PRESCHOOL ENROLLMENT AND MOTHERS’ LABOR MARKET OUTCOMES IN BRAZIL

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ABSTRACT

I analyze the increase in financing early childhood education in Brazil by FUNDEB in 2006 and the establishment of compulsory preschool enrollment by Constitutional Amendment #59 in 2009 to understand its effects on preschool enrollment and mothers’ labor outcomes measured by their probability of working, hours worked and earnings. I provide empirical evidence of mothers’ responsiveness to changes in compulsory preschool enrollment and financing preschool. I hypothesize that FUNDEB and the establishment of Amendment #59 positively affected preschool enrollment. Then I hypothesize that this increase thus positively affected mothers' labor market outcomes. Through a difference-in-differences analysis, I exploit geographic variation across time and states in preschool enrollment. I compare the labor outcome of mothers of preschoolers with those of mothers with older children. Individual-level data (mothers and children) and aggregate data (families) come from the Brazilian National Household Survey (PNAD). Results indicate that the establishment of both FUNDEB and Amendment #59 positively increased preschool enrollment of 4 and 5 year old children compared to 6 and 7 year olds enrolling in primary education. Results also indicate that higher preschool enrollment positively affected mothers of preschoolers’ probability to work. However, that increase did not affect mothers’ earnings and hours worked, as these effects are not statistically significant.

Keywords: Mothers Employment, Mothers Earnings, Mothers Work Hours, Preschool, Public Policy, Work and Family, Gender-Gaps in the Labor Market
INTRODUCTION

For more than 450 years, gender-gaps in education favored men in Brazil, however, in the past three decades, women have achieved higher rates of graduation from elementary education, high school, and university compared to men (Beltrão and Alves 2009; Bloom et al. 2011). This educational gender-gap reversal happened in the 1980s when many Brazilian women started to seek higher educational attainment and qualifications in order to overcome gendered barriers in the labor market (Beltrão and Alves 2009). According to the authors, it was one of the most significant conquests of Brazilian women in the last century.

This female triumph, however, has still not been sufficient to reverse the gender gap in the labor market. Brazilian women remain underrepresented, earn considerably less compared to men, are more likely to be unemployed, and face many career impediments (Beltrão and Alves 2009). This is not ideal not only for women but for society as a whole. Reports by Catalyst show conclusively that the more gender-equal companies are, the lower are their turn-over and attrition rates, and their employees, are more likely to consider themselves happy and have higher job satisfaction and higher rates of productivity (Catalyst, 2013-2017). In other words, gender inequality is expensive and should be avoided at all costs. So why women are still underrepresented in the labor market?

One significant barrier to women’s participation in the labor market is the competing demands on their time in the workplace and home, especially if their home includes children. The cultural norm of women being the caregiver makes it difficult for females to reconcile family life with employment. This is called by the literature as the “motherhood penalty” (Bertrand 2018). In sum, the motherhood penalty is defined by the penalty
imposed on women via lower wages, lower participation rate, and lower leadership roles rate in the labor market. Those challenges faced by women happen because they have to meet the demands of childcare, which is a time-intensive activity, and work activities.

Data from the Brazilian National Household Survey show that women dedicate on average 35 hours per week to work while men dedicate 42 hours per week. On the other hand, while men dedicate less than 10 hours per week on house and children-care activities, women dedicate 25 hours per week, which amounts to 140 percent more of their time when compared to men. If women are explicitly expected to work more at home, then they are implicitly expected to work less at the workplace. Labor participation and child care are jointly determined for women (Berlinski and Galiani 2007).

As Blau (2001) and others suggest, increasing availability of preschools increases parents’—especially mothers’—likelihood of employment. In this research paper, I examine the importance of preschool programs and policies on female labor force participation, earnings, and other labor market outcomes in Brazil.

In the past few years, the preschool enrollment rate has been increasing in Brazil. This progress can be partially attributed to the establishment of a fund that invests in early childhood education (ECE), called Fundo de Manutenção e Desenvolvimento da Educação Básica e de Valorização dos Profissionais da Educação (FUNDEB); as well as the establishment of Constitutional Amendment #59, which makes it mandatory for 4 and 5 year old children to attend preschool.

FUNDEB was instituted in Brazil in December 2006 and is a set of 27 funds (26 states and 1 Federal District) that serves as a redistribution mechanism for resources destined to Basic Education. In sum, it funds the development of basic education with the
focus on early-childhood education (ECE) and teachers. Among the sectors financed by the fund is preschool.

Amendment #59 made it mandatory for all children ages 4 and 5 years old to attend preschool, as stated before. Before this amendment was approved, mandatory education in Brazil started at age 6. This amendment thus makes preschool education mandatory after January 2010. Angelov et al. (2016) argue that children age 7 and younger need more direct attention and support from their parents. The cultural norm of women being the caregiver makes it even more difficult for mothers of young children to reconcile family life with employment (Blau 2010).

