The Association between Conditional Cash Transfer Programmes and Cohort Fertility: Evidence from Brazil

Camila Ferreira Soares, Everton Emanuel Campos de Lima

Abstract: Brazil's Bolsa Família Programme (BFP) aims to combat poverty and social inequalities through monetary transfers to families. A much-discussed indirect effect of the programme was its correlation to the fertility of the beneficiary families. In this paper, we use a cohort fertility approach with parity progression ratios that differs from existing literature, which mainly used period fertility measures, to better understand the relationship between fertility and the BFP. This study analyses the relationship between the BFP and the reproduction of Brazilian women. We use data from the 2010 Brazilian micro-censuses, the only census after the start of the BFP in 2004, to reconstruct the childbirth history of women with incomplete reproductive cycles (women aged 25 to 29), and estimate parity progression ratios (PPRs) and cohort fertility rates (CFR). In addition, we estimate propensity score matching (PSM) models comparing fertility outcomes of beneficiaries and non-beneficiaries of the programme. Our results show distinct differences in CFRs and PPRs. On average, BFP beneficiaries had more children than women not covered by the programme. This finding remained consistent even after controlling for educational gradients and other covariates. Our empirical findings show that women opt for a "rational" strategy, where they tend to have children in more rapid succession up until three children. These findings contradict the recent literature that has not found any correlation between BFP and fertility. The results also suggest that cohort analyses may fill certain gaps left by previous studies of period fertility. This paper is one of a few that have analysed the relationship between a conditional income transfer programme and cohort measures in Brazil.

Keywords: Bolsa Família Programme · Cohort fertility · Propensity Score Matching · Parity progression ratio

1   Introduction

During the traditional process of demographic transition, mortality first drops, followed by a decline in fertility as described by *Notestein* (1953). Brazil has not been an exception to this rule and its own transition followed this trend. First, mortality in the country fell by 35 percent in the 1940s and fell a further 25 percent in the following decade, while fertility remained essentially constant during the same period (*Carvalho/Wong* 1996). The beginning of Brazil's fertility transition occurred only 30 years after mortality decreased. We note the speed of the Brazilian fertility decline in relation to developed countries, which took less than half a century to occur (*Martine* 1996; *Patarra/Oliveira* 1988; *Merrick/Berquó* 1983).

According to *Carvalho et al.* (1981), this rapid decline was due to changes in the reproductive behaviour of the lower social strata, and related to institutional, economic, social and cultural changes (*Merrick/Berquó* 1983; *Faria* 1989; *Paiva* 1987). Additionally, *Faria* (1989) highlights several structural and institutional changes that indirectly affected fertility behaviour. He linked the government policies of the mid-1960s, such as increased consumer credit, investment in telecommunications, the establishment of a social security system and increased investments in health care as the main factors that created a demand for fertility control.

Beginning within higher socioeconomic groups of society, in 1991, the decline in fertility rates was more pronounced among the less educated and poorest – especially residents of the (traditionally poorer) northern and north-eastern regions of the country (*Berquó/Cavenaghi* 2005), resulting in a significant reduction in fertility rates (*IBGE* 2010). In the following decades, the fertility reduction had been achieved by all socioeconomic groups in Brazil (*Alves/Cavenaghi* 2012). Today, despite Total Fertility Rates (TFRs) reaching rates below population replacement, significant differences in fertility rates between the different social strata still exist in the country (*Lima et al.* 2018; *Rios-Neto et al.* 2018).

As we have noted, variables such as income and years of schooling are especially important for understanding developments in TFR, because these two variables present an inverse relationship with fertility only for women (*Lesthaeghe/Surkin* 1988; *Beaujouan et al.* 2013; *Berquó/Cavenaghi* 2014; *Becker* 1991a/b). The situation is, however, more complicated in Brazil. According to an *UNFPA* report (2018), in 40 percent of the poorest households women have the average number of offspring above the reproduction level and at the ages of 20 to 24 years old. During the Brazilian fertility transition, reproductive behaviour varied greatly due to inequalities in income and education levels. However, unlike in developed countries where fertility was delayed with increases in education, in Brazil, increases in education levels did not cause women to delay having children (*Wong/Bonifácio* 2009) and fertility became concentrated between the young ages of 15 and 24. Interestingly, these young mothers generally have children until a certain parity is achieved and then begin to control their fertility by opting for female sterilization as a primary method of contraception (*Rios-Neto* 2005).

Gupta and *Leite* (1999), using the Demographic and Health Surveys (DHS) from 1986, 1991 and 1996, examined the trends and determinants of adolescent fertility

in the poorest Brazilian region: the Northeast. They found a strong relationship between years of schooling and the postponement of birth among adolescent women between the ages of 15 and 19 and this education effect has increased in the Northeast since these studies.

However, a reversal process was observed by the 2010 census and fertility began to be postponed slightly (*IBGE* 2010). We notice this process particularly among highly educated women (*Lima/Myrskylä* 2014; *Lima et al.* 2018; *Rios-Neto et al.* 2018). Nonetheless, adolescent motherhood remains common in the country. *Cavenaghi* (2013) meanwhile analysed the fertility of young Brazilian women according to education and income levels. The author found that young women (aged 15 to 19) with low socioeconomic status showed higher levels of fertility than those of the same age but with a higher economic status.

The Bolsa Família Programme (BFP) was developed to fight poverty and income inequality among the Brazilian population. The programme consists of monetary benefits and is considered a conditional cash transfer programme due to certain commitments that beneficiary families must fulfil. For example, children and adolescents of families enrolled in the programme must attend school, and mothers must seek healthcare and social assistance for their children (*Brasil* 2013). On one hand, these conditions allow basic individual rights to reach families with very low per capita incomes, i.e., families with a per capita income below the national poverty line of R$140.00 per month. On the other hand, for those in extreme poverty, having children is not a requirement to receive this monetary benefit (*Campello* 2013).

However, this social benefit is generally destined for families with a per capita income that is slightly above the poverty line and for women with children aged 17 or below. The BFP limits benefits to five per family (e.g., maximum 3 children and/or 2 adolescents, according to Law 10,836, dated 9 January 2004). Some authors therefore believe that this benefit and its limits may influence a woman's decision to have a child by affecting the fertility preferences and by reducing the opportunity costs of the child (*Stecklov et al.* 2006).

Many demography issues can be discussed and analysed in the context of this social programme, including access to modern contraceptive methods, contact with health facilities, years of education and the inclusion of women from low socioeconomic groups into the formal labour force, which can be seen as a way to ensure women's empowerment. Similarly, the programme raises a series of questions. For example, how might non-monetary benefits, such as those provided indirectly by the BFP, lead women to want fewer children? In addition, which factors related to this cash transfer programme may lead to changes in women's decisions? In this study, we explore the relationship between cohort fertility levels, parity progression and receiving or not receiving the BFP benefit in an attempt to answer the question: Does the BFP acts as pronatalist programme, e.g., increasing the chances of women to opt for an additional child?

We used a different approach and a different dataset. We aim to perform an exploratory analysis, comparing cohort fertility levels from BFP beneficiaries and non-beneficiaries who are eligible for the cash transfer programme. We analyse incomplete cohort fertility and its relationship with the BFP, using the retrospective

children ever born information provided by the 2010 Brazilian census. This study will analyse the relationship between BFP beneficiaries and several cohort fertility measures, such as average parity and parity progression ratios of beneficiaries and eligible non-beneficiaries of the programme. The latter is the only control group available because with the information available in the data we are not able to compare fertility levels before and after the start of the BFP. This group consists of women who do not receive the benefit, but who also belong to an extremely low socioeconomic stratum with an income per capita below R$140.00 (corresponding to approximately 78 USD).

