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THE IMPACT OF POSTPONING MOTHERHOOD ON WOMEN'S INCOME IN BRAZIL

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Abstract

This paper investigates the impact of the postponement of motherhood on women's earnings and gender gap in Brazilian labor market, based on data from Brazilian National Health Survey of 2013. Using the Heckman (1979) approach, the results suggest that postponing motherhood has a positive impact of 1.55% on earnings each year of postponement. By comparing men and women, the results suggest that being a woman generates a wage penalty of approximately 22%, but the postponing of motherhood can eliminate that gender gap, especially for those who are white, yellow and higher educated.

Keywords: labor market, first child, earnings, gender inequality.
JEL codes: J31, J13, J16.

Resumo

Este artigo investiga o impacto do adiamento da maternidade nos rendimentos das mulheres e na diferença de rendimento entre homens e mulheres no mercado de trabalho brasileiro, com base em dados da Pesquisa Nacional de Saúde de 2013. Usando a abordagem Heckman (1979), os resultados sugerem que o adiamento da maternidade tem um impacto anual positivo de 1,55% sobre os rendimentos. Ao comparar homens e mulheres, os resultados sugerem que ser mulher gera uma penalidade de cerca de 22% nos rendimentos, mas o adiamento da maternidade pode eliminar essa diferença de gênero, principalmente para as mulheres brancas, amarelas e com ensino superior.

Palavras-chave: mercado de trabalho, primeiro filho, rendimentos, desigualdade de gênero.
Códigos JEL: J31, J13, J16.

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1 Introduction

The labor market, in both developed and developing countries, has undergone several structural changes over the last decades, especially with the entry and increased participation of women. However, income inequalities are still present and have different formats. As reported by indicators from the Organization for Economic Cooperation and Development - OECD (2015), there are high-income gaps between men and women with the same level of education in Brazilian labor market, since the average income of a woman with higher education corresponds to only 62% of the average income of a man with the same educational level. Along with Chile, this is the largest gender pay gap when comparing data from other OECD partner countries.

During the last decades, the gender wage gap has decreased considerably according to Blau & Kahn (2016), who analyzed the United States labor market from 1980 to 2010. In Brazil, this trend was also observed according to Madalozzo (2010), in an analysis for the period from 1978 to 2007. The gender difference depends on many factors, such as personal, household and occupational characteristics (Bertrand et al. 2010, Goldin & Mitchell 2016). However, a well-known finding in the literature is that the gender wage gap persists even when controlled by a wide range of observable characteristics of companies and individuals.

In addition, inequality among women is evident when analyzing the role of fertility and its change over the past decades. According to Bratti (2015), most developed countries show an increase in the age women have their first child. As reported by data from IZA World of Labor (2015), between 1970 and 2011 the age of women giving birth to their first child increased by 6.0 years in Germany, 4.9 years in Italy, 2.7 in Sweden, and 2.3 years in the United States. Looking at Brazilian data, according to the World Bank (2019), the total fertility rate, which represents the average number of children per woman until the end of their reproductive life, decreased from 6.07 children per woman in 1960 to 1.711 children in 2017[1]. Consequently, the implications of the postponement of motherhood in terms of earnings have attracted the attention of researchers. Miller (2011) found from US data from 1979 to 2000 that delayed motherhood increases the amount of hours worked and women's wages and, therefore, it improves career gains, as well as post-motherhood wage rates. Thus, the wage penalties suffered by women throughout their careers due to motherhood present themselves as an additional obstacle to economic equality between men and women.

On the other hand, pregnancy after age thirty-five tends to be considered late from a medical perspective. Conforming to Gomes et al. (2008), pregnant women after this age are included in a group of high-risk, requiring special care since the beginning of pregnancy. In order to prevent complications for both baby and mother, this care includes a greater number of consultations and a variety of prenatal procedures. The authors add that high-risk pregnancies may be an indicative of greater emotional and social problems, leading to increased maternal anxiety levels. As state in a study by Santos et al. (2009), that interviewed female adolescents, adults, and elderlies(i.e. thirty-five years old or older), it was observed lower Apgar scores in the fifth

[1] As the level of fertility rate of population replacement is 2.1 children per woman, this number indicates a possible steady state, followed by a decrease in absolute terms of the Brazilian population.

minute[2], preeclampsia, premature membrane rupture, diabetes, and higher risk of cesarean section among those over thirty-five years old. In agreement with Alves et al. (2017), the predisposition of advanced pregnancy to higher obstetric risks may present as reasons the pathological process of aging of the ovaries and the increased frequency of pre-existing chronic diseases, which expand with age.

The postponement of motherhood and the fertility rate behavior also play an important role in the process of demographic transition that Brazil has been facing in recent decades. Following Vasconcelos & Gomes (2012), the country began the process of demographic transition from 1950 onwards, characterized by declining levels of mortality, birth, and fertility, in addition to increased life expectancy at birth. As a result, over the last few years the country has totally transformed its demographic profile from a predominantly young population to an increasing number of people aged sixty or older, showing that the age structure goes through an aging process.

For developing countries, especially Brazil, there is still little evidence on the effects of motherhood postponement. In this context, this research seeks to assess the impact of motherhood postponement on women's earnings and on the gender gap in Brazil according to information from the Brazilian National Health Survey of 2013. The hypothesis is that postponing motherhood has a positive impact on women's earnings.

The study of the women's participation in the labor market is relevant to analyze public policies directed at them. Meulders et al. (2008) discuss working conditions and public policies implemented regarding motherhood in fifteen countries in Europe[3] and stress the economic and social importance of women's increasing participation in the labor market, but they also emphasize the need to help them stay, considering that the birth of a child can cause them to interrupt their professional activity or change their working time or line. Such modifications may lead to loss of income and lower career prospects. Pignatti (2016) discusses policies aimed at encouraging the participation of women in the workforce in countries in transition, which are in the process of transferring from central planning to a market economy. The author states that increasing female participation in the labor market is an important factor for sustainable economic development, especially in countries with aging population characteristics and a high level of women's qualifications. Brainerd (2014) analyzes the effectiveness of government policies in reversing unwanted declines in fertility in Central, Eastern, and Western European countries. The author concludes that government birth policies are capable of raising the number of births only narrowly, especially regarding second and third children. When analyzing the effectiveness of government policies aimed at childcare in Northern and Southern Europe, the United Kingdom, the United States, and Canada, Vuri (2016) states that access to childcare, especially for children under the age of three or between three and five years old, allows the primary caregiver, usually the mother, to dedicate herself to

[2]According to Casey et al. (2001), the Apgar score is a mean of evaluating the physical condition of newborn infants at one and five minutes after delivery. Five characteristics are assessed: heart rate, respiratory effort, muscle tone, reflex irritability, and color. Each component has a value of 0 to 2 and the total score is the sum of all the characteristics. A baby's condition is considered good to excellent if the score is 7 or higher.

[3]Denmark, Belgium, Portugal, Sweden, Greece, Finland, Spain, Italy, Luxembourg, France, the Netherlands, Austria, Ireland, Great Britain, and Germany.

the labor market, thus reaching a more satisfactory level of work-life balance.

Therefore, the objective of this article is to contribute to the line of research related to gender disparities in the labor market and in society, fostering debate on the topic. Changes in the participation of women in the labor market and in the fertility rate are important to the elaboration of public policies as they directly influence the age structure of the population with reflexes on the demand for public services such as schools, daycare centers, health and social security.

