



The influence of government cash-transfer programs on internal migration in Brazil

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1. Introduction

Economic and social regional disparities explain a large part of internal migration in Brazil. The standard historical migration flow portrays individuals leaving the poorest regions, typically the Northeast, toward the richest areas, typically the Southeast. However, recent migration flows present some important differences, with weaker poor region-rich region flows, and an unprecedented presence of return migration. This change coincides with the implementation of a governmental program of cash-transfers to households with per capita income up to R\$100 (one hundred reais) per month (*Bolsa Família - BF*)¹. The monthly amount transferred to families with per capita income below R\$50 per month is R\$50, with an additional R\$15 per child in the age range 5-14 (maximum of three children). Households with per capita income between R\$50 and R\$100 received only the

¹ Values of 2004. Although different programs existed before, they were consolidated into the *Bolsa Família* program in 2003. The total amount transferred increased from 2001 on.



part related to children, which, in both cases, are conditional to regular health exams and school attendance.

Azzoni et al. (2008) concluded that the impacts of BF is highly favorable to reducing regional inequality; Silveira-Neto and Azzoni (2008) have shown that these cash-transferences, together with the appreciation of the minimum wage, explain approximately 40% of the observed reduction in regional income inequality in the country since 1995. This has happened because the social programs end-up affecting more strongly the poorest Brazilian regions, since these have larger shares (and even absolute numbers) of poor individuals and families. For example, more than 50% of *BF* resources went to Northeast region in 2005, although this region had no more than 28% of Brazilian population. The program has presented other social impacts, such as in school attendance (Cardoso and Souza, 2004; Duarte and Silveira-Neto, 2008), but its regional or spatial impact has not been fully explored. Investigation of their influence on migration is also new. Angelucci (2004) and Stecklov et al. (2005) showed that the cash-transfers of the similar Mexican Progresa Program do influence both Mexico-US and internal migration.

In this paper we deal with the impacts of BF on internal migration, including return migration. The paper is organized in five sections. In the next section we present evidence on recent patterns of internal migration in Brazil and highlight the economic importance of BF across Brazilian regions. In section three, we present a simple theoretical framework for understanding the potential impact of BF on individual location choices. The empirical results are presented in section four, and the conclusions are presented in section 5.

2. Regional inequality and migration in Brazil: recent facts

Recent information for 2006, based on a household survey covering over 250,000 families all over the country², indicates that recent migration trends replicate the historical situation of poor regions sending migrants to richer and/or booming regions in Brazil. The richest Southeast region is the most important receiver, and the poorest Northeast region is

² PNAD – Pesquisa Nacional por Amostra de Domicílios, IBGE
(<http://www.ibge.gov.br/home/estatistica/populacao/trabalhoerendimento/pnad2007/default.shtm>)



the most important sender. Together, they are responsible for approximately half inter-regional migration flows. Justos (2006) confirms that recent internal inter-regional migration is mainly explained by the Brazilian well-known regional disparities in economic and social conditions, confirming results from studies dealing with decades more distant in time (Sahota, 1968; Yap, 1976; Hollanda-Filho, 1989).

Regional inequality used to be quite stable since the 1930's, but Silveira-Neto and Azzoni (2008) have shown an important reduction from 1995 onwards. They have shown that both labor market and non-spatial social public policies, cash-transference programs included, have a role in explaining regional income reduction in Brazil in the period, with social policies accounting for 40% of the observed inequality reduction. Given that inequality is a migration driver, these recent changes are interesting investigating from the point of view of their impacts on migration.

The BF program is clearly pro-poor, in regional terms. The poorest Northeast region, which hosts 28% of population, receives more than 52% of the total national amount of cash transfers. The per capita amount transferred to that region is equivalent to 23.6% of its average household per capita income, and 20.1% in the case of the also poor North region, and less than 10% in the other regions. Therefore, both by the larger amounts transferred and the higher proportional importance in the poorer regions, BF has a clear bias towards regional equity, and some influence on the intensity and on the direction of migration flows should to be expected. It is indeed the case, since the share of recent migrants (less than one year in the receiving region) in population is clearly declining in general, but especially after 2001, when the cash-transfer programs were intensified.

Considering that internal migration is mainly motivated by regional disparities, this picture is consistent with the regional income inequality reduction observed in the period. The share of the poorest Northeast region in the total number of migrants declined until 1999, but remained stable since then. Simultaneously, the share of the richest Southeast region in total migration, which increased until 1999, has also presented a stable pattern since that year. The role of the rich Southeast region as a migrant destination is declining, whereas the poor Northeast region is increasing its role as a migration destination. The other important change refers to the Mid-West region, due to the boom of new agricultural activities in the area.