We note that the BFP was not designed to be evaluated in terms of treatment and control groups, which made defining these two groups a challenge. In fact, a municipality quota (or percentage) restricts the number of households able to receive the benefit and consequently no control group exists (*Oliveira/Soares* 2013). Therefore, we were careful to conduct our analyses and separate our sample into groups that were as comparable as possible.

We estimated a series of parity progression ratios (PPRs) and cohort fertility rates (CFRs), focusing on the women who declare they are the head of the household at the time of the census interview. We also performed analyses controlling for education level and regional differences. Finally, to select random samples, we applied a Propensity Score Matching (PSM) to our data, this time controlling for education level, region of residence and other relevant confounding variables. We used PPR and CFR measures because there is a lack of studies on the relationship between cash transfer programmes and cohort fertility. Although this approach presents some limitations due to the available data, we believe that this work is important and explores new avenues in this well-discussed topic in demographics.

2 The Bolsa Família Programme

The legislation for the BFP was introduced in October of 2003, as Provisional Measure No. 132, and converted into Law No. 10,836 in 2004. It provided for the unification of various previous cash transfer programmes and specifically combined five such programmes.

Registration for the BFP is performed at the municipal level, through the Unique Registration (*CadÚnico*) for Social Programmes of the Federal Government. This registration platform is the gateway to all Brazilian social programmes, such as *Bolsa Verde* (Green Grant) and *Minha Casa Minha Vida* (My Home My Life). Created in July 2001, *CadÚnico* aimed to identify families with a monthly per capita income of up to half of the national minimum wage. In 2003, *CadÚnico* became the only means of accessing Brazilian social programmes, including the BFP.

In the 2010s, families with a per capita family income between R$70.01 and R$140.00 per month and with children up to 17 years of age and families with a per capita income below R$70.00 per month – even those without children – were eligible to receive the BFP benefit. The value received through the benefit is estimated by calculating a base value and several variable benefits that depend on the composition

of the family. Therefore, the BFP provides five benefits in total: 1) one base value for families in extreme poverty; 2) a variable benefit for children through the age of 15; 3) a Youth Variable Benefit, for 16- and 17-year-old adolescents; 4) a benefit to help overcome extreme poverty; and 5) an extraordinary variable benefit for families with monetary losses after migrating from other programmes to the BFP.

Certain benefits depend on the number of children per family, the per capita family income and the ages of the children. The base benefit is for families living in extreme poverty – including families without children. The variable benefit is intended for families with pregnant women and for mothers of children up to the age of 15, with a maximum of three benefits per family through 2011 and a maximum of five benefits after 2011. Families with children between the ages of 16 and 17 who attend school can receive a maximum of two benefits per family. The fourth benefit listed above is for families that remain below the extreme poverty line, even after receiving the benefits above (*BRASIL* 2004).

In 2010, families in extreme poverty (income below R$70.00 per month) could receive a base benefit of R$68.00 and a maximum of three additional benefits of R$22.00 for each child through the age of 15. These families could also accrue two additional benefits of R$33.00 for any 16- or 17-year-old children. Based on these values, a family in extreme poverty could receive a maximum of R$200.00 per month. Meanwhile, households with monthly family incomes between R$70.01 and R$140.00 would not receive the base benefit of R$68.00 and the maximum such families could receive from the social benefit was R$132.00 (*BRASIL* 2013).

The selection of beneficiaries is made by self-declaration of income by the head of household and registered in the CadÚnico database. This form of selection differs from most income transfer programmes in developing countries that use proxy means tests (PMT) to estimate the household income (*Souza et al.* 2018) by using multivariate regression to correlate proxies such as household expenditure or consumption (*Kidd/Wylde* 2011). Then, this income is verified in the administrative records of the Federal Government. However, some families do not receive the benefit because of a municipal quota and hence some families enter a waiting list. As soon as a family leaves the programme, the next person on the waiting list receives the benefit. This system also implies that once the quota value is reached, for a family to enter the programme it is necessary that another leaves it. However, this system was not updated efficiently until 2011 and sometimes families with incomes higher than the permitted value continued to receive the benefit, a situation that made it impossible for another household to receive the BFP. In this case, the only way for families that were left out to enter the programme is via an increase by the Federal Government of the BFP budget available to the programme, thus expanding the municipality quota.

There are also many families with incomes below R$140.00 that are not registered in CadÚnico, possibly due to a lack of information, especially among women in rural areas. According to a report by CadÚnico (2013), 78 percent of registered families lived in urban areas, which have a lower proportion of extremely poor residents, while only 22 percent lived in rural areas. The place of residence and the degree to which women and families are informed are related to the household selection for

participation in the BFP. Since the programme is based on self-registration, families need to search for the place in their municipality to register in CadÚnico. In rural regions, generally the registration of families is more difficult because women may not be aware of this benefit and where to register (*Tavares* 2010).

In this context, our aim is to further understand how these BFP conditions may – indirectly – affect the reproductive behaviour of women. In the next sections, we will discuss the data and estimates used to explore this relationship.

3   Theoretical considerations and literature review

The studies about fertility and cash transfers find support in the microeconomic theories of *Becker* (1960) and *Schultz* (1974, 1993) and establish arguments for understanding variations in fertility in developed countries. According to the theory used by *Becker*, parents behave rationally and their parenting decisions are oriented to maximize the utility of the children (*Becker* 1960, 1991a/b). Thus, family size is a function of the interaction between children's quantity-quality and the usefulness of other consumer goods, which are related to income and prices. For *Becker* (1960), this trade-off between quantity and quality is strongly determined by income. With an increase in household income, both measures should increase; however, the elasticity of quantity is weaker than the elasticity of the child's quality (*Becker* 1960). Specifically, with higher income, families choose to invest in what will improve the quality of the life of the child rather than invest in having multiple children. *Becker* (1991b) assumes that parents are altruistic towards their children. The utility function of the parents depends on their consumption and the utility of each child as well. For those women who invested in human capital, with higher education, and greater participation in the labour market, the opportunity cost will be higher, causing a drop in the number of children due to incompatibility between professional and maternal activities (*Becker* 1991a/b). The division of labour in a household takes place according to the specialities in the activities of each family member, which in many cases means a significant part of household work goes to the woman within that labour division. However, with the increase in women's labour force participation, their activities inside the family tend to reduce and thus, the decision to have a child can be also impacted (*Becker* 1991a).

According to *Schultz* (1974), the decision to have children depends on factors that are not only economic but also environmental – factors that can modify the idea of ideal family size. For *Schultz* (1993), conditionalities reduce the costs of investment in child quality, leading to a decrease in the number of children, considering the two goods as substitutes. We find the arguments of *Becker* and *Schultz* to be extremely important for understanding the rationality of the quantity-quality trade-off of children among socioeconomic groups in extreme poverty. In another study, *Becker* and *Lewis* (1973) analysed the interactions between the quality and quantity of children and their effects on the demand for offspring. According to the authors, highly educated women prefer to increase the quality of their children rather than the quantity. Exploring the theory of *Becker* and *Lewis* (1973), *Angrist*

et al. (2010) found new evidence about the quantity-quality trade-off. They used different treatment groups and exogenous variations in family size, also considering the incidence of multiple births and the composition of family siblings of the same sex. According to them, the birth of twins causes an increase in parity numbers and also the preference for mixed sexes among siblings results in higher order births (*Angrist et al.* 2010).

In addition, the authors found no significant effect on fertility levels after controlling for education and the labour market, that is, no evidence of a quantity-quality trade off. Their approach is innovative, juxtaposing the results of multiple instrumental variable strategies to capture the effects of fertility for different groups of people (*Angrist et al.* 2010). However, the limitation of the study by *Angrist et al*. (2010) is that it does not capture the effect of one child.

