To assess the impact of a child on women's outcomes, I follow Kleven et al. (2019b) and estimate separate regressions for the treatment group (women who had children between 2012-2014) and the control group (women whose placebo birth are between 2012-2014). In particular, I estimate the following regressions:

$$y_{ist}^m = \sum_{j \neq -1} \alpha_j^m \cdot \mathbf{I}(j = t) + \sum_k \beta_k^m \cdot \mathbf{I}(k = \text{age}_{is}) + \sum_{yr} \gamma_{yr}^m \cdot \mathbf{I}(yr = s) + \epsilon_{ist}^m \quad (2-1)$$

Where y_{ist}^m is the outcome of interest for person i in year s at event-time t net of pre-trend effects¹. I denote by m the motherhood status: $m = l$ for legit

¹In order to control for pre-trends, I follow Kleven et al. (2019b) and estimate a linear

births and $m = p$ for placebo births. The first term on the right side of the equation represents the event time dummies. The omitted dummy is $t = -1$. I also include age dummies ($\mathbf{I}(k = \text{age}_{is})$) and year dummies ($\mathbf{I}(yr = s)$), non-parametric controls for life-cycle and time trends, respectively. The main assumption for the causal identification of child penalties is that, conditional on controls, the timing of having a child is not endogenous to labor market outcomes.

The outcomes investigated are employment, wages, and the probabilities of becoming a manager, working part-time and being employed in the public sector. I restrict them to 5 years before the event and 5 years after for all outcomes except employment. For employment, my analysis differs. I restrict to workers employed in the formal sector the previous 3 years before the childbirth. Then, I investigate motherhood impacts on the probability of holding a formal job 3 years after the event ². Following Kleven et al. (2019b), outcomes are specified in levels but are converted into percentages through:

$$P_t^m \equiv \hat{\alpha}_t^m / \mathbb{E}[\tilde{y}_{ist}^m | t]$$

Where \tilde{y}_{ist}^m is the predicted y_{ist}^m if the event-time term were omitted. Exceptionally, because of the sample restrictions, the plotted coefficients for the employment analysis are the $\hat{\alpha}_t^m$.

Finally, using estimates for post-child event time, I will present the Child Penalty, a statistics by how much women with children are falling behind childless women:

$$P_t^p - P_t^l$$

2.3 Results

2.3.1 Employment

Figure 2.1 shows the evolution of employment rates for women with children and the control group. A woman is considered employed in a year if she holds a formal job at the end of that year. The event time coefficients assess the impact of childbirth relative to the omitted event-time $t = -1$. There

trend for the pre-event period and then residualize the outcome with the estimated pre-trend.

²I only look three years forward because, to estimate the impact on employment, I input the years a worker is missing in data and assign a zero value to the binary variable of employment. As my last year of observation is 2017, if a woman had a baby in 2014, I could only observe up to 3 years after.

is a drop in employment rates in the years after the event because I impose the worker should be observed working in the formal sector three years before the childbirth (or placebo childbirth). Thus, the fall in employment for placebo mothers should reflect the turnover rates of formal Brazilian female workers. Although this estimate looks high, it is compatible with the labor turnover experienced in Brazil (Gonzaga, 2003). In appendix A.3 Panel A, B and C, I show survival rates at the formal labor market for individuals employed at age 20, 25 and 30. By construction, employment rates are 100% for workers at those three starting ages. Then, we show different survival rates for the next five years. We show large turnover rates for both men and women in the Brazilian formal labor markets. The survival rate varies significantly by age. Only 63% of the employed workers employed at age 20 will be in the formal labor force one year later. This rate is less alarming for employed workers at age 25 and 30, 70% and 74% survival rates for the following year, respectively. Three years later, 50% , 58% and 60% of workers employed - respectively - at age 20, 25, and 30 survive in the formal labor market, which is consistent with the employment analysis results.

To assess children's impact on women's formal employment, we can compare how the employment rate evolves for the control group compared to women who had children. Therefore, the graph informs how, given the restrictions, the mother's employment rate is evolving compared to non-mothers and relative to $t = -1$. After childbirth, the employment gap between mothers and our control group is considerable. The fall is less pronounced at the time of the event. This modest drop at $t=0$ could be due to Brazilian legislation: women have 5 months of job stability after maternity leave. Nevertheless, one year after childbirth, there is a sharp drop in employment for mothers. The mean child penalty in our three years of analysis reaches 9.9 p.p.

It is important to highlight that our estimation of employment penalties differs from estimation for other countries (Kleven et al., 2019a; Berniell et al., 2019). First, our event is conditional on the women being employed at the formal labor market during childbirth. Second, we cannot differentiate between sorting to non-employment or sorting to informality, since RAIS only covers the formal sector. Resorting to informality may be especially important after child arrival because the informal sector provides more job flexibility (Maloney, 2004). We will explore informality in further analysis using PNAD-C database.

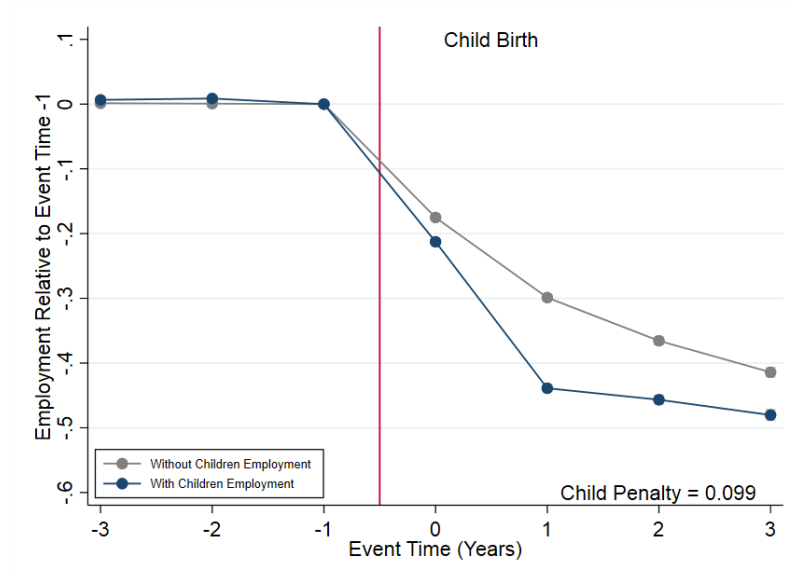


Figure 2.1: Employment

Data source: RAIS. The figure shows the evolution of employment relative to $t = -1$ for women with children compared to childless women. Event-time for childless women are based on assigned placebo births. The figure reports the post-period child penalties. The figure show 95 % confidence intervals based on robust standard errors.

Heterogeneity in employment penalty

I investigate whether child penalties in employment differ between schooling, earnings and women's sector (public or private). For this purpose, I divide workers into the following subgroups: college graduated and not graduated from college; top 10% earnings (percentile 90 of the wage distribution in our sample) and bottom 90%; and employed in the private or public sector³. Next, I estimate child penalties in participation in the formal labor market for women with and without children that belong to that subgroup. Together with the figures, I will present an estimated Difference in Child Penalties: the difference between the penalty⁴ for the most vulnerable group and the less vulnerable group⁵.

In the first panel, I present heterogeneity for schooling, showing penalties differently for women with a university degree and women without it. First, more skilled women (mothers and non-mothers) have a higher attachment to the formal labor market. Also, the gap in employment rates between not

³Earnings and sector are calculated at the time of childbirth. "College graduated" is a dummy variable whether the higher education level achieved by that mother was a bachelor's degree.

⁴The penalty is calculated as in Figure 1, $P_t = P_t^p - P_t^l$.

⁵Most vulnerable are: not graduated from college, bottom 90 percentile of wages and private sector employees. Less vulnerable are: college graduated, top 10 percentile of wages and public sector employees

graduated mothers and not graduated childless women is much larger than graduated women's.

In my second panel, I show the results by heterogeneity in the wage distribution. I investigate if the top 10% of wages of our sample present a lower child penalty than the rest of the distribution. Women at the top of wage distribution could be less penalized after having children because they may afford to outsource childcare by hiring a domestic worker. Panel 3 shows there is no difference in employment for wealthier mothers compared to non-mothers. On the other side, there is a large gap between mothers on the bottom 90 percentile of wages and childless women on the bottom 90 percentile of wages.

The next panel shows heterogeneous results by sector the women is employed. The Brazilian Federal Constitution offers job stability for public sector employees who have a statutory contract. Although our *dummy* variable for the public sector also covers temporary public sector jobs, the average stability on the job is still higher for the public employees. Therefore it is not surprising that the motherhood penalty in the public sector is much smaller than in the private sector, as shown in the third panel. Besides stability on the job, the public sector can present more amenities and flexibility that are especially valuable for women after childbirth. This could prevent mothers from sorting out the formal labor market.