Information on more recent migration trend indicates that the importance of inter-regional return migration in total inter-regional migration has been increasing almost continuously. It is interesting to observe that the dynamic of the richest region as an origin is similar to the poorest region as a destination for return migrants. The possible connections between these two aspects need to be investigated, especially because these movements have occurred in a period of consistent regional income inequality reduction.

3. Cash-transfer programs and migration: a simple theoretical framework

The above evidence suggests that an improvement in economic perspectives in the poor region could reduce the incentives for individuals to migrate to richer regions, and increase the incentives for those who had migrated in the past to return to their region of origin. In order to investigate this idea, we use a very simple model of residential choice for a representative potential migrant born in the poor region. We deal with three sequential situations. We start with an individual in the poor region, who makes a decision on whether or not to migrate towards the rich region. In the second situation, there will be people living in the rich region because they were there before situation 1 or because they have migrated in the previous decisional step. These individuals now make a decision on whether to stay where they are, or to migrate back to the poor region. In the last situation, there will be individuals living in both regions, without any incentive to migrate³.

Formally, we represent the welfare conditions by the following utility function, in which equations (2), (3) and (4) are the associated restrictions:

$$U(C_t, C_{t+1}, C_{t+2}) = \log(C_t) + \beta \log(C_{t+1}) + \beta^2 \log(C_{t+2}) \quad (1)$$

$$C_t = (1 - I_1)W_t^p + I_1W_t^r + (1 - I_1)T_t - I_2M_t \quad (2)$$

$$C_{t+1} = (1 - I_1)W_{t+1}^p + I_1W_{t+1}^r + (1 - I_1)T_{t+1} - I_2M_{t+1} \quad (3)$$

$$C_{t+2} = (1 - I_1)W_{t+2}^p + I_1W_{t+2}^r + (1 - I_1)T_{t+2} \quad (4)$$

³ It is assumed that no credit market exists, which is a quite realistic situation in the Brazilian setting, especially for low-income individuals



Where C_i indicates the consumption level in period i ; $\beta < 1$ is an inter-temporal discount rate; W_i^p and W_i^r are the wage levels in the poor and rich regions; T_i indicates the amount of cash-transferences; $I_1=0$ if the individual is in his/her native region, $I_1=1$ otherwise; $I_2=0$ in case of no migration, $I_2=1$ otherwise; M_t and M_{t+1} are migration costs in times t and $t + 1$ (assumed to be independent of location). Note that this framework assumes that the possibility of receiving cash transfers in rich regions is not considered during migrant location arbitrage. This is consistent with the empirical evidence about regional disparities in Brazil, where regional wages difference are higher for individuals of lower quantiles of income distribution (Silveira-Neto and Campelo, 2003).

The model allows for the study of both migration and return migration. We just need to compare the welfare conditions between regions based on optimum individual consumption choices in each region, through a two-stage optimization. From the welfare conditions derived from the optimum consumption choices in stage 1, we can derive the optimum locational choice in the second optimization stage, and their migration implications. An individual will migrate if:

$$\log\left(\frac{W_t^p + T_t}{W_t^p + T_t - M_t}\right) < \beta \log\left(\frac{W_{t+1}^r}{W_{t+1}^p + T_{t+1}}\right) + \beta^2 \log\left(\frac{W_{t+2}^r}{W_{t+2}^p + T_{t+2}}\right) \quad (5)$$

or

$$\log\left(\frac{W_t^p + T_t}{W_t^p + T_t - M_t}\right) < \beta \log\left(\frac{W_{t+1}^r - M_{t+1}}{W_{t+1}^p + T_{t+1}}\right) \quad (6)$$

In other words, the individual will migrate if the sum of the temporally ($t+1$ and $t+2$) adjusted income gains from migration compensates the investment that has to be made to migrate, measured by the relative income loss in time t (condition (5)). More strictly, the individual will migrate if the income gain in time $t+1$, net of migration costs, compensates the initial investment in migration, measured by the relative income loss in time t (condition 6). Higher amounts of cash-transferences and/or higher wage levels in the poor region at times $t+1$ and/or $t+2$ will make migration less probable.

