Does local fiscal policy affect migration? Evidence of a fiscal windfall in a developing country

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Resumo

Os municípios brasileiros têm parte de suas receitas advindas de transferências federais, dentre estas, destaca-se o FPM, o qual tem uma relação direta com o tamanho da população de cada município. Através do uso das regras de alocação de recursos do FPM, especificou-se uma Regressão em Descontinuidade Fuzzy para identificar o efeito causal de um aumento exógeno de recursos sobre variáveis migratórias. Nossos resultados mostram que o aumento de transferências federais levam a uma queda na migração de entrada e na migração de saída, apesar de mais significantes na primeira. Nossos resultados não encontram evidências de migração de bem-estar no Brasil.

Palavras-chave: FPM, transferências, migração, bem-estar

Abstract

Brazilian municipalities have part of their revenues coming from federal transfers, among them, the FPM scheme stands out, because it has a direct relationship with the size of the population of each municipality. Through the use of FPM allocation rules, we have specified a Fuzzy Discontinuity Regression to identify the causal effect of an exogenous resource increase on migratory variables. Our results show that the increase in federal transfers leads to a decrease in in-migration and out-migration, although the first seems more significant. Our results do not find evidence of welfare migration in Brazil.

Key-words: FPM, transfers, migration, welfare
JEL Classification: C10, H73, J10, O10, R10
ÁREA TEMÁTICA: 14. População, migração e desenvolvimento

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Introduction

Migration has always been a phenomenon of great interest for society, however, in the last years, migration has become a central concern for public policy, particularly after the most recent cases of mass migration and efforts to avoid in-migration in developed countries. Examples of events that brought back the spotlight to this matter are the Trump wall and the mass migration of Asian and African countries to Europe, in which the debate is surrounded by opinions of costs, benefits and controversy. In developing countries the recent case of Venezuela might be one of the most emblematic episodes of out-migration in South America and also caused a lot of discussion, especially in countries that share borders with it, like Colombia and Brazil.

Internal migration is just as intriguing as international migration and is also subject of a lot of controversy. McAuliffe e Ruhs (2017) report that more than 740 million people had migrated within their own country of birth, what seems to indicate that it might be important to understand the reasons that make people leave their home cities, notably when public police is being discussed. According to Drabo e Mbaye (2015) there are several channels that might affect the decision to migrate, such as new labor opportunities, natural disasters, agriculture and nutrition, climate change and war events, but in our case, the main interest is related to the regional public finance, that is welfare spending and tax revenue.

The literature about welfare migration is very wide. Tiebout (1956) is probably the first paper to theorize about the theme. As stated by Tiebout, in the absence of transaction costs, local governments, or jurisdictions, would supply different sets of goods so that individuals could choose those in which the amount of public spending and tax revenue would satisfy their own utility functions, thereby promoting migration to that jurisdiction. His take on this matter is also known as "voting with feet" in allusion to the locational decision faced by individuals. Ross e Yinger (1999) demonstrate that without a head tax, Tiebout's framework might generate a large distortion between supply of public goods and their funding. The main problem occurs when a property tax is imposed, which would stimulate poor individuals to migrate since their contributory capacity is lower due to the smaller size of their houses. As a consequence, the marginal cost of public goods would increase for the other consumers and, for this reason, jurisdictions could try to prevent the in-migration of poor people to their region or, in some cases, develop some sort of fiscal zone to homogenize the individuals tax capacity and supply of public goods (Hamilton (1975)).

Another branch of the literature disagrees with Tiebout's type models. For these works, inter-jurisdictional competition would not generate a *race to the top* process. Oates et al. (1972) has demonstrated that competition among local governments would lead to sub-provision of public services due to either strategic interaction or welfare migration. Our main interest lies in the second case, where the sub-provision of public goods could happen due to low income migrants seeking to enjoy higher benefits in a given jurisdiction. To avoid the distortion between costs and benefits, local governments might deliberately lower public spending to amounts below the social optimum. Brueckner (2000) explores a welfare migration model in which migration equilibrium happens when the total income of poor people[1] from jurisdiction J_1 equals the total income that could be perceived in jurisdiction J_2. The basic implication of the model is that when one jurisdiction increases the amount of benefits supplied, it becomes more attractive to migrants, resulting in a

[1] Income is defined as the sum of wages and total benefits acquired at that jurisdiction.

inflow of people and a increase in the marginal cost of public services for the the non poor. Considering that political and financial power is higher for the non poor, they could pressure for a lower level of public spending to restrain unwanted migration, since their higher income allowed then to search for private services instead of public ones. Brueckner (2003) also emphasizes that models of welfare competition also falls into the resource-flow category, so that a reaction function could be calculated.