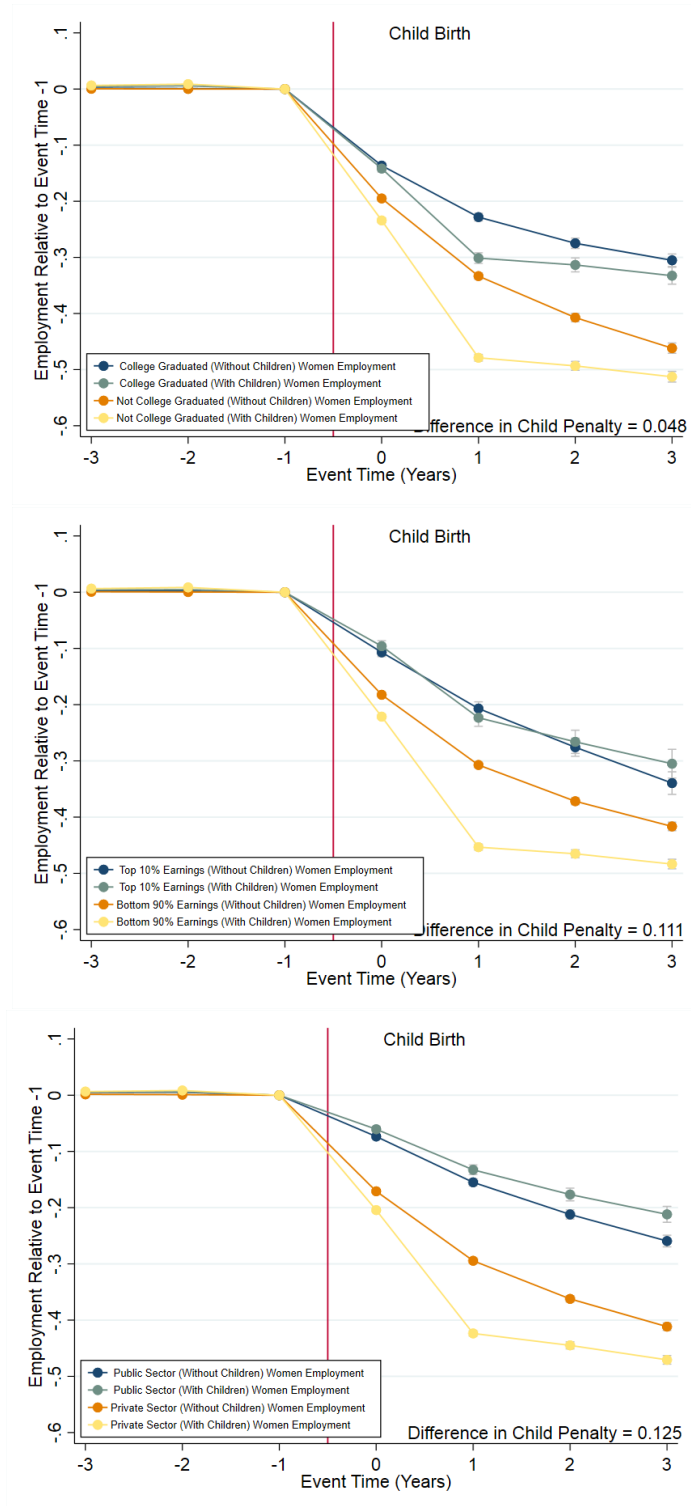


Figure 2.2: Heterogeneity in Employment

Data source: RAIS. The figure shows the evolution of employment by subgroups. The figure reports the differences in post-period child penalties for each group. The figure shows 95 % confidence intervals based on robust standard errors.

2.3.2 Wages

Figure 2.3 plots the dynamics of wages for women who remain in the formal labor markets. In the first panel, the gap arising after birth is small in the first two years but begins to rise afterward. The total post-child penalty is approximately 5 p.p.⁶

One possible caveat of this analysis is that women remaining in the formal labor market after childbirth may constitute a positively selected group. Mattar (2018) shows that, after motherhood, non-skilled women sort more to the informal sector. The heterogeneous analysis shows a change in mothers' composition remaining in the labor force towards more skilled and wealthier. To partially deal with selection into formal labor markets, I control for individual fixed effects in a robustness check. As indicated in appendix A.4 panel A, including this control increases our post-child penalty. The increase in magnitude could suggest a positive selection of women after childbirth into the formal labor market.

In appendix A.4 Panel B, I estimate equation 2-1 using a balanced sample, that is, women working in the formal sector all years of our sample. I do this check for two main reasons. First, I am interested in maximizing the probability we are observing the effect of the first child. Secondly, I want to guarantee that our control group of women that do not take maternity leave is constituted by women that do not have children. This robustness check corroborates with the existence of child penalties, even for a select group of women very attached to the formal labor markets.

⁶As highlighted by Kleven et al. (2019b), the use of wage variable in level can result in more weight put on the top of the distribution. I also calculate wage penalties using $\log(wages)$ as the dependent variable and the magnitude of child penalties is similar

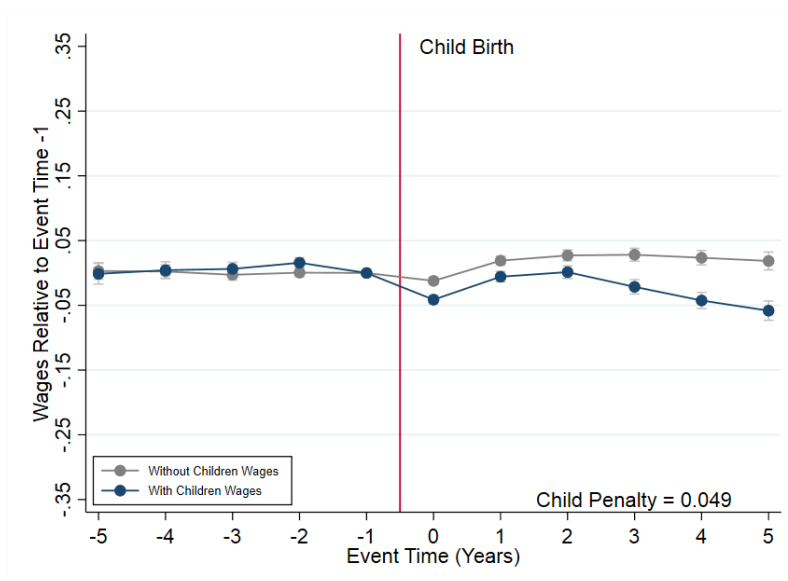


Figure 2.3: Wages

Data source: RAIS. The figure shows the evolution of wages relative to one year before the childbirth for women with children compared to the control group of women without children. The figure shows 95 % confidence intervals based on robust standard errors.

2.3.3

Managerial Positions, Part-Time Job and Public Sector

In this subsection, I investigate how children impact career choices and evolution by analyzing the probability of holding a managerial position, having a part-time job, and being employed in the public sector. If employers regard mothers as less committed to their work, they could receive fewer offers for job promotions (Correll et al., 2007). Also, if managerial occupations are less flexible, it could be more difficult for mothers to reconcile childcare and paid-work (Goldin, 2014; Bertrand, 2018). The first panel of Figure 2.4 shows that, after childbirth, a gap in the probability of being a manager arises for mothers compared to the control group. While the probability of having a managerial position is stable for the control group, it drops for women that had children.

Adjustments in hours worked could be a consequence of having children. However, as an administrative database, RAIS only reports contractual hours worked. Therefore, the hours variable presents little variation and is uninformative of the actual hours worked by employees. Thus, we explore another dimension of adjustment in hours: working part-time. Part-time jobs are relatively uncommon in Brazilian formal labor markets, even though they are much more disseminated in the informal labor market. Employing a part-time worker is relatively costly for the employer since it needs to pay a wage proportional to full-time workers while training costs and layoff costs do not change

at the proportion (Mattar, 2018). Although less common in the formal labor market, panel B shows the probability of holding a part-time job increases for mothers while remaining constant for non-mothers compared to one year before the event.

Panel C shows how the probability of holding a public-sector job evolves around childbirth. There is a sharp increase in this probability after the event for mothers. As the public sector provides more employment stability, we could observe lower layoff rates for their employees. This hypothesis is consistent with finding shown in 2.2 panel C. Also, mothers could resort to public sector jobs or avoid quitting their public service because it offers more amenities that are especially valuable after motherhood. To explore if transitions to the public sector increase after childbirth, we investigate how public sector employment changes for the balanced sample: workers employed in all years of our sample. Appendix A.5 shows there is a transition to the public sector for mothers highly attached to the formal labor markets. However, we should see these results cautiously since the workers with a long history of employment in the formal sector may differ from the mean worker in our unbalanced sample.

