The Impact of Bolsa Família Program in the Beneficiary Fertility

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Abstract

The Bolsa Família Program is a Conditional Cash Transfer Program that was implemented in Brazil in 2003. Since the implementation of the program some of its effects were studied, but its effects on fertility decision has drawn a little attention. The objective of this paper is to evaluate if there is an impact of Bolsa Família Program in the fertility of beneficiaries. We use the Household Sample National Survey (PNAD) for the years 2004 and 2006 and estimate the first-differences for each year, to find the average treatment effect on treated (ATT). To find comparable groups of treatment and control, we use Propensity Score Matching methods. We compared the ATT outcomes for the two years and its estimated confidence intervals and found that there are no statistical differences between the ATT results in 2004 and 2006.

1. Introduction

In recent decades a new format of social programs directed to poor families and individuals became very common in developing economies (Stecklov et al, 2006). Contrary to the previous programs that simply transferred money or goods to families based on a means-test, the newer programs condition money transfers to a specific behavior. These programs, known as Conditional Cash Transfer Programs (CCT), require that families participate in health and educational activities in order to receive their monthly transfer. Policy-makers believe that creating incentives for these behavior would reduce intergenerational poverty and stop poverty cycle.

The emergency of these programs raised many questions for academics and policy makers regarding the indirect effects of the programs (Rawlings, 2004). Many CCT programs have been operating for many years and producing extremely positive results, being their indirect (or negative) effects – for example, on adult labor supply – generally low[1]. Brazil is a good example of a recent and positive CCT program: Bolsa Família was implemented in 2003 and in 2006 reached 11 million families below the poverty line (Santana, 2007; MDS, 2007).

Empirical evidences in several countries suggest that there is no significant impact of transfer programs on fertility (Stecklov, et.al, 2006). The evidence holds for different types of programs, including those that only provide child-care, the traditional cash transfer programs and income tax exemption policies. (Gauthier e Hatzius, 1997; Acs, 1996; Whittington, Alm e Peters, 1990, apud Stecklov et al., 2006). Moreover, the impact of a transfer program to the fertility behavior is one of the oldest and most important demographic questions (Stecklov et al, 2006). Surprisingly, despite being one of the main points made by the critics of the program, the impact of Bolsa Familia on fertility decisions in Brazil has drawn little attention.

Classical economic models suggest that fertility decisions are based on individual choices, that individuals are rational and decide their fertility level maximizing household utility, considering the budget constraint (Becker, 1991). The CCT programs affect household budget constrain, which can affect fertility decisions and time allocation decisions. Following Becker and Lewis (1973) families might

[1] Stecklov et al (2006), MDS (2007), Brière e Rawlings (2006).

decide their fertility level by a trade-off between quantity and quality of the children, and recent programs can affect their preferences as well.

Stecklov et al. (2006) investigated three developing countries in Latin America and find different outcomes for each one of them. In Mexico and Nicaragua, there were no significant impacts of cash transfers on beneficiary fertility, whereas in Honduras an increase of 2 to 4 percentage points in the fertility of beneficiaries was observed. The main explanation for the results observed in Honduras is that the program did not limit the number of recipients in each family; thus, higher fertility was linked to higher benefits (Stecklov et al., 2006).

Brazil is an interested case to be study. The country has a large conditional cash transfer programs and is going trough major demographic changes in recent years. Fertility rates in Brazil are declining rapidly, in less than four decades the total fertility rate dropped from 6 children per woman to about 2 children per women. Recent estimates from the 2006 Demographic and Health Surveys show a TFR of 1.8 children per women. However, there are huge regional and educational differences in fertility. Rios-Neto (2005) shows that the TFR for better educated women is about 3 times lower than the one observed in the less educated groups. The objective of this paper is to estimate Bolsa Familia's impact on the fertility of beneficiaries in 2004 and 2006. In this way, we contribute by providing a base on which to found complementary policies for mitigating an adverse incentive, if it exists, or by reinforcing the validity of the program, if it does not.

In order to identify beneficiaries of Bolsa Família we use the National Household Sample Survey (PNAD), carried out annually by the Brazilian Institute of Geography and Statistics (IBGE), since 1971, except in Population Censuses years (1970, 1980, 1991 and 2000). PNAD collects information on education, labor, income and housing. Each year, a special supplement is also included in the survey. Questions about the beneficiaries of Bolsa Família were included in 2004 and 2006, making it possible to identify in the survey the program's beneficiaries.