Arguing from another perspective, *Easterlin* (1975) studied the macroeconomic aspects of reproductive control and cited three main determinants of fertility level: 1) the demand for children, 2) the potential output of children and 3) the cost of fertility control, including subjective and objective costs. The first determinant of demand is influenced by preferences, prices and income. However, the author argues that subjective and social factors must also be considered in the demand for children.

Galor and *Weil* (1996) also investigated different mechanisms to explain the relationship between fertility and economic development. The authors consider three components: first, the fertility decision is given by a function of the relative wages of men and women. The higher relative wages for women tend to increase the opportunity costs of children more than total household income, as pointed out by *Becker* (1991a). The second component is the population growth rate that affects the level of capital per worker. Finally, the level of capital per worker affects the relative wages of men and women. These three components form a cycle, thus an increase in capital raises the relative wages of women, which leads them to invest in the labour market rather than having children (*Galor*/*Weil* 1996). *Thévenon* and *Gauthier* (2011) suggest that even if they are not aimed at fertility, policies to tackle poverty (such as BFP) create favourable environments for motherhood because such social policies also reduce the costs of a child. In addition, *Kalwij* (2010) argues that such policies can increase complete fertility, creating stimulus for young women to make an early motherhood transition and increasing the likelihood of having more children during women's reproductive period by reducing the costs of a child.

An increase in family income can reduce financial constraints that work as an obstacle for families to desire more children (*Luci-Greulich*/*Thévenon* 2013; *Becker* 1991b; *Wesolowski*/*Ferrarini* 2018). As income increases, bearing children becomes more manageable. This indicates that cash transfer programmes promote not only monetary benefits, but more access to health and education usually linked to the programme conditionalities, thus reducing the cost of a child, which in turn is assumed to influence fertility.

This theoretical economic background is important for understanding the rational choices behind fertility outcomes. Therefore, we expect that our data will show that the economic incentives provided by the cash transfer programme are associated with a couple's decision whether to have an additional child.

3.1   Previous research in other Latin American countries

The conditions of certain cash transfer programmes in other Latin American countries – such as Chile Solidario (Chile), Juntos (Peru), Red de Protección Social – RPS (Nicaragua), Oportunidades/Progresa (Mexico), Families in Action (Colombia), Programa de Asignación Familiar – PRAF (Honduras) and Programme of Advancement through Health and Education – PATH (Jamaica), – are similar to those of the BFP (*Stecklov et al*. 2006). Studies have questioned how such programmes are related to the fertility of these nations. *Stecklov et al.* (2006) have explored this relationship in some of these countries, analysing the RPS, Progresa and PRAF programmes and their association with the number of children among beneficiary women.

According to the authors, Progresa and RPS demonstrated no relation to fertility. However, the PRAF programme had a pronatalist profile, presenting many incentives for women to raise children (*Stecklov et al*. 2006). Additionally, PRAF, similar to BFP, allows for an increase in benefits if the family has an additional child, whereas Progresa and RPS do not. After this study, PRAF formulators modified the conditions of the programme to approximate those of Progresa and RPS, which in turn decreased the fertility incentive from PRAF (*Stecklov et al*. 2006). Using the data after the changes made to the PRAF, *Li* (2016) replicated the study by *Stecklov et al.* (2006) and she found an insignificant change in fertility levels due to the families being part of the programme.

In a separate study, *Garganta et al.* (2017) analysed Argentina's cash transfer programme, Asignación Universal por Hijo (AUH), and its relationship to national reproduction rates. This programme also contains conditions that provide monetary benefits to women with up to five children under the age of 18 and the authors found that the programme is related to an increasing family size until this limit of five children was achieved. Interestingly, they found that in families with children over the age of six, this financial support does not appear to encourage women to have another child. Moreover, the positive financial incentive was higher among mothers with lower levels of education (*Garganta et al.* 2017).

Outside of Latin America, *Andersen et al.* (2018) analysed the relationship between the Cash-for-Care (CFC) programme introduced in Norway in 1998 and changes in fertility behaviour among eligible versus ineligible mothers over a four-year period. The results showed that the probability of having a second child was reduced and the programme caused a reduction in the total fertility levels of women (*Andersen et al.* 2018).

Signorini and *Queiroz* (2009), *Rocha* (2018), *Simões* and *Soares* (2012), and *Cechin et al.* (2015), *Superti* (2020), *Olson et al.* (2019), among others, used national household surveys to explore the relationship between the BFP and the country's TFR. All studies found either little or no relationship between the social programme and fertility levels. Some even argued that the BFP had a negative impact on fertility in the two years after its implementation (*Signorini/Queiroz* 2009).

3.2 Previous Brazilian studies

On the other hand, the positive results of the BFP on education and health in Brazil are already well known. Studies have shown that BFP participation increases the numbers of poor children and adolescents going to school (*Araújo et al.* 2010; *Oliveira/Soares* 2013; *Simões/Soares* 2012). In addition, the conditions of the programme in the area of education can help to decrease inequality in education and consequently reduce intergenerational cycles of poverty (*Cireno et al.* 2013). With respect to health, the programme has served to improve the nutrition of children, reduce child mortality from malnutrition, increase vaccination rates and provide greater access to health care for children (*Camelo et al.* 2009; *Raselha et al.* 2013). A study by *Facchini et al.* (2013) found a higher use of basic health units (BHUs) among beneficiaries of the BFP, implying improved health care among those in the programme.

Carloto and *Mariano* (2010) argue that the fact that the BFP benefit card contains the name of the woman creates a gender issue – specifically, it attributes the role of "family caregiver" to the woman and reinforces the stereotype of the female condition. In addition, the authors highlight certain issues attached to the conditions of the programme. First, they note that as women are the representatives of the family in the BFP, the women then wish to meet the conditions for the programme, which results in an increase in their family responsibilities (*Carloto/Mariano* 2010). This event is what *Corgozinho* (2015) refers to as the "feminization of care." Meanwhile, *Rego* and *Pinzani* (2013) highlight several testimonials from BFP beneficiaries who affirm that the programme promoted a sense of citizenship, more autonomy within the family, engendered greater respect and encouraged better expectations for the future. *Pires* (2013) also argues that many beneficiaries created a bond with the "external world" by complying with programme conditions, thus creating both confidence that goes beyond consumption and greater autonomy within the home.

Several studies have focused on finding a link between the BFP and women's fertility. For example, *Rocha* (2018) evaluated the programme by comparing fertility before and after the programme was implemented, using household surveys from 1995 to 2007 from PNAD (Brazil's household survey) and propensity score matching method. The author did not find a positive relationship between fertility and the BFP. His explanation of this result is linked to the BFP enabling investments in the quality of children's lives, in contrast to influencing the women's desire to have more children (quantity). Other studies reinforced how the BFP indirectly provides assistance to its beneficiaries in terms of health care, which facilitates women's access to reproductive health information and contraception (*Rocha* 2018; *Ribeiro et al.* 2017). Meanwhile, some studies (previously cited) presented similar results (*Simões/Soares* 2012; *Signorini/Queiroz* 2009), finding no relationship between fertility rates and BFP. In their studies, *Simões* and *Soares* (2012) used data from PNDS (National Demographic and Health Survey) from 2006, and *Signorini* and *Queiroz* (2009) used PNAD (National Household Survey) 2004 and 2006. Both studies applied a model based on a differences in differences approach to measure the correlation with the programme and fertility. However, *Cechin et al.* (2015) reached different conclusions

after analysing a longer period of exposure to the BFP and using 2010 census data. They found that the programme is slightly correlated with a woman's progression from a first to a second child (*Cechin et al.* 2015). *Alves* and *Cavenaghi* (2012) also argued for a likely relationship between the social benefit and fertility based on the hypothesis of inverse causality. Specifically, an increase of one additional child reduces per capita family income; therefore, the family becomes eligible for the BFP. However, they do not demonstrate any substantial empirical analysis to prove their hypothesis. In contrast to our estimates, *Superti* (2020) using data from CadÚnico, the database that allocated BFP benefits, showed that BFP had no relationship with fertility decisions. In addition, *Olson et al.* (2019) study the relationship between Bolsa Família and teenage pregnancy (ages 15 to 18) using PNAD (Brazil's household survey) from 2004 to 2013.They find a reduction in teen pregnancies after the year 2010. It is important to note that we are working with women from a very low social stratum, who find an identity in maternity (*Patias/Buaes* 2012). The transition to motherhood for these women usually occurs earlier compared to other social strata (*Vieira* 2009). In addition, these women view maternity as something sacred and a ritual, considered a "gift from God" (*Rego/Pinzani* 2013). However, the lack of future financial benefits could delay the passage to motherhood.