The necessary conditions for an individual to be a return migrant are given by:



$$\log\left(\frac{W_t^p + T_t}{W_t^p + T_t - M_t}\right) < \beta \log\left(\frac{W_{t+1}^r - M_{t+1}}{W_{t+1}^p + T_{t+1}}\right)$$

and

$$\log\left(\frac{W_{t+2}^p + T_{t+2}}{W_{t+2}^r}\right) \geq \beta \log\left(\frac{W_{t+1}^r}{W_{t+1}^r - M_{t+1}}\right) \quad (7)$$

The first condition (the same as in (6)) assures that migration is preferred to non-migration; the second assures that return-migration is better than staying in the non-native region. It can be seen that higher labor income levels in the third period, and/or larger cash-transferences, make return-migration more probable.

Notice that the above conditions assume that the individuals plan the potential return to the native region. In fact, this framework cannot be used to fully understand the potential role of cash-transference programs on migration, because the majority of migration flows took place before these programs were in place. But it can be modified to get the spatial arbitrage conditions faced by a migrant living in a non-native region before the existence of such programs. In fact, we just need to consider only two periods of analysis, a situation similar to the case of a non-planned return. It is possible to show that, both for an individual in his/her region of origin in the initial period, and for the case he/she was initially out of his native region, the total income gain with migration and with return migration must compensate the investment involved in moving from one region to another. The decisions to migrate and to return to the native region will be the optimum choice, respectively, if:

$$\log\left(\frac{W_t^p + T_t}{W_t^p + T_t - M_t}\right) < \beta \log\left(\frac{W_{t+1}^r}{W_{t+1}^p + T_{t+1}}\right) \quad (8)$$

and

$$\log\left(\frac{W_t^r}{W_t^r - M_t}\right) \leq \beta \log\left(\frac{W_{t+1}^p + T_{t+1}}{W_{t+1}^r}\right) \quad (9)$$

In other words, migration will be an optimum decision if the time-adjusted second period income gains more than compensate the initial investment involved in migrating (measured by the loss of income in the first period). From equation (8), we note that higher levels of cash-transferences and/or higher wage growth in the poor region make migration



less probable. On the other hand, for the case of an individual initially out of his native region, from equation (9) we observe that higher levels of cash-transferences and/or higher wage growth in the poor region makes return-migration more probable.

The above analysis calls for important qualifications. Firstly, even under a neoclassical perspective, it does not consider the potential impact of BF program on individuals with strong liquidity restrictions for migration. For these individuals, the cash-transfers could potentially increase migration (Faini and Venturi, 1993). Although this is a theoretical possibility, the small amount of cash transferred in the BF program, and the short run analysis we are dealing with, make a positive migration reaction to the program less probable. Nevertheless, only empirical evidence can clarify the importance of this kind of relationship for the case of BF program. Secondly, and still within the neoclassical analysis, only families with children under 15 years-old can qualify for the BF cash-transferences. Thus, in addition to the potential higher opportunity-costs related to labor market in other regions, the cash-transfers from the BF program have a smaller effect in per capita terms and create less expectation of affecting migration. Finally, the “New Migration Theory” (Lall et al., 2006) considers the migration decision as the result of a family planning process, involving costs and benefits for its members. In this case, the possibility of having a non-earning monthly source of income can reduce risks and the need for diversification through migration, since, as recently shown by Yang and Choi (2007), remittances appear to function as a insurance to the families. As highlighted in Stecklov et al. (2005), in this case we should expect a reduction in the probability of migration as result of BF program.

4. Estimating the influence of *cash*-transfers on internal migration

4.1. The Data

We use micro data from PNAD (Pesquisa Nacional por Amostra de Domicílios), a comprehensive yearly household survey, which included a special supplement referring to social programs in its 2004 edition. There are some difficulties in using this data set for the objective of this study. Firstly, the selection of beneficiaries was not random, but followed



an income criterion⁴. However, as not all eligible families were included in the BF program in 2004, the problem is not so serious. Secondly, since the survey does not identify the beneficiary family before and after receiving the cash-transfer, we cannot rely on the difference-in-difference estimator to calculate the impact of the program, since we cannot control for potential time-fixed, non-observable factors. As a result, we could only use cross-section data. Thirdly, PNAD only informs if the person migrated in the current year, in the year before, in the year before that, etc. In the case of migration, there is an additional difficulty, since both observable and non-observable factors can simultaneously affect the condition of being a BF beneficiary and a migrant. Given the differentiated characteristics migrants usually exhibit, it is probable that they have better knowledge about the existence of the cash-transference program. At the same time, migrants are probably less satisfied with local economic conditions, what makes them more willing to respond to economic incentives. Finally, recent migrants could face more difficulties in accessing local government agencies in the destination region.