We estimate the impact of Bolsa-Família on fertility behavior of beneficiares using a regression model based on the First Differences approach. Then, we compared

whether the outcomes fro 2004 and 2006 are statistically different. Unfortunately, we do not have information for the same group of people before and after the implementation of the survey. In the program to find comparable groups – treated and control – we use Propensity Score Matching methods.

The matching estimations from both years were done restricting the beneficiary's sample to low income women in reproductive age, and we selected the parameters to perform the matching process based on the selection criteria for the program.

Results point to a positive impact of Bolsa Família on the fertility of beneficiaries, albeit of almost negligible value. However, results for first-differences estimations for both years show that there is a considerable and significant difference in the fertility of control and treatment groups, since women in the latter had a smaller probability of having had a child in the previous year. We have to point that the results are influenced by the chosen method, and this is an important issue.

2 . The Bolsa Família program and its possible effects on the fertility of beneficiaries

2.1 The design of Bolsa Família (MDS, 2007)

Since the middle of the 1990's, there have been in Brazil social programs based on cash transfers to poor families that have children in scholar age, if these children attend school. The first of these programs was called Bolsa Escola, established in 1995 in city of Campinas-São Paulo, and was adopted in several other districts of the country, being transformed into a national program under the federal government's supervision in 2001. The main objective of Bolsa Escola was to create incentives to school attendance by poor children, under the assumption that they leave school because they need to work in order to complement family (or household) income.

The Bolsa Familia program began in 2003, uniting some pre-existing social programs that were directed at poor families, like Bolsa Escola and others that focused not only on those with children. In such way, through just one benefit, there would be provided a monthly minimum income of R$50.00 (about US$ 21) to families below the poverty line, which is R$50,00 per capita. Moreover, there would also be given an additional benefit to each pregnant woman, child at low age or child at school age. In

the first year of implementation, Bolsa Família benefited about 3.6 million poor families , the program coverage increase rapidly reaching 11 million families in 2006.

The design of Bolsa Família, however, like its management mechanisms, underwent some changes. In 2007 a single register of social programs was created, called CadÚnico, an instrument to collect data and information in order to identify all poor families in Brazil. The register is composed of information about household characteristics, family composition, family members' schooling, their professional skills and job market status. It can be used in all government spheres to identify targets of social programs, thereby avoiding the superposition of benefits to the same family. Furthermore, another change in Bolsa Família's design was a measure, announced on January 2008, that enlarges the coverage of the program in order to include poor young people between 16 and 17 years of age who attend school regularly (our analysis does not cover this recent change).

The current design of Bolsa Família considers an income of R$60,00 to R$120,00 per capita for selecting poor families and incomes below R$60,00 per capita for extremely poor families. Families with the lowest incomes have priority, which is checked through information from CadÚnico. The program's conditionalities include children's (and, now, the youth's) school attendance and the fulfillment of basic health care measures (immunization, going to the health clinic, pre-natal care, among others). The lowest school attendance accepted for the year is 85% of the total, while health conditionals are the attendance of medical consultations in pre and postnatal periods for pregnant women, complete vaccination for children below 7 years old and nutritional attendance for both. Extremely poor families receive a basic benefit, increased of variable benefits according to the family's composition, as explained above. The composition of benefits in 2004 and 2006 are shown in Table 1.

In addition to the benefits shown in Table 1, since early 2008 beneficiaries can receive the Youth Variable Benefit (BVJ), for teenagers attending school up to age 17. The limit of beneficiaries for each household is of 3 members among pregnant women and children below 15 years old, and 2 members of 16 or 17 years old in the case of BVJ. This way, the most vulnerable families can receive up to R$172.00 monthly (about US$72).

Table 1: Composition of the benefits of Bolsa Família Program

Eligibility criteria		**Children between 0 and 15 years old, pregnant and breast-feeding women**	**Quantity and kind of benefit**	**Value of benefit (R$)**
Situation of the family	**Household income *per capita***			
Poverty	Between R$ 60,01 and R$ 120,00	1 Member	(1) Variable	18,00
		2 Members	(2) Variable	36,00
		3 or + Members	(3) Variable	54,00
Extreme-poverty	Up to R$ 60,00	Sem ocorrência	Basic	58,00
		1 Member	Basic + (1) Variable	76,00
		2 Members	Basic + (2) Variable	94,00
		3 or + Members	Basic + (3) Variable	112,00

Font: Ministério do Desenvolvimento Social e Combate à Fome (MDS), 2007

Moreover, there is a benefit given to families that were attended by other programs besides Bolsa Família and to which the migration to the program brought about monetary losses. This benefit, called Extraordinary Variable Benefit (BVCE), has an expiration date established and its amount varies in each case.