Borjas (2011) discussed the welfare magnet hypothesis, which is related to the welfare migration theory. According to the author, migratory decisions would be influenced by the generosity of the welfare system of a given destination. There are several empirical studies about welfare migration, some of those find evidence of the phenomenon. Among those studies, there are those who evaluate a specific population (Blank (1988), Meyer et al. (1998)), public education expenditures (Speciale (2012)), family aid programs ((JR, 1981), labor market selectivity (Razin (2013), Razin e Wahba (2015), Bhagwati e Hanson (2009), Jasso e Rosenzweig (2008)) and overall size of the generosity of the welfare state (Giorgi e Pellizzari (2009)). Other studies didn't find any strong evidence between migration and welfare generosity (Walker e Poverty (1994), Levine e Zimmerman (1999)). In conclusion, empirical evidence is quite mixed and this is probably due to the fact that most of these studies do not consider endogeneity or ignore the migration regime (whether immigration is free or restricted) to assess how welfare policy might affect migration.(Giulietti e Wahba (2013)).

To have a better understanding on how this channel works it is imperative to address some sort of causal methodology and for that reason we'll explore a Brazilian federal transfer law called *Fundo de participação dos municípios*, or FPM, which displays exogenous variation due to it's allocation mechanism based on population brackets. Since the amount of federal transfers increases with population, it creates incentives for some municipalities to attract people, and therefore, increase their own revenues. At the same time, the higher amount of revenues could be used to increase the quality of the public services, so that if we assume that individuals are able to compare and distinguish which location supplies better public services we would have a case of welfare migration.

This paper aims to contribute to the migration literature by using a causal methodology to assess the impact of an exogenous rule over migration variables. To do that, we reviewed several works that have used FPM discontinuities. Brollo et al. (2013) have found a positive effect of FPM transfer over different measures of corruption, Litschig e Morrison (2010) were able to identify that an increase in transfers would cause the likelihood of reelection and local public spending to also increase. Litschig e Morrison (2013) found a direct impact of FPM transfers over development indicators such as schooling per capita and literacy rates, what seems to indicate that the higher revenues are indeed spent to offer better public services. Corbi, Papaioannou e Surico (2018) identified the causal effect of public spending on local labour markets and were able to show that most of this effect comes from services and it is more pronounced in municipalities where individuals face some sort of liquidity constraint, Mata (2015) identified that the municipalities of São Paulo state that are less dependent of federal grants have a faster growing housing sector. The author also theorizes about how municipalities at different sides of the population threshold would relate to migration in his setting and concludes that land use would play a key role at retaining or attracting people, depending if the benefits of new land use regulations surpasses it's costs[2].

[2] Costs can be portrayed as zoning costs

Our analysis is closest to Mata (2015), but we do not restrict our database to only São Paulo state and we use the effective number of migrants instead of relying on population and housing market growth[3] as we seek to have a better understanding of the fiscal channel related to migration. In other words we want to get more insight on how migration might be affected when facing an exogenous fiscal windfall via the municipality behavior over it's public spending and fiscal effort. Municipalities that have just crossed one cutoff have an incentive to have a lower fiscal effort since their revenues are guaranteed due to the FPM population scheme, however as population grows and per capita spending decreases, the incentive shifts to raise fiscal effort. Considering that public service quality might varies even more than per capita revenue across population sizes, attraction and repulsion should be a concern for in-migration just as evasion and retention for out-migration[4]. Gadenne (2017) found that governments spend increases in tax revenues more toward expenditures that raises citizens' welfare than increases in grant revenues. If the way governments are financed matters, this must be addressed when we talk about welfare migration.

Our results show that there seems to have a higher impact of an increase in federal transfers over in-migration than out-migration. Also, we found no support of welfare migration in Brazil, probably due to the fact that individuals can't correctly evaluate how those revenues increases are being spent, since it probably has little effect on their welfare.

The rest of the paper is structured as follows. After this introduction, we present the institutional background and data. Section three discuss the estimation and the last section concludes.

1 Institutional Background and Data

The proclamation of the constitution of 1988 completely changed how Brazilian public finance would be managed by promoting a more decentralized orientation. Since then, the 26 States and 5570 municipalities share different responsibilities regarding tax collection and supply of public goods. For example, local governments, which are the lowest level of administration, are in charge of services more closely related to a specific population such as public transportation, primary education, street lighting, garbage collection, urban planning and city maintenance. Other services, which demand a larger scale, are usually responsibility of a higher instance of government, such as the federal government. According to Carneiro (2014), such division aims to increase the efficiency in the provision of public services.