The purpose of this study is to understand the causal relationship between the establishment of FUNDEB and Amendment #59 on preschool enrollment and mothers’ labor outcomes. To do so, I use a quasi-experimental identification strategy.

**BACKGROUND**

Women's participation in the labor market is essential not only for companies but also for countries since it directly contributes to a nation’s economic growth. A report by the McKinsey Global Institute (2015) shows that almost half of all women of working age in Latin America are not participating in the labor market. In fact, the participation gap between men and women, at more than 30 percentage points, is one of the largest in the world. Moreover, women’s contribution to GDP in Latin America is below the world average by 4 percentage points, to which McKinsey estimates that $28 trillion could be added to global 2025 GDP if women’s participation in the economy were identical to men. Aguirre et al. (2012) estimate the impact of increasing the number of females in the labor
force on GDP in Argentina and Brazil. They find that doing so is associated with an increase in GDP by 19 percent in Argentina and 15 percent in Brazil.

Although women have accumulated an average of 8.8 years of schooling compared to an average of 7.7 years for their male counterparts, men still make 56 percent more income than women in Brazil according to data from the Brazilian Household Survey. Nonetheless, the unemployment rate for females consistently exceeds that of males by an average of 4 percentage points, and this gap is twice as high for those who are between 15 and 24 years of age, according to the same survey. This suggests that women have been striving to attain higher education to overcome labor barriers but are not succeeding.

In addition, Brazilian workers are required to have a “work card” to be able to work. No company may legally hire a worker without such a document, which is obtained from the regional office of the Ministry of Labor. The Brazilian Institute of Geography and Statistics (IBGE) reports that women are less likely than men to have such work cards which guarantee workers’ legal rights.

This employment and wage gap occur mainly because many jobs in Brazil involve long hours and inflexible schedules (Bertrand 2018). As stated before, since women devote an average of 35 hours per week to household chores, compared to men who devote an average of fewer than 10 hours per week, females face additional pressures from having to balance both market and non-market demands, especially that of childcare. This burden leads women to prefer part-time jobs instead of full-time ones. In fact, as we can see in Figure 1 and Figure 2 below, Brazilian females tend to spend much more time engaging in child and housework than males. Males, on the other hand, devote more time to work (e.g., working more than 8 hours a day).
Given the figures above, I hypothesize that preschool services may be a very useful tool in helping women reconcile labor market and non-labor market demands. In Brazil, preschool enrollments have been increasing in the past years (see Figure 3) while the birth rate has been decreasing at about an average of -1.4% per year since the 2000s, according to data from the Brazilian Household Survey’s National Sample Survey of Households (PNAD). Given this, we can assume that parents are actually enrolling their children in preschool programs at a higher rate. Below we can see trends in the enrollment rates for preschoolers (4 and 5 year old children) and compare it with the rates for 6 and 7 year olds who are in the first year of primary school.

As the figure shows, preschool enrollment rates have been increasing in the past several years while primary school enrollment has been relatively constant. Nevertheless, the rise in preschool enrollments can be partially due to both the establishment of FUNDEB and Amendment #59.

**LITERATURE REVIEW**

Here, I review recent research that explains the motherhood penalty. I analyze literature documenting women’s greater demand for flexibility in the workplace. I also review studies that discuss how childcare and preschool programs help women balance the labor market and childcare demands. Then I review studies on how childcare and preschool availability positively affect women’s labor market outcomes. In some developed countries, reforms that increase the availability or affordability of public childcare have
shown positive effects on maternal employment, but in other countries, those policies only affect children’s enrollment but not maternal employment.

*Gender-Gaps in the Labor Force related to Children-Caring*

Despite decades of progress and increased investments in education, women still face a significant gender gap in the labor market, whether it is by being less likely to be employed, not working as many hours as they would like, or earning considerably less than men. Two particularly important studies find that children are a key factor explaining why mothers work and earn less compared to fathers, even when they both have the same level of schooling and previous experience (Bertrand 2018; Bertrand et al. 2010). They find that women face not only a gender-penalty in the labor market but a considerably larger motherhood-penalty.

In their two studies, Angelov et al. (2016) and Kleven et al. (2017) quantify the motherhood-penalty (or child-penalty). Angelov et al. (2016) find that 15 years after entering parenthood, the male-female gender gap in income in Sweden has increased by 28 percentage points over its pre-child level. Kleven et al. (2017) find that wives in Denmark experience sharp drops in labor force participation rate, earnings, hours worked, and wage rates compared to their spouses immediately after giving birth to their first child. These results are remarkable, given that Scandinavian countries have smaller gender imbalances in earnings when compared to the rest of the world.