In addition to this introduction, the rest of the paper is organized as follows: Section 2 introduces the theoretical and empirical background on the topic, ranging from the theory of an individual's job offer to women's motherhood decision and its economic implications; Section 3 discusses the methodology used in this work to estimate earnings equations using the Ordinary Least Squares Method, the Heckman Method, and the Instrumental Variables Method; finally, Section 4 presents the results and the discussion regarding the methodology used. The main findings are summarized in the conclusion.

2 Theoretical and empirical background

Considering the traditional approach, the individuals' job offer can be studied from the maximization of their well-being in the consumption of goods and leisure (Varian 1992). Individuals seek to maximize their well-being through the consumption of goods and leisure when making decisions regarding labor supply and such decisions depend on the past generation's decisions about motherhood (Borjas 2009). By incorporating the demand for children, Becker (1981) assumes that each family maximizes a utility function of the quantity of children of each child's expenditure, also called by the author as quality of children and quantity of other goods. According to this approach, children are not buyable products, but each family produces them and they use goods and market services, in addition to the time of parents, especially the mother's. Since the cost of time and the domestic production functions are different between families, the total cost of raising children is different. Therefore, the demand for children depends on the relative price of children and total income, i.e., an increase in the relative price of children reduces the demand for children and increases the demand for other products, keeping real income constant.

Therefore, decisions about the job offer of individuals, especially women, are directly related to decisions concerning the family sphere. Thus, the analysis of the woman's age choice to have her first child, as well as the number of children she will have, becomes relevant to this discussion. Regarding the postponement of the decision to be a mother, Bratti (2015) affirms that such strategy may allow women to accumulate human capital before having a child, expand their participation in the labor market and boost their income. However, it may make this woman more likely to have fewer children. This way, countries can intervene to soften this trade-off by investing in family-friendly policies. In order to understand why the postponement of motherhood can affect wages and labor supply, the author adds that having a child implies a temporary exit from the labor market for women and consequently a proportional loss of income. In addition, when returning to the labor market, a woman may return to the pre-birth wage level or may fall back to a lower one.

Some papers specifically address fertility rate behavior. Kim (2016) analyzes women's educational level and its impact on fertility and concludes that there is a negative correlation between these two variables, so that women who are more educated commonly have fewer children than the less educated ones. This correlation can be strongly observed across time and regions, however, it is not the same across countries as it varies depending on different levels of women's education, stages of country development and institutional aspects, including the quality of education. In this line of study, Berquó & Cavenaghi (2006) analyze fertility in Brazil and state that the fertility rate is declining and female schooling and income show a negative correlation with fertility levels. This subject is also relevant for the elaboration of public policies.

In order to understand the decisions regarding work supply, it is necessary to understand the behavior of women in the labor market. There are several researches in empirical literature that aimed to study this subject. The insertion of women in the labor market was marked by progress, although a number of unfavorable conditions remained. In Brazil, the work of Bruschini et al. (2008) concludes that between 1995 and 2005 the country underwent relevant demographic transformations, such as reduction in fertility rates, decrease in the size of family arrangements, aging population and the growth of female-headed family arrangements. However, there is a persistence of traditional family models, which implies that women are still responsible for domestic activities and childcare. Verick (2014) highlights the complexity of the nature of women's participation in the labor market in developing countries such as Brazil, India, Indonesia and Turkey and concludes that the relationship between this variable and the development of a country reflects changes in economic activity, educational attainment, fertility rates, social norms and other factors. As a result, female labor supply is both a driver and a result of development.

As noted, time spent on domestic activities is a relevant factor in terms of women's participation in the labor market. Accordingly, some studies investigate housework and the organization of time between men and women, as in Rizavi & Sofer (2008), who identify a modern version of the traditional division of labor in European countries[4] and the United States so that both spouses participate in the labor market, but men specialize relatively more in the labor market and women specialize in housework. De Henau & Puech (2008), who performed a comparative analysis regarding the duration, organization, and breakdown of professional and domestic working hours between men and women in Europe, found similar results. In Brazil, Dedecca (2008) states that current working hours assign a high workload to workers, especially women, who are entrusted with work for social reproduction, which indicates the extent of inequality present in Brazilian society.

Assuming that, despite advances, traditional family models persist. Studies assess the wage gap for women and the postponement of motherhood, among them, Amuedo-Dorantes & Kimmel (2003) analyzed the aspect in the United States using data from the 1979 National Longitudinal Survey of Youth and found that there is no wage penalty for college-educated mothers, there is a wage boost instead. They also found that these mothers could increase this

[4]Belgium, Germany, Estonia, France, Hungary, Slovenia, Finland, Sweden, Great Britain, and Norway.

boost further by delaying motherhood. Anderson et al. (2003) also assessed the motherhood wage penalty using data from the National Longitudinal Survey of Labor Market Experience of Young Women (NLSYW) and their results indicated that mothers tend to face the highest wage penalty when they first return to work and it happens even if their children are older. Van Bavel (2010) studies the impacts of the postponement of motherhood by European college-graduated women aged twenty to forty years old from a perspective of the choice of the field of study. The author found that this postponement is related to stereotypical attitudes about family roles. Buchmann & McDaniel (2016) examined the family wage gap for highly educated professionals in the United States from 1980 to 2010 and indicated that the negative wage differential for motherhood has been declining over time in all professions, but in traditionally male-dominated positions mothers experience a positive wage differential and in female-dominated ones, the wage differential is negative. Miller (2011) assessed the effects of motherhood timing on career path in the United States from 1979 to 2000 and the obtained results suggested that delaying becoming a mother increases the amount of hours worked and women's wages and, therefore, it improves career gains, as well as post-motherhood wage rates.

Budig & J (2010) analyzed the earnings inequality in the United States using data from 1979 to 2004. The results showed that the motherhood penalty varies by earnings levels, being larger on low-wage women and smaller among highly paid women. Gustafsson (2001) studied the determinants of the postponement of maternity in European countries since the 1970s and found that woman's career costs is the main factor that works for later births. Moreover, consumption smoothing and woman's career planning are explanations to the postponement of maternity as well. Pazello (2006) examined the impact of an exogenous shock on motherhood, represented by twin first birth, on women's participation in Brazilian labor market between 1992 and 1999. The results suggest that the probability of women's participation in the labor market could be negatively affected by an unplanned increase in the number of children and this impact is negative only in the short run. Pazello & Fernandes (2004) studied the occurrence of stillbirth as an instrument to maternity to compare the behavior of women that have one child or more and women that do not have children, but tried to have one child and did not succeed. Using data from 1992 to 1999, the authors found that motherhood has a negative effect on women's participation in the labor market, but this negative participation tends to decrease over the long run. This negative relationship between motherhood and the participation of women in the Brazilian labor market is also observed by Cunha & Vasconcelos (2016), considering information from the period from 1995 to 2009.

Overall, as suggested by the literature, the labor market has undergone significant demographic transformations, characterized by reduced fertility rates, declining family arrangements, aging population and the growth of female-headed family arrangements. However, traditional family models persist, which implies that women are still responsible for domestic activities and childcare. Consequently, the need to help them to remain in the labor market is highlighted, considering that the birth of a child can cause them to interrupt their professional activity or modify their working time or their line of work. Thus, this paper seeks to contribute to this literature by addressing the effects of postponing maternity on women's earnings in Brazil in 2013. Next,

we discuss the methodological procedure used and, subsequently, we present the results.

