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EDUCATIONAL DIFFERENTIAL BETWEEN BENEFICIARIES AND NON-BENEFICIARIES OF PROGRAMA BOLSA FAMÍLIA

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ABSTRACT

Programa Bolsa Família *[Program to Eradicate Child Labor] – PBF – was created in 2003 to reduce inequality and extreme poverty. It was conceived as a conditioned income transfer system: in exchange for a monthly amount, families comply with a series of conditions, including keeping their children attending school regularly. The objective of this work is to observe possible consequences of this conditions for school achievement, specifically for the age-grade distortion of students whose families declared they were beneficiaries of the program, in the 2010 Census. The results show that there are important positive differences among the children benefited by PBF in comparison to those that were not, especially among those aged 8 to 11 years.*

PROGRAMA BOLSA FAMÍLIA • SOCIAL INEQUALITY • BRAZIL • EDUCATION

THE ERADICATION OF POVERTY AND THE REDUCTION OF SOCIAL INEQUALITY HAVE possibly been two of the greatest challenges of the Brazilian government over the past decades. In 2003, the federal government created *Programa Bolsa Família* (PBF), whose aim is to promote social development and combat poverty through direct and conditioned transfer of income, in association with other social programs.

One of the institutional mechanisms to solve or mitigate possible differences and inequalities within a society is the implementation of public policy that acts directly on the chance of more equitable conditions. This is closely related to the development of social rights, defined as participation in collective wealth (CARVALHO, 2002).

In the case of Brazil, a reform in social policies has occurred from 1990 onwards, introducing income transfer programs inspired by Eduardo Suplicy's negative income tax bill to combat poverty (BICHIR, 2011).[1] The first experiences took place at the municipal level, with programs called "bolsas escolares" [school grants]; the municipality of Campinas was the pioneer in 1995. In the same year, the Federal District implemented a similar program, and by 2001 seven states had school grants (VILLATORO, 2010). Due to its popularity, *Programa Bolsa Escola* (PBE) was transformed into a federal program in 2001 by then President Fernando Henrique Cardoso (FHC).

Federal PBF under the responsibility of the Ministry of Education was created to ensure that, to guarantee the transfer of income, children aged 6 to 15 years of families then with monthly income per capita of

1 In a manner analogous to Income Tax, according to which people who earn beyond a certain level pay a proportion of their income to the government, the Negative Income Tax model proposed that those who earned less would be entitled to receive a proportion of the difference, which would be about 50% of the amount between that level and their income (SUPLICY, 1991).

up to R$ 90.00 did not drop out of school. In exchange, the children of the beneficiary families had to attend school during at least 85% of the monthly hours, which minimized the time for child labor (VILLATORO, 2010).

In the logic of this type of program, when conditionalities such as those of PBE are created for one to receive a benefit from the social protection system, there is a shift from the goal of short-term poverty reduction to the increase in human capital in the long run (VILLATORO, 2010) thus breaking the intergenerational cycle of poverty, that is, the children of the beneficiaries will have a greater chance of having better jobs in areas with better remuneration than those of their parents, because they will have greater human capital. From this perspective, cash transfer conditioned to education of children has a high probability of having a positive effect on their future (SKOUFIAS; PARKER, 2001). Most children work to supplement family income and therefore do not go to school. Thus, if children start spending their time at school, this reduces the financial power of families, which is already small. Consequently, when families start to receive a certain amount equivalent to what children brought home, children are more encouraged to attend school, which reduces dropout rates.

In 2003, demonstrating the priority of income transfer programs to fight hunger and poverty, the main program of the government of Luiz Inácio Lula da Silva was created by Provisional Measure 132/2003, converted into Law 10,836/2004, and regulated by Decree 5,209/2004: *Programa Bolsa Família* – PBF.

PBF was created through the unification of four programs with smaller dimensions – *Bolsa Escola* [School Grant], *Cartão Alimentação* [Food Aid Card], *Bolsa Alimentação* [Food Grant], and *Auxílio-Gás* [Gas Aid] – and, along with other actions, it was part of *Programa Fome Zero* [Zero Hunger Program]; it recently became part of *Plano Brasil Sem Miséria* [Brazil Without Extreme Poverty Plan] (BRASIL, 2014a). The main objective of PBF was to reduce inequalities through conditioned cash transfer to families in poverty and extreme poverty, not only to enable their emancipation and overcoming vulnerability, but also to impact on education and health through conditionalities. Another objective was to more effectively coordinate social protection actions, which was achieved with the addition of programs, since resources and actions became the responsibility of an institution only: the Ministry of Social Development and Fight against Hunger, which was then established.

PBF has three primary axes: income transfer, conditionalities, and complementary actions and programs. Conditionalities are commitments made by families and the government, which must oversee whether they are being met. In the health area, families have to monitor the vaccination card, the growth and development of children under 7 years; women aged 14 to 44 years also have to do preventive health

monitoring and, when pregnant or nursing, they have to make prenatal visits and monitor their health and the baby's. As for education, families commit themselves to keeping children and adolescents aged 6 to 15 years enrolled and with monthly school attendance equal to or greater than 85%. For students aged 16 to 17 years, the minimum attendance is 75%, a requirement added only after the variable benefit for adolescents in this age group was created in 2004. Finally, regarding social assistance, children and adolescents aged up to 15 who are at risk of or have been withdrawn from child labor by *Programa de Erradicação do Trabalho Infantil* [Child Labor Eradication Program] (Peti)[2] have to participate in Services of Coexistence and Strengthening of Bonds of Peti and attend at least 85% of the monthly school hours (BRASIL, 2004).

Because of its importance, some studies have already focused on the impact of PBF on several social and even demographic areas. Soares and Alves (2013) found that the contribution of the program to the decrease in inequality between 1995 and 2004 was 21% and, even at its beginning, the return was expressive. Vaz (2012) analyzed PBF's impact on income inequality in a more recent period, the year 2010. Once again, there were important returns in reducing income inequality among very poor and extremely poor families, one of the program's target groups.

In the field of nutrition, using Pesquisa de Orçamentos Familiares [Household Budget Survey] (POF) of 2008/2009, Baptistella (2012) pointed out that PBF was one of the determinants for the increase in food consumption, since the difference in the comparison between beneficiaries and non-beneficiaries was significant: about R$ 145.00. Among foods, a higher consumption of grains (R$ 43.26), poultry (R$ 42.46) and other types of meat (R$ 35.29) stands out.