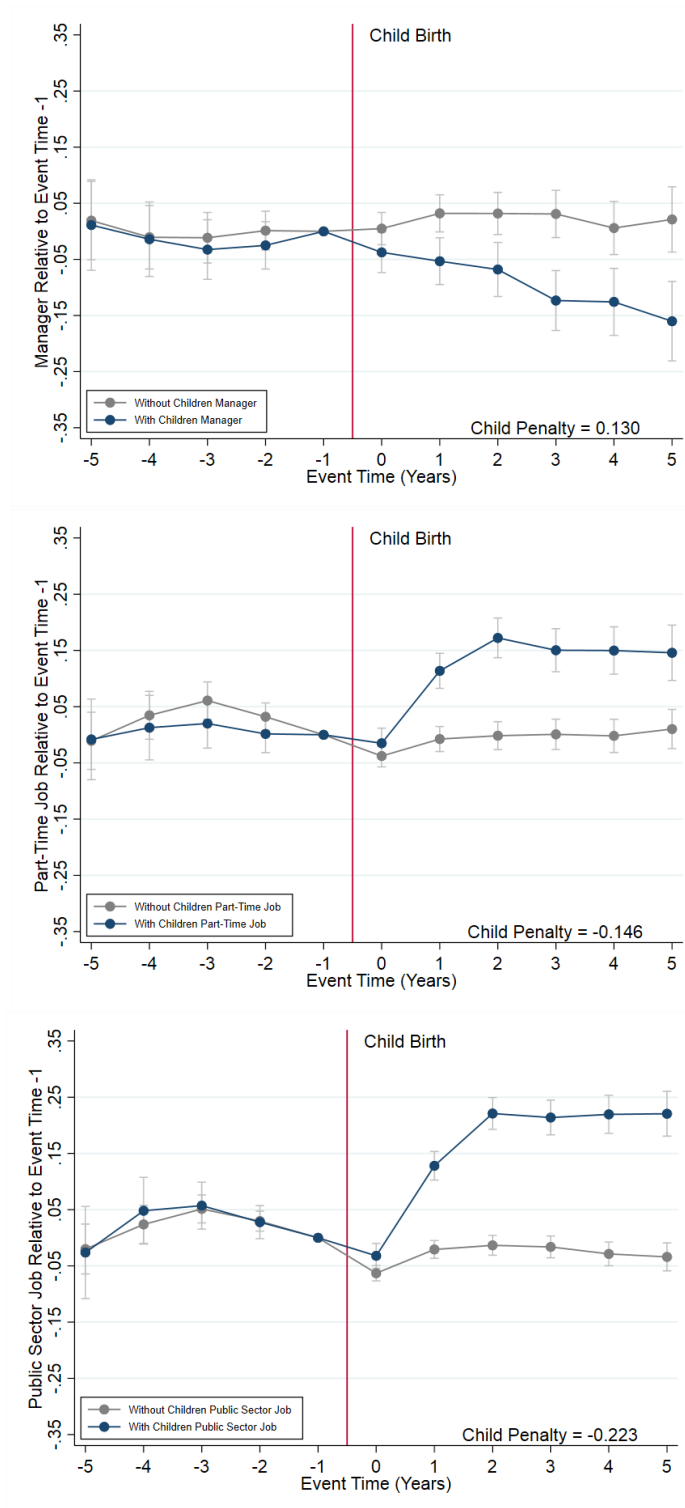


Figure 2.4: Managerial Positions, Part-Time Job and Public Sector
 Data source: RAIS. The figure shows the evolution of probabilities of becoming a manager, holding a part-time job and having a job in the public sector. The figure reports the post-period child penalties, estimated as a difference-in-differences between legit and placebo birth. The figure shows 95 % confidence intervals based on robust standard errors.

2.3.4

Discussion

Changes in Brazilian women's labor market outcomes after motherhood follow a similar pattern than other countries that found that mother's employment and wages decrease (Kleven et al., 2019a; Berniell et al., 2019). However, as our analysis uses an employer-employee dataset where the event is only observed if mothers are employed in the formal labor market, comparing magnitudes of these results with other countries' is ill-suited. The household survey analysis in the next chapter will allow us to observe the childbirth even if women is not employed in the formal labor market.

The results from section 2.3.3 supports the idea that women require more flexibility after childbirth - they work more in part-time regimes and in the sector that provides more amenities. However, an important margin of flexibility is missing when we use formal labor market data: resorting to informality. Women looking for greater flexibility in hours worked could sort to informal labor markets, where the contractual hours are less rigid and intermittent contracts are more disseminated (Mattar, 2018; Berniell et al., 2019). Quantitative surveys support the idea that the informal market may be appealing to mothers. Maloney (2004) shows that *Competing household chores* are the reason for 31.4% of self-employed women and 12.6% of unregistered employees not wanting to be hired formally. The household survey data analysis in the next sections, will allow us to further explore this margin of flexibility, since we can observe informal employment in PNAD-C.

3 Gender Differences in Child Penalty

3.1 Data

To investigate how children impact differently men and women, we will use household survey data from *Pesquisa Nacional por Amostra de Domicílios Contínua* (PNAD-C) from 2012 to 2019. The survey contains data on various labor market characteristics, family structure and informs household member's date of birth. PNAD-C is a quarterly survey that follows a household for five quarters. Therefore, it presents a rotating panel structure that allows us to observe mothers and fathers before and after childbirth. I use the method developed by Ribas & Soares (2008) that recovers the longitudinal design of PNAD-C¹.

I only keep households interviewed in the five quarters and where a baby was born during the interview period. To identify who is the mother and the father of this baby, I keep only households where the child was son or daughter of the head of the household or his/her partner^{2 3}. I exclude households where two babies, not twins or triplets, were born during the survey period for two reasons. First, this facilitates the event identification. Secondly, I avoid that a second pregnancy drives post-child effects. To keep our investigation close to the analysis using RAIS database, I only keep parents between 18 and 30 years old at childbirth. $t = 0$ is the quarter of childbirth. The description of variables used in this analysis is presented in Appendix A.2.2.

¹Although PNAD-C presents a panel structure, IBGE does not provide an individual identifier for longitudinal analysis, only the household identifier. To identify individuals, I use the Ribas-Soares method (Ribas & Soares, 2008) available at Datazoom package. First, the individuals are subject to the basic pairing on invariant characteristics, as date of birth and sex. The individuals left without pairing constitute a sample that will be identified by a method that considers the answer's closeness (Mittelbach & Gonzaga, 2020).

²There is also the case where the baby is grandson or granddaughter of the head of the household. However, when multiple sons live in this household, it is not possible to identify who the parents are.

³Because of some imprecision on Ribas-Soares's method, some household presents more than two individual identifiers when we restrict the sample for only mothers and fathers that are head of household or its partner. For the main analysis, I exclude these households. However, results are still consistent if we include them.

Descriptive statistics calculated three quarters before childbirth, thus before pregnancy, are presented in Appendix A.2. There are gender differences in various labor market outcomes before childbirth. Future mother's participation in the labor market is 34 p.p. less than future father's. Their unemployment rate is 6 p.p. higher. Among employed women, a more significant proportion is in the public sector than men. Before conception, a smaller proportion of employed mothers are informal workers than employed fathers who are informal. Father's wages are approximately 34% higher than mother's. Mothers-to-be work around 5,5 hours less than fathers-to-be. In contrast, the percentage of future mothers that are college graduate is 3 p.p. higher than future fathers'.

3.2 Empirical Strategy

The empirical strategy follows Equation 2-1 closely, but I will estimate the event-study separately for mothers and fathers:

$$y_{ist}^p = \sum_{j \neq -1} \alpha_j^p \cdot \mathbf{I}(j = t) + \sum_k \beta_k^p \cdot \mathbf{I}(k = \text{age}_{is}) + \sum_{qt} \gamma_{qt}^p \cdot \mathbf{I}(qt = s) + \epsilon_{ist}^p \quad (3-1)$$

Where y_{ist}^p is the outcome of interest for person i in quarter s at event-time t , where $p \in \{\text{mother}, \text{father}\}$. $\sum_{j \neq -1} \alpha_j^p \cdot \mathbf{I}(j = t)$ denotes the event dummies and the omitted time period is one quarter before childbirth. As in Equation 2-1, age and year dummies are included. Our main assumption for causal identification is that the timing of child arrival is exogenous to labor market outcomes.

Outcomes will also be specified in levels and then converted into percentages following the method by Kleven et al. (2019b), applied in Section 2: $P_t^p \equiv \hat{\alpha}_t^p / E[\tilde{y}_{ist}^p | t]$. The Child Penalty in our analysis with PNAD-C will be a statistics by how much mothers are falling behind fathers: $P_t^{\text{father}} - P_t^{\text{mother}}$

In PNAD sample, some individuals are not interviewed the five quarters due to attrition. In order to deal with possible misspecification of the event time variable, in appendix A.7 we provide a robustness check for all our main outcomes using a balanced sample, that is, workers observed all the five quarters⁴. All results are consistent with the main sample's outcomes.

In addition, in appendix A.8, we show penalties only for the first child's birth. The literature supports that the main child penalty is on the extensive rather than the intensive margin Lundborg et al. (2017). However, restricting for first-time parents decreases the number of our observations and

⁴They represent 68% of the main sample

compromises the precision of our estimates. Nevertheless, the point estimates for the first child are higher in magnitude than estimates for the main sample.