To deal with these difficulties, we adopted a series of procedures. We have drawn a sample of individuals with household per capita income lower than R\$200, which includes all eligible families⁵. Additionally, as BF begun only recently, we have only included migrants living in the destination state for no more than two years of the survey interview. Therefore, we deal with short-term migration only. We define as a migrant an individual from a low-income family, as defined above, who had lived (return migrant) or was living out of his native poor state (non-return migrant). In order to concentrate on economic arbitrage decisions only, we deal solely with adult individuals (21-65). The total number of individuals in the sample is 50,001, of which 3,816 are beneficiaries. Among all individuals in the sample, 1,741 are migrants, and 452 are return migrants. Table 1 presents some descriptive statistics.

In general, migrants are relatively younger, more educated, married - but with fewer children, whiter, and have slightly larger per capita income levels. The share of non-migrants receiving BF cash-transfers is much higher than for migrants or return migrants. In regional terms, there are more migrants in the Southeast region and more return migrants

⁴ Different from the Mexican *Progressa* program.

⁵ Note that this value is slightly higher than the eligibility limit, including the children allowance (R\$100 + R\$45). We have also used R\$150 as the limit, and the results were similar.



in Northeast region. The above evidence indicates that migrants do form a differentiated group in terms of observable characteristics, confirming the results of Santos-Jr et al (2005). This differentiation is not so strong for return migrants, though. The table also indicates that the BF program directs resources to less educated, non-white individuals, to families with younger children, and to the poorest among the poor families. A regional bias favoring the Northeast region is also evident. The Northeast region presents the highest share of individuals living in rural areas, 29%, what explains the lower share of individuals living in urban areas in the group of BF beneficiaries. One should bear in mind that this region historically shows the largest outflow of migrants, and, at the same time, is the most important destination of return migrants. It is also possible to observe that the share of migrants in the BF beneficiaries group is lower than in the control group; the opposite occurs for return migrants.



Table 1. Descriptive Statistics

	Migration Status			Cash-transfer status	
	Migrant	Return migrant	Non-migrant	Beneficiary	Control group
Average age	34.1 (10.5)	34.5 (10.1)	36.6 (11.5)	35.6 (10.3)	36.6 (11.6)
# of years of education (% of total)					
Less than 1	13.6	12.4	18.8	23.4	18.0
1 to 3	16.7	17.9	17.8	22.9	17.2
4 to 7	35.3	40.0	32.5	34.0	32.4
8 to 10	16.7	15.3	14.5	10.7	15.0
11 to 14	15.9	13.1	14.9	8.3	15.7
15 and more	1.4	0.6	0.9	0.1	1.0
Race (% white)	36.9	34.7	34.1	28.3	34.9
Married (% of total)	81.4	83.4	78.2	72.5	63.4
With children (% of total)	7.6	8.5	15.1	13.4	19.5
Age of children (% of total)					
0 to 5	44.3	42.3	31.1	40,8	29.0
6 to 10	28.4	26.1	24.9	43,9	26,5
11 to 14	23.9	20.4	23.5	45,8	31,1
15 or more	29.5	23.7	48.6	48,7	51,9
# of Household members (average)	4.4 (1.9)	4.2 (1.8)	4.8 (2.1)	5.6 (2.2)	4.7 (2.1)
Household <i>per capita</i> income (R\$, average)	108.73 (58.8)	100.87 (58.6)	103.70 (55.6)	72.75 (46.0)	107.50 (55.6)
Region (% of total)					
North	20.1	8.4	12.9	10.8	13.4
Northeast	28.9	57.1	49.7	65.2	47.2
Southeast	20.4	16.1	21.5	14.0	22.4
South	8.2	10.6	10.4	7.3	10.7
Mid-West	22.4	7.7	5.4	2.7	6.3
Urban area (% of total)	81.2	83.1	75.5	66.6	76.8
Receiving <i>Bolsa Família</i> (% of total)	5.3	7.1	10.6	-	-
Migration Status					
Migrant (% of total)	-	-	-	1.6	3.6
Return migrant (% of migrants)	-	-	-	31.7	25.8
Number of individuals (Total = 50,001)	1,741	452	47,808	3,816	46,185

Source: Authors' calculation, from PNAD data



4.2. Econometrics

As for the evaluation of the impacts, we use two approaches. Since the choice of beneficiaries is not random, we cannot use a traditional *probit* model to estimate the impact of being from a family receiving cash-transferences from BF program on a migration indicator (Stecklov et al, 2005). Instead, we adopt the public policy evaluation framework for non-experimental data, comparing the levels of target variables between groups (beneficiaries and non-beneficiaries). We take as impact variables the proportion of migrants and return migrants, and use matching of individuals based on the propensity score to estimate the probability of being a beneficiary of BF, taking into account the incentives to be a migrant and a return migrant. We deal with the specificity of simultaneously being a potential migrant and a BF beneficiary using a bivariate probit model, both for the probability of being a BF beneficiary and the probability of being a migrant to obtain propensity score estimates. More specifically, we match individuals (BF beneficiaries and BF non-beneficiaries) with similar probabilities of being simultaneously a BF beneficiary and a migrant (with similar bivariate predicted probabilities).