3.3 Hypotheses and assumptions

We propose that the benefit of BFP, with the programme's conditionalities, reduces a child's opportunity cost. Therefore, the conditions of the BFP should operate as incentives to women to have more children and lead them to invest in quantity instead of quality as their income increases, because it provides to mothers a variable amount of money for each child born, with a maximum of 3 children up to the age of 15 years. To confirm these results using another analytical method, we perform propensity score matching, the results of which we will discuss next.

Our hypothesis is that the women who receive the BFP, even if this benefit corresponds to a low monetary value, have more children compared to mothers in the same social stratum who are not beneficiaries of the programme. In addition, we hypothesize that women in poor socioeconomic conditions that allow them to participate in the BFP already have higher fertility rates than other social classes. In this case, the BFP may act as an incentive to fulfil these women's desire to have children. Of course, another interpretation is also possible and they have more children as a way to gain some monetary relief from their poverty.

Given the data we use and according to our hypothesis, we expect to find a positive correlation between the programme and fertility, with beneficiaries displaying higher fertility. Unlike other studies previously mentioned here, we suggest that the programme conditions may also correlate with parities progressions in a different way.

4   Data and methods

We use reproductive and socioeconomic data from the 2010 Brazilian micro-census, provided by the Brazilian Institute of Geography and Statistics (IBGE). We tabulated the cohort fertility measures of BFP beneficiaries and non-beneficiaries based on family income information and whether or not they declared in the 2010 census that they receive the benefit. We use the reproductive information on children ever born (CEB), separated by five-year age intervals, educational level and region of residence. We also tabulate this information for all women in the aggregate, for only women who are heads of household. This last tabulation is important for our analysis, as heads of household are more likely to have children and also control the income of the household.

Therefore, the aim of this study is to analyse the relationship between fertility and the BFP among different cohorts. To this end, we selected two groups of women: BFP beneficiaries in 2010, between the ages of 15 and 49, and non-beneficiaries from the same age group, despite being eligible for the programme. These non-beneficiaries are women aged 15 to 49 whose per capita family income is below R\$140.00 per month (the poverty line in 2010, as described in Fig. 1). One may argue that this analytical choice could create a selectivity bias yet this was the only feasible way that we saw to select the eligible women (our control group) and comparable to the BFP beneficiaries. We also suggest that the propensity score matching applied in this study may reduce this selectivity issue, because it selects the groups randomly and with comparable characteristics and the only difference between them is in relation to whether or not they received the BFP.

These women are eligible for the BFP, but for some unknown reason did not receive the benefit that year. One possible reason for not receiving the benefit may be linked to the municipal quotas. To select comparison groups, we used the following census microdata variables: women from five-year age intervals; total number of CEB, grouped by the age of the mother; per capita family income; and whether or not the family has monthly income provided by the BFP. The sample includes 1,377,394 BFP beneficiaries and 955,381 non-beneficiaries.

Important points need to be addressed. First, the 2010 population census was the only data with reproductive and the social benefit information after the start of the BFP in 2004. This dataset is still a good benchmark to analyse the proposed relationship between the benefit and fertility because the families that enter the programme could continue for at least 2 years, even if their income increases due to household income volatility (*Souza et al.* 2018). In addition, every two years the family needs to update their registration information and the period of benefit is restarted. In reality, in some municipalities families are unable to update their information in the required register (resulting in continuing the benefit) (*Soares/ Sátyro* 2010). Secondly, even after voluntarily leaving the BFP, there is a 36-month guarantee period for families to return to the Bolsa Família if their financial situation worsens (*Barros et al.* 2018). Thirdly, according to *Souza et al.* (2018), BFP is the best-focused social programme in the country. The programme's coverage between 2004 and 2010 was around 50 percent among the poorest 20 percent of the population,

Fig. 1: Construction of beneficiary versus non-beneficiary (but eligible) groups, Brazil, 2010
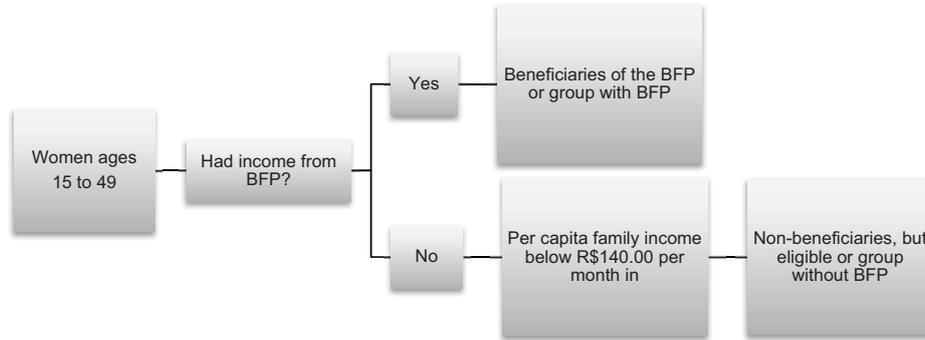
Source: Own design

stabilizing at 60 percent of this population in 2012 (*Souza et al.* 2018). This good degree of focus is thanks to the selection criteria linked to the registered families and the number of quotas in the programme (*Barros et al*. 2008).

4.1 Cohort fertility and parity progression ratio estimates

Next, we reconstructed the birth history of women with incomplete reproductive cycles and estimated PPRs, which represent the proportion of women who progress from one parity to the next, or the share of women from birth order *i*, who progressed to birth order *i* + 1. PPRs can be calculated for cohorts of women defined either by their age or time of marriage. Generally, when studies divide women into age cohorts, parity progression ratios can be calculated from the parity distribution of a particular age group of women. These ratios are estimated as the proportion of women at a certain age interval with at least one child, divided by the total of women in that same age group, according to the formula below:

$$_5PPR_x(i) = \frac{_5M_x(i+1)}{_5M_x(i)} \tag{1}$$

Where:

- $_5PPR_x(i)$ is the parity progression ratio between parity *i* and *i* + 1;
- $_5M_x(i+1)$ is the proportion of women between *x* and *x* + 5 who reached parity *i* + 1;
- $_5M_x(i)$ is the proportion of women between *x* and *x* + 5 who reached parity *i*.

