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Article

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Evidence of eligibility manipulation for conditional cash transfer programs

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Abstract

This paper assesses whether eligibility for conditional cash transfer programs has been manipulated, as well as the impact of this phenomenon on time allocation within households. To perform this analysis, we use data from the 2006 PNAD (Brazilian national household survey) and investigate the eligibility manipulation for the *Bolsa Família* (Family Stipend) program during this time period. The program assists families with a monthly per capita income of around R\$120.00 (US\$60.00). By applying the tests developed by McCrary (2008), we find suggestive evidence that individuals manipulate their income by voluntarily reducing their labor supply in order to become eligible to the program. Moreover, the reduction in labor supply is greater among women, especially single or divorced mothers. This evidence raises some concern about the unintended consequences related to the eligibility criteria utilized by *Bolsa Família*, as well as the program's impact on individuals living in extreme poverty.

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JEL classification: I38; O15

Keywords: Conditional cash transfers; Brazilian *Bolsa Família*; Regression discontinuity; Eligibility manipulation

Resumo

O artigo investiga a manipulação para a elegibilidade de programa de transferência condicional de renda bem como se essa manipulação se dá através de mudanças da alocação do tempo dos membros da família. Para tanto, ele utiliza os dados da Pesquisa Por Amostragem Domiciliar 2006 (PNAD/IBGE) no Brasil e investiga a manipulação para elegibilidade no Bolsa Família. O programa se dirige a famílias com renda per capita familiar inferior a R\$120 (US\$ 60.00) mensais. utilizando-se os testes desenvolvidos por McCrary (2008), se encontram evidências sugestivas que indivíduos manipulam suas rendas reduzindo voluntariamente sua oferta

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de trabalho. esta redução é maior entre as mulheres solteiras e chefes de família. Estas evidências levantam algumas preocupações sobre as consequências não intencionais dos critérios de elegibilidade do Bolsa Família e dos seus impactos sobre a pobreza e bem estar das famílias.

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Palavras chaves: Transferências Condicionais de Renda; BolsaFamília; Regressão com Descontinuidade; Manipulação de Elegibilidade

1. Introduction

Brazil is a country known to have a high level of income inequality with a Gini coefficient of per capita household income of approximately 0.54 (IPEADATA, 2013). Aside from this factor, Brazil also has significant levels of both poverty and extreme poverty. In 2009, about 21.4% and 7.3% of the population was poor and extremely poor, respectively (IPEADATA, 2013).

In order to help combat this poverty, a conditional cash transfer program – the *Bolsa Família* Program (PBF)¹ – was created in 2004. The goal of the program was to increase the income level of economically underprivileged subpopulations, as well as generate direct incentives for children to improve their education and health outcomes. By 2013, there were around 14 million families participating in the program, encompassing more than 50 million individuals. The total value of the cash transfers reached more than 0.5% of the Brazilian Gross Domestic Product (GDP).

According to Foguel and Ulyseia (2007), public transfers have accounted for the major source of non-work related income in the past few years. Some studies, such as those by de Barros et al. (2007a,b,c), Hoffmann (2006), Soares et al. (2006), and Cury et al. (2009), find that the PBF has had a positive impact PBF on the reduction of income inequality and poverty in Brazil. Ferro and Kassouf (2003), Cardoso and Souza (2004), Bourguignon et al. (2004), and Glewwe and Kassouf (2012) note the positive effect that conditional cash transfer programs have on increasing the school attendance of children whose families are beneficiaries. However, there is no evidence of positive impact on vaccination (CEDEPLAR, 2007).

However, since per capita household income is one of the eligibility criteria for the PBF, the program may have adverse effects on agents' labor supply. For example, individuals with incomes slightly higher than the maximum level for participation in the program would be encouraged to reduce their labor supply in order to meet the eligibility criteria.

Manipulation of income may shift the focus away from the subpopulation of interest, for which the benefit is badly needed. Data for 2012 show that there were 16.2 million people in Brazil with a monthly income per capita less than R\$70.00, which is the extreme poverty line (World Bank, 2013). Hence, if non-eligible individuals benefit from the program, those most in need are likely to be excluded from the PBF as the budget becomes larger than expected.

The aim of this paper is to ascertain possible manipulation in the eligibility status for the PBF and verify if the manipulation is performed by behavioral changes on the time allocation of the individuals within the households. This manipulation is assessed by the test developed by McCrary (2008), which determines the presence of discontinuity in the density estimated by local linear regressions around the cutoff that defines the eligibility for the program, which was R\$120.00 (US\$60.00) in terms of monthly per capita household income in 2006. Next, we use a fuzzy regression discontinuity design in order to obtain evidences of the eligibility manipulation by changes on time allocation.

The paper contributes to the public debate of social policy design. Particularly, there is a debate whether the targeting of social programs should be *means tested* or *proxy-means tested*. A means tested targeting strategy implies that household with income below certain thresholds qualify to the program. This is the case of *Bolsa Família* program. On the other hand, a proxy-means tested strategy makes program eligibility to depend on a composite score of a household's characteristic such as asset holdings, demographic composition, and dwelling characteristics that are proxies for household income. This is the case of the *Oportunidades* program in Mexico.

The advantage of the means-tested targeting strategy is its simplicity and low cost (less information collection required, easiness to compute, etc.). Its drawback is that it may increase the probability of including non-eligible

¹ Throughout the paper we use the Portuguese version of the acronym (*Programa Bolsa Família*).

families because household may lie about their true income. On the other hand, the proxy-means testing decreases the chances of inclusion error because household's asset holdings and other characteristics are more difficult to manipulate. However, the disadvantage is that it may increase the chance of exclusion error. The program may not react properly in case of families that suffer a negative income shock and become eligible to the program.

Although this is an important debate, there is scant evidence on the advantages or disadvantages of each strategy. This paper sheds new light to this debate by showing that means-tested targeting leads to inclusion error, because households change their behavior in order to become eligible to the program.²

Including this introduction, the paper is organized into six sections. Section 2 describes the main characteristics of the PBF and the incentives associated with participation. The construction of the database and the sample selected are noted in Section 3. Section 4 describes the methodology. Results are presented in Section 5, while Section 6 offers our conclusions.

2. The *Bolsa Família* Program

The PBF is a conditional cash transfer program officially launched by the Brazilian federal government in 2004. It consisted of a merger of several existing social programs, such as the cooking gas subsidy, the National School Allowance Program, the Food Card Program, the Food Allowance Program, and the Child Labor Eradication Program.³ In this section, the description of the PBF relates to 2006 because the data used in this study were obtained from the 2006 PNAD (Brazilian national household survey). In that year, the supplement of the survey collected information about the conditional cash transfer programs.⁴

In 2006, a household needed to have a monthly per capita household income equal or below to R\$120.00 to qualify for the PBF. "Poor" families, defined as those with a monthly per capita household income between R\$60.00 and R\$120.00, were eligible if they had children younger than 15 years of age, or if family members included pregnant women or breastfeeding mothers. If these factors existed, the family would receive a variable transfer of R\$15.00 for each child (or pregnant woman or breastfeeding mother), restricted to a maximum of three transfers per household. For cases in which the monthly household income was lower than R\$60.00, the families were classified as "extremely poor" and received a basic transfer of R\$50.00, even if there were no children, pregnant women or breastfeeding mothers in the household. In addition, these families could receive a variable transfer of R\$15.00 per beneficiary (not to exceed three beneficiaries).

In order to qualify for the R\$15.00 variable cash transfer, households needed to meet the following requirements:

- Children aged 6–15 years old had to be enrolled in school and have a school attendance rate of at least 85%.
- Pregnant women and breastfeeding mothers were required to attend prenatal and postnatal visits, according to the timetable established by the Brazilian Ministry of Health.
- Children up to seven years of age had to be up-to-date with the recommended vaccine schedule.