Another dimension analyzed by the literature, but less frequently, is the relationship between receipt of the benefit and fertility. Studies of this nature are motivated by the hypothesis that beneficiaries would be encouraged to have more children, since the amount of the benefit depends on the number of children. Signorini and Queiroz (2011) verified that the program does not impact significantly on the decision to have children among its beneficiaries, which is the same conclusion reached by Rocha (2010).

Programa Bolsa Família also shows a return in terms of education. Regarding school performance, Simões (2012) presents interesting conclusions with evidence from data from the national exam Prova Brasil 2007 and approval and dropout rates in the same year. At the beginning, there is a negative impact on educational indicators, but it decreases over time of participation in the program, or according to the value of the benefit paid to the families, which suggests an increase in learning by beneficiary students. In a recent study on the impact of participating

2 Peti associates a set of actions to remove children and adolescents under 16 years old from child labor, except as apprentices, from 14 years old on. The program includes income transfer – mainly through PBF –, family support, and offer of social assistance services, and acts in coordination with states, municipalities, and the civil society. By means of Ordinance 666, of Dec 30, 2005, Peti was incorporated into PBF, which included eligible families in the program, provided there was no income loss, but kept those who were above the ceiling of the period: R$ 100.00.

in PBF on students' school performance, Oliveira and Soares (2013) concluded that the chances of students receiving *Bolsa Família* repeat a year are about 11% lower than the chances of students enrolled in Cadastro Único [Single Register] not benefited by the program. Despite such relatively low impact, it must be taken into account that they are children in conditions of economic vulnerability, and that therefore these positive results are extremely relevant.

In relation to attendance, Romero and Hermeto (2009) found that in general about 90% of the beneficiaries had not missed school in the month prior to the research reference date, whereas among non-beneficiaries this percentage was approximately 86%. Amaral, Weiss and Gonçalves (2013) presented conclusions on school dropout with data from 2005. They found that children from families assisted by PBF are less likely to drop out. Gonçalves (2015) ratifies the previous conclusions in light of the 2010 Brazilian Demographic Census (Instituto Brasileiro de Geografia e Estatística [Brazilian Institute of Geography and Statistics] – IBGE, 2010), finding a positive association between being a beneficiary of the PBF and school attendance. These notes indicate that the education conditionality meets expectations and that such conditionality has generally been met.

Taking as reference education conditionality, this paper proposes to analyze whether the fact that children benefit from PBF is associated with the likelihood of their attending school outside the appropriate grade for their age, which is an important educational indicator. The rather intuitive hypothesis that guided this study is that children living in households benefited by PBF are less likely to present age-grade distortion, as they must attend school regularly to maintain the benefit. To test this hypothesis, we used microdata of the Demographic Census of 2010, collected by IBGE.

The universe analyzed was children aged 8 to 14 years of families who declared they were beneficiaries or non-beneficiaries of PBF in the Brazilian Demographic Census of 2010. We did descriptive analyses and estimations of binary logistic regression models for the dependent variable, with age-grade distortion of the children. Models were estimated for the entire sample, as well as separately for different segments considering per capita household income limits, census status, and age of the children. The main independent variable indicates whether children were part of households that declared they were beneficiaries of PBF (treatment group) or that did not declare they were beneficiaries of PBF (control group).

The results indicate that there are differences among children benefited by PBF, in comparison to non-beneficiaries, regarding age-grade distortion. Most of the children benefited by PBF tended to show less chance of age-grade distortion at younger ages, and this result varies among the groups with older ages.

The following sections present: the main arguments concerning the determinants of school performance and that guided the construction of the models tested in this work; description of methodology, data, universe, and method; presentation of results; and finally some considerations.

FACTORS ASSOCIATED WITH EDUCATION

The first large studies on the assessment of educational performance were conducted in the United States in the 1960s, and measured the effectiveness of schools – not that of students – in standardized tests of basic skills (BROOKE, 2010). One of the first references on student assessment is classic Coleman report (1966). It was commissioned by the United States government because they suspected that the distribution of school quality was uneven, and such inequality impacted directly on educational and occupational opportunities (BROOKE, 2010). One of the conclusions of the report was that schools differed little from one another and that the main difference explaining variations in the results was family background. As a result, factors such as parental education and their occupation levels gained prominence in the discussion. The report also showed that the performance of children with low socioeconomic status who attended more homogeneous schools was lower than that of children under the same socioeconomic conditions, but who lived with other children in better conditions, that is, who attended more heterogeneous schools. In addition, improvements in the provision of education impacted more on the performance of black students and other minority groups than on the performance of whites and Easterners (COLEMAN, 1966).

The conclusions of Jencks (1972) were similar. The author stated that the most important determinants for school achievement are family characteristics, which can be assessed by measurable economic differences between households and by some non-economic variations that are difficult to quantify. This author did not find relevance in the effect of the school context either, and concluded that secondary schools accounted for only 2% of the variation among students.

Among European studies, the report of the Central Advisory Council for Education in England (2008) pointed out that more important than the influence of parents are the differences between parents, both in terms of the time they spend at home and in terms of their ability to contribute to the child's learning, which can be measured in years of study (education).

The studies focused on Brazil also emphasize this individual dimension and family *background*. Silva and Hasenbalg (2002) indicate three dimensions as fundamental to observe the influence of families

on students' results. The first is the economic resources that can be spent on children. The second is the educational resources or cultural capital of the family, which can provide an environment of socialization that fosters learning. Finally, there is a third dimension: the structure of family arrangements.

Another more recent study also shows that the worsening of the performance of students and schools over time is associated with a higher concentration of students of lower socioeconomic level, the group most benefited by educational expansion (RODRIGUES; RIOS-NETO; PINTO, 2011). But this occurs when one analyzes the composition effect, that is, as the number of students with lower family background increases, the proportion of those with greater learning difficulties rises and, consequently, overall school performance drops (RODRIGUES; RIOS-NETO; PINTO, 2011).

At the same time, the difference in outcomes between the most privileged students and the underprivileged fell (RODRIGUES; RIOS-NETO; PINTO, 2011), which indicates the high complexity of the educational framework in Brazil, which shows improvement in access indicators, but also the still low quality of the education offered to children who now come to school (MARTELETO; CARVALHAES; HUBERT, 2012).