The benefits in Bolsa Família, as in other programs of the same format, are preferentially given to women. This preference is based on researches that point to female altruism, directed to the welfare of all family members (MDS, 2007).

2.2 Theorical Background: possible effects of Bolsa Família on fertility behaviot

It is possible that some characteristics of CCT programs can lead to an increase fertility for beneficiaries. In this subsection we try to relate the implementation design of Bolsa Família to the economic theory fertility, in order to demonstrate under what aspects the program could lead to an increase in the fertility of beneficiaries.

2.2.1 Demand and supply of children

Becker and Lewis (1973) used a microeconomic approach to explain the demand for children as the decision of a family, in which the utility function of the family depends on the number and on the quality of children chosen and on consumption of other goods, given the simplified family's budget constraint. An important point of the model is that the shadow price of children with respect to number is positively related to the number of children, leading to the result that an increase in quality is more expensive if there are more children, since the increase has to apply to more units. Similarly, an increase in quantity is more expensive if children are of higher quality, because higher-quality children cost more. Therefore, a positive shock on family income will lead to a larger increase in the consumption of other goods consumption than in quantity or quality. Thus, the receipt of benefits from conditional cash transfer programs would have a bigger impact on consumption of other goods than on the fertility of beneficiaries.

According to Stecklov et al (2006), if children are normal goods, the sum of the income-elasticities of quantity and quality must be positive. However, the Becker and Lewis model's specification suggest that income-elasticity of quantity is negative. The income-elasticity of quality would thus need to be sufficiently positive in order for the sum to remain positive. Hence, if the CCT's transfers are unconditional, a reduction of the demand for children accompanied by a rise in quality could happen, depending on the family's preferences. However, if transfers are linked to family's behavior and to the health and schooling of children, the benefit's effect is to reduce children's price, which might lead to other results.

If there is in the family a "public good" or a "family's good", as books and clothes that can be used by all the children, or, in the CCT's case, the mother's knowledge about

hygiene or contraceptive and prenatal methods, an exogenous improvement of contraceptive methods (or of the access to them) can lead to an increase of the quality chosen to children, if quality and quantity are substitutes. Furthermore, children's cost is connected to the mother's wage in the labor market, since the latter is higher, the greater will be the monetary loss of the mother if she chooses to stay home taking care of her children instead of working.

As argued by Stecklov et al (2006) mother's education about health and hygiene is a "familiar public good" that can reduce the cost of quality, while payments and assistance during pregnancy can decrease the cost of quantity. Health and school attendance can further reduce the cost of children. The final effect of CCTs on fertility behavior, however, depends on specificities of the program and its conditions are directly relative to these costs.

Other factors can influence the decision between quality and quantity of children relatively to the mothers' job. If the quality of children is positively correlated to the time spent by mothers to take care of them, the choice of more quality will necessarily lead to less time in the labor market, leading to a proportionately lower wage. For this reason, CCT's benefits can make mothers need to dedicate less time to work in order to win the same income, dedicating more time to children, and consequently choosing a higher quality to them, which, considering the quality-quantity trade-off, leads to lower fertility.

Furthermore, fertility decisions can generate externalities that involve what is called "strategic complementariness" (Cooper e John, 1988, apud Sartoris e Souza, 2004). This means that the utility function depends on the total number of children in the community and that the utility of one aditional children will be higher the higher is the neighbors' number of children. In CCTs programs, this externality could provoke an increase of fertility among neighbors of beneficiaries that were not selected to the programs, if the selection was done through proxy means test. Thus, the inclusion of one more member in the family, maintaining the income constant, would lead to a reduction of income per capita, raising their probability of inclusion. Clearly, this will depend on these neighbors' expectations relative to the growth of the program or on the

list of beneficiaries being opened or closed. In this way, a “contamination” of the beneficiaries’ neighbors that are not benefited can occur, increasing their fertility.

Stecklov et al (2006) also point, on this issue, to the necessity of a model that takes into account the supply of children, since CCT programs include interventions, such as family planning and health and nutrition information, which can influence biological supply of children. This effect can be analyzed through the model of fertility control presented by Rosenzwieg e Schultz (1985), that considers the number of children as an exogenous variable and assumes that fertility is a random variable that can be reduced by the use of fertility control.