Families failing to meet these requirements were subject to gradual penalties, including notification, cancellation of the cash transfer, and exclusion from the program. Nevertheless, no severe penalties exist for manipulating income information. Income verification for participation in the program depends on the institutional framework of each region, and this data is seriously compromised by the fact that a large number of beneficiaries hold informal job contracts.

With these imposed requirements, it is reasonable to assume that violations linked to mandatory school attendance are the most likely to incur severe penalties. In addition, the Ministry of Social Development (MDS), which manages the PBF, relies on the state and municipal public education systems to check whether the requirements are properly satisfied.

The effects on labor supply of programs similar to the PBF have been addressed by comprehensive studies, chiefly in the United States and in the United Kingdom (e.g., Moffitt, 1992; Blundell and Macurdy, 1999; Eissa et al., 2006).

² The authors would like to thank an anonymous referee for highlighting this point.

³ The program is pursuant to law 10.836, as of January 9, 2004, and is currently managed by the Brazilian Ministry of Social Development and Hunger Eradication.

⁴ Additional information about the program is available at www.mds.gov.br.

There are a sizeable number of empirical studies focusing on disincentives to labor force participation due to conditional cash transfer programs adopted by developing countries. However, the findings are not conclusive. For instance, [Parker and Skoufias \(2000\)](#) and [Skoufias and di Maro \(2006\)](#) investigated the Mexican program *Oportunidades* and did not find disincentives to contributing to the labor supply among adult workers. Likewise, [Edmonds and Schady \(2008\)](#) also suggest that Ecuador's *Bono de Desarrollo Humano* (BDH) program did not produce effects on the rate of participation of adult individuals in the labor market. On the other side of the spectrum, [Maluccio and Flores \(2005\)](#) showed that Nicaragua's *Red de Protección Social* (RPS) program significantly reduced hours worked among adult male workers, but not among adult female workers.

Recently, several studies have sought to determine the effects of the PBF and other conditional cash transfer programs on adult labor supply in Brazil (e.g., [Soares et al., 2007](#); [Ferro and Nicollela, 2007](#); [Tavares, 2008](#); [Teixeira, 2008](#); [Covre et al., 2008](#); [Foguel and de Barros, 2008](#)). In general, these analyses on the adverse incentives related to conditional cash transfer programs have also led to distinct conclusions. These studies use different empirical strategies to compare all beneficiaries against observationally similar non-beneficiaries. The program has a set of incentives that can affect the adult labor supply in opposing directions. On one hand, the income transfer may lead to a decrease in labor supply if leisure is a normal good. On the other hand, the conditionalities related to the time allocation of children and adolescents may change adult time allocation, which may increase this group's labor supply. Thus far, the empirical studies estimate the net effect of these different channels.

Our present study contributes to the literature in two ways. Firstly, we find evidence that indicates income eligibility manipulation for a conditional cash transfer program. Secondly, our study shows that this manipulation occurs (in part) through a decrease in the labor supply of adult members for those families on the margin of qualifying for the PBF.

3. Dataset and sample selection

The data used in the present study were obtained from the Brazilian national household survey (PNAD) conducted in 2006. The Brazilian Institute of Geography and Statistics (IBGE) conducts the PNAD on an annual basis. The survey covers all regions of Brazil (except for some rural areas). Around 75,000 households (300,000 individuals) are interviewed. The PNAD general questionnaire collects information about social, demographic, and economic characteristics of the individuals and households.

For each year, there is a specific questionnaire, aside from the general one, that gathers information about a specific topic or issue. The 2006 PNAD is especially useful in identifying which households had at least one PBF beneficiary. However, the PNAD does not have a specific variable to assess the cash transfers an individual receives from social programs. Cash transfers from these programs are included in the V1273 variable, along with the interest generated from savings accounts and other financial applications, dividends, and other revenues.

In order to obtain the value exclusively comprised of PBF transfers, based on the V1273 variable, we use the filtering procedure shown in [Fig. 1](#). This model closely follows the procedure used by [de Barros et al. \(2007c\)](#).

With this procedure we are able to construct the value of the PBF cash transfer by household. Following this, we construct the variable monthly net household income per capita of the PBF cash transfer.

We use different samples of individuals and classify them into two groups to check for heterogeneities in the income manipulation tests⁵:

- Family group “1”: members of households made up of couples with at least one child younger than 15 years of age.
- Family group “2”: members of households consisting of mother as household head, with at least one child younger than 15 years of age.

Based on the household profile, in order to capture the possible heterogeneous effects of the PBF on labor supply, the subsamples were stratified into another two groups:

- Demographic group “A1”: men (household heads) belonging to family group “1”.

⁵ The selection of households with at least one child younger than 15 years of age is justified by the criterion that makes poor people eligible for a variable cash transfer.

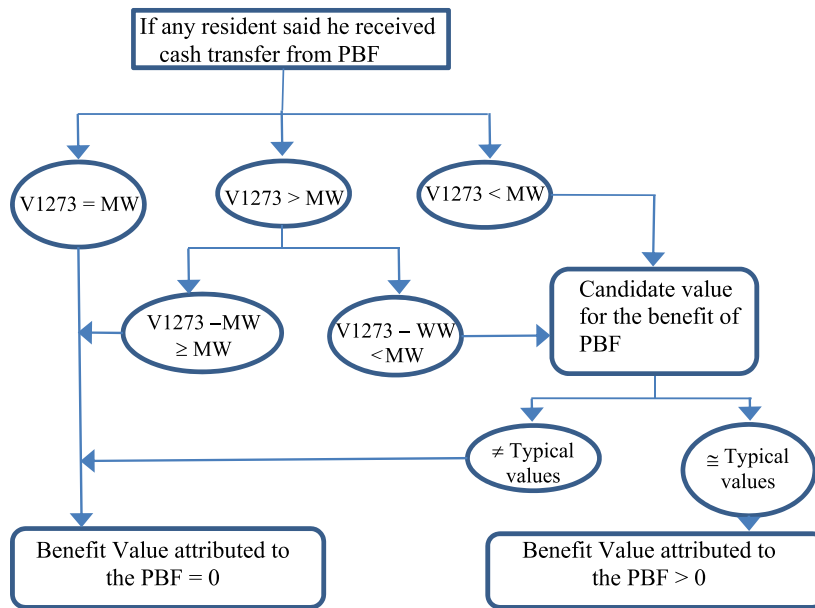


Fig. 1. Filtering procedure for calculation of the PBF value. *Notes:* MW \Rightarrow minimum wage in September 2006 used as reference (R\$260.00). Values equal to, or a multiple of, constant MW in the V1273 variable are attributed to cash transfer from the Continuous Cash Benefit (BPC) program, as is explained in de Barros et al. (2007c); Typical Values = Typical values of PBF and correlates, as well as their combinations, as illustrated in Table 6 in de Barros et al. (2007c). Values close to “Typical Values” (\pm R\$5.00) were considered in order to make up for possible incorrect information provided by the respondent.

- Demographic group “B1”: women (mothers) belonging to family group “1”.
- Demographic group “B2”: women (mothers) belonging to family group “2”.

We perform our empirical analysis separately for each demographic group. The descriptive statistics of the samples are presented in Table 1.

In Table 1, the descriptive statistics for family groups “1” and “2” are presented together, as well as separately. Within a group, the statistics are presented separately for beneficiaries and non-beneficiaries. The average monthly per capita household income of PBF beneficiaries, discounted from the cash transfer values for the whole sample, is quite close to the eligibility criterion (R\$120.00). For family group “1,” the average monthly per capita household income is slightly greater (1.2%) than the cutoff point, whereas for family group “2,” that figure is 7.6% lower than the cutoff point.