3.3 Results

3.3.1 Employment

Panel A of Figure 3.1 shows the pre and post-child trajectories of employment for mothers and fathers. Childbirth is associated with a sharp drop in mothers' work, while fathers do not observe such a fall. The figure also shows that employment start falling for mother since two quarters before childbirth. Therefore, the pregnancy could also impact women's employment through an incapacitating effect or even through discrimination. In order to make our results comparable to other countries' penalties that mostly use one year before childbirth as the omitted event-time (Kleven et al., 2019a), I re-estimate the event-study omitting the event time -4 in Panel B. In this figure, employment penalties are in the magnitude of 33 p.p. one year after childbirth. Brazil presents higher employment penalties compared to Denmark (Kleven et al., 2019b), but similar employment penalties compared to Chile (Berniell et al., 2019).

Panel C shows the estimated employment penalty for women employed in the formal and informal sector at the first interview. I also omitted time event -4 for these estimates in order to compare them to our findings for RAIS data. It is interesting to note that employment for informal sector's female employees starts falling before the quarter of childbirth. This result could be associated with a lack of job stability in the informal sector. However, there is close to no pre-trend effect for women employed in the formal sector because women have job stability from the moment they discover the pregnancy until the fifth-month post-childbirth. Job stability can also explain the differential pattern of employment fall post-birth: while employment falls much more smoothly for women in the formal sector, there is a sharp drop in the informal sector after childbirth. Overall, employment rates are similar for formal and informal employees after the third quarter when women lose job stability in the formal sector and informal mother's employment recovers. In addition, the employment penalties for the formal sector's mothers are consistent with the results I found for RAIS dataset: one year post-birth, the employment fall are around 30% compared to one year before.

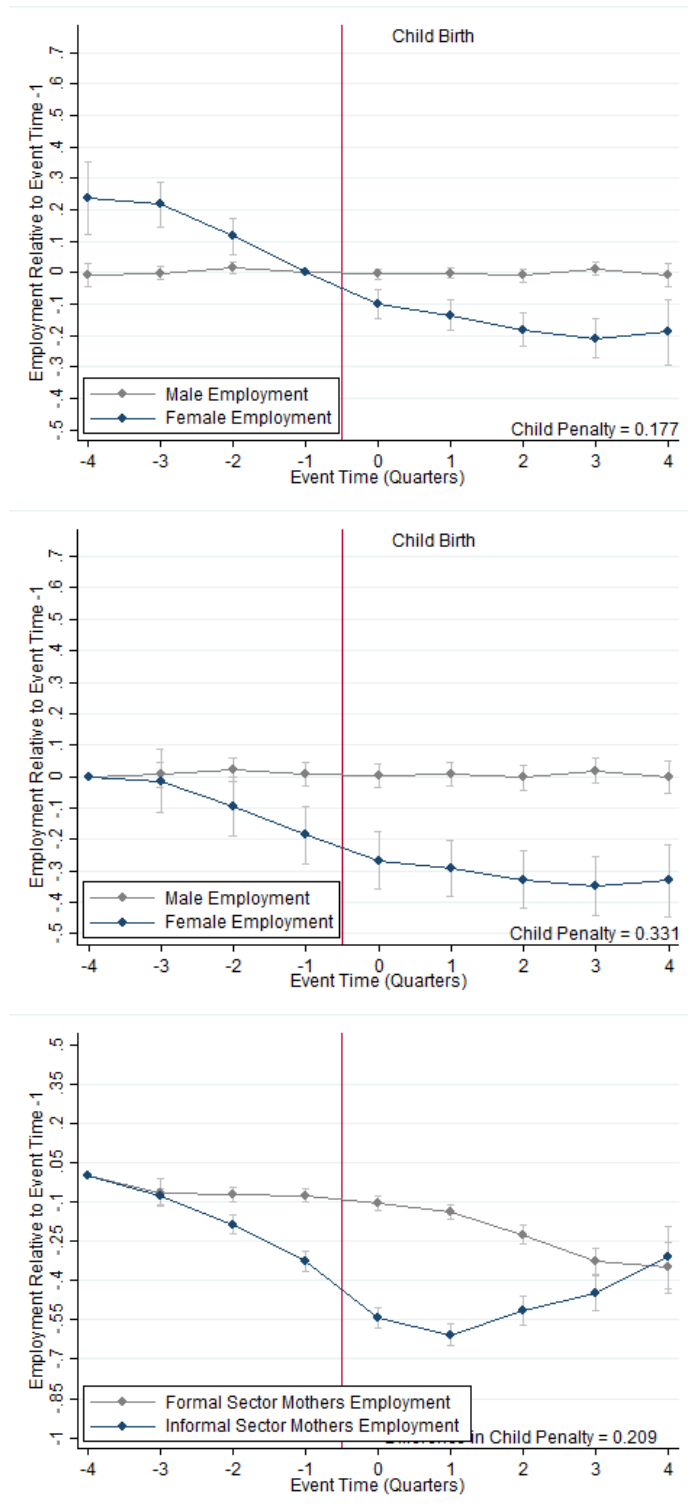


Figure 3.1: Employment

Data source: PNAD-C. Panel A shows the evolution of probabilities of being employed for mother and fathers. Panel A reports the post-period child penalties, estimated as a difference between mother's and father's post-child period penalty. Panel B shows trajectories of employment for mothers employed in the formal and informal sector at the first interview. Both figures show 95 % confidence intervals based on robust standard errors.

3.3.2 Wages and Earnings

Panel A and B of Figure 3.2 report, respectively, the evolution of wages (main job's earnings) and earnings (all job's earnings) around childbirth. After childbirth, women present a decrease in wages and earnings, but men do not show any penalty due to parenthood. Since we attribute zero value to wages and earnings if the person is not employed, these trajectories could mainly reflect the employment penalty. Therefore, in Panel C and D we estimate wages and earnings penalties for employed workers. Although the differences are not significant, point estimates show a decline in mothers' wages and earnings in the last quarter but no difference in fathers' outcomes. These results could indicate that wages and earnings start to fall for employed mothers after the period of job stability on the formal job.

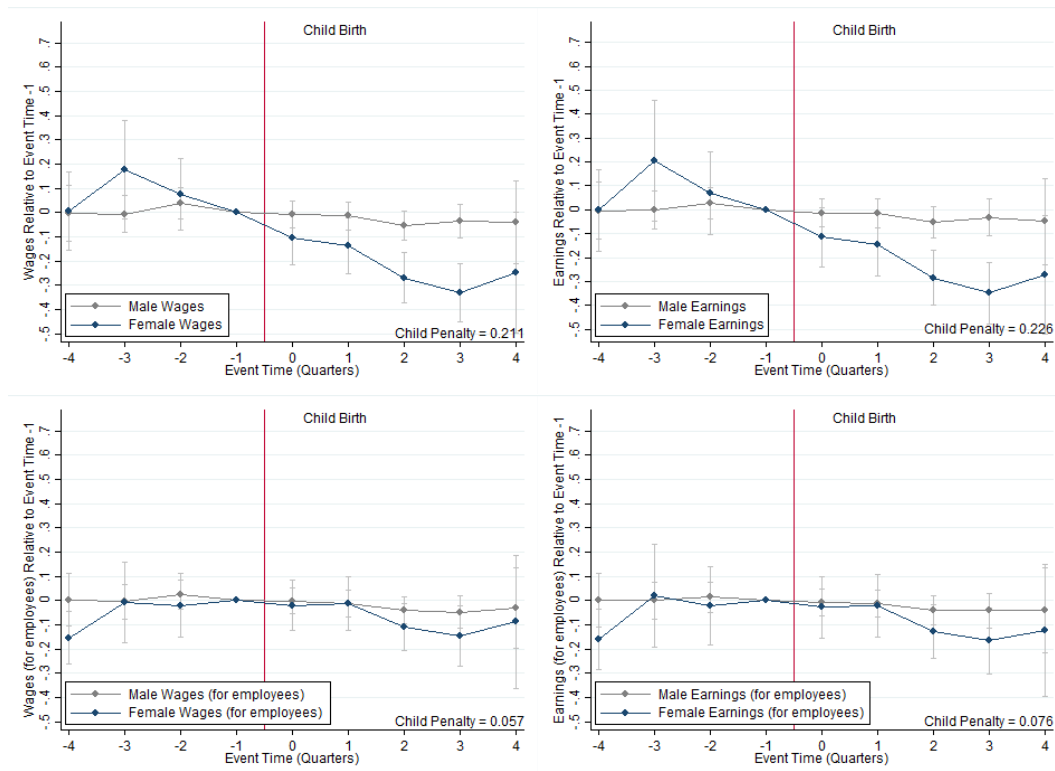


Figure 3.2: Wages and Earnings

Data source: PNAD-C. Panel A and B show the evolution of wages in the main job and earnings from all jobs. For these estimates, we consider wages and earnings as 0 for non-employed individuals. Panel C and D present estimation results only for employed individuals. The figures report the post-period child penalties, calculated as a difference between mothers' and fathers' post-child period penalties. Both figures show 95 % confidence intervals based on robust standard errors.