3 Methodology

3.1 Data

This study uses as a basis the microdata of the Brazilian National Health Survey conducted in 2013, which was based on the objective of addressing the performance of the national health system, the health conditions of the Brazilian population, the surveillance of chronic non-communicable diseases and associated risk factors. The Brazilian National Health Survey is part of the Integrated System of Home Surveys of the Brazilian Institute of Geography and Statistics and has a period of five years. The target population of the research comprises residents of permanent private households in the national territory.

The Brazilian National Health Survey sampling is stratified and the questionnaire is divided into three stages of conglomeration, with the census tracts being the primary sampling units, the households as the second-stage units, and the adult residents, aged eighteen or older, as the third stage units. Thus, this survey is a complex sample, as it comes from cluster research and includes a process of stage weight calibration. The estimates of this paper considered this sample design.[5]

Initially, the total number of observations in the database is 205,546. The survey questionnaire module for women's health, preventive examinations, reproductive history and family planning is applied to women aged eighteen or older. In addition, the part of this module related to women's reproductive history is not applied to women at fifty and older. Therefore, for the estimation of the results of this study, only individuals from eighteen to forty-nine years old were considered. For the construction of the database, women who answered the questionnaire stating that they were unaware of their first pregnancy age and women who reported having children older than their age at the time of the survey were excluded. Those who declared their color or race as "ignored" were excluded. As a result, the final number of observations was 39,871.

3.2 Methods

The Mincer income equation is the most commonly used to measure wage differentials and allows establishing a relation between the log of wage received by the individual and other explanatory factors such as education, usually measured by years of schooling, experience, derived from the individual's age, quadratic experience and other attributes. In order to identify the effect of the postponement of motherhood on women's income in Brazil in 2013, the parameters of the following income equation are estimated:

$$Ln(Y_i) = \beta_0 + \gamma A1B_i + \sum_{j=1}^{k} \boldsymbol{\beta}_j \boldsymbol{x}_{ji} + \varepsilon_i \tag{1}$$

where Y_i represents income, $A1B_i$ corresponds to the age of the woman at first pregnancy ("age at first birth"), $\boldsymbol{x}_{ji}$ is the vector of control variables and ε_i is

[5] For more details, see Souza-Júnior et al. (2015).

a term of error. Hence, the term γ is not random and consequently it denotes the effect of motherhood delay on the income variable. The other explanatory variables are described in Table 1.

Earnings equations are first estimated using the Ordinary Least Squares Method (OLS). However, using Mincer equations may result in the problem of sample selection bias, when the sample is inconsistent. Thus, seeking to correct this problem, the equations are estimated again through the Heckman Method. This approach was proposed by Heckman (1979), who highlights the problem of selection bias in the case of estimating earnings equations for women, which corresponds to the theme of the present work. The first step of this method is to estimate a selection equation using a probit model and, from this equation, calculate the inverse of the Mills ratio (λ) for each individual in the sample. The selection equation is determined by the following equation, which can be estimated using a probit model:

$$z_i^* = \boldsymbol{w_i'\gamma} + u_i \tag{2}$$

The equation of greatest interest is:

$$y_i = \boldsymbol{x_i'\beta} + \varepsilon_i \tag{3}$$

y_i is observed only when z_i^* is greater than zero. It is assumed that ε_i and u_i have a normal bivariate distribution with zero mean and correlation ρ.

$$y_i = \boldsymbol{x_i'\beta} + \beta_\lambda \lambda_i(\alpha_u) \tag{4}$$

Where

$$\alpha_u = -\boldsymbol{w_i'\gamma}/(\sigma_u) \tag{5}$$

and

$$\lambda(\alpha_u) = \phi(\boldsymbol{w_i'\gamma}/\sigma_u)/\Phi(\boldsymbol{w_i'\gamma}/\sigma_u) \tag{6}$$

Therefore, $\phi(.)$ represents the probability density function and $\Phi(.)$ corresponds to the cumulative distribution function. Thus:

$$y_i|z_i^* > 0 = E[y_i|z_i^* > 0] + \upsilon_i \tag{7}$$

$$= \boldsymbol{x_i'\beta} + \beta_\lambda \lambda_i(\alpha_u) + \upsilon_i \tag{8}$$

The second step of the Heckman Method is to estimate income equations using the Ordinary Least Squares Method including the inverse Mills ratio (λ) as an additional regressor. Performing this procedure circumvents the problem of sample selection bias and sample inconsistency. Earnings equations can be represented as:

$$Ln(Y_i) = \beta_0 + \gamma A1B_i + \sum_{j=1}^{k} \beta_j \boldsymbol{x}_{ji} + \beta_j \hat{\lambda}_i + \varepsilon_i \tag{9}$$

However, if the variable $A1B_i$, which corresponds to the woman's age in the first pregnancy, is correlated with the error term ε_i due to, for example, the omission of some variable, the OLS method and other techniques will

Table 1: Description of the variables

Variable	**Description**
ln_hourly_wage	Hourly wage
A1B	Woman's age at first pregnancy
Age at first child	
f_24	1 if she had her first child up to 24 years old and 0 otherwise, × A1B
f25_29	1 if she had her first child between 25 and 29 years old and 0 otherwise, × A1B
f30_34	1 if she had her first child between 30 and 34 years old and 0 otherwise, × A1B
f35_49	1 if she had her first child between 35 and 49 years old and 0 otherwise, × A1B
Age	Age from 18 to 49 years old
age2	Squared age
Education	
study1	1 if she is illiterate or not completed primary school 0 otherwise, the reference category
study2	1 if she has attended and has completed primary school, but has attended and has not completed elementary school and 0 otherwise
sudy3	1 if she has attended and completed elementary school, but has attended and has not completed high school and 0 otherwise
study4	1 if she has attended and completed high school, but has attended and has not completed a college degree - graduation course and 0 otherwise
study5	1 if she has attended a college degree or more, and 0 otherwise
Race	
white_yellow	1 if she is white or yellow and 0 otherwise
white_yellow_n	1 if she is black, brown or indigenous and 0 otherwise, the reference category
Region	
northeast	1 if she lives in the Northeast region and 0 otherwise
south	1 if she lives in the Southern region and 0 otherwise
southeast	1 if she lives in the Southeast region and 0 otherwise
midwest	1 if she lives in the Midwest region and 0 otherwise
north	1 if she lives in the North region and 0 otherwise, the reference category

Source: Microdata from the Brazilian National Health Survey of 2013.

Table 1: Description of the variables (continued)

Variable	**Description**
Occupation	
director	1 if she is a director or a manager and 0 otherwise
science	1 if she is a science professional or an intellectual and 0 otherwise
professional	1 if she is a technician or a mid-level professional and 0 otherwise
administrative	1 if she is an administrative support worker and 0 otherwise
service	1 if she is a service worker, a seller of trades and markets and 0 otherwise
forestry	1 if she is a skilled worker in agriculture, forestry, hunting, and fishing and 0 otherwise
craft	1 if she is a skilled worker, construction worker and craftsman, mechanical arts and other crafts and 0 otherwise
operator	1 if she is a plant and machine operator or an assembler and 0 otherwise
elementary	1 if she is in an elementary occupation and 0 otherwise, the reference category
Sector	
industrial	1 if she works in the industrial sector and 0 otherwise
construction	1 if she works in the construction sector and 0 otherwise
trade	1 if she works in the trade and services sector and 0 otherwise
agriculture	1 if she works in the agriculture sector and 0 otherwise, the reference category
Position	
employee	1 if she works as an employee and 0 otherwise
employer	1 if she is an employer and 0 otherwise
self – employed	1 if she is self-employed and 0 otherwise, the reference category
Marital status	
married	1 if she is married, and 0 otherwise
single	1 if she is not married, and 0 otherwise, the reference category

Source: Microdata from the Brazilian National Health Survey of 2013.

produce biased estimates. In order to avoid the endogeneity problem, the predictor variable influencing the predicted variable and vice versa, the income equations are estimated again using the Instrumental Variable Method.