It is important to note that the average number of children is larger for PBF beneficiaries and that the geographical distribution between the two groups is different, since approximately 50% of beneficiaries live in the northeast, in contrast to non-beneficiaries. Non-white individuals are the overwhelming majority among beneficiaries.

Table 2 describes the characteristics of the household members in each group. Employment rates and the average number of weekly hours worked among PBF beneficiaries are higher for group A1 (men) and lower for group B1 (married women). On the other hand, the participation rate is very similar between married male beneficiaries and non-beneficiaries. The beneficiaries belonging to the group of married mothers are the youngest. Single or independent mothers, however, have higher average schooling levels.

Table 3 shows the targeting ability of the PBF according to the income eligibility criterion by family groups. A family is considered eligible if monthly per capita household income is less than or equal to R\$120.00. The PBF indicator variable is equal to one if the family declares to have a PBF beneficiary in the family. It is important to note that the targeting is imperfect. A significant number of PBF beneficiaries did not meet the eligibility criterion and are still included in the program. In other words, their income is greater than R\$120.00, but they still receive the benefit. Assuming the PNAD information about income is accurate raises the question of whether individuals might be manipulating their income information in order to qualify for the program. In this case, assessments of the PBF’s

Table 1
Descriptive statistics of family groups.

Variables	Family groups “1” + “2”		Family group “1”		Family group “2”	
	PBF = 1	PBF = 0	PBF = 1	PBF = 0	PBF = 1	PBF = 0
Observations	10,796	34,767	9184	30,299	1612	4468
<i>(A) Household characteristics</i>						
Monthly household income per capita (Avg., in R\$)						
With Transfer ^a	134.68	453.20	135.59	464.71	129.48	375.12
Without Transfer	119.90	453.20	121.48	464.71	110.87	375.12
Number of children (Avg.)						
Total	2.7	2.0	2.7	2.0	2.6	2.0
<15 years	2.3	1.7	2.3	1.7	2.1	1.5
Region						
North	1427 (13.2%)	4566 (13.1%)	1243 (13.5%)	4012 (13.2%)	184 (11.4%)	554 (12.4%)
Northeast	5626 (52.1%)	8389 (24.1%)	4879 (53.1%)	7251 (23.9%)	747 (46.3%)	1138 (25.5%)
Southeast	2064 (19.1%)	10,935 (31.5%)	1691 (18.4%)	9545 (31.5%)	373 (23.1%)	1390 (31.1%)
South	994 (9.2%)	6331 (18.2%)	800 (8.7%)	5535 (18.3%)	194 (12.0%)	796 (17.8%)
Central West	685 (6.3%)	4546 (13.1%)	571 (6.2%)	3956 (13.1%)	114 (7.1%)	590 (13.2%)
<i>(B) Characteristics of household heads</i>						
Sex						
Male	8526 (79.0%)	27,883 (80.2%)	8526 (92.8%)	27,883 (92.0%)	0 (0.0%)	0 (0.0%)
Female	2270 (21.0%)	6884 (19.8%)	658 (7.2%)	2416 (8.0%)	1612 (100.0%)	4468 (100.0%)
Race						
White	3274 (30.3%)	17,223 (49.5%)	2789 (30.4%)	15,115 (49.9%)	485 (30.1%)	2108 (47.2%)
Other	7522 (69.7%)	17,544 (50.5%)	6395 (69.6%)	15,184 (50.1%)	1127 (69.9%)	2360 (52.8%)
Years of schooling (Avg.)	4.3	7.8	4.1	7.7	5.1	8.0
Age (Avg.)	38.2	37.8	38.3	37.7	37.3	38.0

Source: PNAD/IBGE (2006).

Family group “1”: families made up of couples with at least one child younger than 15 years of age.

Family group “2”: families made up of mother (household head) with at least one child younger than 15 years of age.

^a “With Transfer” designates families that received the extra payment because of the number of children eligible for the program.

impact PBF on outcomes relied on the variation of participation in the program, based on the discontinuity of a running variable that determines the eligibility criterion will likely be biased.

Fig. 2 shows the kernel density functions for the monthly net household income per capita of the PBF transfers in 2006. First, the average income of recipients is below the income cutoff for eligibility (R\$120.00). Another important characteristic of recipient households is the existence of a larger concentration of observations below the cutoff value, compared to the distribution of non-recipients. Despite the greater proportion of beneficiaries among poor families, there are a non-negligible number of PBF participants whose monthly per capita household income is higher than the cutoff value. These characteristics raise two possibilities:

- a) The focus of the program was appropriate as the mean of the average per capita household income, discounted from the cash transfers, is much lower than the eligibility cutoff.

Table 2
Descriptive statistics of family group members.

Variables	Demographic group A1		Demographic group B1		Demographic group B2	
	PBF = 1	PBF = 0	PBF = 1	PBF = 0	PBF = 1	PBF = 0
Observations	9184	30,299	9184	30,299	1612	4468
<i>(A) Characteristics of individuals</i>						
Labor force participation rate	95.4%	95.8%	61.6%	64.6%	78.2%	82.9%
Employment rate	91.5%	93.1%	55.6%	58.6%	68.9%	75.9%
Hours worked if employed (Avg.)	45.7	46.9	28.5	36.2	35.6	39.9
Years of schooling (Avg.)	4.1	7.7	4.8	8.2	5.1	8.0
Age (Avg.)	38.6	37.9	34.1	33.9	37.3	38.0
Race						
White	2777 (15.5%)	15,088 (84.5%)	2816 (15.4%)	15,493 (84.6%)	485 (18.7%)	2108 (81.3%)
Other	6407 (29.6%)	15,211 (70.4%)	6368 (30.1%)	14,806 (69.9%)	1127 (32.3%)	2360 (67.7%)
<i>(B) Household characteristics</i>						
Monthly household income per capita (Avg., in R\$)						
With Transfer	135.59	464.71	135.59	464.71	129.48	375.12
Without Transfer	121.48	464.71	121.48	464.71	110.87	375.12
Number of children (Avg.)						
Total	2.7	2.0	2.7	2.0	2.7	2.0
<15 years	2.3	1.7	2.3	1.7	2.3	1.7
Region						
North	1243 (23.7%)	4012 (76.3%)	1243 (23.7%)	4012 (76.3%)	184 (24.9%)	554 (75.1%)
Northeast	4879 (40.2%)	7251 (59.8%)	4879 (40.2%)	7251 (59.8%)	747 (39.6%)	1138 (60.4%)
Southeast	1691 (15.0%)	9545 (85.0%)	1691 (15.0%)	9545 (85.0%)	373 (21.2%)	1390 (78.8%)
South	800 (12.6%)	5535 (87.4%)	800 (12.6%)	5535 (87.4%)	194 (19.6%)	796 (80.4%)
Central West	571 (12.6%)	3956 (87.4%)	571 (12.6%)	3956 (87.4%)	114 (16.2%)	590 (83.8%)

Source: PNAD/IBGE (2006).

Demographic group “A1”: men (household heads) belonging to family group “1”.

Demographic group “B1”: women (married mothers) belonging to family group “1”.

Demographic group “B2”: women (single mothers) belonging to family group “2”.

Table 3
Frequency of PBF beneficiaries and non-beneficiaries according to the eligibility criterion (*cutoff* = R\$120.00).