Riani and Rios-Neto (2008) also identified the importance of family background, mainly of mothers' education. The study's results showed a strong impact of this determinant on children's school performance, reducing age-grade distortion. However, it also identified that, in households headed by women, children show greater distortion. One explanation for this is the fact that most of these households are single-parent families. As most of these women are in the labor market, the greater distortion may be related to the reduction in the time available to assist children in school work, since mothers continue to be those that influence educational outcomes the most.

A second dimension that deserves attention is the school. While Coleman (1966), Jencks (1972) and other authors responsible for the early studies on educational performance indicated school's low relevance, others noted the importance of this socializing environment. In the survey of the Central Advisory Council for Education in England (2008), for example, the experience of teachers was identified as one of the main factors contributing to results in student proficiency exams, even when teachers have similar skills.

The work of Mortimore et al. (1988) did not follow the mainstream of the studies of Coleman (1966) and Jencks (1972); on the contrary, it attributed greater weight to schools in explaining variations in performance in mathematics, reading, writing, among other indicators, than to family background, gender, or age of children.

Another study that shows the importance of infrastructure is Barros et al. (2001). The quality of school infrastructure compares to the relevance of teachers' education, or it is even more important. A different result was found by Rios-Neto, César and Riani (2002), but it supports the argument that the school input is expressive. The authors identified a trade off between the educational level of teachers and the education of mothers, especially in the chances of progression in the 1st grade (currently the 2nd year in Brazil).

Most of the various studies focus on the influence of individual and family characteristics on student performance, but little has been analyzed in aggregate terms. In contrasting several analyses of Brazil, another factor is perceived as a central point: the municipality. Understanding the dynamics of education within the municipality enables public policy makers to identify points for intervention, to minimize factors that accompany students, such as their socioeconomic origin, which are intrinsic to the student and less amenable to intervention. According to Riani and Rios-Neto (2008), this identification would allow actions that would diminish the importance of the children's family context and thus reduce educational stratification.

Brazilian municipalities have a heterogeneous structure, which permeates the structure and dynamics of their educational systems. Some municipalities have schools of good quality and a good supply of education, with well-trained teachers and well-structured schools. On the other hand, others have precarious school systems, with low quality infrastructure and school resources. In addition, they are unable to meet the demand of students in terms of number of places and school levels (RIANI; RIOS-NETO, 2008; GONÇALVES, 2015).

Moreover, turning our attention to municipalities allows us to understand the relations of macrostructural forces with educational demand, which also influence results. Regarding the first factor, macroeconomic conditions may affect more or less the investment in the structure of schools, depending on economic contexts. The second one interferes in the capacity of municipalities to serve all (MARTELETO; CARVALHAES; HUBERT, 2012).

However, it is necessary to explain how these multiple factors are linked, affect, and explain variations in school performance, particularly in the focus of this work: age-grade distortion. Using them provides some degree of control and allows identifying a more liquid effect of PBF on the educational indicator, even within a certain methodological limitation. This control is essential when there are not two perfectly homogeneous groups that can be compared, which is the case of this work.

DATA AND METHODS

In this work, Brazilian Census was used as secondary source of data (IBGE, 2010), with the purpose of meeting the objectives proposed herein, that is, to analyze age-grade distortion among public school students with similar socioeconomic backgrounds, aiming to test the hypothesis that, among those students, those of beneficiary families of PBF have a lower probability of showing this distortion.

The census is perhaps one of the most reliable databases, especially because of its sample design, which is representative by area of weighting, which makes it a good choice for analysis. In addition, there is identification of those who declared they were beneficiaries of PBF and of the social background variables listed in the previous section, which help to understand the phenomenon analyzed: age-grade distortion.

The information regarding PBF has two problems in the 2010 Census: the first, the simplest of them, is that the question also involves receiving aid from another program, Peti, which can lead to confusion in the response (VAZ, 2013). In 2010, children whose families had per capita household income below R$ 140.00 were in the records of PBF,[3] while families with income above this cut and with children younger than 16 years working, except as apprentices, from 14 years old on, and record in the Single Register, were beneficiaries of Peti. This information was used to separate potential beneficiaries from each of the programs.

The second problem, which is more complex, is the under-enumeration of persons considered beneficiaries (VAZ, 2013). In relation to this, the problem is present not only in the Census of 2010, but also in the 2006 Pesquisa Nacional por Amostra de Domicílios [2006 National Sample Household Survey] (PNAD), surveys that contain the information on the beneficiaries. This may be detrimental to impact assessments, because the under-enumeration may imply the presence of beneficiary families in the control group. Studies that use both the Demographic Census and PNAD in impact assessments are subject to this problem, which may result in the presence of selection bias due to a measurement/calculation error (SILVEIRA; CAMPOLINA; VAN HORN, 2013). But this limitation does not make the study unfeasible, and other studies have dealt with the same problem (SIGNORINI; QUEIROZ, 2011; SILVEIRA; CAMPOLINA; VAN HORN, 2013; VAZ, 2012). However, due to this limitation, self-declared beneficiaries were treated as beneficiaries of the program.

In relation to the work universe, we defined groups with similar social situations and contexts to be analyzed and compared, which made it possible to verify more directly the effects of conditionality, since several features not measured by the model are naturally controlled after this cut. Per capita household income was used as a criterion for

3 In 2010, the first group of families eligible for PBF was composed of those whose per capita household income was up to R$ 70.00, and the second by individuals whose per capita household income was between R$ 70.01 and R$ 140.00.

the selection of the two groups or universes, and both were divided into treatment groups (children of families who declared they were beneficiaries) and control groups (children of families who did not declare they were beneficiaries). The first universe is composed only of children whose per capita household income is up to R$ 70.00 (a figure that coincides with families in extreme poverty); and the second up to R$ 140.00. Such income brackets correspond to the eligibility limits of the program in 2010 (ROMERO, 2008).

In addition to per capita household income, we used information on age to select the study sample. We selected children aged 7 to 14 years, which ensures that all are within the target group of education conditionality (6 to 15 year olds). Finally, it is worth emphasizing that the selection considered only children from public schools.

In order to comply with what was proposed, we used multi-factor controlled binary logistic regression. Using a logistic model made it possible to estimate the results for (dependent) response variables that are qualitative and with two possible results: success (p) or failure (1 - p) (LONG, 1997).