According to the model, through the supply of information about family planning, CCT programs can reduce the costs of that planning or improve the control’s efficiency, what could conduce to a decrease of fertility. Furthermore, CCTs can influence children supply, affecting the specific fertility of the couple by improving the nutritional status, for example. Moreover, the supply of information about breast-feeding benefits, included in health and nutrition conditionality, can rise the period of breast-feeding, affecting fertility negatively (Bongaarts, 1982).

Another important issue that can affect the supply of children are the changes in the migratory pattern, since transfers can reduce the necessity of migration of poor people that search for better life conditions. Not migrating, the frequency of the couple's sexual relations may rise, leading to an increase of fertility.

2.2.2 The possible effects of Bolsa Família

Bolsa Família pays health, nutritional and educational benefits together, so that it is not possible to distinguish clearly which benefit can impact the fertility decision of beneficiaries. In another way, the CCT’s analyzed by Stecklov et al (2006) pay health and educational benefits apart, making it possible to distinguish these effects.

Extremely poor families in Bolsa Família, contrary to poor families, receive a fixed benefit (R$58 in 2007), but we do not expect this transfer to have impact on beneficiary’s fertility behavior because it has a fixed value and is independent of household composition. Furthermore, the benefit is not conditional to specific behaviors. This translates into a simple income effect, not changing prices of

components of family's utility function. Thus, pure income growth should increase consumption of all goods, and if children are normal goods, considering the quality-quantity trade-off, that benefit can increase consumption of other goods as well as of children. However, that does not immediately mean an increase of fertility, but rather the possibility of growth in the number of children (fertility) or in their quality, which depends on preferences and on the social context of the family.

We expect the variable portion the the benefit to have an impact on fertility decisions f sorts is the variable benefit. The existence of a 3-person limit of common variable benefits in each household could be a way to prevent immediate incentives to an increase in beneficiaries' fertility. However, for households with less than 3 eligible members the transfer benefit may affect fertility decisions, since including additional members to the household increase the amount received. On the other side, the program also creates an incentive to families to invest more in their children, thus an increase in household income might not affect fertility behavior but will increase the amount of money and time invested in each children.

3. Data and Methods

We use the Household Sample National Survey (PNAD), carried out annually by the Brazilian Institute of Geography and Statistics (IBGE), since 1971, except in Population Censuses years (1970, 1980, 1991 and 2000). PNAD collects information on education, labor, income and housing. Each year, a special supplement is also included in the survey. The survey included questions about Bolsa Família in 2004 and 2006.

In 2004, the PNAD sample identified 24.338 (6,17% of sample) households receiving Bolsa-Família benefits. The total number of benefited households in that year was about 4.550.469[2]. In 2006, these numbers were respectively 87.800 (21,42% of the sample) and 11.118.074.

In order to estimate the impact of Bolsa Família on the beneficiaries' fertility behavior, we use a regression model based on First-Differences approach. Unfortunately, we do not have information on the same group of people before and after

[2] MDS (2007)

the implementation of the survey. To find comparable groups – treatment and control – we use Propensity Score Matching methods.

To evaluate the impact of a CCT program on the outcome variable (Y), which depends on treatment (D=1 if treated and D=0 if non-treated) and exogenous factors (X = control variables), the problem of evaluation is given by:

$$Yi = a + bDi + cXi + Ui$$

Where Ui is the error term, "a", "b" and "c" are parameters and the impact of treatment in the year of interest is given by "b".

However, a selection bias can exist if D and U are correlated. Therefore, to control this bias we must use in X the greatest number of observable characteristics that can affect the participation in the program and the outcomes without participation, an assumption known as "Conditional Independence Assumption". One of the conditions to meet it is that there are individuals in the control group with the same vector X as their relative treated units, i.e., the common support condition must be fulfilled. The estimation of propensity score solves this problem in our case, since the selection to the Bolsa Família Program was not randomized, due to the fact of the program being targeted on poor people and its implementation almost universal, what makes it impossible to carry out experimental methods.

The estimation of propensity score matches the probability of participation in the program:

$$P(Xi) = Pr(Di=1|Xi)$$

Assuming that, given X, participation is independent of outcomes, what means that if no bias give X then no bias given P(X). In this way, for each participant we can find a sample of non-participants that have similar propensity scores, making it possible to compare the outcomes between the control and treated groups and to estimate the program's impact. We did this for both years and compare the "b" outcome in 2004 from the one in 2006, analyzing if they are statistically different in order to say if the program has or not a positive impact in the fertility of beneficiaries.