*Positive Effect of Preschool and Childcare on Mothers’ Labor Outcomes*

Some studies show evidence of a positive relationship between available public childcare and preschool and women’s participation in the labor market. Gustafsson and Stafford (1992) find that in Sweden, high-quality public childcare encourages women with
preschoolers to participate in the labor market. Bauernschuster and Schlotter (2015) rely on the birth date threshold for public childcare eligibility to analyze the effects of a childcare reform in Germany. The authors find that having the youngest child receive childcare increases the probability of the mother being employed by 36.6 percentage points. Using data from 10 countries across Europe, Dimova and Wolf (2011) show that regular use of childcare provided by grandparents has a positive effect on maternal labor force participation.

Busso (2015) argues that an increase in subsidized childcare supply in Latin America over the past three decades has had a long-term positive effect on increases in female labor force participation. Toledo (2015) emphasizes that the expansion of preschool education can serve a dual goal: improve a child's cognitive development and incentivize mothers’ employment, especially in Latin America. Paes de Barros et al. (2011) showed that, in Brazil, access to free childcare had a 17 percent increase in employment of mothers who previously were not working in addition to a 16 percent increase in household income.

Not only does the literature suggest that the availability of childcare or preschool services increase female labor force participation, but it also indicates the importance of preschool affordability in influencing this increase in participation. Anderson and Levine (1999) provide detailed reviews of estimates of the elasticity of female labor supply concerning the cost of childcare in the United States and suggest that female labor force participation increases as the price of childcare decreases. Lokshin (1999) models mothers’ participation in the labor force, working hours, and household demand for childcare in Russia and finds that the decision to take a job and use childcare is sensitive to the price of the childcare service.
Berlinski and Galiani (2007) used a differences-in-differences analysis to explore the effect of increasing the supply of preschools on female employment in Argentina, which was positive. Also in Argentina, Berlinski, Galiani, and Ewan (2011) found that mothers were more likely to work more hours per week when their young child attended preschool. In Germany, Bauernschuster and Schlotter (2015) used a differences-in-differences methodology to show that an increase in kindergarten attendance had positive effects on maternal employment. Cascio (2009) shows that public preschools provide a price subsidy for childcare on the employment margin, encouraging mothers to enter paid work. For mothers that would work more hours than the amount provided to child care by preschool, the price subsidy is inframarginal (Gelbach 2002).

**Null Effects on Mothers’ Labor Outcomes**

However, there are also studies that show no empirical evidence of effects of childcare or preschool subsidies or incentives on female labor market participation. Havnes and Mogstad (2011) find no significant effects of childcare provision on maternal labor supply in Norway. These findings may be related to the fact that public childcare is universal in Norway. Additionally, Hallman et al. (2005) find that reductions in formal childcare prices in Guatemala do not predict mothers’ labor force participation but do have a substantial positive effect on Guatemalan mother’s work hours.

Fitzpatrick (2010) also finds that subsidies for universal preschool in the U.S. states of Georgia and Oklahoma resulted in an increase in enrollment but had no effect on maternal labor supply. This can be related to the hypothesis that only women who work less than the number of hours of care provided by the program would indeed increase their labor supply. Fitzpatrick (2012) found null effects on the employment of single mothers but
positive effects on the employment of married mothers. She emphasizes the importance of the initial level of female labor supply and the childcare policy environment so the program could actually affect mothers’ outcomes in the labor market.

**CONCEPTUAL FRAMEWORK**

How can preschools programs help alleviate women’s caregiving pressures and ultimately reduce gender-disparities in the Brazilian labor market? To answer these questions, I begin by introducing and critiquing Gary Becker’s Economic Theory of Discrimination (1957) and New Home Economics Theory (1981). The first theory is relevant to the effects of employer prejudice on the wages of women. The second theory systematically analyzes family dynamics and the maximization of individuals’ behaviors and argues that government interventions are not optimal.

To challenge these prevailing theories, I present Marianne Bertrand’s Glass Ceiling Theory (2018) and the Demand for Non-Parental Childcare Theory (2010). Bertrand's theory explains the motherhood penalty in the labor market while the other shows how policies are a great tool to influence gaps in the intrahousehold division of labor, and consequently in the labor market. These theories offer different ways to study the relationship between the availability of preschool programs and women’s labor force participation from the perspective of the gender gap in housework.

*Becker’s Economic Theory of Discrimination*

In his work on the economic theory of discrimination, Becker (1957) analyzes employer discrimination and its implications for earnings differences between groups. Central to the theory is that a prejudiced employer would only be willing to hire a minority worker at a wage that is less than that of an equally productive non-minority worker.
However, according to the economic theory of discrimination, competitive markets impose a penalty on a firm in the form of lower profits when the firm discriminates against workers. Non-discriminating firms will have lower real costs of production compared to discriminating firms.