To obtain consistent estimates of the impact of postponing motherhood, in the first stage of this method the $A1B$ is modeled as the result of the woman's desired moment and random shocks. In this regression, other determinants are included in addition to the variables in the income equation. These variables, called instruments, must be correlated with $A1B$, but not correlated with the random term of the earnings equation. The purpose of these variables is to capture random and unanticipated factors that make the difference between the actual timing of motherhood and optimal or expected timing:

$$\begin{aligned} A1B_i = \alpha_0 \quad &+ \quad \alpha_1 miscarriage + \alpha_2 abort + \alpha_3 treatment + \alpha_4 dchildren \\ &+ \quad \alpha_5 smoking + \alpha_6 care + \alpha_7 surgery + \alpha_8 yearbirth \\ &+ \quad \sum_{j=1}^{k} \delta_j \boldsymbol{x}_{ji} + \kappa_i \end{aligned} \tag{10}$$

In the equation, $A1Bi$ is the dependent variable, which corresponds to the age of the woman in the first pregnancy; *miscarriage* indicates if the woman has ever had a miscarriage; *abort* indicates if the woman has had any abortions; *treatment* is a variable that indicates whether the woman and her partner have had or are undergoing treatment for pregnancy; *dchildren* determines the number of children who were born alive and died later; *smoking* indicates if the woman started smoking cigarettes daily in the year she had her first child or later; *care* indicates whether the woman had prenatal care the last time she was pregnant; *surgery* indicates if the woman has already had surgery to remove the uterus; *yearbirth* corresponds to the year of birth of the individual or the assumed age. Moreover, x_{ji} represents the control variables of the income equation.

There are variables that have a positive expected impact, such as *miscarriage* and *treatment*. On the other hand, the variables *abort*, *dchildren*, *smoking*, and *yearbirth* have an expected negative impact. Finally, the variables *care* and *surgery* can have a positive or negative impact. Therefore, the equations described are estimated using the instrumented variable $A1B_i$. Three sets of tests were used to assess whether this approach was fit or not. Initially, to check whether the variables were exogenous, the Durbin and Wu-Hausman tests were used. When these tests are significant, it is suggested that there is an endogeneity problem between the regressors (Wu 1974, Hausman 1978). Subsequently, the Sargan (1958) and Basmann (1960) tests were used to verify the constraints of overidentification. A significant test statistic indicates invalid instruments when the instruments are correlated with the error term or an incorrectly specified structural equation. Finally, the minimum eigenvalue statistic (MES) tests whether the set of instruments is weak as a null hypothesis (Stock et al. 2002).

To verify whether the postponement of motherhood cancels the penalty of having children in relation to those who did not have children, estimates were initially made, including only women with children, using the Ordinary Least Squares (OLS) method, the instrumental variable (IV) and Heckman procedure. In addition to estimating the impact of postponement of mater-

nity from the age of first pregnancy, it is also considered all women in the following equations:

$$Ln(Y_i) = \beta_0 + \gamma mother + \sum_{j=1}^{k} \beta_j \boldsymbol{x}_{ji} + \theta \hat{\lambda}_i + \varepsilon_i \tag{11}$$

$$\begin{aligned} Ln(Y_i) = \beta_0 \quad &+ \quad \gamma_1 f\_24 + \gamma_2 f25\_29 + \gamma_3 f30\_34 \\ &+ \quad \gamma_4 f35\_49 + \sum_{j=1}^{k} \beta_j \boldsymbol{x}_{ji} + \beta_j \hat{\lambda}_i + \varepsilon_i \end{aligned} \tag{12}$$

The mother variable is a binary variable with a value of one if the woman is a mother and zero otherwise. In the following equation, this variable is changed by four more to capture the impact of the postponement phenomenon: f_24 is a variable with a value one if the woman had her first child up to twenty-four years old, and zero otherwise, multiplied by the variable $A1B$. Likewise, f25_29, f30_34 and f35_49 are equal to one in the twenty-five to twenty-nine, thirty to thirty-four and thirty-five to forty-nine age brackets. Therefore, the reference category is women who have no children. These age groups were established considering the reproductive cycle of women, seeking to highlight the two five-year periods of twenty-five to thirty-four years old, in addition to the previous and subsequent periods.

Lastly, other estimates were made with all women and men, including a binary variable to indicate when the individual is a woman in equations 11 and 12. Thus, the variable *woman* is a dummy which is equal to one if the individual is a woman and zero if the individual is a man. This estimate seeks to verify whether the postponement of maternity reduces or eliminates the gender gap in the Brazilian labor market.

3.3 Descriptive analysis

When analyzing the age at which women had their first child, it can be observed that, in 2013, the highest proportions were concentrated between seventeen and nineteen years old, as shown in Figure 1a. Moreover, observing the information from the Brazilian National Health Survey, 34.25% of women had no children, 9.82% had children aged zero to two years old, and 7.26% had children aged three to five years old. Also, 8.5% had children aged six to ten years old, 7.03% had children aged eleven to seventeen years old, and 33.12% had children aged eighteen years old and older.

The relationship between age and first pregnancy can also be observed according to the woman's characteristics, such as her education, race and earnings, as shown in Figures 1b, 1c, and 1d. The age, between eleven and forty-five years old at which the women analyzed by the research had their first child, according to educational level, is in Figure 1b. In general, women with a low level of education became younger mothers when compared to women with a middle and high level of education. Examining these women, 40.3% of them had a low level of education, that is, they were illiterate, literate, but have not completed primary education, and those who have completed primary education, but have not completed elementary school. 45.8% of the mothers have had high school level, they have completed elementary school,

but they have not finished high school and those who have completed high school, but not higher education. In addition, 13.9% had a high level of education, which means they were undergraduated, taken master's degree or PhD.

The composition of the age at which the analyzed women had their first child, according to color or race is in Figure 1c. The figure shows women divided into two groups: white, which represents 44.2% of mothers, and non-white, characterized by 55.8% of them. The group of mothers considered white comprises white and yellow women, while the group of non-white mothers includes black, brown and indigenous women. There is also a difference in the behavior of these groups, in which non-white women have children earlier on average than white women. The composition of the age at which non-white women first became mothers is between sixteen and twenty years. In contrast, when analyzing white women, the percentages are more distributed along the graph, which suggests a lower concentration when compared to the other group of women.