Beneficiaries	Eligibility					
	Family groups “1” + “2”		Family group “1”		Family group “2”	
	Di = 1	Di = 0	Di = 1	Di = 0	Di = 1	Di = 0
PBF = 1	6701	4095	5671	3513	1030	582
PBF = 0	6810	27,957	5,741	24,558	1069	3399
Total	13, 511	32,052	11,412	28,071	2099	3981

Source: PNAD/IBGE (2006).

Eligible if monthly household income per capita is less than or equal to R\$120.00. Ineligible, otherwise.

Family group “1”: families made up of couples with at least one child younger than 15 years of age.

Family group “2”: families made up of mother (household head) with at least one child younger than 15 years of age.

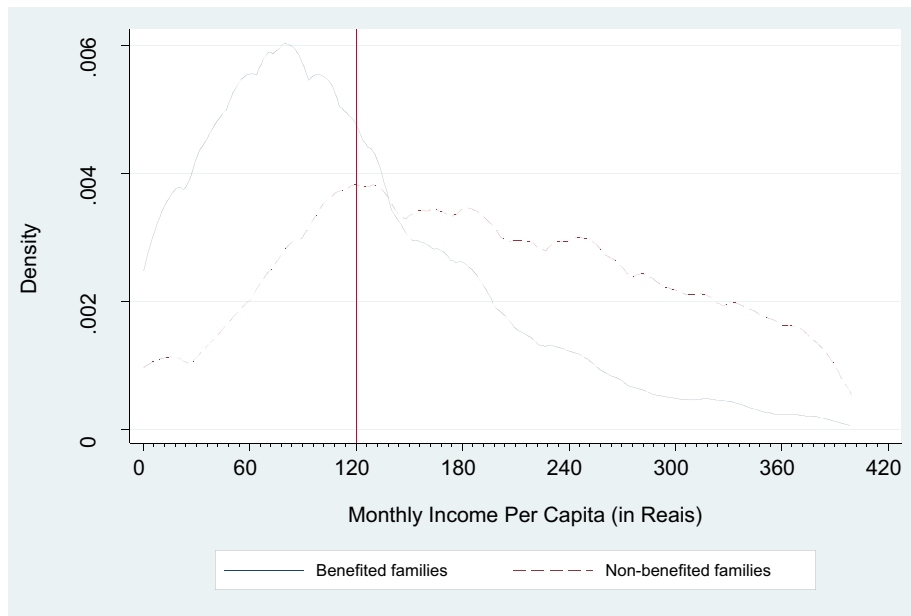


Fig. 2. Kernel density of monthly household income per capita, 2006.

- b) The household income criterion encourages people to behave opportunistically and creates a classical moral hazard situation. Some people on the margin of the threshold voluntarily reduce their labor market participation or their working hours in order to become eligible for the program.

4. Methodology

4.1. McCrary's test

McCrary (2008) suggests that if there is a discontinuity in the density of the running variable at the program's eligibility threshold, this may imply that some agents were able to perfectly manipulate their treatment status. In our case, this phenomenon means that the allocation of the household from one side of the cutoff point to the other is manipulated. This is done by participants either altering their household income or by omitting information about it to the policy maker.

We use the density test proposed by McCrary (2008) to check whether there is evidence of discontinuity in the density of the monthly per capita household income at the cutoff value for the eligibility criterion. This procedure is a local linear density estimator performed in two stages: the first step estimates a per capita household income histogram, while the second phase smoothens the histogram on each side of the cutoff point using a local linear regression. Since it is a test of the existence of discontinuity in the density, the estimation uses the entire distribution of the monthly per capita household income. After this computation, a Wald estimator is used to test the null hypothesis of whether discontinuity is equal to zero around the cutoff.

4.2. Regression discontinuity design

In order to further investigate whether individuals manipulate their eligibility status by changing their income through labor supply decisions, we evaluate the effect of being qualified for the PBF on a series of individual outcomes. We estimate the following type of regression:

$$y_i = \alpha + \beta D_i + g(R_i) + \theta X_i + u_i, \quad i = 1, \dots, n \quad (1)$$

where $g(R_i) = \psi_{00} + \sum_{j=1}^J \psi_{1j}(R_i - \bar{R})^j + \sum_{j=1}^J \gamma_j(R_i - \bar{R})^j D_i$.

Eq. (1) specifies the relationship of an outcome variable y_i and the indicator variable $D_i = 1[R_i \leq \bar{R}]$ of program eligibility, $g(R_i)$ and additional controls X_i . The outcomes of interest are: an indicator variable, of PBF participation; an indicator variable of labor market participation; an indicator variable, if the individual is working in the labor market; and the number of weekly hours worked in the labor market. The indicator variable D_i assumes a value equals one if the individual ex ante income R_i is equal or below the threshold value \bar{R} of the eligibility criterion for participation in the PBF. The function $g(R_i)$ is a polynomial based on the individual ex ante income centered at the cutoff given by the eligibility criterion. X_i is a vector of additional controls and includes region dummies, sector of activity, race, age, age squared, years of schooling, and a dummy variable indicating whether an individual holds a formal job.

The coefficient of interest is β . This term measures the difference in the outcome between an individual located right below the cutoff point \bar{R} and an individual immediately above this threshold. Two points are worth emphasizing here. First, we test parametrically if there are discontinuities around the eligibility cut-off criterion for program participation and labor supply outcomes separately. Since being below or above the cut-off does not perfectly predict participation, we refer to these estimations as “fuzzy” regression discontinuity estimators.

Second, for this exercise we do not perform a Wald estimator using a classical fuzzy regression discontinuity design where the indicator variable of program eligibility serves as excluded instrument in a first stage regression of program participation. The reasons are that the instrument may not be exogenous and we rather want to know if there are suggestive evidences that the program participation is manipulated by labor supply responses.

5. Results

5.1. Manipulation tests

Figs. 3–5 show the density of monthly household per capita income net of the transfer values received by beneficiaries. Fig. 3 represents the density for family groups “1” and “2” jointly, and Figs. 4 and 5 illustrate the individual densities for family groups “1” and “2” respectively. All of the figures have significant discontinuity around the eligibility criterion of R\$120.00. It is important to note that the density of the sample is increasing from having zero income to R\$120.00. The density is also decreasing to the right from the cutoff of R\$120.00.

Additionally, we perform the McCrary density tests for different cutoff values. The results are presented in Figs. 6 and 7. We estimated household income density functions with cutoff points of R\$150.00 and R\$140.00 for

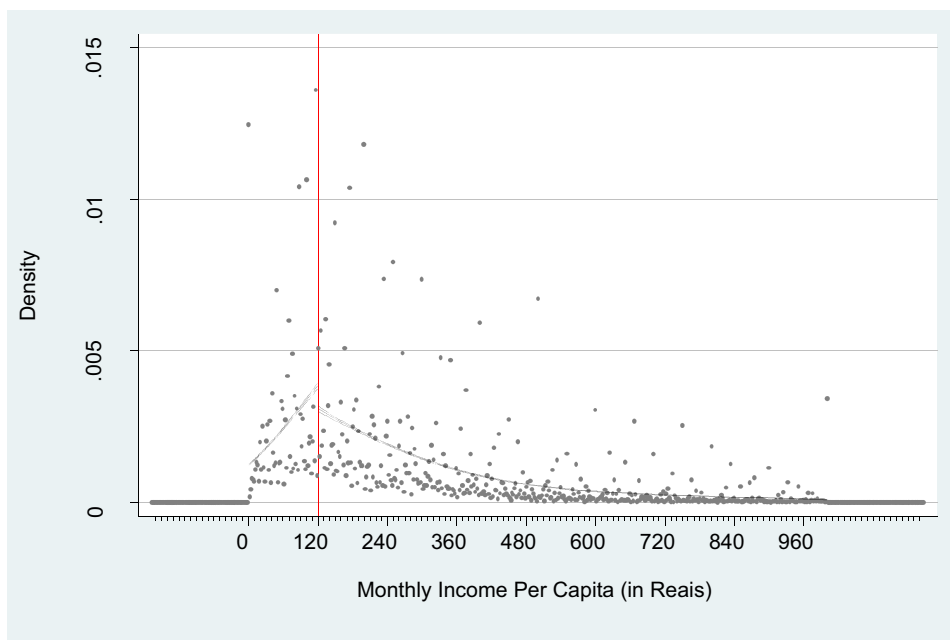


Fig. 3. Normalized density of the PBF eligibility variable – cutoff = R\$120.00 (family groups “1” and “2”).