3.1 Characteristics of the sample of Bolsa Familia's beneficiaries in the PNAD

Most of the benefited households in both years were concentrated in the Northeast region (58,46% in 2004 and 53,46% in 2006) and in urban areas (68,55% in 2004 and 69,47% in 2006). The per capita income of about 96% of the households was less than R$300 (about US$ 130) and R$400 (about US$ 174) in 2006. These values were used as income limits for eligibility in each year, instead of the official income value, so as to expand the sample and produce more robust outcomes.

Most families attended by Bolsa Família were composed by a couple with all children below 14 years of age, in both years (41,34% in 2004 and 34,80% in 2006), followed by a couple with children below and above 14 years of age (27,10% and 27,36%, respectively), what shows that most of the beneficiaries had children living in the household. About 63,23% of the benefited women in reproductive age (15 to 50 years old) are between 15 and 35 years old in the 2004 sample, and 58,33% in the 2006 sample. The average number of children living with their mothers in the household was 2,54 in 2004 and 2,34 in 2006. The average years of schooling of the beneficiaries was 4,14 in 2004 and 6,77 in 2006.

Table 2 shows the percentage distribution of beneficiaries by other characteristics in each year:

Table 2: percentage distribution of Bolsa Família`s beneficiaries by characteristics – 2004 and 2006

Characteristic (average numbers)	Proportion of beneficiaries (%) - 2004	Proportion of beneficiaries (%) - 2006
Electricity	91,62	93,99
Sewage disposal	31,56	32,12
Access to clean water	25,47	24,26
White	29,88	28,77
Metropolitan area	27,71	23,08
Formal labor market	17,51	20,89

Woman head of family	4,68	5,40

Source: PNAD 2004, 2006

Table 2 shows that some characteristics related with poverty status are very similar in the period. Most of the benefited households had access to electricity, while only a minority had access to sewage disposal and clean water. The proportion of women as the head of the family was low, as well as the proportion of beneficiaries that participated in the formal labor market, were white or lived in the metropolitan area.

3.2 MATCHING

With the purpose of doing the matching, we clean our sample in order to select just women in reproductive age (15 up to 50 years old) and up to the per capita income limits that reach about 96% of the sample's beneficiaries (R$300 in 2004 and R$400 in 2006). Logit models were estimated to find the probability of participation on the program. The dependent variable is a dummy that assumes value=1 if women had a child in the previous year and value=0 if it had not. We used independent variables that affected participation in Bolsa Família, based on CadÚnico selection criteria, and variables that can affect outcomes, as shown in the annexed table. We use the nearest neighbor matches method.

We perform several different estimations so that the Balancing Hypotheses would be satisfied, implying that the mean of each characteristic was not different between treatment and control groups. The best specifications were chosen considering the number of observable characteristics and the satisfaction of Balancing Hypotheses. The results are shown in the next tables:

Table 3: Logit model (1) (Bolsa Família, 2004)

Variables	Coefficient	Standard error	z	P>z	95% Conf Interval	
White	-0,00541	0,095331	-0,06	0,955	-0,19225	0,181437
Years of schooling	-0,01381	0,012874	-1,07	0,283	-0,03904	0,011421
Number of children living in the household	0,135343	0,025702	5,27	0	0,084969	0,185717
Southeast	0,359171	0,332828	1,08	0,281	-0,29316	1,011503
North	0,106463	0,293884	0,36	0,717	-0,46954	0,682464
Northeast	0,755147	0,285915	2,64	0,008	0,194765	1,31553
Midwest	-0,35172	0,366806	-0,96	0,338	-1,07065	0,367203
Urban area	-0,09047	0,092796	-0,97	0,33	-0,27235	0,091404
Metropolitan area	0,068867	0,108606	0,63	0,526	-0,144	0,28173
Age	-0,00192	0,005099	-0,38	0,707	-0,01191	0,008073
Electricity	0,212592	0,132914	1,6	0,11	-0,04791	0,473099
Sewage disposal	0,010109	0,045658	0,22	0,825	-0,07938	0,099597
Woman head of family	-0,4153	0,14915	-2,78	0,005	-0,70763	-0,12297
Access to clean water	0,031589	0,089623	0,35	0,724	-0,14407	0,207247
Household income (per capita)	-0,00402	0,000828	-4,85	0	-0,00564	-0,0024
Couple with children	0,512144	0,437065	1,17	0,241	-0,34449	1,368775
Couple without children	-0,01763	0,52114	-0,03	0,973	-1,03905	1,003784
Mother with children	0,784958	0,438084	1,79	0,073	-0,07367	1,643587
_constant	-2,66401	0,590135	-4,51	0	-3,82066	-1,50737