The calculation of the equation generates regression coefficients, which are summary measures of the effects identified. These coefficients can be analyzed through the odds ratio, which is equivalent to the chance of success of an individual belonging to a group compared to the same chance of success of an individual belonging to another group, in which Y is the variable to be explained, X_k are the explanatory variables, and the binary logistic regression model can be exposed as follows:

$$Pr(Y=1|B) = P,$$
$$log\,[P/(1–P)]_i = \beta_0 + \beta_k X_{ki} + u_i.$$

where:

Pr $(Y=1|B)$ = Probability of being in an age-grade distortion situation;

$\beta_k X_{ki}$ = Explanatory variables of the model.

One of the assumptions for regression analysis is that there is independence between observations, that is, the income of each child is not influenced by the income of the other. Unfortunately, this is not possible because it would require that each student be isolated in an independent environment. To minimize method limitations, binary logistic regression was estimated with fixed effects by weight area, the latter being the smallest unit of spatial analysis possible in the 2010 Census.

Fixed-effect models estimate coefficients of interaction between independent variables and the location variable, in this case, the weighting area. However, these coefficients are not reported in the

results of the logistic model. Therefore, both the standard error and the coefficients are corrected (WOOLDRIDGE, 2008). It is assumed that the location factor alters the slope of the model, but not the level.

The condition of the student was used as a dependent variable: being or not being in a situation of age-grade distortion. Distortion corresponds to children who do not attend the appropriate grade for their age. This variable is difficult to construct, since there is no question that informs on this condition. On the contrary, it was necessary to construct the information using two other variables: the age of the child and the grade in which s/he is enrolled; and if the child was two years older than the appropriate age, s/he was considered in a situation of age-grade distortion (RIGOTTI; CERQUEIRA, 2004).

In addition to information on whether the child resided in a household beneficiary of BFP (main independent variable of interest), we chose as controls: variables regarding domicile, the student's mother, the child, and the municipality, more specifically, the weighting area, the latter by means of the fixed effects. These controls were chosen according to previous studies on the determinants of academic performance and outcomes, besides what was made available by the census.

In the case of the variable receipt of aid from PBF, we constructed a dichotomous variable, in which the children of beneficiary households in PBF received a value equal to one and those non-beneficiaries received a value equal to zero. However, not all household members were declared beneficiaries. As the federal government considers that the unit benefited is the family and not only an individual, we chose to allocate information to the domicile. Thus, if any member responded positively to the question, all were considered beneficiaries, which minimized this bias in data collection. It is believed that children belonging to beneficiary domiciles do not need to help supplement family income precisely because of the effect of the financial benefit provided by PBF, which increases the time available for study and the chances of showing good educational results, leading to a lower chance of lagging behind.

Household variables bring the factors tied to the context in which the child is immersed, considered as basic infrastructure for the child to have good conditions of study and learning (HANUSHEK; GOMES-NETO; HARBISON, 1996; RIANI; RIOS-NETO, 2008). Among the variables of household characteristics available in the census, we selected: (1) number of household members; (2) availability of piped water network; (3) electricity; (4) garbage collection service; and (5) household location (rural or urban). Variables 1 to 4 are all binary, and 1 corresponds to the household having the item indicated. It is expected that the better the household infrastructure, the better the environment for the child to study, which reduces the chances of distortion. In addition,

urban areas have a better school structure, related to their better social and financial conditions. Therefore, it is assumed that children living in urban areas are less likely to lag behind.

The variables related to the mother of the children guaranteed control over student family background, a dimension considered relevant for school performance by the literature (COLEMAN, 1966; JENCKS, 1972; RIANI; RIOS-NETO, 2008). Characteristics of mothers were used as proxy in the analysis model. The characteristics are: (1) information on whether the mother is the head of the household – for those mothers who were the person responsible for the household, we assigned a value equal to 1; (2) Color/race – black/brown received value 0, or white, which received value 1; (3) education – dichotomous variables from each of the categories of the original variable, maintaining the category "with no education or with incomplete primary education" as reference; (4) age – four dichotomous variables for age, considering the percentage of people in each category, "mothers aged up to 24 years", "mothers aged 25 to 34 years", "mothers aged 35 to 49 years" and "mothers older than 50 years", where the second category was the reference; (5) residence time – three dichotomous variables constructed, "those who lived up to 4 years in the domicile", "those who lived from 5 to 9 years", and "mothers who lived in the domicile for 10 years or more", and the latter was used as reference; and (6) mother's weekly work hours: four binary variables, "mothers who did not work", "mothers who worked 1 to 20 hours weekly", "mothers who worked from 21 to 39 hours weekly" and "mothers who worked more than 40 hours a week".

The hypotheses for inclusion of these variables were as follows: mothers who are the head of the household are more overworked, as well as those who work longer hours, and thus children receive less support, especially if fathers are not present to share tasks and responsibilities; children of white mothers are less likely to lag behind than children of black mothers, due to racial inequalities widely identified in social and economic indicators in Brazil; a higher level of schooling of the mother allows her to collaborate more effectively with the child's school activities, increasing the child's chances of attending classes; children of mothers living in the domicile for a shorter time would have a greater chance of distortion due to lack of assimilation to the new environment of residence. Finally, mothers who work more hours weekly are more overworked and their children receive less support from them, especially if the father is not present, which can reflect on educational indicators.