3.3.3 Informality

In this subsection, I investigate if women resort more to informality after childbirth. Since the burden of childcare falls on mothers, they may require more flexibility to reconcile paid work and non-market work. As argued by Mattar (2018), the formal labor market in Brazil is very rigid. For example, according to Brazilian law that prevailed until 2017, part-time workers' wages should be proportional to full-time workers employed in the same job. As fixed costs of hiring, training, and firing do not reduce proportionally, hiring in part-time regimes may be costlier. In addition, the law prohibited over-time hours from part-time workers and intermittent work. After the labor legislation reform in 2017, the law started permitting intermittent work, but the formal labor market remains more inflexible than the informal.

Figure 3.3 shows the probability of having an informal job for employed workers. Following IBGE (2018), a job is considered informal if it employs workers without a legal working permit (*Carteira de Trabalho Assinada*), is an unpaid work or if workers are self-employed and employers that do not contribute to the pension's system. While men do not present any statistically significant different probability of holding an informal job after parenthood, women show a pattern of drop in the first quarter after childbirth and then increase in the later quarters. I interpret these results as follows. In the first quarter after childbirth, there is a composition effect of more informal workers dropping the labor force, as shown in Panel B of Figure 3.1. After the end of the job stability period in the formal labor markets and due to recovery in employment to informal workers, the probability of holding an informal job increases.

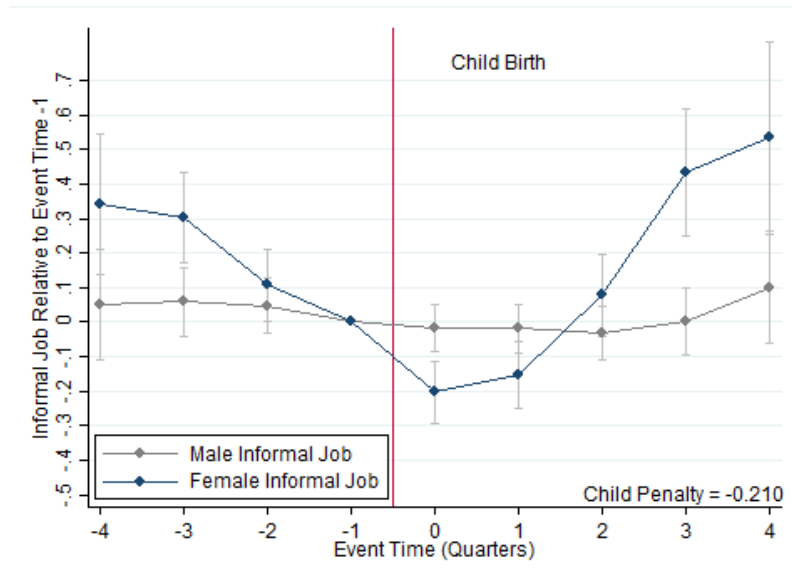


Figure 3.3: Informality

Data source: PNAD-C. The figure shows the probability of having an informal job for employed workers. The figures report the post-period child penalties, estimated as a difference between mother's and father's post-child period penalty. Both figures show 95% confidence intervals based on robust standard errors.

Next, I explore the main two margins of informality: unregistered employees (without a valid work permit) and self-employed who do not contribute to the pension's system. Figure 3.4 shows that, after childbirth, the highest increase occurs in the number of unregistered self-employed mothers. Self-employment may allow for greater flexibility because it provides more independence to balance schedules than working for an employer. This is in line with Maloney (2004) who find that among women who report not wanting to leave the informal job, 31.4% of self-employed reported competing household chores as the main reason. In contrast, 12.6% of unregistered employees reported the same.

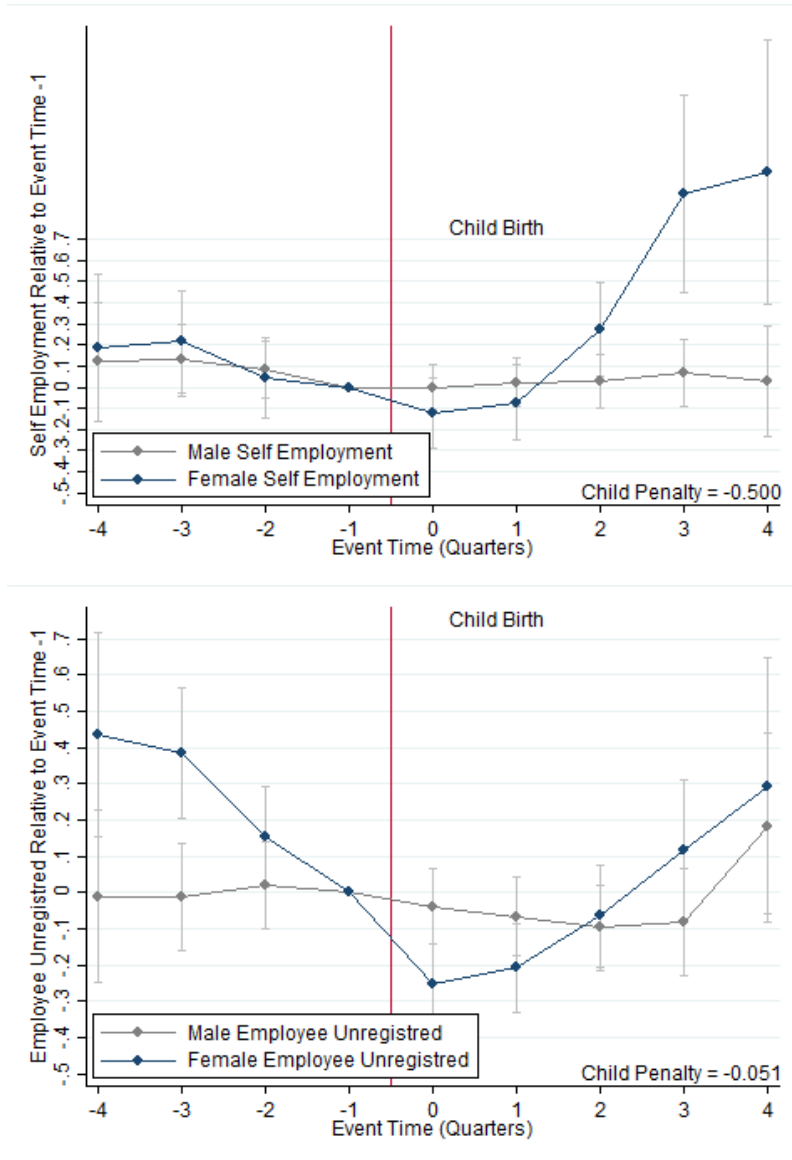


Figure 3.4: Margins of Informality

Data source: PNAD-C. The figure shows the probability of being a self-employed worker that do not contributes to the pension's system and being employed without a working permit, respectively, for employed workers. The figures report the post-period child penalties, estimated as a difference between mother's and father's post-child period penalty. Both figures show 95 % confidence intervals based on robust standard errors.

4 Mechanisms

Why are women much more penalized than men after childbirth? In this section, I investigate if there is an association between child penalties and a couple's division of hours allocated to childcare and household chores. To employ this analysis, I merge the quarterly data of PNAD-C with the supplementary PNAD-C (PNAD-C annual). The first and the last interview of PNAD-C have additional questionnaires with useful variables for this investigation. Especially interesting to our purpose, the last interview (interview 5) investigates other types of work besides paid labor. I use the variable of hours dedicated to household chores and family member's care to construct a *dummy* variable that indicates if the household is above or below the median gap¹ in the division of hours dedicated to non-market work. The median gap in our sample is 0.71. Therefore, in families with above the median gap, women dedicate significantly more hours to non-market work than men. Figure 4.1 show results for child penalty in employment for families with more unequal (above median) and less unequal (below median) division of non-market work. In couples with less unequal division, women are much less penalized in terms of employment. Interestingly, less unequal division of household chores and family members' care do not seem to hurt men. We present the statistic of difference in Child Penalties, that is, the difference between the penalty for the couples with less than the median gap in hours and couples with above the median gap in hours.

The unequal division of childcare and household chores can contribute to larger employment penalties since women have less time to dedicate to paid work. However, the results above do not necessarily show that unequal division of hours dedicated to non-market work causes the employment penalties post-childbirth because hours dedicated to household chores is an endogenous variable that depends on employment status. For example, mothers can present higher dismissals after childbirth (e.g. because of employer's discrimination), thus having more time to family and housework.