The PPRs also allow us to find the CFR, according to the formula:

$$CFR = PPR_0 + PPR_0 . PPR_1 + PPR_0 . PPR_1 . PPR_2 + \ldots \tag{2}$$

Additionally, for each comparison group, we initially estimated the CFR for cohorts with complete reproductive histories (women aged 45-49 years)[1] and after incomplete reproductive histories (women aged 25-29 years). We note that the following tables and figures only show the results for women with an incomplete reproductive history (25-29 years). This is because the BFP began in 2004 and women aged 25 to 29[2] in 2010 were between the ages of 19 and 23 at the time of the programme's implementation; and fertility was still considerably high in the recent periods for women aged 19 to 23 (*Berquó/Cavenaghi* 2014; *Lima/Myrskylä* 2014; and *Gupta/Leite* 1999). Thus, older cohorts were less exposed to the relation between the BFP and fertility since a portion of their reproductive years had already been completed before the programme was implemented. The decision to follow this approach was based on previous studies about the relationship between Bolsa Família and fertility. For example, *Cechin et al.* (2015) have found differences in fertility levels between the programme beneficiaries at the ages of 16 and 34 years old and *Rocha* (2018) has also shown fertility outcome differences between women aged from 26 to 35 years.

Moreover, as a household may include daughters, grandparents or other relatives who do not receive the benefit or who are not mothers, we decided to include in our cohorts only the women who declared they were head of the household. These women represented almost 70 percent of the families who declared receiving the BFP in that period. An additional analysis was carried out including the men who declared they were head of the household, but the pattern of cohort fertility found did not change much in comparison with the households headed by women.[3] The decision to work only with women heads of the household was considered to avoid the risks of selecting daughters (who also may be mothers) and other female relatives, avoiding counting the same benefits more than one time in a single household. In addition, households in Brazil have a long history of extended families (*IBGE* 2010) and daughters may constitute another family inside the same household, which, in turn, can bias the proposed comparison. This selection provides us with groups of women who may manage the financial resources and care of the children in the family. This same age selection was performed by *Cechin et al.* (2015), *Todd et al.* (2012). Thus, we hope that this selection may raise other important highlights not illustrated by previous studies, such as the correlation with parities; in other words, the difference between the two groups according to birth orders. This new sample contains 399,500 women beneficiaries who are responsible for the household (versus 205,260 non-beneficiary heads of household).

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[1] Not showed in this paper.

[2] We have also tabulated CFRs and PPRs for complete reproductive (not shown), i.e., women who were ages 15 to 49. However, due to the large scope of our analyses, we limited our estimates to women aged 25-29 for reasons explained in the manuscript. Nonetheless, the results for all cohorts are quite similar in terms of PPRs.

[3] Due to the length of analysis, these results are not shown in this work.

Two important points must be addressed with regard to the cohorts of women who had already completed their reproductive years by the time the programme began: First, we assume no mortality differential by parity of older women. However, we avoid this problem by using the incomplete reproductive information from younger cohorts. Thus, measures derived from younger women may undergo both censoring and selection effects. This means that the comparison of the parity progression rates of younger and older women may sometimes be misleading (*Moultrie* 2013). Thus, we attempt to reduce this bias by selecting two groups that are easily comparable in terms of socioeconomic characteristics. Both groups fall under the poverty line (a condition to receive the benefit) and differ only in terms of whether or not they receive the benefit, which should help in reducing the selectivity effect.

4.2 Propensity Score Matching estimates

Programmes like BFP are difficult to separate into comparison groups, due to the design of the programme itself. Despite that fact, a strategy to contour this problem would be to use quasi-experimental estimators. In this study, we sought to comprehensively investigate the relationship between fertility and the social programme by applying propensity score matching to separate the control and treatment groups and estimate the difference between the two groups in relation to the number of children ever born.

PSM relates to the conditional probability of assignment to a particular treatment group based on observed covariates (*Rosenbaum/Rubin* 1983). The method generally uses a logistic regression, probit or logit, to calculate the propensity scores, according to equation 3:

$$e(x_i) = pr(z_i = 1 | x_i) \tag{3}$$

The function $e(x_i)$ is called the propensity score, which is the propensity for exposure to treatment i given the observed covariates x_i (*Rosenbaum/Rubin* 1983). The treatment indication is denoted as z_i, where $z_i = 1$ are the units that receive treatment, and $z_i = 0$ otherwise.

The PSM is used to perform the balancing scores, selecting a control group with a propensity score similar to that of the treatment group, eliminating the selection bias of the study. For counterfactual estimation, the similarity between groups is a basic requirement, which is guaranteed by propensity score matching (*Cechin et al*. 2015). Given a variable of interest, the method is designed to observe if there is a difference between control and treatment groups, e.g., in terms of the number of children ever born in the case of this study. For this, the Average Treatment effect (ATT) is calculated, described in equation 4, where r_1 is the response for the treatment group and r_0 the response for the control group. This measure gives the estimate a correlation of the programme under analysis on the cohort fertility levels (*Cechin et al*. 2015; *Rosenbaum/Rubin* 1983):

$$ATT = E(r_1|z = 1) - E(r_0|z = 0) \tag{4}$$

We estimate PSM models, controlling for women's education level, region of residence, household location, age, race/ethnicity, if the women live with a partner, the type of union, occupation and their religion. All of these variables are well explored in other studies of fertility differentials (*Gupta/Leite* 1999; *Marteleto/Souza* 2012; *Marteleto* 2010; *Merrick/Berquó* 1983). Reinforcing that, for the reasons already cited, the models are estimated for the selection of women aged 25 to 29 years old and heads of household. We consider that these women control the family finances and they are the ones at greater risk showing some relation with the programme (*Cechin et al*. 2015).

One PSM method's limitation is that it allows the user to work only with observable variables. Unobservable variables can also correlate with the woman's decision to have children and differences in the number of children ever born cannot be explained only by whether the woman receives the Bolsa Família social benefit. To assess the correlation of unobservable variables with the PSM model, *Rosenbaum* (2002) suggests a sensitivity test, or *Rosenbaum's* limit, which tests the robustness of the propensity score matching results. According to the test, if the odds ratio is equal to 1, this implies that there is no selection bias and the difference between the control and treatment groups is explained by the Bolsa Família programme.

5 Results

The results are presented in two subsections. First, we show the results for the cohort of women between the ages of 25-29 years who are head of the household, separated by region and educational levels. In both analyses, we estimated the PPRs and CFRs. Second, we present the propensity score matching analysis, this time controlling for more confounding factors.

5.1 Descriptive analysis of PPRs and CFRs

Table 1 presents a descriptive analysis of the two comparison groups, according to certain socioeconomic and demographic characteristics. Most of these beneficiaries and non-beneficiaries are located in the poorest, north-eastern region of the country.

As shown in Table 1, in the group of beneficiaries most women are spouse/partner to the head of the household. However, among non-beneficiaries, the percentage of spouses/partners and children are very similar (both near 33 percent). The share of heads of household in both beneficiary and non-beneficiary groups are similar (29 percent and 21.48 percent, respectively).

Meanwhile, the percentage of women by cohabitation is similar among beneficiaries and non-beneficiaries. We also found that women living in urban areas account for the majority of households in both groups. We did not notice any significant differences between the two groups in terms of ethnicity.