Source: PNAD, 2004

Table 4: Inferior bound, number of treated and number of controls for each block (Bolsa Família, 2004)

Inferior of block of pscore	Treatment		Total
	0	1	
0,041653	1.037	90	1.127
0,1	1.028	137	1.165
0,15	851	183	1.034
0,2	1.148	396	1.544
0,4	19	6	25
Total	4.083	812	4.895

Table 3 shows that variables related to poverty status generally have the expected signals. The number of children living in the household increases the probability of participation in the program, while a bigger household per capita income decreases this probability. The region with the largest probability of eligibility is Northeast, the poorest region of Brazil. Mothers with children also had a bigger probability of participation. It is important to note that the fact of some variables included in the model are not significant is not a problem. According to Rubin and Thomas (1996, apud Caliendo and Kopeining, 2005), a variable must be excluded from the model just if it is not appropriate.

The matching for 2006 has one difference in independent variables if compared to 2004. To satisfy the Balancing Hypothesis we had to make a change in regional dummies, putting together the South and Southeast regions in order to create a new dummy with value=1 if the individual lives in one of these regions, and value=0 if she lives in the Northeast, North or Midwest regions. However, this is not a problem because poverty characteristics are similar between combined regions. The results are presented in Table 5:

Table 5: Logit model (2) (Bolsa Família, 2006)

Variables	Coefficient	Standard error	z	P>z	95% Conf Interval	
White	0,061641	0,076899	0,8	0,423	-0,08908	0,212361
Years of schooling	-0,03008	0,00996	-3,02	0,003	-0,0496	-0,01056
Number of children living in the household	0,198833	0,024252	8,2	0	0,151301	0,246366
South_Southeast	-0,25048	0,121099	-2,07	0,039	-0,48783	-0,01314
Urban area	-0,29525	0,073739	-4	0	-0,43977	-0,15072
Metropolitan area	-0,36453	0,088103	-4,14	0	-0,53721	-0,19185
Age	0,024203	0,004014	6,03	0	0,016336	0,032071
Electricity	0,526534	0,106594	4,94	0	0,317614	0,735454
Sewage disposal	0,026105	0,034505	0,76	0,449	-0,04152	0,093734
Woman head of family	-0,51167	0,105984	-4,83	0	-0,71939	-0,30394
Access to clean water	0,153083	0,071968	2,13	0,033	0,012029	0,294137
Household income (per capita)	-0,00402	0,00045	-8,93	0	-0,0049	-0,00313
Couple with children	0,295597	0,251078	1,18	0,239	-0,19651	0,787701
Couple without children	-0,52299	0,300138	-1,74	0,081	-1,11125	0,065272
Mother with children	0,709302	0,253795	2,79	0,005	0,211873	1,206731
Constant	-1,2491	0,333713	-3,74	0	-1,90316	-0,59503

Source: PNAD 2006

Table 6: Inferior bound, number of treated and number of controls for each block (Bolsa Família, 2006)

Inferior of block of pscore	Treatment		Total
	0	1	
0,065051	183	38	221
0,2	316	98	414
0,3	479	214	693
0,4	493	446	939
0,5	447	523	970
0,6	350	848	1.198
0,8	30	94	124
Total	2.298	2.261	4.559

Font: PNAD 2006

The results for 2006 follow the same direction of 2004. The number of children living in the household increases the probability of participation in the program, while a large household per capita income decreases this probability, the same being true for a household that is located at urban and metropolitan areas. The regional dummy shows that families of the North, Northeast and Midwest regions have a bigger probability of eligibility that those of the South and Southeast regions, as expected. Mothers with children had a bigger probability of participation, while couple without children had less probability.

We analyzed the means of the variables of interest before and after matching to certify the quality of the procedure and to verify the differences between treatment and control groups. Table 7 and Table 7 show results for 2004 and 2006, respectively.