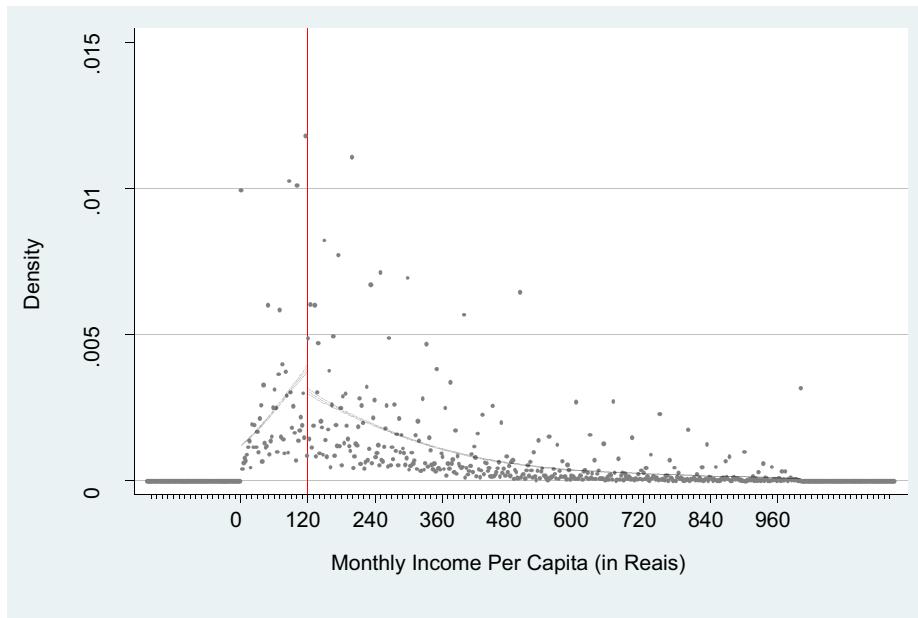


Fig. 4. Normalized density of the PBF eligibility variable – *cutoff*= R\$120.00 (family group “1”).

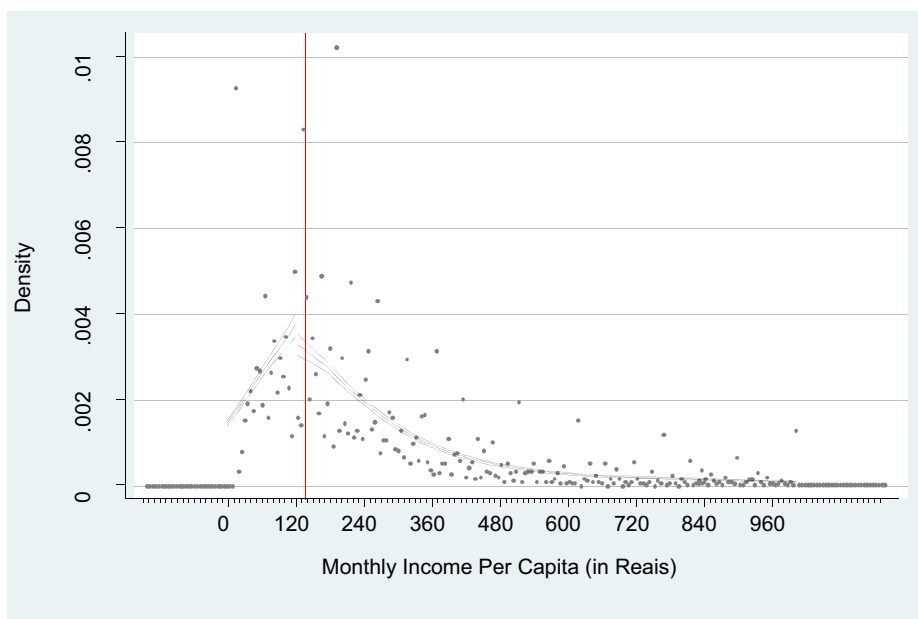


Fig. 5. Normalized density of the PBF eligibility variable – *cutoff*= R\$120.00 (family group “2”).

family groups “1” and “2” respectively. These two figures indicate that the densities on the right and left sides of the cutoff points are similar.

We also perform the McCrary test for the distribution of the logarithm of income. In this case, we drop all observations with zero income. Table 4 shows the discontinuity estimates in logarithm of household income per capita, according to the local linear density estimator proposed by McCrary (2008). There are discontinuities for all family groups around the cutoff of R\$120.00. The density is lower immediately after the threshold and the difference is statistically significant.

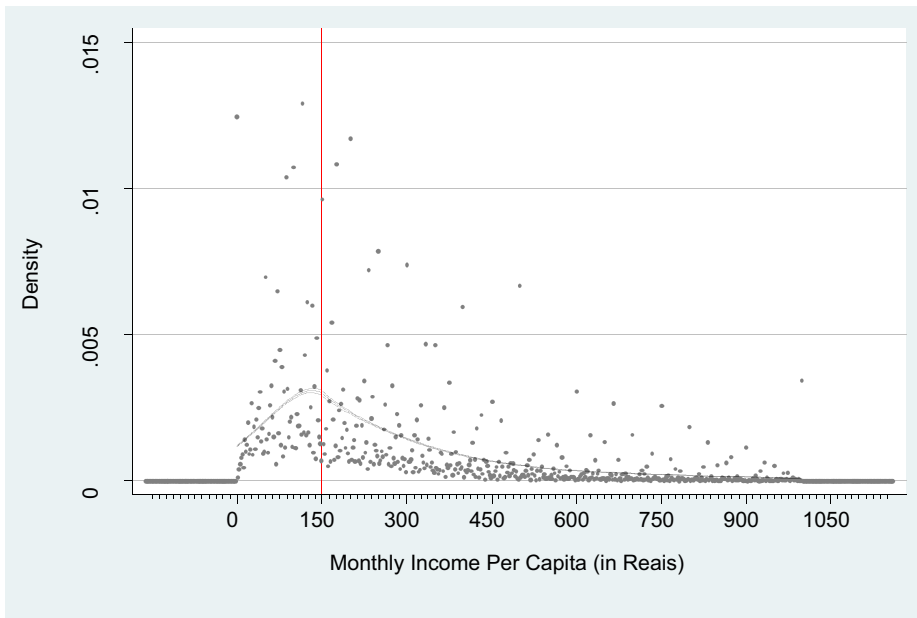


Fig. 6. Normalized density of the PBF eligibility variable – *cutoff*= R\$150.00 (family group “1”).