¹The gap is calculated as $\frac{H_w}{H_w + H_m}$ where H_w and H_m are the total hours per week the women and men dedicate to household chores and family member's care, respectively

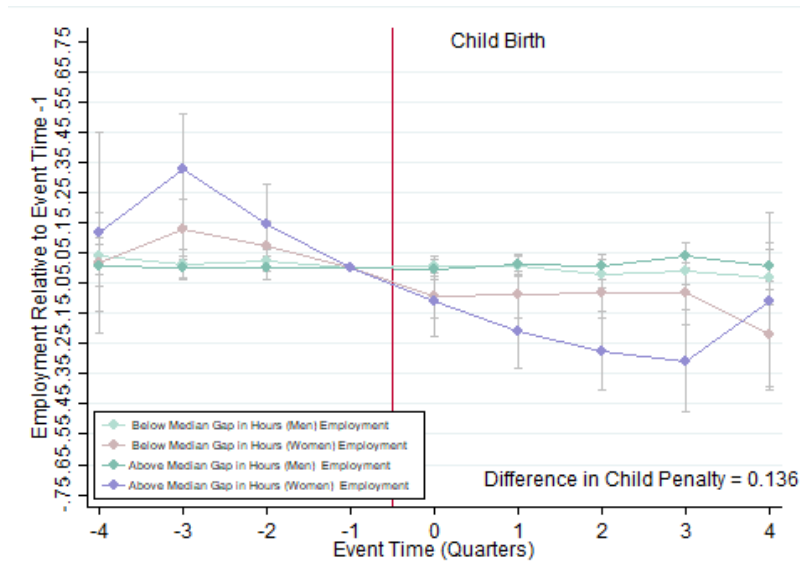


Figure 4.1: Non-market work and Child Penalties

Data source: PNAD-C. The figures show the probability of being employed for mothers and fathers divided by the gap in hours dedicated to household chores and family member's care. The figures report the differences in post-period child penalties for each group. Both figures show 95 % confidence intervals based on robust standard errors.

5 Conclusion

In a country where women are disproportionately responsible for childcare, the first child's arrival may impact her labor market outcomes. I investigated this hypothesis using Brazilian administrative and household data and employed an event study around the time of childbirth. First, using matched employer-employee data, I examined how children impact women in the formal labor comparing mothers and non-mothers. To that purpose, I generated a control group of childless women and assigned a placebo event of childbirth. Therefore, the evolution of childless women's outcomes would recover what would happen with mothers absent children.

I found a significant child penalty on employment rates. These penalties are larger for the most vulnerable women: there are considerable differences in penalties by schooling and earnings. In addition, women employed in a sector that offers more job stability and amenities (public sector) experience a smaller penalty in employment. Although there is evidence of a positive selection of women who remain in the formal labor markets after having children, I still find a child penalty on wages.

I also investigated how children could impact mothers' careers. After the child's arrival, I found a decrease in the probability of being a manager or a director. One possible explanation for this finding is that a managerial occupation is more inflexible and requires more hours of work. Therefore, it could be challenging for mothers to reconcile a managerial position with childcare. Also, mothers may be judged as more dedicated to family than work and thus, discrimination could make career progression more difficult for them. In addition, I found there is an increase in part-time jobs after the arrival of children. This result is consistent with women adjusting their labor supply in hours worked because of childcare. Furthermore, there is an increase in the proportion of mothers who hold public-sector jobs. While this result could indicate lower layoff for mothers in the public sector, it could also be the case that mothers working in the public sector choose to stay in the formal labor market or transition to the public sector because these jobs provide more job stability and flexibility.

Next, I use household survey data to compare how children impact men

and women differently. Although PNAD-C panel is short, the main advantage is that we can compare genders and account for the informal sector. I find a fall in the probability of being employed, in wages and earnings for mothers. On the other side, I find no penalty for men. In addition, when the job stability period in the formal labor market ends, the probability of working in an informal job rises for mothers. This increase is driven by a growth in the number of women working as self-employed, a type of work that offers more flexibility.

Finally, I investigate how child penalties are associated with unequal division of hours dedicated to household chores and family members' care. In couples with above the median gap in the household division of hours dedicated to non-market work, women's employment present a larger fall after childbirth.

Bibliography

- Aguilar-Gomez, S., Arceo-Gomez, E. O., and la Cruz Toledo, E. D. (2019). Inside the black box of child penalties. Technical report.
- AKERLOF, G. A.; KRANTON, R. E.. **Economics and Identity**. The Quarterly Journal of Economics, 115(3):715–753, 2000.
- ANAZAWA, L.; GIMENES, N.; WINK JUNIOR, M.; BERNARDINI, R. ; KANG, T.. **Desafios do acesso à creche no brasil - subsídios para o debate**. Technical report, Fundação Maria Cecília Souto Vidigal, 2020.
- ANGRIST, J. D.; EVANS, W. N.. **Children and their parents' labor supply: Evidence from exogenous variation in family size**. The American Economic Review, 88(3):450–477, 1998.
- BERNIELL, I.; BERNIELL, L.; DE LA MATA, D.; EDO, M. ; MARCHIONNI, M.. **Gender Gaps in Labor Informality: The Motherhood Effect**. CEDLAS, Working Papers 0247, CEDLAS, Universidad Nacional de La Plata, June 2019.
- BERTRAND, M.; KAMENICA, E. ; PAN, J.. **Gender Identity and Relative Income within Households ***. The Quarterly Journal of Economics, 130(2):571–614, 01 2015. .
- BERTRAND, M.. **Coase Lecture – The Glass Ceiling**. *Economica*, 85(338):205–231, April 2018.
- CHARLES, K. K.; GURYAN, J. ; PAN, J.. **The Effects of Sexism on American Women: The Role of Norms vs. Discrimination**. NBER Working Papers 24904, National Bureau of Economic Research, Inc, Aug. 2018.
- CORRELL, S.; BENARD, S. ; PAIK, I.. **Getting a job: Is there a motherhood penalty?** *American Journal of Sociology*, 112(5):1297–1338, 2007.
- CORTES, P.; PAN, J.. **Children and the Remaining Gender Gaps in the Labor Market**. IZA Discussion Papers 13759, Institute of Labor Economics (IZA), Sept. 2020.

- FOGLI, A.; FERNANDEZ, R.. **Culture: An Empirical Investigation of Beliefs, Work, and Fertility**. *American Economic Journal: Macroeconomics*, 1(1):146–177, January 2009.
- FRAGA, E.; GONZAGA, G. ; SOARES, R. R.. **Selection on Ability and the Early Career Growth in the Gender Wage Gap**. IZA Discussion Papers 10791, Institute of Labor Economics (IZA), May 2017.
- GOLDIN, C.. **A grand gender convergence: Its last chapter**. *American Economic Review*, 104(4):1091–1119, April 2014.
- GONZAGA, G.; OAQUIM, M. ; TERRA, C.. **Gender Wage Gap and Job Flexibility**. Technical report, Mimeo, 2020.
- GONZAGA, G.. **Labor Turnover and Labor Legislation in Brazil**. Textos para discussão 475, Department of Economics PUC-Rio (Brazil), Aug. 2003.
- HOTZ, V. J.; JOHANSSON, P. ; KARIMI, A.. **Parenthood, family friendly workplaces, and the gender gaps in early work careers**. Working Paper 24173, National Bureau of Economic Research, December 2017.
- IBGE. **Estatísticas de gênero indicadores sociais das mulheres no brasil**. Technical report, Estudos e Pesquisas. Informação Demográfica e Socioeconômica.n.38, 2018.
- IBGE. **Síntese de indicadores sociais: Uma análise das condições de vida**. Technical report, IBGE, 2018.
- INGLEHART, R.; C. HAERPFER, A. M.; WELZEL, C.; K. KIZILOVA, J. D.-M.; LAGOS, M.; P. NORRIS, E. P. ; ET AL., B. P.. **World values survey: Round six - country-pooled datafile version**. Technical report, World Value Survey, 2014.
- KLEVEN, H.; LANDAIS, C.; POSCH, J.; STEINHAEUER, A. ; ZWEIMULLER, J.. **Child penalties across countries: Evidence and explanations**. *AEA Papers and Proceedings*, 109:122–26, May 2019.
- KLEVEN, H.; LANDAIS, C. ; SØGAARD, J. E.. **Children and Gender Inequality: Evidence from Denmark**. *American Economic Journal: Applied Economics*, 11(4):181–209, October 2019.
- KLEVEN, H.; LANDAIS, C. ; SØGAARD, J. E.. **Does biology drive child penalties? evidence from biological and adoptive families**. *American Economic Review: Insights*, 3(2):183–98, June 2021.