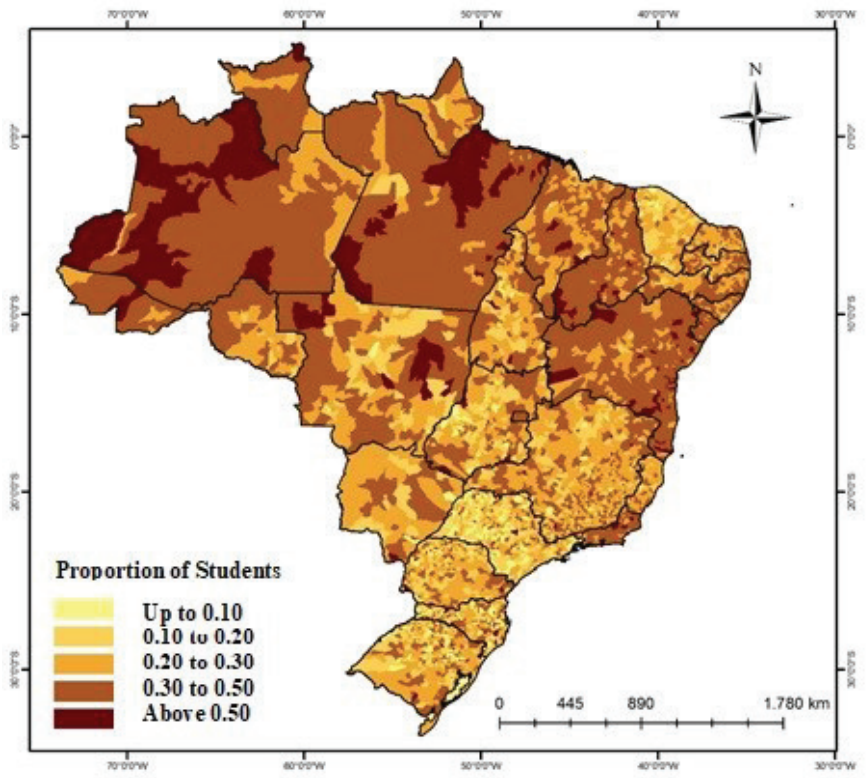
The third conglomerate of variables aimed at controlling individual questions (RIANI; RIOS-NETO, 2008). The following were selected as controls: age and gender. Race was not used because it had a high correlation with the mother's race variable. It is believed that the

older the child is, the greater the chance that s/he will be in a situation of age-grade distortion. This is due to the child's entering the labor market to supplement family income. In addition, male children also have higher chances because they join the labor market earlier than girls.

Finally, the control regarding the municipality. This control usually involves factors related to the community, such as the stock of capital and resources, which alter the educational offer (RIANI, 2005; RIANI; RIOS-NETO, 2008), but have not been studied here. The strategy adopted was to simplify the study by applying the fixed-effect method rather than use a method that considers students separately on a first level and the municipality on a second level (hierarchical model), as other authors have done (RIANI, 2005; RIANI; RIOS-NETO, 2008).

In order to better understand the importance of the local dimension, we have prepared Map 1. It shows the proportion of students in the analysis universe who are in a situation of age-series distortion, by municipality. Municipalities in the North and Northeast are the ones with the highest proportions, in descending order. On the other hand, in the South and Southeast, the situation is the opposite. Therefore, estimating the coefficients and standard errors of the model without taking this dimension into consideration could generate biased estimates.

MAP 1
PROPORTION OF STUDENTS AND PUBLIC SCHOOLS WITH AGE-GRADE DISTORTION, BRAZIL, 2010



Source: Censo Demográfico do Brasil de 2010 [2010 Brazilian Demographic Census] (IBGE, 2010).

FACTORS ASSOCIATED WITH AGE-GRADE DISTORTION

The first analysis was to observe the percentage distribution of children by categories of independent variables in both income limits determined. Among the variables for the control of domicile, the average number of residents was between five and six people, regardless of income. The percentage of children residing in households with access to piped water network, with electricity and garbage collection service rose with the increase in the household income limit. We observed that 71.20% of the children were residents in households with piped water networks in the income limit up to R$ 70.00; such figure increased to 77.76% in the income limit up to R$ 140.00. For garbage collection services, the variation was between 52% and 61%. In addition, in all income brackets, the largest fraction of children lives in households located in urban areas.

TABLE 1
PERCENTAGE DISTRIBUTION OF CHILDREN AGED 7 TO 14 YEARS BY CATEGORIES OF INDEPENDENT VARIABLES, BRAZIL, 2010

VARIABLES	CATEGORIES	INCOME LIMIT	
		UP TO R$ 70	UP TO R$ 140
HOUSEHOLD VARIABLES			
Number of household members	Mean	5.77	5.80
Regular water supply	Yes	71.20	77.76
	No	28.80	22.24
Electric lighting	Yes	92.78	94.98
	No	7.22	5.02
Daily garbage collection service	Yes	52.67	60.87
	No	47.33	39.13
Census status	Rural	45.92	38.50
	Urban	54.08	61.50
MOTHER VARIABLES			
Mother head of the household	Yes	43.48	42.63
	No	56.52	57.37
Mother's color/race	Black or brown	74.92	73.81
	White	25.08	26.19
Mother's education	Illiterate or incomplete primary education.	81.11	79.36
	Primary education or incomplete secondary education	11.30	12.51
	Secondary education or incomplete higher education.	6.77	7.43
	Higher education	0.48	0.42
Mother's age	Up to 24 years	3.66	3.44
	25 to 34 years	42.20	41.91
	35 to 49 years	44.17	42.96
	50 years or older	9.97	11.69
Years lived by the mother in the municipality	Up to 4 years	6.74	7.49
	5 to 9 years	5.31	5.81
	10 years or older	87.96	86.71
Mother's weekly work hours	None	73.16	67.67
	1 to 20 hours	10.68	11.48
	21 to 39 hours	5.37	6.29
	40 hours or more	10.78	14.56
CHILD VARIABLES			
Child's age	Mean	10.47	10.50
Child's sex	Female	49.21	49.39
	Male	50.79	50.61
Sample (n)	**-**	**425,782**	**871,905**
Population (N)	**-**	**3,179,225**	**6,651,579**

Note: Sample weight information was used to estimate the statistics of this table.
Source: 2010 Brazilian Census (IBGE, 2010).

In both income limits, there is a balance in the percentage of children residing in households headed by the mother, approximately 43%. Most of the children have black mothers, with the highest percentage observed in the lower income bracket: 74.92%. Another important characteristic was the predominance of mothers with no education or with incomplete primary education among the children in the sample. We also noticed the prevalence of children whose mothers are between 25 and 49 years old, regardless of income limits. Most children are of women who have resided for 10 years or more in the municipality. In relation to hours worked weekly, there are more children whose mothers did not work during the interview period.

Finally, regarding the characteristics of the children, there was no difference between the means of age in the two income limits analyzed, which was approximately 10 years. There is a slight predominance of male children, a little more than 50% in all household income cuts per capita.