Companies therefore face lower profits for discriminating against women and especially mothers. However, this potential loss will be less than what firms save by paying these women and mothers less than other workers. Hence, the discrimination is related to the assumption that workers who are also mothers will be less committed to the company’s productivity.

In Becker’s analysis of the family, he applies economic theory to personal decisions, such as choosing a spouse or having children. Thus, Becker uses economic assumptions such as maximizing behaviors, stable preferences, and economic equilibrium in markets to analyze the allocation between spending time in childcare activities and the labor market. In this study, I focus on Becker’s assumptions and analysis of the families and gender roles.

The intrahousehold distribution of working time in the market and the household is explained by each partner’s comparative advantages. This approach can be considered gender-blind, mainly because it favors the gender division of labor, where mothers bear most of the burden of childcare within the family. As a result, the cost and provision of childcare and preschool programs are acknowledged determinants in mothers’ labor participation decisions, but not fathers’.

Becker's economic approach to the family ignores the fact that women's labor participation decisions are also affected by endogenously determined intrahousehold interactions, along with the allocation of time (Kaya Bahçe and Memis 2013).
Intrahousehold decision-making rules are also determined by the social context, social norms, ethical principles, patriarchal and gender-biased relations, institutions, regulations, law, and policies (Berik and Kongar 2013).

**The Glass Ceiling Theory**

According to Marianne Bertrand, there is an explanation that suggests that there might be observed gender gaps in earnings even when employers practice equal pay for equal work. Women and men are paid relatively equally immediately after they graduate from college (Bertrand 2018). However, the pay-gap widens more sharply when both men and women are in their 20s to mid-30s, which is the time when many women have children. The main reason why having children and getting married decreases women’s earnings is related to the unequal division of labor at home. Unmarried women without children continue to earn closer (although still less) to what men do (Bertrand 2018).

Precisely because women dedicate a considerable amount of their time to their children than men do, their demand for flexibility in the workplace is also higher than men's, and many women decide to work part-time. The labor market, however, increases penalties associated with such demand for flexibility.

Bertrand's theory suggests that women’s earnings deficit compared to men’s is not solely a reflection of different occupations since women earn less within the same occupation as well. In other words, according to her, a gender-based earning gap may still exist even if we ignore the sexist biases of employers, employees, and co-workers. If women are expected to work more within the home, then they have less time to devote to working outside the home, which helps refute the unequal payment argument.
Ultimately, to achieve greater pay equality, changes would have to be applied to both men and women. Paid paternal leave or provision of subsidized childcare programs are examples that can help diminish the gender gap as I discuss below.

*Demand for Non-Parental Child Care Theory*

Parental childcare at home may be supplemented with non-parental childcare provided by education institutions. The analysis of the demand for these services came from the conventional consumer choice approach, which predicts mothers’ demand for preschool services based on their preferences, budget, and time (Chaudry, Henly and Meyers 2010). Under this approach, the demand for childcare is assumed to contribute to maximizing mothers' utility concerning childcare, which is directly connected to their labor force participation utility.

In order to acknowledge their mutual dependence, mothers' labor supply decisions as to whether or not to work and for how many hours, and demand for childcare are often modeled simultaneously.

Based on that theoretical framework, I understand childcare and preschool services as an important tool to increase mothers’ participation rate in the labor force that could also affect other labor market outcomes. Thus, I derive three research questions to understand how preschool programs can affect mothers’ outcomes in the labor market.

1. Has the increase in ECE financing resulted in increases in preschool enrollment in Brazil between 2003 and 2015?
2. Has Amendment #59 resulted in increases in preschool enrollments?
   If preschool enrollments have increased, then:
3. Have increases in preschool enrollments affected mothers’ outcomes in the labor market in terms of the following:
   a. Probability to work
b. Monthly earnings

c. Hours worked per week

**DATABASE AND SAMPLE**

In this study, I use repeated cross-sectional data from the National Sample Survey of Households (PNAD), issued by the Brazilian Institute of Geography and Statistics (IBGE). Established in 1967, PNAD collects socioeconomic and demographic information about the Brazilian population at the individual and family level.

Household and individual questionnaires collect information on housing characteristics, migration, education, employment, earnings, and fertility. The nationally representative sample covers about 150,000 households and 363,000 individuals across 27 federal units, nine metropolitan regions, and five macro-regions. I analyze around 400,000 observations in the individual level per year throughout the years 2003 to 2015 (before and after FUNDEB-2006 and Amendment-2009).