Tab. 1:   Socioeconomic, demographic, and geographic characteristics: cohort ages 25 to 29, BFP beneficiaries versus non-beneficiaries, Brazil, 2010

	BFP women	Non-BFP women in %	Differences BFP – Non-BFP
Relationship to household head			
Head	29.00	21.48	7.52
Spouse/Partner of Head	55.54	33.60	21.94
Child	10.52	33.29	-22.77
Other Relative	4.47	10.28	-5.81
Other	0.46	1.34	-0.88
Total	100	100	
Type of union			
Civil and Religious	14.33	18.95	-4.62
Civil Only	15.34	14.47	0.87
Religious Only	6.16	3.69	2.47
Union by Cohabitation	64.17	62.89	1.28
Total	100	100	
Race/ethnicity			
White	26.62	34.14	-7.52
Black	10.03	9.35	0.68
Asian	1.37	1.22	0.15
Mixed-Race	61.12	55.01	6.11
Indigenous	0.86	0.28	0.58
Total	100	100	
Household location			
Urban	69.25	76.8	-7.55
Rural	30.75	23.2	7.55
Total	100	100	
Education level			
Incomplete Primary	55.93	43.86	12.07
Primary Education	23.27	21.58	1.69
Secondary/Tertiary Education	20.79	34.57	-13.78
Total	100	100	
Brazilian regions			
North	12.4	14.89	-2.49
Northeast	54.16	39.3	14.86
South	6.94	6.83	0.11
Southeast	21.0	33.16	-12.16
Midwest	5.49	5.82	-0.33
Total	100	100	
N	1,377,393	955,381	

Source: Own calculation based on data from 2010 Brazilian Population Census.

Regarding education levels, we found that beneficiaries present a higher percentage of women with an incomplete primary school education in comparison to non-beneficiaries. Likewise, 44 percent of beneficiaries completed primary school, compared to 56 percent of non-beneficiaries. For this reason, we have tabulated PPRs and CFRs according to education levels to identify how differentials in education affect the relationship between cohort fertility and whether or not a household receives the social benefits.

When analysing the beneficiaries and non-beneficiaries regionally, we find that the majority of BFP beneficiaries are concentrated in the Northeast (54 percent). This is consistent with official estimates from the national statistics office, which showed this region as having the highest percentage of the population living below the poverty line, followed by the Southeast, North, South and Midwest (*IBGE* 2010).

We compared the PPRs among BFP beneficiaries and non-beneficiaries (although eligible for the BFP) in 2010, for heads of household. Figures 2 and 3 show the PPRs by educational level and regions. With respect to CFRs, rates in the whole country were higher for beneficiaries than for non-beneficiaries, at 2.42 versus 1.81, respectively. This represents a notable difference (equal to 0.61) in reproduction between the two groups, as fertility varies from above replacement level for beneficiaries to below replacement for non-beneficiaries.

We find the same pattern of increasing PPR up to the third parity when we disaggregate our analyses by education level. We used the following educational categories: did not complete primary school, completed primary school and completed secondary or secondary and tertiary school. (We grouped those that had completed secondary and tertiary school, since the two presented few cases.) We found that women with an incomplete primary level education demonstrated the highest CFRs (2.71 and 2.35 for beneficiaries and non-beneficiaries, respectively). Meanwhile, women who had completed secondary school or higher presented the lowest cohort fertility levels (1.79 and 1.05 for beneficiaries and non-beneficiaries, respectively), both below population replacement. Cross-group comparisons also showed that, disregarding educational level, BFP beneficiaries present consistently higher CFRs than non-beneficiaries. The results of the PPR analysis were even more insightful. Beneficiaries showed a consistently higher PPR until the birth of a third child, after which the PPRs of beneficiaries and non-beneficiaries converged, even when controlling for education levels.

In Figure 3, we analyse how the fertility estimates are correlated geographically. Brazil is historically a country characterized by extreme inequality, in part determined by place of residence (*Berquó/Cavenaghi* 2004; *IBGE* 2010). The north and north-eastern areas of the country are less developed in comparison with the southern and south-eastern regions and BFP beneficiaries are concentrated in the Northeast (Table 1). As a result, one would expect to find regional differences in cohort fertility measures between beneficiaries and non-beneficiaries, due to well-known differences in fertility rates across Brazilian regions (*Berquó/Cavenaghi* 2014). However, we did not find significant differences in PPRs between the two groups across regions. Instead, we found a consistent pattern in all regions, which implies similar conclusions to those of the previous analyses by education

Fig. 2: PPRs for women heads of household, cohort ages 25 to 29, by educational level, Brazil, 2010
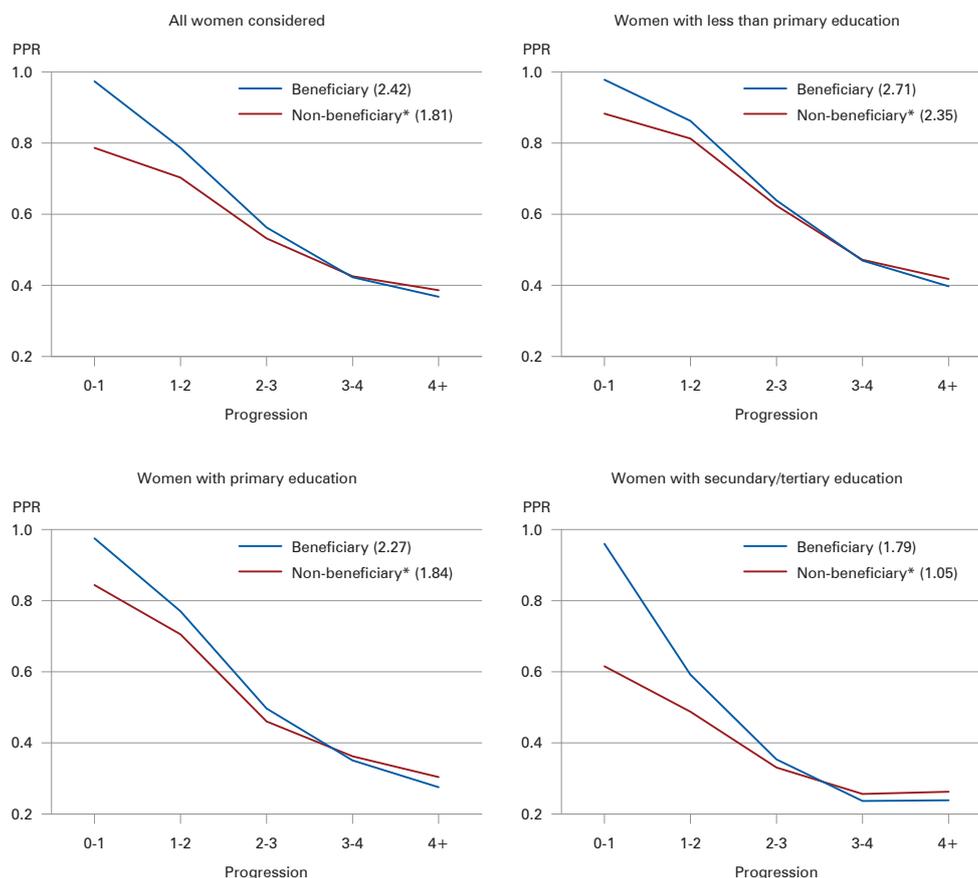
* Non-beneficiary, but eligible. The values in parentheses correspond to the CFR.
Source: Own calculation based on data from 2010 Brazilian Population Census.

level – specifically, regardless of the region where the household is located, the beneficiaries show a slightly higher fertility, up until the birth of a third child and that the progression to having another child is less determined by the social programme.