The next step was to perform the proportion test for the dependent variable "being in a situation of age-series distortion" according to income limits and census situation. The difference in the proportion of students in distortion is statistically significant in all cases. Only in rural areas did a lower proportion of students of beneficiary families of PFB attend school outside their normal age group (-4.36% for household income per capita up to R$ 70.00 and -2.08% for household income per capita up to R$ 140.00). In the others, the proportion was higher. In other words, there is a greater proportion of children of families who declared they were beneficiaries in a situation of age-grade distortion.

TABLE 2
TEST OF PROPORTION OF CHILDREN WITH AGE-GRADE DISTORTION BY RECEIPT OF PROGRAMA BOLSA FAMÍLIA, BRAZIL, 2010

BENEFICIARY OF PROGRAMA BOLSA FAMÍLIA?	HOUSEHOLD INCOME PER CAPITA					
	UP TO R$ 70.00			UP TO R$ 140.00		
	TOTAL	URBAN	RURAL	TOTAL	URBAN	RURAL
Yes	32.58%	30.32%	34.17%	30.38%	27.90%	32.82%
No	32.20%	28.16%	38.53%	29.39%	26.51%	34.90%
Difference (treatment – control)	**0.38%****	**2.16%*****	-4.36%***	0.99%***	1.39%***	-2.08%***

Note: *** Significant proportion difference test at the 99% confidence level; ** Significant proportion difference test at the 95% confidence level.

Source: 2010 Brazilian Census (IBGE, 2010).

Despite the above evidence, a more thorough analysis is needed to conclude what the real association between being a beneficiary of PBF and distortion is, since the preliminary results point only to a possible trend, not to a minimally direct relationship. Therefore, such association was tested via fixed-effect binary logistic regression (Table 3). Six models were estimated: (1) children aged 7 to 14 years of families with per

capita household income up to R$ 70.00; (2) children aged 7 to 14 years of families with per capita household income up to R$ 70.00 living in urban areas; (3) children aged 7 to 14 years of families with per capita household income up to R$ 70.00 living in rural areas; (4) children aged 7 to 14 years of families with per capita household income up to R$ 140.00; (5) children aged 7 to 14 years of families with per capita household income up to R$ 140.00 living in urban areas; (6) children aged 7 to 14 years of families with per capita household income up to R$ 140.00 living in rural areas.

For the first group of variables (household variables – Table 3), we observed a similar behavior of a large part of the control variables between the models. Children whose homes have good infrastructure (piped water network, electricity and garbage collection service) were less likely to be attending school outside the appropriate age. In addition, as the number of people living in the household increased, the chance of being in a situation of age-grade distortion also increased.

The variation between the models estimated for the urban and rural areas and the general model (models 1 and 4) was small. There was a difference between children in rural and urban areas, and those living in the latter had a higher chance of attending school at the regular age.

About regions of residence, the students residing in the North and Northeast of Brazil have the greatest chance of distortion relative to the reference (Southeast region), regardless of the model. This reflects regional inequality. Indeed, the variables of the Midwest region did not show statistical significance, not even at the 90% confidence level, while the variables of the South region were significant only for the models of the rural area.

The second dimension groups the variables regarding the characteristics of the mothers. Children living in households where the mother is the main provider have a greater chance of being in a situation of age-grade distortion, regardless of the model. For the educational variable, the reference used was mothers "illiterate or with incomplete primary education". As the mother's education increased, the probability of the child lagging behind decreased in all models. Regarding the age of the mother, it was verified in all the models that children whose mothers are younger (up to 24 years old) are more likely to be attending school outside the appropriate age. The hypothesis for the inclusion of "hours worked by the mother" in the model is that the higher the number of hours, the shorter the time available for the mother to assist the child in the study, especially if the father is not present to share activities. However, we did not identify what was expected.

As for controls for individual characteristics, the increase of one year of age was expressively associated to the chances of lagging behind

in all models of Table 3. In addition, in all models, male children showed a greater chance of distortion when compared to girls.

Lastly, we need to analyze the relationship between being a beneficiary and the chances of distortion. We expected an association that indicated an increase in the probability of lag of the student if s/he was a beneficiary, since the trend shown in Table 2 indicated a higher proportion of beneficiaries lagging behind in comparison to the group of non-beneficiaries. However, controlling for the various factors mentioned above, we only estimated one direction for the PBF coefficient: reduction of the chances of children being in a situation of age-grade distortion, regardless of census status or income limits.

TABLE 3
ODDS RATIO AND EXPONENTIALS OF STANDARD ERRORS ESTIMATED BY BINARY LOGISTIC REGRESSION MODELS WITH FIXED EFFECT FOR THE DEPENDENT VARIABLE "AGE-GRADE DISTORTION", BRAZIL, 2010

INDEPENDENT VARIABLES	UP TO R$ 70.00			UP TO R$ 140.00		
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	MODEL 6
	-	URBAN	RURAL	-	URBAN	RURAL
HOUSEHOLD VARIABLES						
Number of household members	1.095***	1.091***	1.097***	1.094***	1.091***	1.095***
	(0.00179)	(0.00243)	(0.00277)	(0.00130)	(0.00189)	(0.00184)
Regular water supply	0.799***	0.798***	0.780***	0.792***	0.796***	0.779***
	(0.00786)	(0.00965)	(0.0155)	(0.00579)	(0.00734)	(0.0109)
Electric lighting	0.727***	0.759***	0.648***	0.721***	0.757***	0.640***
	(0.0102)	(0.0120)	(0.0265)	(0.00812)	(0.00969)	(0.0198)
Daily garbage collection service	0.860***	0.902***	0.802***	0.847***	0.882***	0.789***
	(0.0106)	(0.0178)	(0.0144)	(0.00714)	(0.0117)	(0.00956)
Rural	Reference	Reference	Reference	Reference	Reference	Reference
Urban	1.071***	-	-	1.040***	-	-
	(0.0132)			(0.00885)		

(*to be continued*)

(*continuation*)