My sample consists of mothers who have 4 and 5 year old children (treatment group) who were affected by the establishment of those policies, and mothers who have 6 and 7 year old children (control group). Here I delete mothers of both groups of children. The mothers of children in these two age groups had similar characteristics and employment outcomes to mothers of preschoolers. Table 1 below shows the descriptive characteristics of women divided by groups of interest: the treatment and control groups of my analysis and non-mothers. I decided to include non-mothers in my descriptive statistics sample to reinforce the sharp difference in labor market outcomes when compared to females who are mothers.

[Table 1 about here]
As we can see, 25% of mothers of 4 and 5 year olds and 26% of mothers of 6 and 7 year olds declare that they work. Mothers of preschoolers (4 and 5 year olds) work on average 33.68 hours per week, similarly to mothers of 6 and 7 year olds, who work 33.52 hours per week. In terms of monthly earnings, mothers of 6 and 7 year olds make 6% more than mothers of preschoolers.

In relation to their children’s enrollment, 68% of all 4 and 5 year old children are enrolled in school, while this number is much higher for mothers of 6 and 7 year olds who attend primary school, which had an enrollment rate of 94%. This is not surprising. As we can see in Figure 3, primary school enrollment is considered high in Brazil. According to the Ministry of Education (MEC), this trend started in 1970s when the government promoted strong incentives to universalize primary education in the country (MEC Reports, 2000).

Non-mothers are more likely to work with 41% declaring that they work. Non-mothers also receive a much higher monthly salary, on average, when compared to mothers. Earnings of non-mothers are more than double the amount of mothers’ earnings, on average.

Non-mothers attain an average of 7.8 years of schooling, but mothers report a much lower average of 5.27 years of schooling for mothers of preschoolers and 5.26 years of schooling for mothers of 6 and 7 year olds. On average, 60% of mothers in the sample also define themselves as a person of color, while 49% of non-mothers do the same. Finally, in terms of urban living, 80% of mothers report living in an urban area. The percentage is relatively higher (88%) for non-mothers.
In order to understand the policies’ impact on preschool enrollment and mothers’ labor outcomes, I examine 3 dependent variables (outcomes of interest): the probability of working, earnings measured by monthly salary and hours worked per week. For each analysis, I control for mothers’ schooling, measured in school years, ethnicity, number of children, and whether the mother lives in an urban area or not.

I also weighted the families of my sample since some families are more representative of Brazilian society than others, in terms of ethnicity and income background. The weight is already provided by PNAD. Finally, I also control for common shocks within states and years using fixed effect in the state and year level in each regression analysis.

**METHODOLOGY AND RESULTS**

**Methodology and hypothesis**

In order to understand the effect of the two policies changes on preschool enrollment, I calculated the increase in enrollment after the establishment of each of the policies. The best way to understand the causal relationship between the establishment of the policies and preschool enrollment is through a randomized controlled experiment (Stock and Watson 2010). However, the analytical insights and methods of randomized control experiments can carry over to nonexperimental settings, so I chose to use a quasi-experiment design, which introduces randomness by variations in individuals’ circumstances as if the treatment is randomly assigned. Specifically, I use the differences-in-differences estimator to analyze the extent to which FUNDEB and Amendment #59 actually affected preschool enrollment, and if so, how much. As stated before I use a cross-sectional database so the differences-in-differences estimator will allow for time-invariant
unobservable differences between treatment and comparison group individuals (Todd 2016).

Since there is no random assignment of the treatment specifically, there is no perfect comparison group. I define the assumptions for the difference-in-differences model on the last page of the Appendix of this paper.

My methodology will be comprised of two general sections; first, I run a differences-in-differences analysis taking into consideration the establishment of FUNDEB (2006) and Amendment #59 on the preschool enrollment rate. Once established that FUNDEB and/or Amendment #59 had a significant effect on preschool enrollment, I estimate the effect of changes in preschool enrollment on mothers' probability to work; hours worked and earnings through a difference-in-differences model that takes advantage of the continuous state-year variation in preschool enrollment. Below I define each regression.

1. Effect of FUNDEB and Amendment #59 on preschool enrollment
   a. How did financing ECE (FUNDEB) affect the probability of enrollment?

\[
enrol_{ijt} = \alpha_0 + \alpha_1 \times TREAT + \alpha_2 \times POST06 + \alpha_3 \times (POST06 \times TREAT) + \alpha_4 \times Z_{ijt} + \gamma_j + \sigma_t + \epsilon_{ijt}
\]

b. How did Amendment #59 affect the probability of enrollment?

\[
enrol_{ijt} = \alpha_0 + \alpha_1 \times TREAT + \alpha_2 \times POST09 + \alpha_3 \times (POST09 \times TREAT) + \alpha_4 \times Z_{ijt} + \gamma_j + \sigma_t + \epsilon_{ijt}
\]

Where enrol is defined by the probability of school enrollment for children of the \(i\)-th mother in the state \(j\) in the year \(t\). It is an individual probability. TREAT is the treatment group, so =1 for mothers of 4 and 5 year olds and =0 for mothers of 6 and 7 year olds. POST06 and POST09 are dummies that control for years before and after 2006 and 2009, respectively. \(Z_{ijt}\) is a vector that includes all of the control variables defined before
(schooling, ethnicity, number of children, lives in an urban or rural area); \( \gamma_j \) is a state fixed-effect that removes fixed-differences across states and \( \sigma_t \) is a year fixed-effect that absorbs variation for common shock throughout the years. Finally, \( \epsilon_{ijt} \) is an individual error assumed to be distributed independently across states.