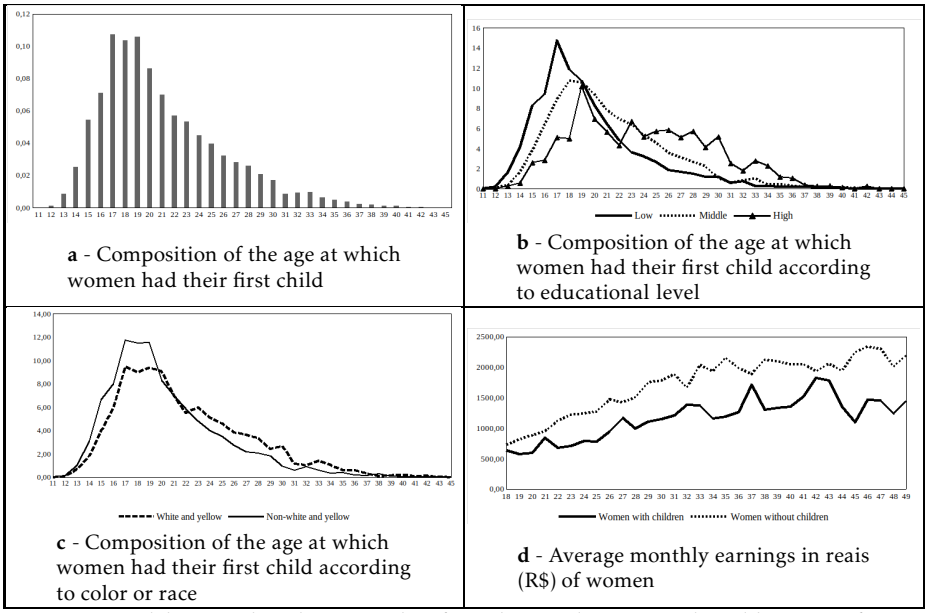
Women's average monthly earnings in reais (R$) in 2013 by their age at the time of the survey is shown in Figure 1d, with information for women with children and no children. At all ages, women without children had higher monthly earnings when compared to women with children. For example, a thirty-five-year-old woman without children earned an average of R$2,152.52 in 2013, while a woman with children at the same age earned an average of R$1,183.75, which is equivalent to a difference of R$ 968.77. Although these results are expected, they may be reflecting the different characteristics of the sample of women with and without children. To control these effects, several characteristics of these women are analyzed, as shown in Table A.1 in the appendix section, and regressions are estimated in the next section.

In general, the average age of women of the survey is approximately thirty-three years old, while the average age of women with children is thirty-six years old and the age of those without children is twehty-eight, according to Table A.1 in the appendix section. In addition, 44.2% of women with children are white or yellow, while the percentage for the ones without children is 51.4%. The level of education is higher among those without children, in which 22.5% of them has completed primary school, but not elementary school, 14.6% of them has completed elementary school, but not high school, 31.2% has completed high school, but not higher education, and 13.9% has attended a higher education program or more. In turn, among women who did not have children, the percentages are 5.47%, 7.91%, 34.9%, and 22%, respectively, according to educational levels. Finally, regarding Brazilian macroregions, there is a higher proportion of women without children in the Southeast region. These heterogeneities in the characteristics of the Brazilian labor market contribute to widening earnings inequalities, as shown in the next section.

4 Results and discussion

In this section, we present the results of earnings equation estimates, first for women with children, then for all women and later for men and women. In addition, to further deepen the understanding of the effect of postponing motherhood on earnings differences, regressions were also estimated, separat-

Figure 1: Composition of the age at which women had their first child – total, according to educational level and color or race – and average monthly earnings in reais (R$) of women in 2013, Brazil.



a - Composition of the age at which women had their first child

b - Composition of the age at which women had their first child according to educational level

c - Composition of the age at which women had their first child according to color or race

d - Average monthly earnings in reais (R$) of women

Source: Own elaboration based on microdata from the Brazilian National Health Survey of 2013.

ing individuals into subgroups with and without higher education.

Initially, estimates of specification (1), in Table 2, were presented using the method of Ordinary Least Squares (OLS), the instrumental variable (IV), and the Heckman procedure[6]. In the case of the instrumental variable method, the Durbin and Wu-Hausman tests did not reject the null hypothesis, which suggests that there is no endogeneity problem between the regressors. These results indicate that no statistically significant problems were found with endogeneity in the estimation of the earnings equation estimated by OLS. In turn, the Sargan and Basmann tests did not reject the null hypothesis that states that the instruments are valid, which indicates that the instruments are not correlated with the error term of the yield equation. Besides, the minimum eigenvalue statistic (MES) that tests as the null hypothesis whether the set of instruments are weak was rejected, whereas the instruments used in the first stage of the procedure are correlated with the variable indicating the postponement of maternity. Thus, while the first statistic suggests that it is not necessary to use the instrumental variable method, as statistically there is no endogeneity problem, the last two statistics indicate that method IV provides estimates that can be analyzed as a robust test in comparison to other methods.

Additionally, in the estimation by Heckman, the coefficient for the lambda regressor, which checks for sample selection bias, was statistically significant. This significant coefficient suggests the presence of unobserved factors that increase returns in the labor market. It is evident that Heckman's procedure shows more robust results than estimates obtained by OLS.

[6]The estimate for the first stage equation of approach IV is shown in Table A.2, which showed a good fit.

These estimates made it possible to test two possible problems in the earnings equation obtained by OLS: the problem of selection bias and that of endogeneity. While the estimates allowed to reject the problem of endogeneity, there is evidence of the presence of selection bias. Therefore, the most robust estimates are those obtained by the procedure of Heckman. Thus, considering that no robust evidence of the problem of endogeneity was found and that there are biases of sample selection, in the analyzes the estimates obtained by the Heckman procedure are considered.

The estimated coefficients for the variable that represents the age at which the woman had her first child, A1B, were significant at 1% in specification (1), suggesting that the postponement of maternity positively affects women's earnings. In the Heckman approach, the estimated coefficient for variable A1B indicates 1.55% impact on earnings each year of postponement of maternity. To illustrate it, if the woman's age when having her first child is twenty years old, the impact on her earnings will be 31%. On the other hand, if a woman postpones maternity and gets pregnant for the first time at the age of thirty-five, the impact on her earnings will be 54.25%.

To analyze whether the postponement of maternity has a non-linear relationship with earnings, the squared terms of the variable *A1B* was included in specification (2). These estimates were significant (2) at the level of 10% of significance. This result suggests a quadratic relationship between postponing motherhood and earnings, which returns are increasing over the reproductive cycle of women.

In general, the other control variables included in the earnings equation were statistically significant and presented the expected signs. Age presented a quadratic relationship with the earnings since the squared term was negative, representing the effect of experience in the job market. Formal education has an increasing impact on women's earnings. The results indicate that white and yellow women have higher yields. There is also evidence of significant regional differences in the country. Regarding job-related controls, it should be noted that the earnings of those employed as science and arts professionals and directors are higher and those engaged in activities in the agricultural sector receive the lowest earnings. In addition, employers have the highest earnings than employees or self-employed workers.

For better understanding of the impact of the postponement of maternity on earnings in the Brazilian labor market, new estimates using the Heckman procedure were made for all women in Table 3, with children, without children and including men. To identify the effect of motherhood, a binary variable was included in specification (1), *mother*, which is equal to one if the woman is a mother and zero otherwise. In turn, in specification (2), to capture the effect of postponing motherhood, this binary variable is segmented into four categories, according to the age the woman was when she had her first pregnancy, f_24, f_25_29, f_30_34 and f_35_49.