INDEPENDENT VARIABLES	UP TO R$ 70.00			UP TO R$ 140.00		
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	MODEL 6
	-	URBAN	RURAL	-	URBAN	RURAL
MOTHER VARIABLES						
Mother head of the household	1.132***	1.120***	1.128***	1.144***	1.121***	1.156***
	(0.00891)	(0.0127)	(0.0130)	(0.00625)	(0.00956)	(0.00850)
Race/color: Black or Brown	Reference	Reference	Reference	Reference	Reference	Reference
Race/color: White	0.927***	0.917***	0.938***	0.920***	0.922***	0.920***
	(0.00837)	(0.0116)	(0.0126)	(0.00570)	(0.00859)	(0.00781)
Illiterate or incomplete primary education	Reference	Reference	Reference	Reference	Reference	Reference
Primary education or incomplete secondary education	0.616***	0.580***	0.651***	0.641***	0.607***	0.664***
	(0.00828)	(0.0122)	(0.0117)	(0.00570)	(0.00923)	(0.00741)
Secondary education or incomplete university education	0.464***	0.480***	0.470***	0.476***	0.476***	0.482***
	(0.00905)	(0.0174)	(0.0112)	(0.00595)	(0.0116)	(0.00714)
University education	0.301***	0.281***	0.319***	0.335***	0.315***	0.355***
	(0.0231)	(0.0386)	(0.0300)	(0.0177)	(0.0284)	(0.0233)
Up to 24 years old	1.379***	1.454***	1.296***	1.389***	1.456***	1.341***
	(0.0274)	(0.0412)	(0.0372)	(0.0198)	(0.0317)	(0.0256)
25 to 34 years old	Reference	Reference	Reference	Reference	Reference	Reference
35 to 49 years old	0.932***	0.939***	0.928***	0.939***	0.944***	0.937***
	(0.00746)	(0.0102)	(0.0115)	(0.00532)	(0.00780)	(0.00746)
50 years or older	0.948***	1.009	0.900***	0.956***	0.995	0.935***
	(0.0123)	(0.0187)	(0.0171)	(0.00816)	(0.0128)	(0.0109)
Years lived in the municipality: up to 4 years	1.092***	1.142***	1.053***	1.111***	1.144***	1.089***
	(0.0158)	(0.0255)	(0.0209)	(0.0106)	(0.0179)	(0.0135)
Years lived in the municipality: 5 to 9 years	1.007	1.000	1.014	0.992	1.024	0.973*
	(0.0165)	(0.0245)	(0.0231)	(0.0109)	(0.0180)	(0.0140)
Years lived in the municipality: 10 years or longer	Reference	Reference	Reference	Reference	Reference	Reference
Weekly work hours: zero	Reference	Reference	Reference	Reference	Reference	Reference
Weekly work hours: 1 to 20 hours	0.942***	0.947***	0.928***	0.934***	0.924***	0.936***
	(0.0110)	(0.0138)	(0.0194)	(0.00750)	(0.00997)	(0.0117)
Weekly work hours: 21 to 39 hours	0.921***	0.912***	0.931**	0.930***	0.912***	0.942***
	(0.0144)	(0.0176)	(0.0270)	(0.00967)	(0.0128)	(0.0151)
Weekly work hours: 40 hours or more	0.954***	0.934***	1.025	0.937***	0.914***	0.962***
	(0.0110)	(0.0135)	(0.0211)	(0.00691)	(0.00963)	(0.0103)
CHILD VARIABLES						
Age	1.211***	1.238***	1.184***	1.192***	1.217***	1.174***
	(0.00199)	(0.00277)	(0.00292)	(0.00137)	(0.00205)	(0.00188)
Female	Reference	Reference	Reference	Reference	Reference	Reference
Male	1.665***	1.720***	1.614***	1.656***	1.720***	1.607***
	(0.0119)	(0.0166)	(0.0175)	(0.00830)	(0.0126)	(0.0113)
PUBLIC POLICY VARIABLE						
PBF beneficiary	0.838***	0.777***	0.902***	0.868***	0.830***	0.899***
	(0.00794)	(0.0107)	(0.0123)	(0.00547)	(0.00822)	(0.00754)
Likelihood ratio test (chi-squared test)[2]	**29,541*** **	**17,724*** **	**11,206*** **	**54,856*** **	**28,311*** **	**24,838*** **
Number of groups (weighting area)	**8,226**	**4,188**	**7,585**	**9,446**	**5,236**	**9,079**
Number of observations (children aged 7 to 14 years)	**419,201**	**225,478**	**189,677**	**868,057**	**398,981**	**464,818**

Note: *** Significant at the 99% confidence level; ** Significant at the 95% confidence level; * Significant at the 90% confidence level. Exponentials of robust standard errors in parentheses. Some groups were excluded from the analysis because all the children in these groups had values zero or one.

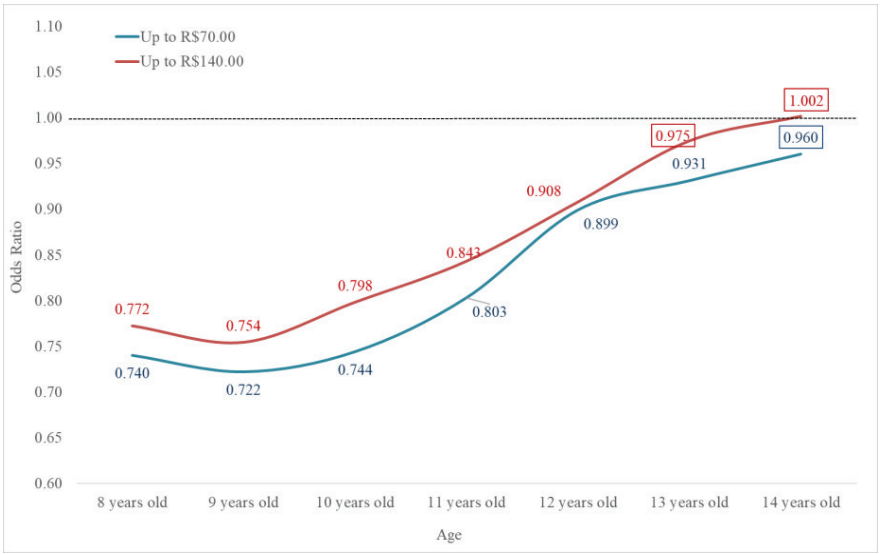
Source: 2010 Brazilian Census (IBGE, 2010).