2. How did women’s outcomes in the labor market change due to the increase in preschool enrollment?

\[
\ln\_earning_{ijt} = \beta_0 + \beta_1 \ast TREAT + \beta_2 \ast TOTAL\_ENROL + \beta_3 \\
\ast (TREAT \ast TOTAL\_ENROL) + \beta_4 \ast Z_{ijt} + \gamma_j + \sigma_t + \epsilon_{ijt}
\]

\[
work_{ijt} = \beta_0 + \beta_1 \ast TREAT + \beta_2 \ast TOTAL\_ENROL + \beta_3 \\
\ast (TREAT \ast TOTAL\_ENROL) + \beta_4 \ast Z_{ijt} + \gamma_j + \sigma_t + \epsilon_{ijt}
\]

\[
h\_worked_{ijt} = \beta_0 + \beta_1 \ast TREAT + \beta_2 \ast TOTAL\_ENROL + \beta_3 \\
\ast (TREAT \ast TOTAL\_ENROL) + \beta_4 \ast Z_{ijt} + \gamma_j + \sigma_t + \epsilon_{ijt}
\]

Where \( \ln\_earning \) is defined by the increase of mothers’ monthly salary, \( work \) is a dummy for mothers’ probability to work, and \( h\_worked \) is the number of hours worked per week. \( TOTAL\_ENROL \) is a continuous variable that takes advantage of the state-year variation in the enrollment rate per group. \( \beta_3 \) is the coefficient of interest, and it captures the effect of changes of aggregate preschool enrollment on mothers’ labor outcomes for potential beneficiaries (treatment group, mothers of preschoolers) when compared to mothers of 6 and 7 year olds.

I hypothesize that in the absence of preschool enrollment increase, the employment trajectories of mothers of preschoolers would have been the same as mothers of 6 and 7 year olds. Traditional differences-in-differences analyses use a dummy for pre- and post-policy, as I used before to define the effect of the policies on preschool enrollment. In this secondary analysis, however, I use the enrollment rate, which is a continuous variable that
can capture more subtle changes in the policy across the years. This approach is similar to what Toledo (2015) uses to empirically analyze preschool policy changes in Mexico.

Results

In this section I first present the results of model 1, referring to the effects of the policies on preschool enrollment. I then present the results of model 2 on the effects of preschool enrollment on mothers’ labor outcomes.

Effects on Preschool Enrollment

Results from model 1 indicate that both FUNDEB and Amendment #59 positively impacted preschool enrollment. As we can see in Table 2, after FUNDEB was established and ECE financing increased, preschool enrollment rate increased by 11% for 4 and 5 year olds when compared to 6 and 7 year olds. A similar phenomenon occurs for Amendment #59. After compulsory schooling was instituted, the preschool enrollment rate increased by 10% for 4 and 5 year olds compared with 6 and 7 year olds. Both results are statistically significant.

[Table 2 about here]

It is interesting to see how FUNDEB and Amendment #59 actually affected preschool enrollment. As Figure 3 shows, in 2005, 63% of 4 and 5 year old children were enrolled in preschool, while in 2011, this rate increased by 13 percentage points. As Berlinski and Galiani (2007) found out in their research, for women with young children, labor participation and child care are jointly determined. Since there was a significant increase in preschool enrollment I expect, thus, to also find an increase in at least one labor outcome, but more specifically on those mothers’ probability to work.
Effects on Mothers’ Labor Outcomes

Table 3 shows the results of model 2, that includes aggregate preschool enrollment per state and year. As seen in the table, the effects of a rise in preschool enrollment were positive and significant on mothers of preschoolers’ probability to work. The analysis suggests that higher preschool enrollment increased the probability that a mother with a preschool age child was employed by 39% when compared to mothers of 6 and 7 year olds. This reinforces my hypothesis that increases in preschool enrollment affected at least one labor outcome for mothers – their probability of working.

However, model 2 shows no statistically significant effect on mothers' earnings and hours worked. The main reasons for those results will be discussed in the following section.

[Table 3 about here]

It is remarkable and a great achievement that mothers of young children that are able to work after the establishment of the policies in Brazil. This increase in representation of mothers of young children in the labor market decreases the motherhood penalty.