As a hypothetical scenario, we simulate the country's fertility if all women heads of household in Brazil received BFP benefits, we extrapolated the relationship of the BFP based on CFRs and the percentage of women BFP beneficiaries in the country in 2010. The fertility rate for women heads of household, ages 25 to 29 (both beneficiaries and non-beneficiaries) in 2010 was 1.38, while the fertility rate for only beneficiaries in the same age group was 2.45. As beneficiaries of the programme represented 21.96 percent of the total number of women ages 25 to 29, 21.96 percent of this CFR of 1.1 is attributed to women who received the BFP. If

Fig. 3: PPRs, cohort ages 25 to 29, head of household, Brazil, 2010
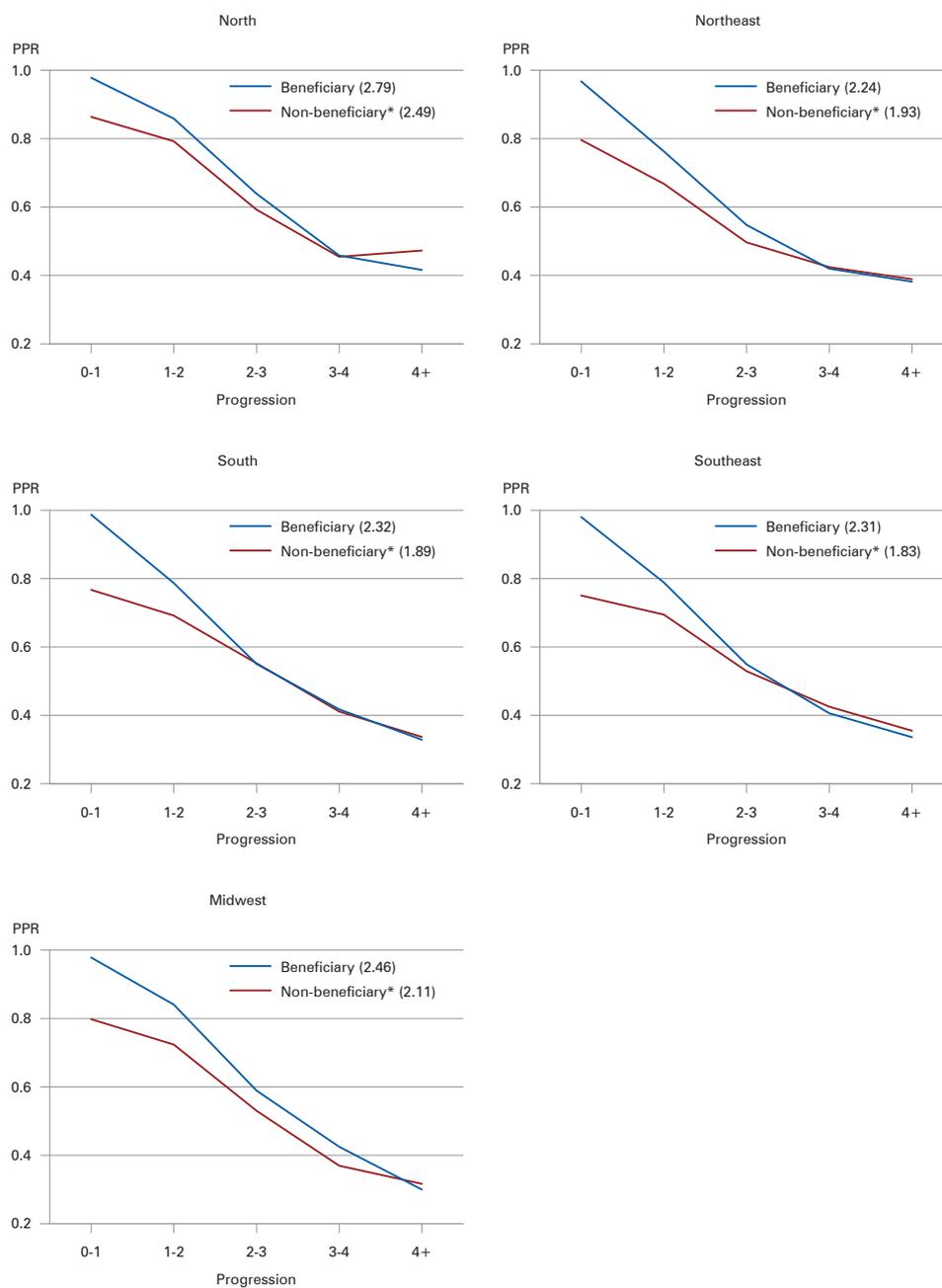
* Non-beneficiary, but eligible. The values in parentheses correspond to the CFR.
Source: Own calculation based on data from 2010 Brazilian Population Census.

we extrapolate and suppose that 50 percent of the women in the age group were beneficiaries, the new cohort fertility rate would increase to 1.76 (an increase in CFR of roughly 28 percent), which would in turn be a considerably high correlation with reproduction in the country.

Our results appear to indicate that the quality-quantity trade-off operates inversely for women in fragile economic positions in society. Therefore, the conditions of the BFP operate as incentives to women to have more children and lead them to invest in quantity instead of quality as income increases, because it provides to mothers a variable amount of money for each child born, with a maximum of 3 children up to the age of 15 years. To confirm these results using another analytical method, we perform propensity score matching, whose results we will discuss next.

The initial step was to perform logistic regression, given the set of variables described in the data section, and to find the propensity scores. Once we estimated the propensity scores, the next step was to calculate the ATTs (as described in Table 2). The PSM models are estimated for CFRs and PPRs separately. The first analysis covers only the cohort fertility and the second aims to understand the parity progression ratios to distinguish birth orders.

Tab. 2: ATT estimation – head of household, age groups 25 to 29, Brazil, 2010

	CFR	PPR 0-1	PPR 1-2	PPR 2-3	PPR 3-4	PPR 4 +
Beneficiary	49405	11345	26552	28886	13369	4773
Non-beneficiary	49405 (129585)	11345 (88090)	26552 (69973)	28886 (36722)	13369 (18200)	4773 (9174)
ATT	0.531	0.226	0.121	0.071	0.033	-0.013
S. E	0.0086	0.0045	0.0042	0.0046	0.0062	0.0185

Note: Values in parentheses are the number of observations before PSM.
Source: Own calculation based on data from 2010 Brazilian Population Census.

For overall cohort fertility, the ATT show a value of 0.531. This means that for women heads of household between 25 and 29 years old who received the BFP, their CFR will be on average 0.531 higher than that of non-beneficiaries with the same characteristics. This result is close to previous findings of CFRs and the differences in the number of children ever born was 0.61 (2.42 for beneficiaries versus 1.81 for non-beneficiaries). This means that, despite the explanatory power of the observed covariates, the BFP still presented a positive correlation with women's cohort fertility.

If we look at the PPRs estimates, we see the same positive relationship between the number of children ever born and receiving BFP. Once more, the results are consistent with the descriptive analysis, showing that women beneficiaries have higher PPRs and reducing this difference while we progress to higher birth orders. The threshold of three children is again observed this time.

For the progression from childless status to one child the difference is almost 22 percent in favour of women beneficiaries. While the progression from one to two children this value is 12 percent and then it declines to 7 percent when women bore a third offspring. In addition, for higher parity progressions this value is much lower, implying less significant differences between BFP beneficiaries and non-beneficiaries.

A word of caution is necessary: Despite these differences in findings, a number of unobserved factors may affect the assignment to the treatment group. Therefore, Rosenbaum sensitivity tests were performed on each model. These tests indicate that there is a critical gamma level at which the results of our models would be questionable. In other words, this critical value raises the question about the validity of the positive correlation of BFP with the cohort fertility. In our models, the critical gamma values for the Rosenbaum test were reached at 1.7 for PPR1-2, 1.4 for PPR2-3, 1.3 for PPR3-4 and 1.15 for PPR4 +. For the CFR and PPR0-1, until the gamma value of 2.0, no critical value was achieved.

In order to reject our results for the PPR1-2, for example, the value of 1.7 indicates that an unobserved covariate or covariates would increase the odds of a treated woman progressing to a second child relative to a matched control woman by 70 percent. Regarding the selected set of variables well explored in many fertility studies and used in our propensity score models, it may be unlikely that there are unobserved factors beyond these variables that would increase the odds of bearing an additional child between matched mothers by an additional 70 percent. Considering the PPR2-3 and the PPR3-4, the odds of parity progressions between matched women would increase in 40 percent and 30 percent, also making these values implausible. Looking at higher birth orders of four or more children, we see an increase in uncertainty of our estimates. But 15 percent is still a considerable value to doubt the model estimates.