Municipality governments, or *municípios*, acquire their revenue from transfers or from their fiscal effort[5]. Taxes on services and on property are the biggest shares of revenue related to the local fiscal performance, despite this, it roughly represents 4% of total municipal revenue in our sample, so that it is required some sort of transfer to complement

[3] When population growth is used, migration is just one part of the effect, since births and deaths also change population size. Moreover, although housing growth displays a strong correlation with migration, it is far from being free from criticism, since housing market could increase/decrease without migration if there is some sort of pent-up demand in that region

[4] To be able to assess more accurately how those forces influence municipality fiscal behavior, a origin and destination approach is recommended because each observation is a destination and a origin at the same time (Oliveira e Chagas (2017)). One model that could be used is a gravitational Spatial Interaction Model, but in this case our causality claim would be lost.

[5] Fiscal effort comprises all taxes and fees collected by the municipality.

the fiscal budget. There are two main types of transfers, Constitutional direct transfers and indirect transfers, the former are the ones which the financial resource is directly passed to the mayor, or *prefeito*, and the latter are those which is necessary some sort of fund. In general, transfers' purpose are to mitigate regional disparities, so that resources are passed on to the needy areas. Among the different types of transfers, the most important is the FPM fund, or *Fundo de Participação dos Municípios*, which was constituted by 22,5% of the Income tax and Industrial Product Tax until 2007, when the Constitutional Amendment 55/2007 added 1% to that amount. From that date on the new amount to be passed would be 23,5%. Taking in account such change, the FPM program represented 35,4% of total revenues in both years 2000 and 2010 in our sample[6].

The regulation for the FPM program came from the National Tax Code, or *Código Tributário Nacional*, in 1966 and was subsequently ratified for the Federal Constitution of 1967. There were some changes over the years, but from 1988 until recent years, the basic scheme remains practically the same. The financial resource allocated to the fund is redistributed to the 26 states following a fixed share rule. Within each state, those funds are then distributed to the municipalities according a coefficient rule determined by population brackets. The coefficients and population brackets are presented in figure 1.

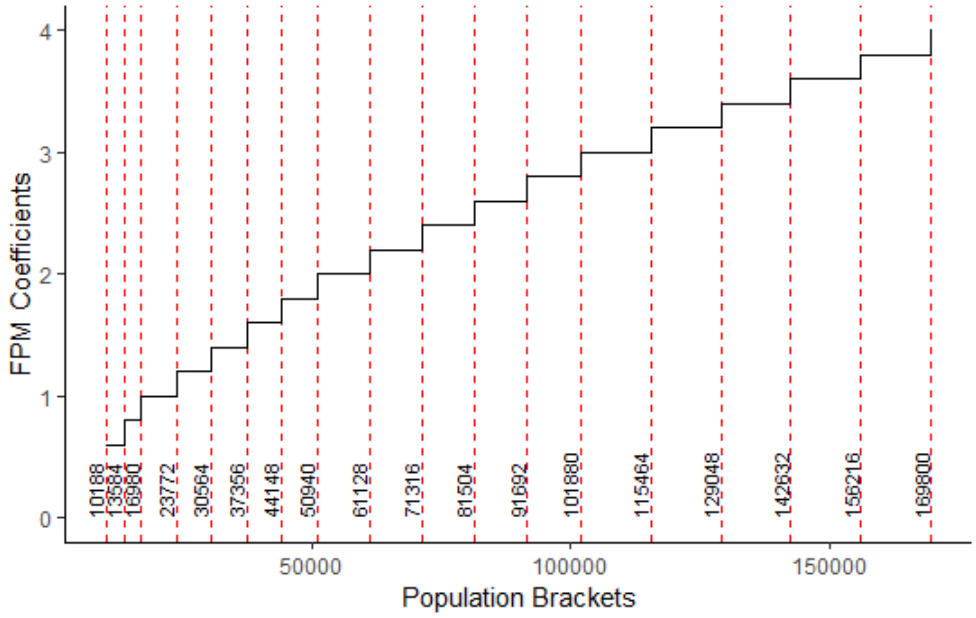

Figure 1 – FPM Scheme based on population brackets

The resource allocated to the FPM fund is distributed as it follows. First the brazilian statistical agency (IBGE) estimates the population for the next year. Second, the Federal Audit Court, or *Tributal de Contas da União - TCU*, generates the transfer share to be designated to each municipality following the legal basis. As said before, the calculation uses a fixed share for each state and a coefficient for each municipality based in its population. Finally the amount of FPM transfers received by municipality i in state