DISCUSSION

As suggested by the findings, both the establishment of a new policy that increased ECE financing (FUNDEB) and made preschool compulsory (Amendment #59), had positive effects on preschool enrollment for 4 and 5 year old children, when compared to the enrollment rate of 6 and 7 year-olds over the past decade. This increase consequently affected mothers of preschoolers’ probability to work. These results are aligned with
findings from the extant literature and with my argument that preschool directly improves women's probability to work.

This is a great gain not only for mothers, but for companies and countries, as everyone will directly benefit from women’s higher contributions to the nation’s economic growth. As the McKinsey Global Institute report (2015) shows, the motherhood penalty is even stronger in Latin American countries. So the fact that Brazil has established two important ECE policies and is now seeing effects of those policies on mothers of young children probability to work, is crucial for the increase of the importance of female labor force participation.

However, the increase in preschool enrollment did not affect mothers’ earnings or hours worked per week. What might explain the non-significant finding related to hours worked per week is the theory that only women who work less than the number of hours of care provided by preschool programs would increase their labor supply (Blau and Kahn 2007; Heim 2007). This is in line with what Fitzpatrick (2010) found in her research on subsidies for universal preschool in Georgia and Oklahoma. These subsidies increased enrollment but did not affect mothers’ hours of work, mainly because all women worked more than the numbers of hours of care provided by the programs. In terms of the non-significant findings related to mothers’ earnings, I believe this can be correlated to hours of work as well.

For future research, it is important to examine the number of hours of care preschools provide. This is essential for comparing the number of hours those mothers have to work per week and obtain a significant effect related to hours worked per week. Also, analyzing different control groups, such as mothers of younger children, for example, could
lead to significant results related to hours worked per week and monthly earnings. Analyzing different income quintiles to understand how those policies affected mothers from high- and low-income backgrounds would also be worth examining. Finally, it could be also interesting to understand the effects of FUNDEB and Amendment #59 on children’s educational development and not only on mothers’ labor outcomes.

CONCLUSION AND POLICY IMPLICATIONS

As has been widely documented, women in Brazil have overtaken men when it comes to completed years of schooling and graduating from all levels of education. However, females still earn considerably less than their male counterparts. As previously discussed, women deal with greater pressures due to competing demands in the workplace and childcare compared to men. Providing accessible preschool is an essential policy for increasing female labor force participation.

Preschool policies have a dual goal by both promoting children's development and increasing mothers' probability to work. Over the past decade, the establishment of FUNDEB and Amendment #59 demonstrated that Brazil is willing to improve its preschool enrollment rate.

In addition to positively affecting preschool enrollment, the policies positively affected mothers of preschoolers' probability to work, which increases the female labor force participation and decreases the motherhood penalty. This amounts to a huge victory for women, but especially mothers of young children who have been always fighting to balance demands related to childcare and the workplace.

There is a still long and vast path to pursue in order to decrease gender disparities in the labor market and at home. Preschool policies are essential for mothers’ employment
trends but are not the only type of policy that can affect gender inequalities in the labor market. Policies such as mandatory paternal leave and inclusiveness of married women in the workforce for example, are important in addressing those inequalities.

Since this study focuses on the establishment of ECE policies, I recommend in broader terms, that more public efforts be made to increase preschool enrollment and ECE enrollment in general, so that their effects on mothers’ participation rate in the labor market can be even more significant. Providing incentives for families from lower income backgrounds to enroll their children or defining and establishing quotas for non-white children to enroll in preschool programs, for example, are ways in which ECE policies can have an even stronger positive effect on women, addressing the populations who need it the most.
REFERENCES


Figure 1: Percentage of part-time and full-time workers by gender in Brazil in 2015

*Note:* full-time jobs require employees to work 40h/week.

Figure 2: Hours per Week Dedicated to Childcare and Work by Gender in Brazil in 2015
Source: Brazilian Institute of Geography and Statistics (2015)
Figure 3: Enrollment Rates for 4 and 5 year olds (Preschoolers) and 6 and 7 year olds per Year in Brazil
Source: Brazilian Household Survey (2015)
<table>
<thead>
<tr>
<th></th>
<th>Child 4-5</th>
<th>Child 6-7</th>
<th>Non-Mother</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work</td>
<td>0.25</td>
<td>0.26</td>
<td>0.41</td>
</tr>
<tr>
<td>Hours worked</td>
<td>33.68</td>
<td>33.52</td>
<td>35.47</td>
</tr>
<tr>
<td>Monthly earnings</td>
<td>2,712</td>
<td>2,901</td>
<td>7,510</td>
</tr>
<tr>
<td>Children’s school enrollment</td>
<td>0.68</td>
<td>0.94</td>
<td>N.A.</td>
</tr>
<tr>
<td>Schooling</td>
<td>5.27</td>
<td>5.26</td>
<td>7.75</td>
</tr>
<tr>
<td>Non-white</td>
<td>0.60</td>
<td>0.61</td>
<td>0.49</td>
</tr>
<tr>
<td>Urban</td>
<td>0.80</td>
<td>0.79</td>
<td>0.88</td>
</tr>
<tr>
<td>Total observations</td>
<td>248,540</td>
<td>274,733</td>
<td>461,142</td>
</tr>
</tbody>
</table>