The bivariate probit models to estimate the propensity of being a BF beneficiary and the propensity of being a migrant are:

$$BF_i^* = X_{ip}\beta_1 + X_{if}\beta_2 + X_{il}\beta_3 + \varepsilon_i$$

$$BF_i = \begin{cases} 1 & \text{if } \varepsilon_i \geq -X_{ip}\beta_1 - X_{if}\beta_2 - X_{il}\beta_3 \\ 0 & \text{otherwise} \end{cases} \quad (10)$$

and $M_i^* = X_{ip}\alpha_1 + X_{if}\alpha_2 + X_{il}\alpha_3 + \mu_i$

$$M_i = \begin{cases} 1 & \text{if } \mu_i \geq -X_{ip}\alpha_1 - X_{if}\alpha_2 - X_{il}\alpha_3 \\ 0 & \text{otherwise} \end{cases} \quad (11)$$

BF_i^* is an indicator of the propensity of individual i to be a BF beneficiary; X_{ip} is a vector of personal characteristics; X_{if} is a vector of household characteristics; X_{il} is a vector of regional characteristics; M_i^* is an indicator the propensity of individual i to be a migrant; and ε_i and μ_i are potentially-correlated error terms. The characteristics included in vector X



are those that presumably affect the propensity of being a BF beneficiary (equation 10) and the propensity of being a migrant (equation 11).

Although the bivariate probit estimation provides four different types of predicted probabilities, we are only interested in the bivariate predicted probability of an individual simultaneously being a BF beneficiary *and* a migrant, or $P(BF_i = 1 \text{ and } M_i = 1)$. If the error terms are correlated, the propensity score matching of beneficiary and non-beneficiary of BF program is based on this predicted probability⁶. The propensity score matching methodology assumes that, conditioned on the covariates, there is no statistic difference in the probabilities of being a beneficiary of the program between the treatment group (beneficiary) and the control group (non-beneficiary). It also assumes that the results of the impact variable, conditioned on the probabilities of participation, are independent of the participation in the program (Rosembaum and Rubin, 1983). These hypotheses depend very much on our capacity to control for all influences in the participation in the program. We use the nearest-neighbor criteria for matching beneficiaries and non-beneficiaries, based on the predicted propensity score⁷.

4.3 The influence of cash-transfers on migration

The aim is to estimate the probability of an individual being a migrant, and measure the impact of BF program. Since the choice of beneficiaries is not random, we use propensity score matching. We match individuals and compare the percentage of migrants in both groups (beneficiaries and non-beneficiaries). Besides a traditional matching of individuals based on the probabilities of being a BF beneficiary, by estimating a bivariate probit, we also do the matching using the estimated probabilities of being simultaneously a BF beneficiary and a migrant.

Column (III) in Table 2 presents Maximum-Likelihood estimates of the parameters of equations (10), a bivariate probit model for the probability of being a BF beneficiary and a migrant. The negative and statistically significant value of the error correlation coefficient (ρ), presented in the last line of the table, indicates that non-observable or non-measurable

⁶ See, for example, Greene (2003).

⁷ We have also used groups, with similar results (available upon request from the authors).



determinants of being a BF beneficiary are negatively associated to non-observable or non-measurable determinants of being a migrant. This implies that we must estimate a bivariate probit model, instead of a single probit. The negative correlation is also consistent with a positive selection of productive skills of migrants, as reported in Santos-Jr et al. (2005). We also present the results of the simple probit model, for comparison purposes (columns I and II).