[6] The Federal Constitution also imposes that local governments must spend 25 percent of total revenues on education and 15 percent on health care

k and year t is[7]

$$FPM_{i,k,t} = \left(\frac{FPM_{k,t}\psi(pop_{i,t-1})}{\sum_{i \in k} \psi(pop_{i,t-1})} \right) \tag{1}$$

where $FPM_{k,t}$ represents the total revenue received for state k, $\psi(pop_{i,t-1})$ is the coefficient bracket calculated with IBGE's population estimates in the previous year. The denominator sums all municipalities coefficients in state k.

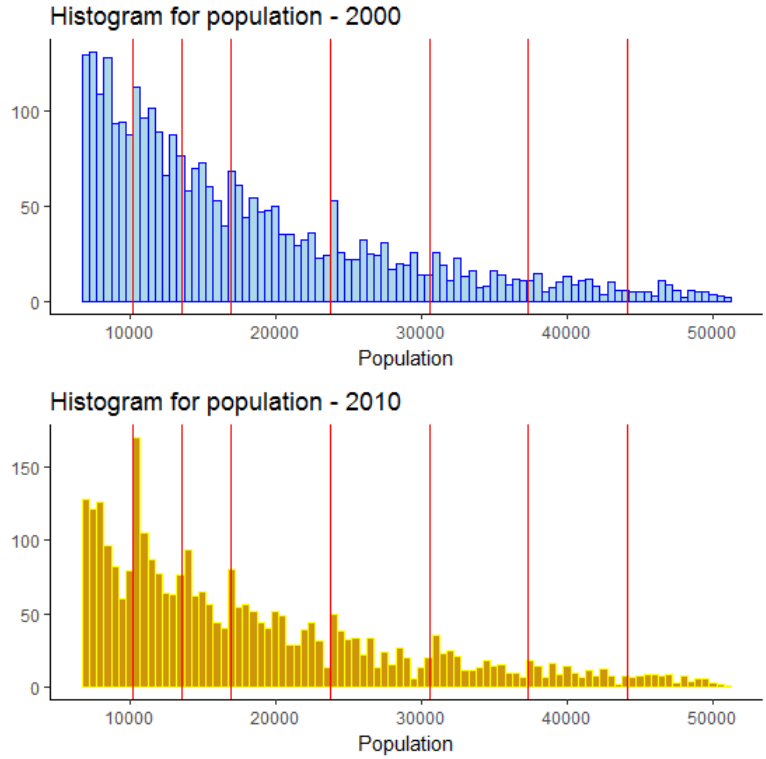

Figure 2 – Histogram for years 2000 and 2010

Data on population are obtained from IBGE. We also use the estimated population IBGE sent to the Federal Audit Court to estimate a theoretical transfer supposing the share rule based on population brackets were perfectly enforced. The reason we compute this variable is for our empirical strategy to be explained in the next section. Municipal fiscal data was collected on the National Treasury's website, *Tesouro Nacional - FINBRA*. It includes variables related to public expenditures and revenues sources, like health expenditure, local taxes, the actual amount of FPM transfers received by each municipality and many others. Municipal characteristics were retrieved from PNUD, *Programa das Nações Unidas para o Desenvolvimento*, which uses data from the Brazilian Census.

Finally, migration data was also retrieved from the Brazilian Census. To count the number of individuals that migrated we used the question about where (which city) the individual was five years ago and with that information we computed three different measures of migration, in-migration, out-migration and population balance, which is the difference between the first two measures. All three variables were calculated for the role

[7] This calculation does not apply for state capitals and municipalities with more than 142633 inhabitants, also known as *municípios da reserva*

sample, high educated individuals[8] and vulnerable individuals[9]. The data was collected for years 2000 and 2010[10], monetary values were measured in 2010 prices and we follow Brollo et al. (2013) and used only municipalities within 6796 - 50940 inhabitants range.

Table 1 – Actual and Theoretical FPM transfers

Population	Actual Transfers	Theoretical Transfers	Obs.
6793 - 10188	3,82	3,71	1398
10189 - 13584	5,01	4,86	1239
13585 - 16980	6,16	6,10	851
16981 - 23772	7,44	7,38	1156
23773 - 30564	8,58	8,50	666
30565 - 37356	9,86	9,87	424
37357 - 44148	11,06	10,96	261
44149 - 50940	15,35	11,57	161
Total	6,60	6,42	6156

Notes: Population is the number of resident inhabitants. The two next columns represent the mean of the actual FPM transfer retrieved form the National Treasury and the theoretical FPM transfer calculated with the population estimates sent from IBGE to the Federal Audit Court. All values are expressed in R$1000000 at 2010 prices.