*Table 1* Mean Values of Descriptive Characteristics of Women by the age of Child in 2003-2015

*Note:* Earning values are defined in Brazilian Reais (R$).

*Source:* Brazilian National Household Survey (PNAD)
<table>
<thead>
<tr>
<th>Effect</th>
<th>FUNDEB</th>
<th>Amendment #59</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUNDEB*Enrollment</td>
<td>0.111***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00254)</td>
<td></td>
</tr>
<tr>
<td>Amendment*Enrollment</td>
<td>0.102***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00230)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.906***</td>
<td>0.891***</td>
</tr>
<tr>
<td></td>
<td>(0.00208)</td>
<td>(0.00210)</td>
</tr>
<tr>
<td>State Fixed-Effect</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year Fixed-Effect</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>397,113</td>
<td>397,113</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.149</td>
<td>0.148</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2 – Effect of the establishment of FUNDEB and Amendment #59 on Preschool Enrollment in 2003-2015
Source: Brazilian National Household Survey (PNAD)
Table 3 – Effect of Preschool Enrollment Increase on Mothers’ Labor Outcomes

<table>
<thead>
<tr>
<th>Effect</th>
<th>Earning</th>
<th>Probability of Work</th>
<th>Hours Worked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrollment Increase</td>
<td>0.379</td>
<td>0.393***</td>
<td>0.265</td>
</tr>
<tr>
<td></td>
<td>(0.446)</td>
<td>(0.121)</td>
<td>(2.470)</td>
</tr>
<tr>
<td>Constant</td>
<td>6.172***</td>
<td>-0.324**</td>
<td>33.65***</td>
</tr>
<tr>
<td></td>
<td>(0.487)</td>
<td>(0.128)</td>
<td>(2.754)</td>
</tr>
<tr>
<td>State Fixed-Effect</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year Fixed-Effect</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>101,536</td>
<td>397,113</td>
<td>118,821</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.065</td>
<td>0.052</td>
<td>0.047</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

*Source: Brazilian National Household Survey (PNAD)*
APPENDIX: ECONOMETRIC DETAILS

The Difference-in-Differences Estimator

Differences-in-differences is a quasi-experimental design that makes use of longitudinal data from treatment and control groups to obtain an appropriate counterfactual to estimate a causal effect and is typically used to estimate the effect of a specific intervention or treatment as illustrated below.

The model is a useful technique to use when randomization on the individual level is not possible, as is the case for my study. Differences-in-differences requires data from pre-post-intervention, such as cohort or panel data (individual level data over time) or repeated cross-sectional data (individual or group level). This approach removes biases in the post-intervention period comparisons of the treatment and control groups that could be due to permanent differences between those groups. This approach also removes biases from comparisons over time in the treatment group that could be the result of trends due to other causes of the outcome (Angrist and Pischke, 2008).

Differences-in-differences Assumptions:

In order to estimate any causal effect, three assumptions must hold:

1. **Exchangeability** - This is the assumption that the data came from randomized control trials (RCT). However, differences-in-differences estimator allows for a less strict exchangeability assumption, i.e., in the absence of treatment from RCT, the unobserved differences between treatment and control groups are the same over time. In other words, having information about one variable will not affect the prediction of another variable.

2. **Positivity** – This is the assumption that any individual has a positive probability of receiving the treatment. In other words, I need both mothers
who have their children enrolled in childcare and preschool and mothers who do not. This assumption is upheld in my study.

3. **Stable Unit Treatment Value Assumption (SUTVA)** – This assumption requires that the composition of intervention and comparison groups to be stable for repeated cross-sectional design and there be no spillover effects of the treatment. Thus, treatment applied in one unit should not affect the outcome of another unit. In my study, this assumption is fulfilled since a mother who has a child attending preschool or childcare (treatment applied in one unit) does not affect other mothers' earnings (an outcome of another unit).

\[ Y_i(1) - Y_i(0) = \tau_i \]

Where \( Y_i(1) \) is the potential earning of a mother \( i \) if she has children in childcare or preschool (if she was given the treatment) and \( Y_i(0) \) is the potential earning if a mother has children that are not attending preschool or childcare (control).