As for the estimated parameters of the bivariate probit, from columns (III) and (IV) we note that the probability of being a BF beneficiary diminishes as income increases, which is consistent with the program's objective. More education decreases the probability of being a BF beneficiary, but increases the probability of being a migrant. We also notice that education reduces the probability of being a BF beneficiary, but increases the probability of being a migrant. Age has no effect on the probability of being a BF beneficiary, but reduces the probability of being a migrant. As for the other personal characteristics, the probability of being a BF beneficiary is smaller for married whites, but their probability of being a migrant is larger. We also note that having children is more important in increasing the probability of being a BF beneficiary than for being a migrant. Being employed reduces the probability of being a migrant, but somehow unexpectedly, increases the probability of being a BF beneficiary. The results also indicate a regional bias in the BF resource allocation: even after controlling for the level of *per capita* family income, not living in the Northeast diminishes the probability of being a BF beneficiary; on the other hand, living in the North and Mid-West regions increases the probability of being a migrant. Finally, living in a non-metropolitan urban area decreases the probability of being in the BF program, but increases the probability of being a migrant. However, living in a metropolitan area produces the opposite results.

Using the above estimated parameters, we have calculated the probability of an individual being a BF beneficiary *and* a migrant. Using the nearest-neighbor matching based on these calculated probabilities of being a BF beneficiary, we have arrived at the results presented in Table 2 (upper part), which shows the proportions of migrants for both groups. Comparing individuals with similar probabilities of being a BF beneficiary *and* a migrant, the group of beneficiaries presents 3.2 percentage points fewer migrants than the control group. In other words, we find out that the program affects negatively migration. It



is interesting to note that both the simple mean difference (1.6 percentage points) and the conventional propensity score estimate (1.8 percentage points) underestimate the impact of BF on migration. One possible explanation for these differences is that, by considering simultaneously the conditions that affect the probability of being a BF beneficiary and a migrant, we compare individuals not only of similar conditions of eligibility for BF program, but also with similar skills and motivations for considering other locations (probably more sensitive to regional income differentials).

Finally, we have also investigated the impact of BF program on migration considering individuals from families with children 15 years old or more. As discussed before, this group receives potentially less resources, because of the children age limit. Individuals in this group also face higher labor market opportunity costs from not migrating, i.e., for not arbitrating among regional labor markets. The bottom part of Table 2 presents evidence of the impact of BF program for this group of individuals⁸. The results follow the same pattern as in the upper part of the Table, i.e., the BF program has a negative impact on migration. Specifically, the group of BF beneficiaries presents 2.2 percentage points less migrant individuals than the control group. However, the values are lower than for all individuals in the sample, which indicates that individuals are sensitive to the amount of cash transferred and to potential opportunity costs. These latter depend, for example, on regional differences in economic performance. These results match those found by Stecklov et al. (2005), in their evaluation of the similar Mexican *Progres*a program. They found evidence of a negative impact of the Mexican program both on Mexico-US migration and on internal migration. However, they differ from the ones found by Angelucci (2004), also for Mexico.

⁸ The estimated parameters are available upon request.



Table 2. Bivariate Probit on migration and Bolsa Família - ML estimation

	Probit		Bivariate probit	
	Coefficient (I)	SE (II)	Coefficient (III)	SE (IV)
Bolsa Família				
Education: 1-4	0,060*	0,030	0,060*	0,030
Education: 4-7	-0,022	0,028	-0,021	0,028
Education: 8 -10	-0,153**	0,034	-0,152**	0,034
Education: 11 -14	-0,289**	0,036	-0,288**	0,036
Education: 15 more	-1,626**	0,313	-1,626**	0,314
Gender: male	-0,164**	0,022	-0,164**	0,022
Age	-0,001	0,006	-0,001	0,006
Age ²	0,000	0,000	0,000	0,000
White	-0,060*	0,021	-0,060**	0,021
Head of the family	0,079**	0,022	0,079**	0,022
Employed	0,153**	0,021	0,153**	0,021
Family <i>per capita</i> income	-0,005**	0,000	-0,005**	0,000
Married	-0,191**	0,057	-0,192**	0,057
Married with children	0,407**	0,055	0,408**	0,055
No. of household members	0,065**	0,005	0,065**	0,005
No. of children 0-5 years old	0,032**	0,013	0,031**	0,013
No. of children 6-10 years old	0,139**	0,014	0,139**	0,014
No. of children 11-15years old	0,102**	0,014	0,101**	0,014
North	-0,307**	0,027	-0,307**	0,027
Southeast	-0,312**	0,025	-0,311**	0,025
South	-0,195**	0,034	-0,195**	0,034
Midwest	-0,504**	0,047	-0,505**	0,047
Urban area	-0,066*	0,023	-0,066**	0,023
Metropolitan area	0,031	0,020	0,031**	0,020
Constant	-1,119**	0,117	-1,121**	0,117
Migrant				
Education: 1-4			0,082	0,042
Education: 4-7			0,052	0,038
Education: 8 -10			0,037	0,044
Education: 11 -14			0,019	0,044
Education: 15 and more			0,226**	0,097
Gender: male			0,090**	0,027
Age			0,006	0,007
Age ²			0,000	0,000
White			0,049	0,025
Household head			0,052	0,028
Employed			-0,154**	0,026
Married			0,211**	0,047
Married with children			-0,153**	0,046
No. of children 0-5 years old			0,098**	0,017
No. of children 6-10 years old			0,028	0,020
No. of children 11-15years old			0,040	0,021
North			0,315**	0,033
Southeast			0,081**	0,031
South			0,027	0,043
Midwest			0,771**	0,035
Urban area			0,269**	0,032
Metropolitan area			-0,297**	0,026
Constant			-2,097**	0,144
N. of observations	50,001		50,001	-
p			-0,152**	0,026
Chi(2)	3585.78**		4101.29**	-