The results for specification (1) indicate that motherhood does not affect women's earnings, which is explained by the results of the estimates in specification (2). These results indicate that initially the effect is negative, since the earlier maternity reduces the earnings, but postponing motherhood increases them. Thus, this negative initial and positive final effect is not captured only by the mother binary variable, which suggests a non-significant mean effect of motherhood in specification (1). In fact, there is evidence that the moment when motherhood starts is relevant to the returns to the labor

Table 2: Earnings equations, women with children, Brazil, 2013

Variable	OLS	IV	Heckman	
	(1)	(1)	(1)	(2)
A1B	0.0168 (0.0025)***	0.0249 (0.0082)***	0.0155 (0.0025)***	−0.0140 (0.0154)
A1B2				0.0006 (0.0003)*
age	0.0227 (0.1154)**	0.0174 (0.0122)	0.0750 (0.0134)***	0.0756 (0.0134)***
age2	−0.0003 (0.0002)	−0.0002 (0.0002)	−0.0009 (0.0002)***	−0.0009 (0.0002)***
study2	−0.0521 (0.0395)	−0.0454 (0.0406)	−0.1270 (0.0448)***	−0.1287 (0.0447)***
study3	0.0015 (0.0365)	−0.0005 (0.0363)	0.0211 (0.0413)	0.0227 (0.0414)
study4	0.0717 (0.0360)**	0.0603 (0.0368)	0.1466 (0.0399)***	0.1509 (0.0398)***
study5	0.4606 (0.0474)***	0.4454 (0.0491)***	0.6286 (0.0511)***	0.6288 (0.0512)***
white_yellow	0.1176 (0.0225)***	0.1122 (0.0233)***	0.1351 (0.0270)***	0.1367 (0.0268)***
northeast	−0.2553 (0.0332)***	−0.2612 (0.0336)***	−0.2448 (0.0369)***	−0.2441 (0.0369)***
south	0.0437 (0.0376)	0.0382 (0.0376)	0.1792 (0.0446)***	0.1792 (0.0445)***
southeast	0.0587 (0.0296)**	0.0507 (0.0311)	0.1366 (0.0345)***	0.1371 (0.0345)***
midwest	0.1195 (0.0322)***	0.1162 (0.0325)***	0.2317 (0.0367)***	0.2310 (0.0368)***
director	0.6143 (0.0871)***	0.6004 (0.0882)***	0.5826 (0.0829)***	0.5824 (0.0830)***
science	0.6799 (0.0453)***	0.6528 (0.0506)***	0.6812 (0.0439)***	0.6813 (0.0439)***
professional	0.4364 (0.0464)***	0.4261 (0.0464)***	0.4321 (0.0459)***	0.4327 (0.0456)***
administrative	0.2379 (0.0365)***	0.2213 (0.0390)***	0.2469 (0.0337)***	0.2476 (0.0340)***
service	0.0830 (0.0286)***	0.0798 (0.0285)***	0.0794 (0.0279)***	0.0804 (0.0278)***
forestry	0.0057 (0.1311)	0.0027 (0.01316)	−0.0162 (0.1305)	−0.0157 (0.1304)
craft	−0.0262 (0.0762)	−0.0256 (0.0772)	−0.0356 (0.0769)	−0.0375 (0.0767)
operator	0.0554 (0.0576)	0.0496 (0.0573)	0.0731 (0.0581)	0.0767 (0.0580)
industrial	0.2584 (0.0907)***	0.2554 (0.0923)***	0.2613 (0.0944)***	0.2604 (0.0941)***
construction	0.3671 (0.1049)***	0.3689 (0.1050)***	0.3821 (0.1060)***	0.3815 (0.1054)***

Source: Own elaboration based on microdata from the Brazilian National Health Survey of 2013.
*** p<0.01, **p<0.05, * p<0.1. The standard deviations of the estimated coefficients are in parentheses.

Table 2: Earnings equations, women with children, Brazil, 2013 (continued)

Variable	OLS	IV	Heckman	
	(1)	(1)	(1)	(2)
trade	0.3402 (0.0756)***	0.3377 (0.0766)***	0.3471 (0.0807)***	0.3460 (0.0803)***
employee	−0.0119 (0.0325)	−0.0132 (0.0326)	0.0403 (0.0336)	0.0382 (0.0335)
employer	0.4790 (0.1288)***	0.4741 (0.1296)***	0.4407 (0.0125)***	0.4399 (0.1259)***
lambda			0.5777 (0.0406)***	0.5734 (0.0413)***
constant	0.3068	0.2692 (0.2157)	−1.1960 (0.2567)***	−0.8723 (0.3165)***
Observations	9,026	9,026	15,858	15,858
R^2	0.383	0.381		
$Sargan(p-value)$		2.8745 (0.8964)		
$Basmann(p-value)$		2.8649 (0.8962)		
$Wu-Hausman(p-value)$		2.4197 (0.1199)		
$Durbin(p-value)$		2.4263 (0.1193)		
MES		116.479**		

Source: Own elaboration based on microdata from the Brazilian National Health Survey of 2013.
*** p<0.01, **p<0.05, * p<0.1. The standard deviations of the estimated coefficients are in parentheses.

market for women.

Considering all individuals in the labor market, both men and women, in specifications (3), (4), and (5) there are evidences of gender gap and the results confirm the effect of postponing maternity for women's earnings. This gap was captured by the binary variable *woman*, which is equal to one if the individual is a woman and zero if the individual is a man. The estimated coefficients of this variable were significant at 1% in all specifications and they indicate that being a woman has a negative impact around of 22% on individuals' earnings. Additionally, in these specifications there is evidence of a gender gap in the Brazilian labor market, but that the postponement of maternity can reduce and even eliminate this average differential if the woman postpones motherhood until the age of thirty-five, since this coefficient exceeds the gender coefficient.

In general, the results of the other specification control variables were similar to those previously found, i.e. a higher level of education results in a greater positive impact on women's earnings, as well as being white and yellow, residing in the Midwest region, and being a director or a manager, or being a science professional or an intellectual. In these results, it is important to highlight the estimates of the coefficients for race since they were positive and significant, suggesting that if the woman is not white or yellow, the effect of the postponement, on average, is not able to eliminate the gender gap, even if a woman postpones motherhood for thirty-five years old or more, which can be seen in the estimate for specification (5).

Lastly, due to the importance of differences in education and race for gender inequalities in the labor market, other estimates using the Heckman pro-

cedure were obtained, segmenting individuals between those with higher education or more and those without higher education, as shown in Table 4. From these estimates it is possible to highlight four evidences. Initially, the effect of postponing motherhood is significant, as seen in specifications (2) and (5). Second, the postponement of maternity has a greater effect among the most qualified or with higher education. Third, among the less qualified, with no higher education, specification (5) suggests that the effect of postponing motherhood is not able to overcome the effect of the gender gap, as occurs for women with higher education in that same specification. Finally, the earnings differential for race is greater among the more qualified. Thus, these results allow us to highlight some structural socioeconomic inequalities in the Brazilian labor market, such as those of gender and race.

These results suggest that there are still significant gender differentials in the Brazilian labor market, despite the reduction indicated by the literature (Madalozzo 2010). In addition, the national literature confirms the existence of racial discrimination among women and the higher the earnings, the greater this effect is (Almeida & Fernandes 2015).

Overall, the results presented suggest that the postponement of motherhood positively affects women's earnings. These results corroborate those verified by Miller (2011), who identified for US data that women can achieve higher wages by delaying motherhood during their early twenties and early thirties. This strategy is a way to reduce the penalties suffered by women throughout their careers due to motherhood, which are evidenced through lower wages when compared to men and women without children, variables also analyzed in the present study. On the other hand, financial rewards for delaying motherhood can be a penalty for early motherhood. The results also corroborate the ones found by Amuedo-Dorantes & Kimmel (2003), suggesting that by delaying maternity, college-educated mothers could improve their wage boost. In addition, Anderson et al. (2003) found similar conclusion, indicating that women face a wage penalty when they become mothers and have to return to work.