As age-grade distortion has an incremental effect over time and as, once a child is lagging behind, s/he will always be in this situation until s/he becomes one of the alumni of the system, we sought to estimate the same models above by age, aiming to understand the association, especially in the models in which statistical significance was not obtained. In other words, Table 3 was reproduced considering the ages 7 to 14 years. This means that 48 new models were estimated, but they will not be displayed. To summarize the results of the variable of interest, "receipt of *Programa Bolsa Família*", charts 1 and 2 were prepared. The former brings the results for the general models in the income limits up to R$ 70.00 and up to R$ 140.00. The latter presents the results for the same limits, but with models estimated sometimes for the rural area and sometimes for the urban area.

In Figure 1, the trend of association between being a beneficiary and age-grade distortion remains in the two income limits. Children aged 7 to 10 years of families who declared they were beneficiaries of the program were less likely to be attending school out of the appropriate age in comparison to the reference group, and there was no difference for the higher ages: 14 years (up to R$ 70.00 per capita) and 13 and 14 years (up to R$ 140.00 per capita). Despite a trend of the pattern in Figure 2 similar to what was discussed above, the exception is due to statistical significance. In the values estimated for children living in rural areas, the association was negative for ages. In the case of the urban areas, for models whose per capita household income limit was R$ 70.00, the association was also negative until 11-year olds, and above that age no difference between beneficiary and non-beneficiary children was found. On the other hand, there was a clear inflection point in one of the ages analyzed in the income limit of R$ 140.00. At 14 years of age, child beneficiaries were more likely to be in a situation of age-grade distortion.

CHART 1

ESTIMATED ODDS RATIO FOR THE VARIABLE "BENEFICIARY OF *PROGRAMA BOLSA FAMÍLIA*" IN RELATION TO THE DEPENDENT VARIABLE "AGE-GRADE DISTORTION" BY INCOME LIMIT AND AGE, BRAZIL, 2010

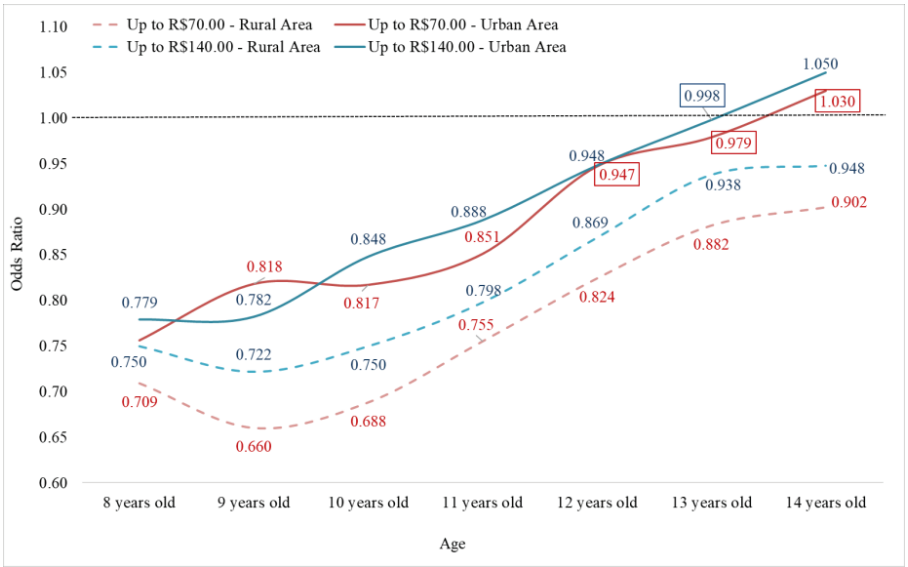


Note: The values highlighted with the borders were not statistically significant. The results presented here are fruit of the 48 models mentioned, but not shown. Some groups were excluded from the analysis because all children in these groups had values zero or one.

Source: 2010 Brazilian Census (IBGE, 2010).

CHART 2

ESTIMATED ODDS RATIO FOR THE VARIABLE "BENEFICIARY OF *PROGRAMA BOLSA FAMÍLIA*" IN RELATION TO THE DEPENDENT VARIABLE "AGE-GRADE DISTORTION", BY AGE, CENSUS REGION AND INCOME LIMIT, BRAZIL, 2010



Note: The values highlighted with the borders were not statistically significant. The results presented here are fruit of the 48 models mentioned, but not shown. Some groups were excluded from the analysis because all children in these groups had values zero or one.

Source: 2010 Brazilian Census (IBGE, 2010).

FINAL CONSIDERATIONS

The problem of evaluating *Programa Bolsa Família* as an educational policy is that there is a good chance it will not be well evaluated. The program addresses the demand for education through one of its conditionalities. Programs of this nature are effective if the provision conditions (school system and quality of schools) function properly for children and are even able to consider their different backgrounds. However, this was not the objective of this article, which sought to evaluate the effect of PBF on age-grade distortion, controlling for other variables that affect academic performance.

Based on the general models, it could be verified that the receipt of the benefit was negatively associated with the chances of age-grade distortion in all six models initially estimated, refuting the proportion test performed. In the models by age, most results pointed to a smaller chance of age-grade distortion of beneficiary children. The opposite was observed for 14-year-old children living in urban areas and whose families declared they were beneficiaries of the program. This educational indicator is the result of an effect of time: the older the child is, the greater the chance that s/he will be lagging behind, especially in the universe analyzed, which includes public school children in an unfavorable economic situation, which requires many of them to help supplement family income. Therefore, the interpretation of these results should be performed with caution. Odds ratio increased with age, which reflected the tendency of convergence in terms of the chance of distortion between the groups. However, what we may be capturing is a composition effect: non-beneficiary children drop out, which would not happen to the other group, generating an increase in distortion. The fact that the group of 14-year-old schoolchildren in urban areas had a greater chance of lagging behind may have a positive aspect: this effect is a consequence of the return of children who were already out of school and were reintegrated into the system so that families could comply with education conditionality. Thus, when they returned to school, they were already in a situation of age-grade distortion.

Some of the limitations of this work should be noted. First, there was no way to control the child's school environment using the 2010 Census, and therefore only the coefficients and the standard error were corrected by the fixed effect. In relation to data, there was sub-enumeration in the self-declaration of receipt of the benefit in the database; therefore, the treatment group was composed by those who answered that they received the benefit or children aged 7 to 14 whose family members answered they were participants in the program. Therefore, this, it is possible that some child who should be in the treatment group was in the control group, generating some bias in the result.

Nevertheless, the conclusions of the study allow a positive evaluation of the education conditionality of PBF, which seems to achieve good results in keeping children in school.

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