- KUZIEMKO, I.; PAN, J.; SHEN, J. ; WASHINGTON, E.. **The Mommy Effect: Do Women Anticipate the Employment Effects of Motherhood?** NBER Working Papers 24740, National Bureau of Economic Research, Inc, June 2018.
- LUNDBORG, P.; PLUG, E. ; RASMUSSEN, A. W.. **Can women have children and a career? iv evidence from ivf treatments.** *American Economic Review*, 107(6):1611–37, June 2017.
- MACHADO, C.; NETO, V. P.. **The labor market effects of maternity leave extension.** Technical report, 2018.
- MALONEY, W. F.. **Informality Revisited.** *World Development*, 32(7):1159–1178, July 2004.
- MATTAR, F.. **Essays on female labor supply.** PhD thesis, PUC-Rio, 2018.
- MITTELBACH, M.; GONZAGA, G.. **Datazoom painel da pnad contínua.** Technical report, Departamento de Ciências Econômicas, 2020.
- MORCHIO, I.; MOSER, C.. **The Gender Gap: Micro Sources and Macro Consequences.** 2019 Meeting Papers 143, Society for Economic Dynamics, 2019.
- NIX, E.; ANDRESEN, M. E.. **What Causes the Child Penalty? Evidence from Same Sex Couples and Policy Reforms.** Discussion Papers 902, Statistics Norway, Research Department, Mar. 2019.
- RIBAS, R. P.; SOARES, S. S. D.. **Sobre o painel da pesquisa mensal de emprego (pme) do ibge.** Technical report, IPEA, 2008.
- WEF. **Global gender gap report 2020.** Technical report, World Economic Forum, 2020.

A Appendix

A.1 Descriptive Statistics RAIS

Table A.1: Summary Statistics at $\tau = -1$

	Mothers	Non Mothers
<i>Mean</i>		
Real Average Wage	1232.09 (1077.1)	1287.13 (1143.9)
Contractual Hours Per Week	41.49 (5.765)	41.08 (5.990)
Tenure (in months)	28.78 (24.27)	27.28 (23.77)
Age	26.37 (2.707)	25.76 (2.801)
<i>Percentage</i>		
Employed at the end of the year	0.96 (0.203)	0.86 (0.345)
Black or Brown	0.34 (0.472)	0.33 (0.471)
Permanent Contract	0.90 (0.305)	0.84 (0.367)
Statutory Contract	0.08 (0.278)	0.13 (0.338)
Temporary Contract	0.02 (0.139)	0.03 (0.166)
Public Sector	0.11 (0.311)	0.16 (0.367)
Part-Time Job (less than 35 hours per week)	0.08 (0.268)	0.09 (0.289)
College Graduated	0.18 (0.386)	0.22 (0.411)
Manager/Directors	0.04 (0.194)	0.04 (0.197)
Observations	150508	226836

Data source: *Relação Anual de Informações Sociais. Wages in R\$2010*

A.2

Variables Construction

A.2.1

Relação Anual de Informações Sociais

– Employment

Employment is a binary variable equal to one if the individual is employed in the formal labor market at the end of the year.

– Wages

Wage is defined as the real average wage (in R\$ 2010) related to the longer contract held in that year.

– Part-Time Job

Part-time is a dummy variable equal to one if the person worked less than 35 hours a week in the main job.

– Public Sector

Public sector is a binary variable constructed based on legal entity codes, main occupational Group (CBO Group 0) and statutory contract.

– Manager

This binary variable is based on Brazilian Occupation Classification (CBO) Main Group 1.

A.2.2

Pesquisa Nacional por Amostra de Domicílios Contínua

– Employment

Employment is a binary variable equal to one if the individual is employed during the interview.

– Wages

Wage is variable that report the real monthly wage (in R\$ 2019) earned in the worker's main job during the interview's period. Wage is set as 0 if the person is not working.

– Earnings

Earning is variable that report the real monthly earnings from all jobs the person held during the interview's period. Earnings are set as 0 if the person is not working.

– Informal

Informal is a binary variable that assumes value 1 if the worker is an employee without official working permit (*Empregado Sem Carteira*), is an unpaid worker, or if he is a self-employed or employer that do not contribute to the pension system.

A.3 Survival Rates

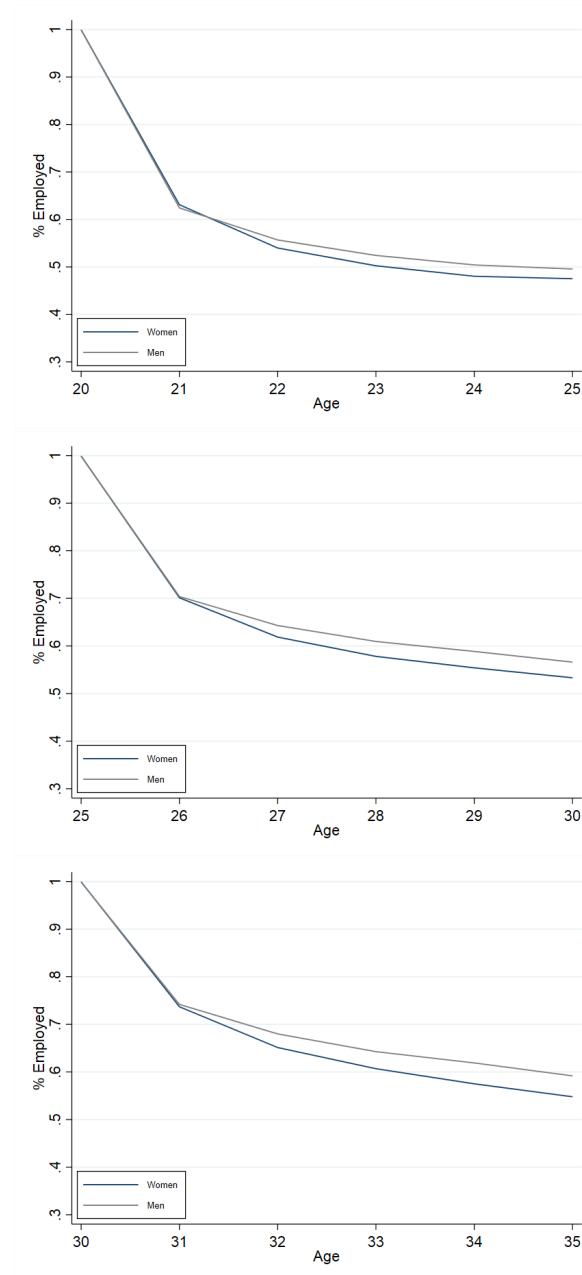


Figure A.1: Survival Rates- Brazilian Formal Labor Market
Data source: RAIS. Panel A, B and C presents survival rates for workers employed at age 20, 25 and 30, respectively.

A.4
Robustness Check: RAIS Wages

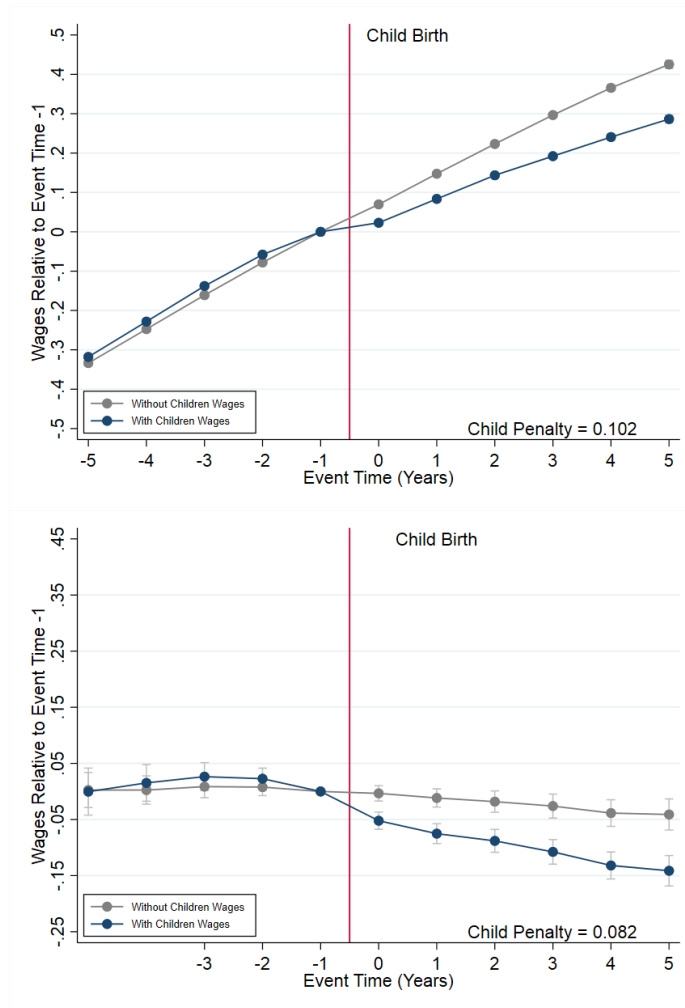


Figure A.2: Robustness Checks- Wages

Data source: RAIS. Panel A presents estimates controlling for individual fixed effects. Panel B display robustness check using a balanced sample.