According to Bratti et al. (2017), who performed a comparison among European countries, delaying the birth of their first child may lead to an increase in wages, as in Germany or Poland, while in other countries the effect may be negative, as in Sweden. This outcome may be related to the policies and institutions in the different countries analyzed. As a result, in more traditional societies and countries that do not invest in family-friendly policies, the gains from delayed maternity are greater. By contrast, in countries seeking to promote greater gender equality, the gains are lower.

The results of the present study are also similar to the ones found by Bratti (2015), who identified that delaying motherhood may be an effective strategy for women to accumulate more human capital before having a child, strengthen their employment and increase earnings. Gustafsson (2001) reviewed empirical and theoretical literature and identified that the woman's career costs have the main effects on delaying birth.

Thus, the evidence presented in this article shows the positive impact of postponing motherhood on women´s earnings. This positive impact of the postponement can even eliminate the gender gap on earnings, especially for white, Asian, and college-educated women. However, it can have negative consequences for women's total fertility rate, making them more likely to have fewer children. In order to soften such negative effects, countries should in-

Table 3: Earnings equations, Brazil, 2013

Variable	Women		Men and women		
	(1)	(2)	(3)	(4)	(5)
women			−0.2357*** (0.014)	−0.2189*** (0.020)	−0.2224*** (0.021)
mother	−0.0217 (0.0222)			−0.0267 (0.022)	
f_24		−0.0451* (0.0236)			−0.0476** (0.023)
f_25_29		0.0663** (0.0301)			0.0474* (0.030)
f_30_34		0.1178*** (0.0489)			0.0899*** (0.048)
f_35_49		0.3043*** (0.0743)			0.2652*** (0.076)
age	0.0917*** (0.0106)	0.0896*** (0.0106)	0.0898*** (0.006)	0.0910*** (0.0007)	0.0905*** (0.006)
age2	−0.0011*** (0.002)	−0.0011*** (0.0001)	−0.0011*** (0.000)	−0.0011*** (0.000)	−0.0011*** (0.000)
study2	−0.2466*** (0.006)	−0.2357*** (0.0387)	−0.1230*** (0.024)	−0.1214*** (0.0024)	−0.1191*** (0.024)
study3	−0.0803** (0.0395)	−0.0766* (0.0393)	−0.0032 (0.026)	−0.0013 (0.0026)	−0.0008 (0.026)
study4	0.0717** (0.0319)	0.0666** (0.0312)	0.1141*** (0.021)	0.1151*** (0.021)	0.1131*** (0.021)
study5	0.5868*** (0.0400)	0.5751*** (0.0397)	0.5642*** (0.027)	0.5633*** (0.027)	0.5582*** (0.027)
white_yellow	0.1390*** (0.0240)	0.1348*** (0.0240)	0.1241*** (0.159)	0.1240*** (0.016)	0.1223*** (0.016)
northeast	−0.2032*** (0.0352)	−0.2087*** (0.0352)	−0.1992*** (0.024)	−0.1992*** (0.024)	−0.2010*** (0.024)
south	0.2025*** (0.0413)	0.1950*** (0.0412)	0.2263*** (0.029)	0.2266*** (0.028)	0.2248*** (0.028)
southeast	0.1802*** (0.0330)	0.1715*** (0.0330)	0.1834*** (0.024)	0.1830*** (0.024)	0.1803*** (0.024)
midwest	0.2578*** (0.0344)	0.2525*** (0.0346)	0.2520*** (0.025)	0.2521*** (0.025)	0.2511*** (0.025)
director	0.6132*** (0.0636)	0.6006*** (0.0633)	0.7358*** (0.036)	0.7336*** (0.036)	0.7289*** (0.036)
science	0.7403*** (0.0368)	0.7187*** (0.0369)	0.8297*** (0.030)	0.8267*** (0.030)	0.8149*** (0.030)
professional	0.4387*** (0.0343)	0.4279*** (0.0336)	0.5145*** (0.026)	0.5121*** (0.026)	0.5077*** (0.026)
administrative	0.2935*** (0.0267)	0.2801*** (0.0267)	0.2988*** (0.020)	0.2950*** (0.021)	0.2893*** (0.021)

Source: Own elaboration based on microdata from the Brazilian National Health Survey of 2013.

*** p<0.01, ** p<0.05, * p<0.1. The estimates were obtained using the Heckman procedure. The standard deviations of the estimated coefficients are in parentheses.

Table 3: Earnings equations, Brazil, 2013 (continued)

Variable	Women		Men and women		
	(1)	(2)	(3)	(4)	(5)
service	0.0772***	0.0729***	0.1620***	0.1596***	0.1585***
	(0.0259)	(0.0258)	(0.019)	(0.019)	(0.019)
forestry	−0.0219	−0.0259	−0.0038	−0.0052	−0.0071
	(0.1369)	(0.1373)	(0.053)	(0.053)	(0.053)
craft	−0.0059	−0.0068	0.2048***	0.2030***	0.2001***
	(0.0656)	(0.0654)	(0.024)	(0.024)	(0.024)
operator	0.0614	0.0578	0.1901***	0.1881***	0.1853***
	(0.0468)	(0.0468)	(0.025)	(0.026)	(0.026)
industrial	0.3496***	0.3429***	0.3134***	0.3144***	0.3161***
	(0.0882)	(0.0886)	(0.040)	(0.041)	(0.041)
construction	0.5373***	0.5377***	0.3700***	0.3701***	0.3693***
	(0.1210)	(0.1206)	(0.041)	(0.042)	(0.041)
trade	0.4034***	0.3966***	0.3372***	0.3384***	0.3391***
	(0.0790)	(0.0792)	(0.038)	(0.037)	(0.037)
employee	0.0023	−0.0013	0.0930***	0.0923***	0.0911***
	(0.0325)	(0.0325)	(0.021)	(0.021)	(0.021)
employer	0.4242***	0.4201***	0.4493***	0.4485***	0.4480***
	(0.1085)	(0.1091)	(0.060)	(0.060)	(0.060)
lambda	0.6040***	0.5959***	0.5532***	0.5534***	0.5517***
	(0.0280)	(0.0290)	(0.020)	(0.020)	(0.020)
constant	−1.1454***	−1.0630***	−0.8983***	−0.9194***	−0.8978***
	(0.1978)	(0.1996)	(0.115)	(0.117)	(0.117)
Observations	22,497		39,871		

Source: Own elaboration based on microdata from the Brazilian National Health Survey of 2013.
*** p<0.01, ** p<0.05, * p<0.1. The estimates were obtained using the Heckman procedure. The standard deviations of the estimated coefficients are in parentheses.

vest in family-friendly policies, such as provision of public childcare services, incentives for private companies to provide childcare services and the promotion of paternity leave policies.

5 Conclusions

The purpose of this analysis is to estimate the effects of postponing motherhood on women's earnings differentials and gender gap in Brazil. This investigation was conducted using data from the National Health Survey for 2013 and estimates from the earnings equation.

We found that the postponement of motherhood positively influences women's earnings, confirming the initial hypothesis of this study. The estimates of the regression models are as expected, as they show the positive effect on earnings both by directly observing the variable regarding the age of the woman having the first child and by analyzing the same information divided into age ranges. The results suggest that postponing motherhood has a positive impact of approximately 1.55% on women's earnings each year of postponement. When comparing the earnings of men and women, the results suggest that being a woman has a negative impact of approximately 22% on earnings. However, the postponement of motherhood reduces this gender gap, especially for white or yellow women with higher education, and it even allows its elimination.