6   Discussion

From our estimates, we found a similar pattern of reproduction among BFP beneficiaries, particularly at the younger ages of 15 to 29, where women tended to have their first through third children quickly, which allowed each family to receive a maximum of three variable benefits for each child from 0 to 15 years (according to the conditions of the BFP through 2011). Moreover, with increases in years of schooling, the disparity between beneficiaries and non-beneficiaries increases in birth orders 0-1 and 1-2. Our analyses at the highest educational level presented outliers and inconsistent estimates due to the small number of observations. We also note that eligibility for the programme can change over time and therefore may not have a correlation with higher educational groups.

However, the PPRs demonstrated similar patterns and differentials in fertility for the two groups at the national level and also when disaggregating the analysis by region and education level. An additional analysis with PSM confirms our CFRs and

PPRs results, showing a positive correlation with the number of children among BF beneficiaries as compared to non-beneficiaries (who are eligible for the BFP).

According to the general microeconomic theory of fertility, an increase in income results in the decision to have fewer children, followed by a greater investment in human capital or child quality, according to the quantity-quality trade-off (*Becker* 1960, 1991a/b). In the case of beneficiaries, this rationality was not directly dictated by this trade-off. For the groups within our study, the rational decision could be to have more children so that the family income would increase due to an increased number of benefits. Our study is compatible with this hypothesis and showed that women may opt for a "rational" strategy. They are having children earlier to receive the associated monetary benefit and then they begin to control fertility once reaching the allowable limit of children under the BFP.

Another explanation for our findings could be that we are working with women from a very low social stratum who find their identity in maternity (*Patias/Buaes* 2012). The lack of future financial certainty may delay the passage to motherhood and the monetary benefits from the BFP can provide a better assurance of the future and monetary security that may encourage women to have children.

However, regardless of years of schooling, the BFP appears to have a positive correlation with women's fertility up to a third child. One plausible explanation for this finding may be related to the conditions of the programme. Specifically, mothers receive a monetary supplement for each child, with benefits limited to three children through the age of 15. Consequently, women appear to have children to receive the per-child benefit until they have three children. Moreover, we could argue that rationality among those in the poorest social strata in the country may not be directly dictated by the quantity-quality trade-off, as *Becker* (1960,1991a/b) predicted. Instead, for these women, the rational decision would be to have more children, as this will increase the household income until a capped number of monetary benefits.

We find it important to highlight that the purpose of this study was not to measure the impact of the BFP on fertility, but to perform a relationship analysis based on PPRs and cohort fertility, neither of which has been used so far in the literature to study the relationship between fertility and the BFP.

7   Limitations and challenges

However, caution is necessary in interpreting these results since this analysis has certain limitations. The first is related to the difficulty in establishing the exact moment that the woman begins to receive the benefit – specifically, the beginning of the association of the BFP with reproduction. With information from the census, even with other available databases such as CadÚnico, we only know whether a woman received the benefit or not in 2010. However, we do not know if the family entered the programme before or after having children. Another important question that needs to be addressed is about the possible existence of reverse causality. That is, with this study design, we cannot control the fact that the women may have many

children to receive the benefit or if they already have children and therefore receive the BF. The second limitation, a consequence of the first, refers to the question of causality. Establishing causality between the BFP and fertility is not possible, especially because the programme was not designed to be quasi-experimental (i.e., with clear distinction of control and treatment groups). Our estimates are based on cross-sectional data and we cannot conclude cause and effect, but rather certain associations between the BFP and fertility.

The third limitation is related to the fact that a number of unobserved factors (not captured by our data) play a role in a woman's decision to have a child, such as the individual desire to be a mother, the lack of access and information about contraception, the absence of knowledge of family planning commonly seen among low socioeconomic groups, etc. However, many other variables impact a woman's decision to have children and should therefore be tested.

A fourth limitation refers to BFP rules that allow families living in extreme poverty to have access to the benefit even without children and that can create confounding effects as well. Finally, our analyses were based on PPRs from the age group of 25 to 29; however, ideally we would use an age group at the end of the reproductive period – women 15 through 49.

In addition to the issue of BFP not having a quasi-experimental design, we are faced with a data problem. The fact that we do not know the exact moment the woman entered the programme means we do not know if she had first a child and therefore she fulfilled the BFP criteria, as a consequence of reductions in household's per capita income due to the increase in the number of family members, or if this woman's children were born after her entering the BFP, characterizing a reverse causality issue. With the data available in Brazil (household surveys or population census) that include fertility information and questions about BFP, we cannot establish the exact direction of this relationship between BFP and fertility. Finally, our analyses were only in relation to education. However, many other socioeconomic variables that might correlate with fertility should be tested. Therefore, we continue our analysis by studying regional differences in PPRs.

Despite all this, the robustness of our estimates provides interesting results and offers a different perspective on the much-discussed topic of fertility and BFP. A final limitation to be aware of is the selectivity effect. The group of non-beneficiaries appears to include women with a higher educational level and living in the most developed region of the country, the Southeast. PSM was used precisely as an attempt to reduce this problem, even though it is known that the method may not capture all selectivity.

Even though it is not possible to establish causality between fertility and BFP, this study presents an important contribution to the discussion concerning the relation between cash transfer programmes and fertility. First, because we clearly verified differences in cohort fertility levels between women that receive the benefit and those eligible that did not participate in the Bolsa Família Programme. Additionally, we saw a positive correlation between the BFP and parity progressions that extended up to the third child, something not explored before. As a result, the only unanimous conclusion in all studies on fertility and social programmes is

the complexity of analysing this relationship. Therefore, more analyses must be performed in this area.

Acknowledgements

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Camila Ferreira Soares (✉). Universidade Estadual de Campinas (UNICAMP). Campinas, Brazil. E-mail: ferreirasoares01@gmail.com
URL: https://www.researchgate.net/profile/Camila-Soares-15

Prof. Dr. Everton Emanuel Campos de Lima. Universidade Estadual de Campinas (UNICAMP). Campinas, Brazil.
E-mail: everton.emanuel@gmail.com
URL: https://www.ifch.unicamp.br/ifch/colaboradores/demografia/625/Everton%20Emanuel%20Campos%20de%20Lima

Appendix

Tab. A1: Logistic regression for the PSM – Brazil 2010

	Odds ratio
Household situation	
Urban (*Ref.*)	
Rural	0.3487***
Region	
North (*Ref.*)	
Northeast	0.5669***
Southeast	-0.4532***
South	-0.3630***
Midwest	-0.2205***
Age	
25 (*Ref.*)	
26	0.0729***
27	0.1320***
28	0.1591***
29	0.1538***
Race/ethnic	
White (*Ref.*)	
Black	0.3364***
Asian	0.2103***
Mixed race	0.3096***
Indigenous	0.4295***
Educational composition	
Less than Primary (*Ref.*)	
Primary Education	-0.3361***
Secondary Education	-0.9867***
Tertiary Education	-2.1950***
Live with someone	
Yes (*Ref.*)	
No, have before	-0.0116
No, never have	-0.9310***
Marital status	
Married (*Ref.*)	
Separated	0.2940***
Divorced	0.1310**
Widowed	0.0014
Single	0.2824***
Religion	
Atheists and Agnostics (*Ref.*)	
Catholic	0.1797***
Mainline Protestants	0.0256
Pentecostal Protestants	0.0942***
Other religion	0.0126**
Income	-0.0033***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: Own calculations based on data from 2010 Brazilian Population Census.