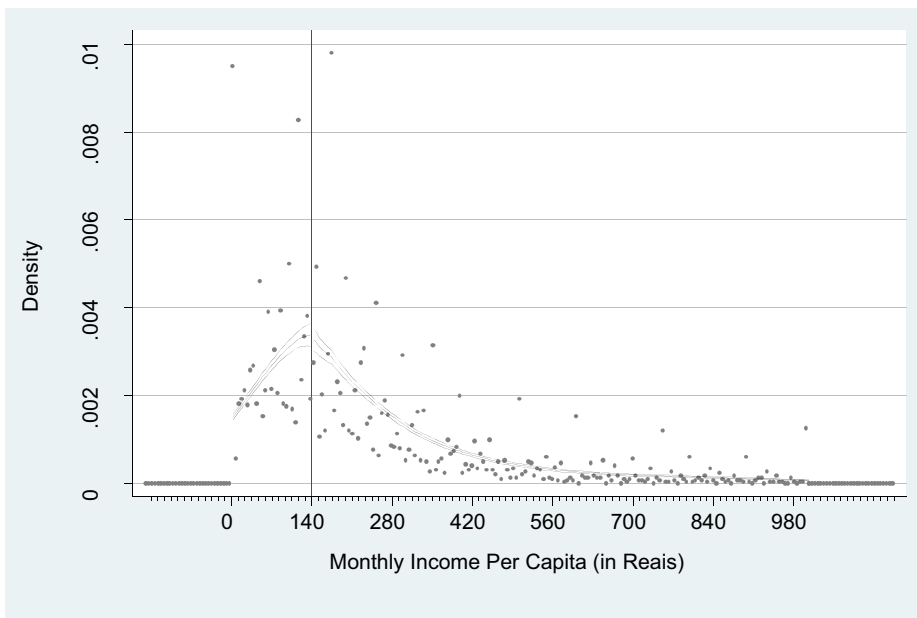


Fig. 7. Normalized density of the PBF eligibility variable – *cutoff*= R\$140.00 (family group “2”).

We also perform the McCrary test for different cutoff points. The value of these cutoff points include R\$130.00, R\$140.00, and R\$150.00. We find some discontinuities for these threshold values as well. They are significantly different from zero for the R\$130.00 and R\$140.00 cutoffs for family group “1” and the whole sample. However, the discontinuity is no longer significantly different from zero at the cutoff value of R\$150.00. Discontinuities at other cutoff values may be due to the fact that our measure of income is imperfect. The actual threshold used by the policy maker is more likely to be around our R\$120.00 value.

Finally, Figs. 8 and 9 show robustness checks that were carried out. These tests determine whether this discontinuity is due to the incentives provided by the program, or whether it is a systematic characteristic of the Brazilian income

Table 4
Discontinuity estimators (in log) for several cutoff points.

Cutoffs	Whole sample	Family group “1”	Family group “2”
R\$120.00	−0.217** (0.020)	−0.228** (0.021)	−0.135* (0.055)
R\$130.00	−0.235** (0.020)	−0.265** (0.021)	−0.077 (0.056)
R\$140.00	−0.211** (0.020)	−0.239** (0.022)	−0.030 (0.057)
R\$150.00	−0.015 (0.022)	−0.075 (0.231)	−0.031 (0.061)
<i>N</i>	10,796	9184	1612

Standard errors in parentheses.

Values calculated based on the local discontinuity estimator (McCrary, 2008).

* *p*-Value <0.05.

** *p*-Value <0.01.

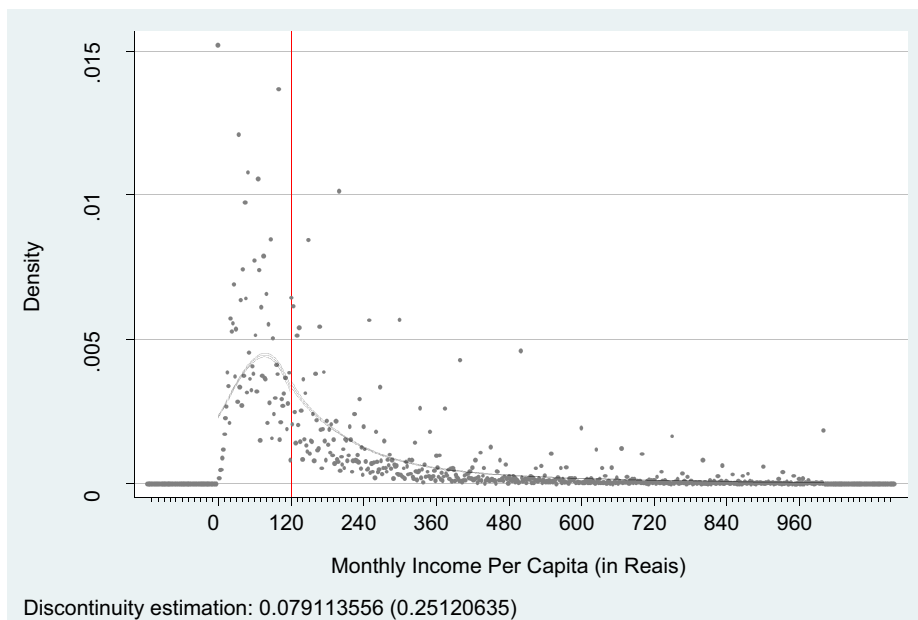


Fig. 8. Normalized density of household income per capita (PNAD 1998).

distribution that exists independently from the PBF. The distribution of household income was plotted for 1998 and 1999, years during which the PBF did not exist. Since no discontinuity is observed in these years, it is likely that the jumps observed in 2006 are related to the PBF.

Overall, these results suggest that agents deliberately reduce their incomes, or report them incorrectly to the policy maker in order to be eligible for the program.

5.2. Eligibility criterion and program participation

We next check to determine if individuals that are eligible for the PBF, based on the methodology described previously, are in fact more likely to participate in the program. For exercises we use the entire distribution. Table 5 presents the results for the estimations of Eq. (1), where $g(R_i)$ is specified in quadratic form. The regressions are estimated separately for family groups “1” and “2.” We test the R\$120.00, R\$140.00, and R\$150.00 cutoff values.

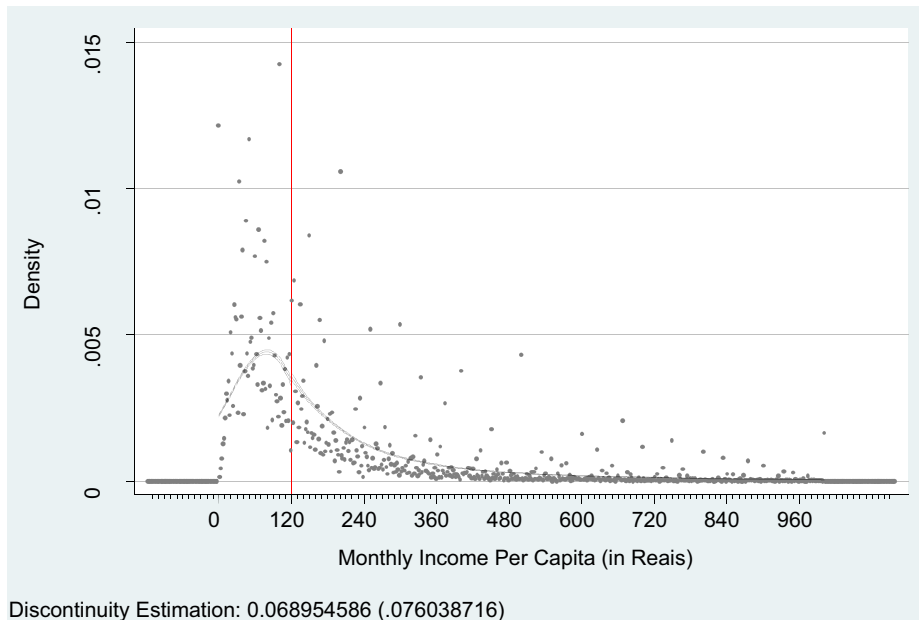


Fig. 9. Normalized density of household income per capita (PNAD 1999).