In addition, it is possible to observe other factors that also positively impact women's income, such as living in the Midwest region and being in more

Table 4: Earnings equations, by education groups, Brazil, 2013

Variable	Women		Men and women		
	(1)	(2)	(3)	(4)	(5)
Higher level of education					
women			−0.2948***	−0.2730***	−0.2977***
			(0.0350)	(0.0440)	(0.0441)
mother	−0.0370			−0.0415	
	(0.0493)			(0.0453)	
f_24		−0.0598			−0.0695
		(0.0518)			(0.0511)
f_25_29		0.0315			0.0339*
		(0.0591)			(0.0588)
f_30_34		0.1523*			0.1482***
		(0.0875)			(0.0827)
f_35_49		0.4118***			0.3780***
		(0.1095)			(0.1105)
white_yellow	0.3069***	0.2925***	0.3164***	0.3151***	0.3085***
	(0.0552)	(0.0545)	(0.0400)	(0.0401)	(0.0401)
Observations	3,624			6,169	
Without higher level of education					
women			−0.2202***	−0.1943***	−0.1921***
			(0.0153)	(0.0231)	(0.0240)
mother	−0.0330			−0.0397	
	(0.0261)			(0.0256)	
f_24		−0.0567**			−0.0630**
		(0.0274)			(0.0274)
f_25_29		0.0741**			0.0507
		(0.0346)			(0.0347)
f_30_34		0.0352			0.0056
		(0.0588)			(0.0596)
f_35_49		0.2262**			0.1895*
		(0.1045)			(0.01068)
white_yellow	0.1167***	0.1137***	0,0965***	0.0965***	0.0954***
	(0.0269)	(0.0269)	(0.0172)	(0.0172)	(0.0172)
Observations	18,873			33,702	

Source: Own elaboration based on microdata from the Brazilian National Health Survey of 2013.
*** p<0.01, ** p<0.05, * p<0.1. The estimates were obtained using the Heckman procedure. The standard deviations of the estimated coefficients are in parentheses. The other variables of the earnings equation were included.

prestigious occupations like a director or scientific and intellectual professional. The level of education substantially widens the income differentials, especially for those who have their first child from the age of thirty. It is also important to note that the racial gap is greater among individuals with higher education. The results of the work suggest that when the woman, at least undergraduated, postpones the first child until after thirty-five years old, the maternity penalty is eliminated, providing a positive earnings differential.

Our main contribution to the empirical literature is the estimation of the impact of postponing motherhood on earnings differentials among women and its impact on reducing the earnings gap between men and women in Brazilian labor market. In a more detailed analysis, it was possible to show that these effects are heterogeneous among women, according to their level of education and race. Furthermore, it is important to highlight the possibility of reverse causality, of wages in postponing of motherhood, which is a suggestion for future work.

The fact that the postponement of motherhood positively affects the earn-

ings of Brazilian women and the fact that the age of women having their first child has increased over the years have consequences for the structuring of public policies, like early childhood care and specialized care for older women who get pregnant. Considering the challenges faced by women with children in the labor market, postponing motherhood may represent a strategy forthem to accumulate human capital before becoming a mother, broadening their participation in the labor market and boosting their earnings.

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Apêndice A

Table A.1: Descriptive data analysis, Brazil, 2013

Variable	Total		Women with children		Women without children		Men	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
ln_hourly_wage	1.842	0.847	1.761	0.867	1.824	0.827	1.870	0.851
A1B			23.139	4.648				
f_24			18.879	2.774				
f25_29			26.659	1.386				
f30_34			31.624	1.425				
f35_49			36.857	1.991				
age	33.436	8.723	36.125	7.431	32.590	8.900	33.276	8.782
age2	1194.024	590.929	1360.244	532.549	1141.325	596.958	1184.406	593.670
study1	0.208	0.406	0.179	0.383	0.221	0.415	0.207	0.405
study2	0.172	0.377	0.175	0.380	0.105	0.307	0.206	0.405
sudy3	0.125	0.330	0.140	0.347	0.093	0.290	0.138	0.345
study4	0.319	0.466	0.321	0.467	0.344	0.475	0.304	0.460
study5	0.177	0.382	0.184	0.388	0.236	0.425	0.144	0.351
white_yellow	0.396	0.489	0.388	0.487	0.435	0.496	0.378	0.485
white_yellow_n	0.604	0.489	0.612	0.487	0.565	0.496	0.622	0.485
northeast	0.287	0.452	0.283	0.451	0.281	0.450	0.290	0.454
south	0.122	0.327	0.129	0.335	0.128	0.334	0.117	0.321
southeast	0.232	0.422	0.224	0.417	0.254	0.435	0.223	0.416
midwest	0.130	0.337	0.141	0.348	0.129	0.336	0.128	0.334
north	0.229	0.420	0.223	0.416	0.208	0.406	0.242	0.428

Source: Own elaboration based on microdata from the Brazilian National Health Survey of 2013.

Table A.1: Descriptive data analysis, Brazil, 2013 (continued)

Variable	Total		Women with children		Women without children		Men	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
director	0.058	0.234	0.044	0.205	0.049	0.217	0.066	0.248
science	0.101	0.302	0.124	0.330	0.154	0.361	0.068	0.252
professional	0.091	0.288	0.074	0.262	0.095	0.293	0.093	0.291
administrative	0.091	0.287	0.086	0.281	0.148	0.355	0.061	0.239
servisse	0.204	0.403	0.280	0.449	0.265	0.441	0.153	0.360
forestry	0.046	0.210	0.025	0.157	0.015	0.121	0.068	0.251
craft	0.125	0.330	0.037	0.189	0.029	0.169	0.196	0.397
operator	0.078	0.269	0.035	0.183	0.031	0.173	0.114	0.317
elementary	0.206	0.404	0.295	0.456	0.214	0.410	0.181	0.385
industrial	0.119	0.324	0.082	0.275	0.088	0.284	0.144	0.351
construction	0.094	0.292	0.008	0.090	0.012	0.108	0.157	0.364
trade	0.697	0.460	0.859	0.348	0.869	0.337	0.567	0.495
agriculture	0.090	0.286	0.051	0.220	0.030	0.171	0.131	0.338
employee	0.748	0.434	0.752	0.432	0.818	0.386	0.709	0.454
employer	0.024	0.152	0.020	0.139	0.017	0.130	0.028	0.165
self – employed	0.229	0.420	0.228	0.419	0.164	0.371	0.263	0.440
married	0.363	0.481	0.409	0.492	0.341	0.474	0.365	0.482
single	0.637	0.481	0.591	0.492	0.659	0.474	0.635	0.482

Source: Own elaboration based on microdata from the Brazilian National Health Survey of 2013.

Table A.2: First stage: determinants of a woman's age when having her first child

Variable	
miscarriage	−0.9412***
	(0.1796)
abort	−1.1646***
	(0.2770)
treatment	0.7457***
	(0.2329)
dchildren	−1.5331***
	(0.2269)
smoking	−3.4356***
	(0.2256)
care	2.5398***
	(0.3311)
surgery	−1.5041***
	(0.4107)
yearbirth	−0.3177**
	(0.1524)
constant	643.5947**
	(303.9142)
Observations	9,026
Ftest	36.84***
Prob > F	0.0000
R^2	0.2936

Source: Own elaboration based on microdata from the Brazilian National Health Survey of 2013.
*** p<0.01, ** p<0.05, * p<0.1. The standard deviations of the estimated coefficients are in parentheses. The other variables of the earnings equation were included.