* Statistically significant at the 5% level.** Statistically significant at the 1% level. For the dummies variables, we take as reference the following individuals: less than 1 years of education (education), woman (sex), non head of the family (head of the family), non married (married), no sons with the referred age (no. of sons), Northeast region, rural area and non BF beneficiary (Bolsa Família).



Table 2. Impact of BF on internal migration, 2004.

	Proportion of migrants in BF (I)	Proportion of migrants in the control group (II)	Impact of BF on migration (III)
<u>Households with children 1-15</u>			
Simple mean difference	0.015 (0.002)	0.031 (0.001)	-0.016** (0.002)
Matching via Propensity Score, probit	0.016 (0.124)	0.034 (0.182)	-0.018** (0.004)
Matching via Propensity Score, bivariate probit	0.016 (0.124)	0.048 (0.214)	-0.032** (0.005)
<u>Households with children 15 or more</u>			
Simple Mean difference	0.007 (0.003)	0.019 (0.001)	-0.012** (0.003)
Matching via Propensity Score, probit	0.007 (0.086)	0.024 (0.152)	-0.016* (0.007)
Matching via Propensity Score, bivariate probit	0.007 (0.086)	0.030 (0.170)	-0.022** (0.007)

Source: author calculation based on micro data from PNAD. Bootstrap standard-deviation in parenthesis. * indicates statistical significance at 5%, ** indicates statistical significance at 1%.

In conclusion, besides contributing to the reduction of regional *per capita* income inequality in Brazil in the short run, as shown in Silveira-Neto and Azzoni (2008), the BF program appears to have another regional important short run impact influencing regional individual locational arbitrage. Given that migration has historically contributed to attenuate regional economic disparities in Brazil, it would be an interesting question to investigate if, in the medium and long runs, the new regional effect of BF we have found do not act in the opposite direction of the short run impacts highlighted in Silveira-Neto and Azzoni (2008).



4.3 The influence of cash-transfers on return migration

In this section we check if the BF cash-transfers affect the return migration decision. Since the selection of beneficiaries is not random, we use a matching of individuals based on the propensity score estimate. Table 3 presents the probit and bivariate probit estimates of the parameters necessary for grouping individuals based on the propensity score. Since the parameter ρ is not statistically significant, we can just use the simple probit model. The results indicate that only migrants living in the Midwest region present lower probability of being a BF beneficiary than individuals living in the Northeast region. Even among migrants, the level of *per capita* family income continues to be an important determinant of being a BF beneficiary.



Table 3. Probit and Bivariate Probit on return migration and BF - ML estimation.