The results of Table 5 show that individuals immediately below the threshold are more likely to participate in the PBF. There is discontinuity in the probability of participating in the PBF around the threshold of R\$120.00 for individuals belonging to both family groups “1” and “2.” Results indicate that individuals in family group “1” and “2” who are directly below the cutoff are, respectively, 11.82 and 12.41 percentage points more likely to participate in the PBF compared to individuals immediately above this value. We do not find discontinuities for other cutoff values, except for family group “1” individuals around the cutoff value of R\$140.00.

Finally, in order to check robustness of Table 5 results, we performed the same exercise for subsamples composed by families with different ranges of ex ante monthly household per capita income values. We selected three subsample with families with income below 400 reais, 500 reais and 600 reais, respectively. The cut-off used is R\$120,00 and the results are presented in Table A.1. They are qualitatively similar to the ones in Table 5. The point estimates are lower (around 0.3) but positive and significant for family group 1. The point estimates are also around 0.3 for family group 2 but no longer statistically different from zero. This may due to the fact that the sample size is greatly reduced.

Table 5
RD estimates: probability of a household participating in the PBF.

Coefficients	Description	Family group “1”			Family group “2”		
		Cutoff = R\$120.00	Cutoff = R\$140.00	Cutoff = R\$150.00	Cutoff = R\$120.00	Cutoff = R\$140.00	Cutoff = R\$150.00
β	Eligibility (D)	0.1181*** (0.0133)	0.1066*** (0.0140)	0.0717 (0.0428)	0.1241*** (0.0316)	0.0692 (0.0362)	0.0572 (0.0303)
N		39,483	39,483	39,483	6080	6080	6080
R^2		0.2508	0.2544	0.2559	0.2105	0.2116	0.2126
F test for $\beta=0$		79.13	68.98	3.05	15.47	3.66	3.57

Family group “1”: families made up of couples with at least one child younger than 15 years of age.

Family group “2”: families made up of mother (household head) with at least one child younger than 15 years of age.

Standard errors corrected for heteroskedasticity shown in parentheses.

* p -Value <0.1.

** p -Value <0.05.

*** p -Value <0.01.

Table 6
RD estimates: effects on labor supply.

Demographic groups	Cutoff= R\$120.00		
	Linear	Quadratic	Cubic
<i>(A) Labor force participation</i>			
GDA1	−0.0299*** (0.0025)	−0.0286*** (0.0025)	−0.0269*** (0.0026)
GDB1	−0.1346*** (0.0053)	−0.1311*** (0.0054)	−0.1261*** (0.0055)
GDB2	−0.1233*** (0.0108)	−0.1228*** (0.0110)	−0.1176*** (0.0115)
<i>(B) Employed</i>			
GDA1	−0.1207*** (0.0032)	−0.1175*** (0.0032)	−0.1117*** (0.0033)
GDB1	−0.2024*** (0.0061)	−0.1955*** (0.0062)	−0.1841*** (0.0063)
GDB2	−0.2580*** (0.0127)	−0.2539*** (0.0129)	−0.2398*** (0.0135)
<i>(C) Weekly hours worked</i>			
GDA1	−2.4554*** (0.1723)	−2.3309*** (0.1740)	−2.2518*** (0.1782)
GDB1	−4.6125*** (0.2882)	−4.4899*** (0.2901)	−4.3133*** (0.2948)
GDB2	−4.9221*** (0.5605)	−4.6078*** (0.5660)	−4.2982*** (0.5826)

(1) GDA1: men (married fathers) belonging to family group “1”; GDB1: women (married mothers) belonging to family group “1”; GDB2: women (single or divorced mothers) belonging to family group “2”.

(2) Standard errors in parentheses.

(3) Besides the variables specified in Eq. (1), the following covariates were used: region, sector of activity, race, age, age squared, schooling, and dummy variable indicating if individuals hold a formal job.

* p -Value <0.1.

** p -Value <0.05.

*** p -Value <0.01.

5.3. Eligibility criterion and labor supply

Thus far, we have found that (i) there is greater density of individuals immediately below the threshold level of the eligibility criterion for the PBF along the ex ante family income per capita distribution; and (ii) the individuals immediately below the threshold level of the PBF eligibility criterion are more likely to participate in the program. In this section, we further investigate whether there are suggestive evidences indicating that individuals manipulate their participation eligibility by changing their labor supply decisions.

In order to do this, we perform two exercises. First, we obtain separate regression discontinuity (RD) estimates of Eq. (1) for the labor supply outcomes of three different demographic groups. They are: GDA1: men (married fathers) belonging to family group “1”; GDB1: women (married mothers) belonging to family group “1”; GDB2: women (single or divorced mothers) belonging to family group “2.” The outcomes utilized are labor force participation, employed, and weekly hours worked. We used three different specifications for the $g(R_i)$ function: linear, quadratic, and cubic. The results for the β coefficients for each regression are presented in Table 6.

Table 6 shows that, for all demographic groups, individuals immediately below the cutoff value of R\$120.00 supply less labor than those immediately above this threshold. They are less likely to participate in the labor market, less likely to be employed during the survey week of reference, and work fewer hours per week. Moreover, women (married or single) reduce their labor supply more than married men. In fact, the point estimates for GDA1 are always below the point estimates for GDB1 and GDB2.⁶

⁶ We also performed the same exercise of Table 6 using different subsamples of families with income below 400, 500, and 600 reals. Most of the results are qualitatively similar. All the parameters estimated are negative and statistically different from zero for all groups when we use the linear

Table 7
McCrary discontinuity estimators (in log) by to occupational status.

Cutoffs	Family group “1”		Family group “2”	
	ocup _{i06} = 1	ocup _{i06} = 0	ocup _{i06} = 1	ocup _{i06} = 0
R\$120.00	−0.347** (0.083)	−0.022 (0.046)	−0.287* (0.120)	−0.208 (0.121)
R\$130.00	−0.157 (0.089)	−0.064 (0.045)	−0.191 (0.127)	−0.061 (0.103)
R\$140.00	−0.314** (0.088)	−0.071 (0.045)	−0.073 (0.133)	−0.099 (0.099)
R\$150.00	−0.143 (0.103)	−0.063 (0.048)	−0.048 (0.159)	−0.063 (0.113)
<i>N</i>	4262	35,221	1790	4290

Standard errors in parentheses.

Values calculated based on the local discontinuity estimator (McCrary, 2008).

Family group “1”: families made up of couples with at least one child younger than 15 years of age.

Family group “2”: families made up of mother (household head) with at least one child younger than 15 years of age.

* *p*-Value <0.05.

** *p*-Value <0.01.

The second exercise classifies the individuals into two occupational groups according to their degree of labor market attachment. Group $ocup_{i06} = 1$ designates individuals employed for less than five months in 2006, or those who were unemployed in the survey week of reference, but employed in that year; group $ocup_{i06} = 0$ designates individuals who were continuously employed throughout the year. The idea being examined is that individuals in group $ocup_{i06} = 1$ are less attached to the labor market, and; therefore, more prone to manipulating their income by changing their labor supply in order to qualify for the PBF. We perform the McCrary test on the distribution of the logarithm of income using the local linear estimator separately for each group. We use different cutoff values and the results are presented in Table 7.

Table 7 shows that discontinuities only remain for the group less attached to the labor market, especially around the cutoff of R\$120.00. The density is lower directly after this threshold and the difference is statistically significant.

The results of Table 7 are additional suggestive evidence that individuals manipulate their eligibility status by changing their labor supply decisions since the discontinuity is observed only among those that are weaker attached to the labor market.