Table 7: Means of variables before and after matching (2004)

		Mean		%reduct	
Variable	Sample	Treated	Control	%bias	bias
Treatment	Unmatched	1	0	.	.
	Matched	1	0	.	.
White	Unmatched	0,2266	0,22973	-0,7	-0,19
	Matched	0,2266	0,23153	-1,2	-57,3
Years of schooling	Unmatched	4,819	5,4032	-17,1	-4,35
	Matched	4,819	4,8744	-1,6	90,5
Number of children living in the household	Unmatched	2,8571	2,3143	31,8	8,44
	Matched	2,8571	2,7867	4,1	87
North	Unmatched	0,24877	0,37769	-28,1	-7,06
	Matched	0,24877	0,24163	1,6	94,5
Northeast	Unmatched	0,66133	0,47625	38	9,75
	Matched	0,66133	0,67586	-3	92,1
Midwest	Unmatched	0,02463	0,06641	-20,1	-4,61
	Matched	0,02463	0,02685	-1,1	94,7
South	Unmatched	0,01847	0,02813	-6,4	-1,57
	Matched	0,01847	0,01429	2,8	56,6
Southeast	Unmatched	0,0468	0,05152	-2,2	-0,56
	Matched	0,0468	0,04138	2,5	-14,6
Urban area	Unmatched	0,52833	0,58095	-10,6	-2,78
	Matched	0,52833	0,53276	-0,9	91,6
Metropolitan area	Unmatched	0,18719	0,19144	-1,1	-0,28
	Matched	0,18719	0,1899	-0,7	36,3

Age	Unmatched	32,933	32,63	3,4	0,87
	Matched	32,933	32,768	1,9	45,4
Electricity	Unmatched	0,88916	0,86835	6,4	1,62
	Matched	0,88916	0,88276	2	69,2
Sewage disposal	Unmatched	3,8941	3,8584	4	1,05
	Matched	3,8941	3,9042	-1,1	71,7
Woman head of family	Unmatched	0,12562	0,15741	-9,1	-2,31
	Matched	0,12562	0,12167	1,1	87,6
Access to clean water	Unmatched	0,31404	0,30867	1,2	0,3
	Matched	0,31404	0,32365	-2,1	-79
Household income (per capita)	Unmatched	79,56	101,42	-39,5	-9,35
	Matched	79,56	79,198	0,7	98,3
Couple with children	Unmatched	0,75616	0,72182	7,8	2,01
	Matched	0,75616	0,75837	-0,5	93,5
Couple without children	Unmatched	0,01601	0,0468	-17,7	-4,02
	Matched	0,01601	0,01429	1	94,4
Mother with children	Unmatched	0,22044	0,21106	2,3	0,6
	Matched	0,22044	0,21921	0,3	86,9

Source: PNAD 2004

We can see that in most the bias reduction was higher than 70%, showing that after matching treatment and control groups are very similar in observable characteristics. Consequently, we can say that matching was done correctly.

Table 8: Means of variables before and after matching (2006)

		Mean		%reduct	
Variable	Sample	Treated	Control	%bias	bias
Treatment	Unmatched	1	0	.	.
	Matched	1	0	.	.
White	Unmatched	0,21274	0,22135	-2,1	-0,71
	Matched	0,21274	0,20885	0,9	54,8
Years of schooling	Unmatched	5,1199	6,1606	-29,9	-10,1
	Matched	5,1199	5,0334	2,5	91,7
Number of children living in the household	Unmatched	2,7205	1,9232	50,2	16,96
	Matched	2,7205	2,7308	-0,7	98,7
South_Southeast	Unmatched	0,0659	0,0855	-7,4	-2,5
	Matched	0,0659	0,0621	1,4	80,6
Urban area	Unmatched	0,46572	0,57031	-21	-7,11
	Matched	0,46572	0,46687	-0,2	98,9
Metropolitan area	Unmatched	0,14418	0,23481	-23,3	-7,86
	Matched	0,14418	0,141	0,8	96,5
Age	Unmatched	33,761	31,843	21	7,07
	Matched	33,761	33,786	-0,3	98,7
Electricity	Unmatched	0,89783	0,87891	6	2,03
	Matched	0,89783	0,88563	3,9	35,5
Sewage disposal	Unmatched	3,8837	3,7917	9,7	3,27
	Matched	3,8837	3,8686	1,6	83,7
Woman head of family	Unmatched	0,15657	0,18663	-8	-2,69
	Matched	0,15657	0,16648	-2,6	67

Access to clean water	Unmatched	0,31667	0,30078	3,4	1,16
	Matched	0,31667	0,30995	1,5	57,7
Household income (per capita)	Unmatched	108,29	143,07	-43,8	-14,79
	Matched	108,29	107,18	1,4	96,8
Couple with children	Unmatched	0,74082	0,68924	11,4	3,86
	Matched	0,74082	0,72525	3,5	69,8
Couple without children	Unmatched	0,02034	0,07248	-25	-8,41
	Matched	0,02034	0,02371	-1,6	93,6
Mother with children	Unmatched	0,22733	0,2092	4,4	1,48
	Matched	0,22733	0,23689	-2,3	47,3

Source: PNAD 2006

The results for 2006 show that the bias was reduced by more than 60% for most of the observable variables, and that the matching was done correctly.