	Probit		Bivariate probit	
<i>Bolsa Família</i>	Coefficient (I)	SE (II)	Coefficient (III)	SE (IV)
Education: 1-4	-0,237	0,247	-0,224	0,246
Education: 4-7	-0,031	0,208	-0,020	0,207
Education: 8 -10	-0,379	0,258	-0,366	0,258
Education: 11 on	-0,488	0,272	-0,474	0,270
Sex: man	-0,072	0,167	-0,018	0,009
Age	0,009	0,059	-0,224	0,246
Age ²	0,000	0,001	0,000	0,0001
White	-0,082	0,147	-0,081	0,148
Head of the family	0,088	0,166	0,059	0,149
Employed	0,320	0,168	0,304	0,158
Family <i>per capita</i> income	-0,005**	0,001	-0,005**	0,001
Married	0,180	0,179	0,177	0,174
No. Of people	0,111**	0,038	0,106**	0,037
No. Of sons: 0-5	0,251**	0,080	0,253**	0,080
No. Of sons: 6-10	0,029	0,099	0,039	0,098
No. Of sons: 11-15	0,064	0,114	0,077	0,112
North	-0,203	0,177	-0,207	0,177
Southeast	-0,257	0,191	-0,264	0,191
South	-0,291	0,285	-0,307	0,286
Midwest	-0,518*	0,212	-0,525*	0,212
Urban área	0,411	0,213	0,416	0,214
Metropolitan área	0,235	0,154	0,241	0,153
Constant	-2,382	1,035	-1,949	0,450
<i>Return Migrant</i>				
Education: 1-4	-	-	0,268	0,139
Education: 4-7	-	-	0,265*	0,126
Education: 8 -10	-	-	0,192	0,140
Education: 11 -14	-	-	-0,018	0,141
Education: 15 on	-	-	-0,002	0,004
Sex: man	-	-	-0,075	0,139
Age	-	-	0,251	0,126
Age ²	-	-	-	-
White	-	-	0,032	0,075
Family head	-	-	0,061	0,077
Employed	-	-	-0,121	0,077
Married	-	-	0,016	0,084
Married with son	-	-	-0,115*	0,053
No. Of sons: 0-5	-	-	-1,343**	0,059
No. of sons: 6-10	-	-	-0,878**	0,064
No. of sons: 11-15	-	-	-0,509**	0,108
North	-	-	-1,440**	0,097
Southeast	-	-	-0,026	0,129
South	-	-	-0,155	0,105
Midwest	-	-	-0,010	0,103
Urban área	-	-	0,268**	0,087
Metropolitan área	-	-	0,265	0,215
Constant	-	-	0,192**	0,075
N. of observations	1,741	-	1,741	-
p	-	-	0,096	0,877
Chi(2)	96.48**	0.000	377.13**	0.000

* Significant at 5%. ** Significant at 1%. Marginal effects use sample means of the variables. References for the dummies variables: less than 1 years of education, woman, non-head of the family, not married, no children in the age range, Northeast region, rural area and non BF beneficiary.



Table 4 presents the estimated impacts of BF on return migration, based on the estimated coefficients in column (I) of Table 3⁹, by using propensity score matching and the nearest neighbor criterion. As can be noted from column (III), there is no statistically significant evidence of the impact of BF on return migration. In fact, although the beneficiaries of *Bolsa Família* present a larger proportion of return migrants, the differences are not statically significant. Thus, differently from its impact on migration, the cash-transfers from the BF program do not appear be capable of affecting the return migration decision. It could be that the costs involved in returning to the native region are higher than the values of cash transfers from the program.

Table 4. Impact of BF on return migration (proportion of migrants), 2004

	Proportion of return migrants: Receiving BF (I)	Proportion of return migrants: control group (II)	Impact of BF on return migration (III)
Mean difference	0.317 (0.060)	0.257 (0,011)	0.059 (0.061)
Matching via Propensity Score, probit	0.317 (0.469)	0.350 (0.481)	-0.033 (0.085)

Source: authors' calculation based on micro data from PNAD 2004. Bootstrap standard-deviation in parenthesis. * indicates statistical significance at 5%, ** indicates statistical significance at 1%.

5. Conclusion

As pointed out in Silveira Neto and Azzoni (2008), non-spatial policies explain an important part of regional *per capita* income inequality reduction in Brazil since 1995. In this paper we have investigated an absolutely unexplored question: the potential impact of *Bolsa Família* (BF) program on internal migration. We have worked with a sample of over 50,000 poor individuals, some of whom are migrants and some are beneficiaries of BF. We had to deal both with the potential selection bias related to the choice of BF beneficiaries and to self-selection of migrants. We have estimated the difference in the proportion of migrants between BF beneficiaries and the control group from the propensity score

⁹ The results do not qualitatively change if use matching based on the probability of individuals being a BF beneficiary and a return migrant.



matching based both on the probit and the bivariate probit models. We have estimated the probability of being a migrant and of being simultaneously a BF beneficiary and a migrant.

Our results indicate that the *Bolsa Família* program does contribute to reduce migration, but does not affect return migration. Although we do not have any empirically demonstrated reason for this difference, we suggest that the retuning migration cost, not necessarily monetary, is higher than the cost of initial migration. These aspects are especially important for recent migrants, since they could be still exploring new opportunities in the new region.

Our results point out to the possibility of a long run implication of BF cash-transfers for the dynamic of regional income inequality in Brazil. Because of the higher proportion of poor individuals in the Northeast region, the short and medium-run impacts of the BF program is to attenuate regional income inequality in the country. But, depending on how good the education provided to the children of the beneficiaries will be, it is possible that in the long run the program can contribute to increase regional income disparities in Brazil, by reducing migration. This longer-term effect is yet to be investigated.

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