Finally, two caveats should be made. First, we interpret the results of greater incidence of program participation and lower labor supply of households slightly below the cutoff value of the PBF eligibility criterion as evidences of eligibility manipulation. However, it might be acknowledged that some decrease of the labor supply may be due to the income effect of the cash transfer itself. Nonetheless, we do not think that the lower labor supply is entirely due to the income effect because of the additional finding of the greater density immediate below the threshold value of the ex ante per capita household income. Some part of this reduction might be due to the manipulation although the precise amount of it is unclear.

Second, the results are also consistent with an alternative explanation. It may be that households underreport income to be eligible to the PBF and those that underreport their income are more likely to also underreport their labor supply. In this case the manipulation would be of a different mechanism. There are no real labor supply responses but manipulation in the reporting itself. Although the PNAD information are reported to the interviewer of the IBGE (Brazilian census bureau) for other purposes and not to the officials from the PBF, we cannot rule out the underreport manipulation hypothesis.

6. Conclusions

In this paper, we assessed the existence of eligibility status manipulation by individuals for participation in the PBF. Our goal was to investigate a possible channel for this type of manipulation through changes in the time allocation

specification. When using the quadratic specification, most of the results for GDB1 are negative and significantly different from zero but for GDA1 and GDB2 become positive.

decisions of individuals. The PBF eligibility criterion establishes that families with a monthly family income per capita equal to or below R\$120.00 are eligible for the program. Evidence of manipulation was obtained through the formal test proposed by McCrary (2008). We found that (i) there is a greater density of individuals immediately below the threshold level of the eligibility criterion for the PBF along the ex ante family income per capita distribution; (ii) individuals immediately below the threshold level of the eligibility criterion PBF are more likely to participate in the program; and (iii) individuals immediately below the threshold level of the eligibility criterion PBF are less likely to participate in the labor market, less likely to be employed, and work fewer hours in the labor market. Moreover, individuals who are less attached to the labor market are the ones associated with the manipulation of their eligibility status. Finally, most of the results are robust for different periods or at different cutoff points.

Our findings contribute to two debates in the microeconomic development literature. First, there is a discussion of the best way to targeting social programs. The targeting mechanism can use objective information (e.g., household surveys) to construct *means tests* or *proxy means tests*, or subjective information directly from the individuals or communities, or even a combination of both source of information. There are trade-offs involved in this choice. The use of subjective information is more sensitive to shocks that change the eligibility status. On the other hand, it is more prone to misinformation or conflicting information. The use of objective information can be more verifiable but less sensitive to changes in the eligibility status. Moreover, there is a trade-off between *means tested* and *proxy means tested* programs. The *means tested* targeting is more likely to incur in inclusion error whereas the *proxies means tested* targeting is more likely to incur in exclusion error. There are scant evidences on these trade-offs. Among the few ones, Alatas et al. (2012) show evidence of the trade-off between the uses of objective or subjective information. They run an experiment on Indonesia on three approaches to targeting the poor families: proxy means tests, community targeting where individuals rank everyone from richest to poorest, and a hybrid of both. They find that proxy means tests perform a little better in targeting the poor but community targeting results in better satisfaction perhaps because they apply a different concept of to being poor. Camacho and Conover (2011), on the other hand, show evidence of inclusion error from a program in Colombia where local politicians manipulate for their own interests the information collection from “poor” households in order to classify them to the central government welfare program. Different from these two studies, our results add to this debate by presenting new evidence of the cost of the use of *proxy means tests* through inclusion error driven directly by the manipulation of the households themselves.

Second, there are several studies that aimed to estimate the causal impact of the conditional cash transfer programs on adult labor supply in Brazil (e.g., Soares et al., 2007; Ferro and Nicollela, 2007; Tavares, 2008; Teixeira, 2008; Covre et al., 2008; Foguel and de Barros, 2008). These studies use different empirical strategies to compare all beneficiaries against observationally similar non-beneficiaries. Their results are not conclusive. Some find no effects and others find negative effects particularly among women. Our results suggest that their estimations may be biased since we find suggestive evidence of reverse causality from labor supply to program participation.

By considering all of our results together, we believe they suggest evidence that some individuals deliberately reduce their income in order to take part in the PBF. This is strongly observed among women. The evidence indicating eligibility status manipulation addressed in this study demands the attention of policy makers, in order for them to develop properly designed social programs. Mechanisms to minimize adverse effects need to be constructed. This will help prevent the diversion of financial resources from the primary goals of these programs, which seek to fight poverty and extreme poverty in the short term and long term.

Appendix A.

See Tables A.1 and A.2.

Table A.1

RD estimates: probability of a household participating in the PBF – quadratic polynomial.

Coefficients	Description	Family group “1”			Family group “2”		
		Per capita income below			Per capita income below		
		400 reals	500 reals	600 reals	400 reals	500 reals	600 reals
β	Eligibility (D)	0.0335*** (0.0108)	0.0359*** (0.0103)	0.0389*** (0.0100)	0.0368 (0.0266)	0.0306 (0.0255)	0.0321 (0.0246)
N		29,193	31,605	33,301	4934	5218	5408
R^2		0.1983	0.2144	0.2259	0.1657	0.1787	0.1875

Standard errors corrected for heteroskedasticity shown in parentheses.

Cutoff = R\$120.

* p -Value <0.1.** p -Value <0.05.*** p -Value <0.01.

Table A.2

Effects on labor supply (cutoff = R\$120).

Demographic groups	Income below 400 reals		Income below 500 reals		Income below 600 reals	
	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic
<i>Labor force participation</i>						
GDA1	−0.0125*** (0.0039)	0.0173*** (0.0048)	−0.0175*** (0.0035)	0.0127*** (0.0045)	−0.0211*** (0.0033)	0.0108** (0.0044)
GDB1	−0.0501*** (0.0082)	−0.0686*** (0.0101)	−0.0610*** (0.0074)	−0.0715*** (0.0096)	−0.0816*** (0.0069)	−0.0716*** (0.0093)
GDB2	−0.0328* (0.0172)	0.0676*** (0.0206)	−0.0574*** (0.0156)	0.0538*** (0.0197)	−0.0840*** (0.0146)	0.0520*** (0.0190)
<i>Employed</i>						
GDA1	−0.0482*** (0.0050)	0.0392*** (0.0061)	−0.0679*** (0.0045)	0.0314*** (0.0058)	−0.0814*** (0.0042)	0.0277*** (0.0055)
GDB1	−0.0487*** (0.0091)	−0.0714*** (0.0112)	−0.0688*** (0.0083)	−0.0737*** (0.0107)	−0.0995*** (0.0078)	−0.0756*** (0.0104)
GDB2	−0.0771*** (0.0198)	0.0723*** (0.0236)	−0.1207*** (0.0180)	0.0534*** (0.0226)	−0.1631*** (0.0170)	0.0483*** (0.0219)
<i>Weekly hours worked</i>						
GDA1	−1.0748*** (0.2417)	0.1236 (0.3012)	−1.3114*** (0.2209)	0.1459 (0.2890)	−1.4919*** (0.2090)	0.2384 (0.2807)
GDB1	−1.6399*** (0.4180)	−0.5514 (0.5381)	−2.1652*** (0.3767)	−0.7638 (0.5140)	−2.4249*** (0.3540)	−0.8954* (0.4973)
GDB2	−2.7858*** (0.7934)	−0.8925 (1.0083)	−3.3337*** (0.7245)	−0.8052 (0.9567)	−3.5339*** (0.6910)	−0.9189 (0.9272)

Standard errors corrected for heteroskedasticity shown in parentheses.

* p -Value <0.1.** p -Value <0.05.*** p -Value <0.01.

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