A.5
Balanced Sample- Public Sector

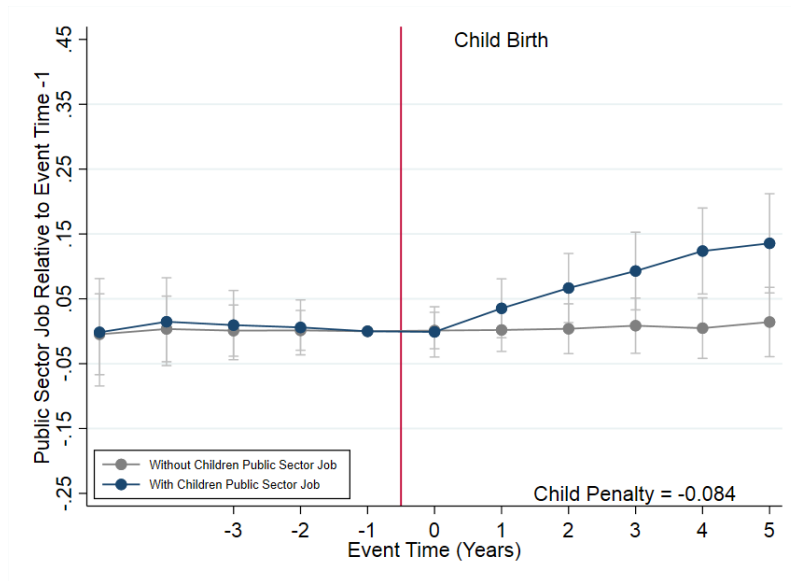


Figure A.3: Transition to Public Sector

Source: RAIS. The figure plots employment in the public sector for workers using the balanced sample

A.6 Descriptive Statistics PNAD-C

Table A.2: Summary Statistics at $\tau = -4$

	Mothers	Fathers
<i>Labor Force Participation</i>		
In Labor Force	0.62 (0.485)	0.96 (0.204)
Unemployed	0.11 (0.316)	0.05 (0.221)
<i>Sector</i>		
Public Sector	0.05 (0.211)	0.04 (0.197)
Private Sector Formal	0.29 (0.453)	0.51 (0.500)
Private Sector Informal	0.17 (0.380)	0.35 (0.478)
<i>Type of Employment</i>		
Employee	0.41 (0.491)	0.65 (0.478)
Employer	0.01 (0.101)	0.04 (0.202)
Self-Employed	0.09 (0.291)	0.22 (0.411)
<i>Earnings</i>		
Real Average Wage	781.35 (541.2)	1048.24 (861.2)
Real Average Earnings	794.95 (557.1)	1072.64 (960.0)
<i>Hours and Experience</i>		
Habitual Hours Per Week	37.51 (13.01)	43.96 (10.98)
Tenure (in years)	3.07 (0.979)	3.27 (1.008)
<i>Demographics</i>		
Age	24.80 (3.126)	25.73 (2.699)
Black or Brown	0.61 (0.487)	0.57 (0.495)
<i>Schooling</i>		
College Graduated	0.08 (0.275)	0.05 (0.217)

Data source: PNAD Contínua 2012-2019. Wages and earnings in R\$2010

A.7 Robustness Check: Balanced Sample PNAD-C

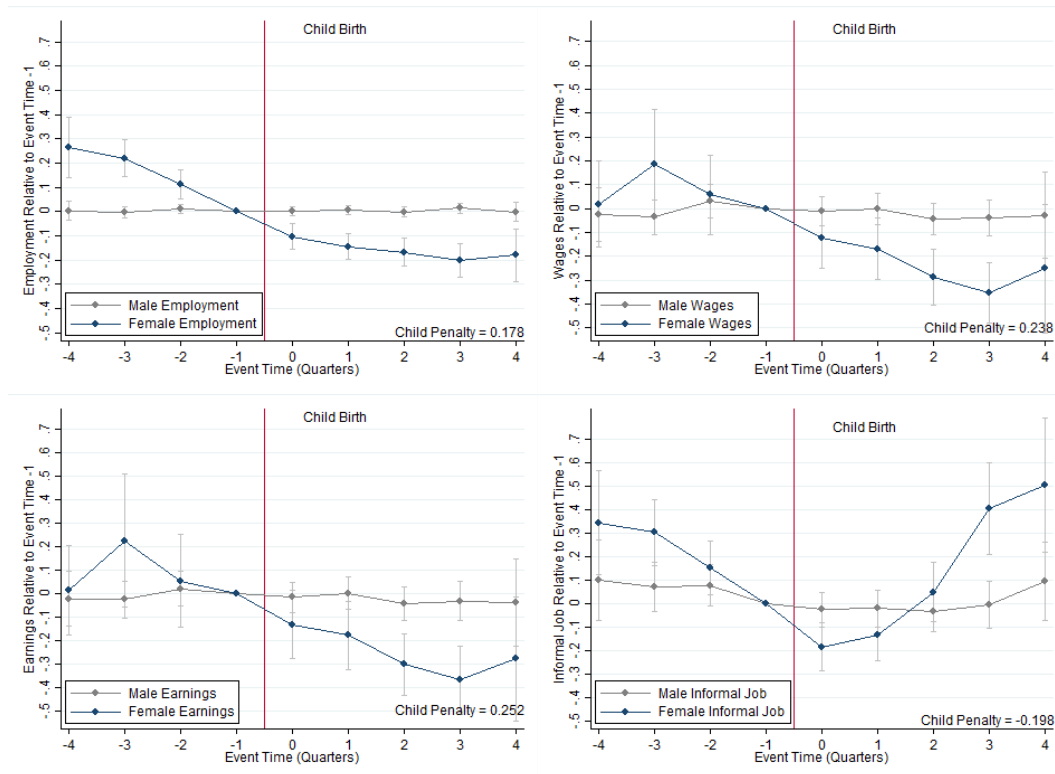


Figure A.4: Robustness- Balanced Sample

Source: PNAD-C. Estimations based on a balanced sample .The figures report the post-period child penalties, calculated as a difference between mothers' and fathers' post-child period penalties. Both figures show 95 % confidence intervals based on robust standard errors.

A.8 First Child PNAD-C

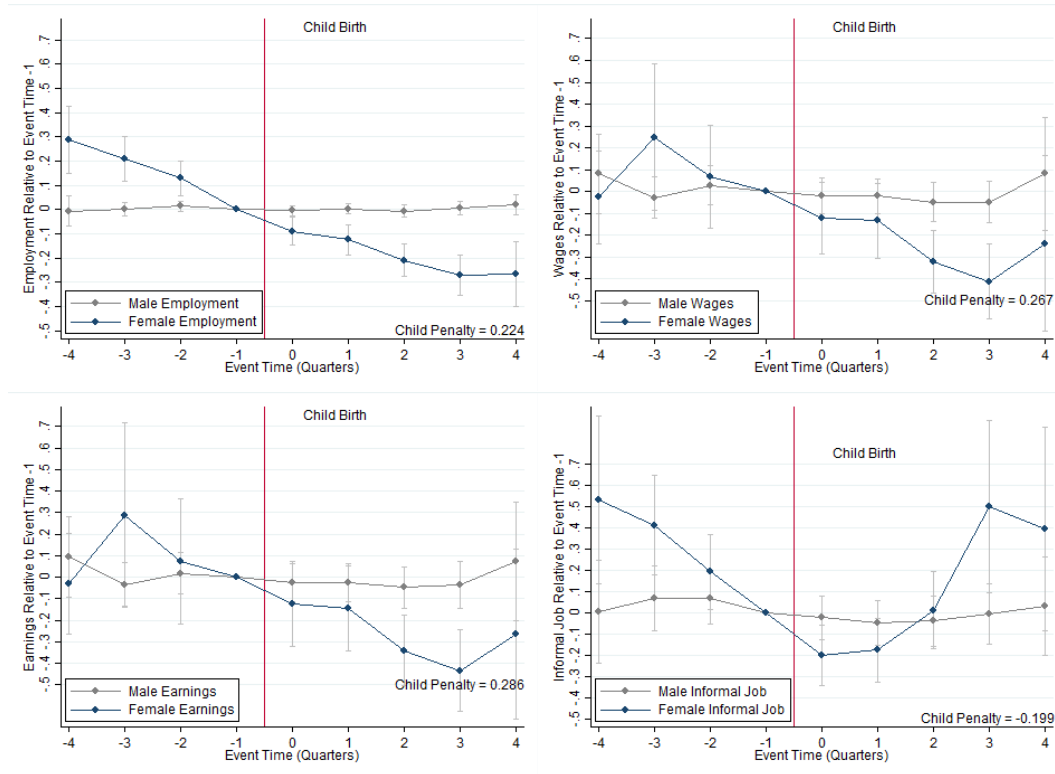


Figure A.5: First-Child Birth

Data source: PNAD-C. Estimations for first child's birth. The figures report the post-period child penalties, calculated as a difference between mothers' and fathers' post-child period penalties. Both figures show 95 % confidence intervals based on robust standard errors.