3.3 The effect of Bolsa Família in the fertility of beneficiaries

After evaluating the quality of the matching, we estimate the difference between treatment and control groups in each year in our dependent variable (If the woman had a child in the previews year), that is, the ATT (average treatment effect on treated). The results are show below:

Table 9: ATT estimation with Nearest Neighbor Matching method (random draw version)/Bootstrapped standard errors – 2004

treat.	contr.	ATT	Std.Err	t
812	673	-0,063	0,026	-2,451

Font: PNAD 2004

Table 10: ATT estimation with Nearest Neighbor Matching method (random draw version)/Bootstrapped standard errors – 2006

treat.	contr.	ATT	Std.Err	t
2261	1066	-0,056	0,016	-3,457

Font: PNAD 2004

Both ATT estimations were significant at 1% level. It is important to note that in both of the analyzed years the probability of a benefited woman having had a child in the previous year was smaller than that of the control group. In 2004, this probability was 6.3 percentage points smaller for the beneficiated group, while in 2006 this value was -5,6 percentage points. Considering signal and magnitude of ATT outcomes, we can note that the program has had a negative impact on the fertility of beneficiaries, despite this impact having been reduced between 2004 and 2006.

The difference between the ATT outcomes of 2004 and 2006 (or the difference-in-difference) suggests that there is a positive impact – of 0,7 percentage points on the probability of a benefited woman having had a child in the previous year - of Bolsa Família Program on beneficiaries' fertility. However, we can't use the difference-in-differences approach, since that the sample are different between the years.

In order to know if the impact of Bolsa Familia in the fertility of beneficiaries was positive or not in the analyzed period, since that the ATT results for first-differences estimations were significant at the 1% level and their magnitude was changed, we calculate the confidence interval to know if the values of the ATT's estimated are statistically different. The 95% confidence interval for 2004 was between -0,11396 and -0,01204, while for 2006 the value was between -0,08736 and -0,02464. Therefore, we can not say that the ATT outcomes are statistically different between 2004 and 2006, since the confidence intervals are coincident between the values of -0,08736 and -0,02464, what suggests that there is no impact of Bolsa Familia program in the beneficiaries' fertility.

4. Conclusions

We don't find an impact of Bolsa Família Program on the fertility of beneficiaries between 2004 and 2006. It is important to note that in both of the analyzed years the probability of a benefited woman having had a child in the previous year was smaller than that of the control group. In 2004, this probability was 6.3 percentage points smaller for the beneficiated group, what suggest that there is a pre-existent difference between control and treatment group. In 2006 this value was -5,6 percentage points, suggesting a positive impact of 0,7 percentage points of Bolsa Família in the fertility of beneficiaries in this period. However, the ATT's estimated were not statistically different, what suggests that there is no impact of Bolsa Familia program in the beneficiaries' fertility. Nevertheless, results presented in this paper are closely influenced by the chosen method, a fact that must be taken into account. In order to continue this work, is very recommendable to estimate other kinds of methods, to compare the results and its robustness.

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Annex

Variables used in specification of models of propensity score	
White	Dummy: white individual
Years of schooling	Years of schooling of the individual
Number of children living in the household	Number of children living in the household with the mother
Southeast, North, Northeast, Midwest, South_Southeast	Dummies for regions of the country
Urban area	Dummy: Household located in an urban area
Metropolitan area	Dummy: Household located in an metropolitan area
Age	Age of the individual
Electricity	Dummy: Household had access to electricity
Sewage disposal	Dummy: Household had access to sewage disposal
Woman head of family	Dummy: The woman is the head of family
Access to clean water	Dummy: Household had access to clean water
Household income (per capita)	Household income (per capita)
Couple with children	Dummy: if the kind of family is a couple with children
Couple without children	Dummy: if the kind of family is a couple without children
Mother with children	Dummy: if the kind of family is a mother with children