Table 1 report descriptive statistics by population bracket, on the Actual and theoretical FPM transfers. On average, municipalities on our sample received R$6.6 million. Theoretical transfers are slightly lower, with an average of R$6.42 million. Figure 2 shows the population histogram with FPM's cutoffs. It's clear that something happens next to the cutoffs so that the histogram displays peaks exactly close to then, especially for the first 3 cutoffs. The FPM redistribution system is the main incentive for small municipalities to cross a threshold, so that more money enters it's budget, improving the possibilities in which a mayor might decide to spend that exogenous revenue increase.

[8] Individuals that completed at least one college major

[9] People which family income does not exceed R$250/month

[10] We used only 2000 and 2010 due to the temporality and the consistency of the census questionnaire, especially for the migration variables

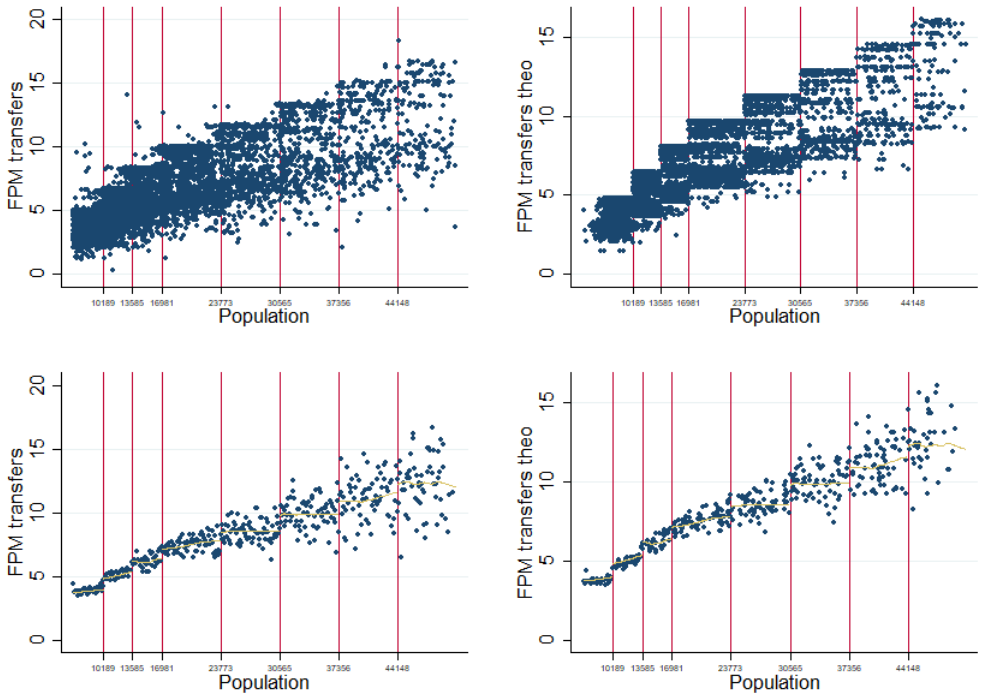

Figure 3 – FPM transfers by population and averaged over 100 inhabitants

Figure 3 explores this relationship and try to shed some light over the phenomenon. As it can be seen, the distribution follows the same pattern of the histograms, that is, municipalities that cross one threshold receive more resources from the FPM fund, which is exactly how the scheme was supposed to work, and why it is possible to see sharp jumps at the cutoffs. Figures on the left report the actual FPM transfers and those on the right, the amount of transfers that would be received if the regulation was perfectly enforced.

2 Empirical Strategy

The institutional background described above is a good candidate to implement a regression discontinuity approach due to the fact that FPM transfers change abruptly at the cutoffs. Therefore, population movements around the cutoffs are possible sources of exogenous variation.

Let $T_i = 1$ if unit i received the treatment and $T_i = 0$ otherwise. Our running variable, which determines the treatment, is the population size, Z_i. If we consider that T_i is a deterministic function of Z_i, a Sharp RDD would be the right choice to estimate the causal effect of regional transfers on migration. However, as we showed at figure 3, there is imperfect compliance to the treatment and for this reason a Fuzzy RDD seems more accurate. In a Fuzzy RDD, treatment eligibility is different from receiving the treatment, so that the probability of receiving the treatment can be different than zero or one, and it also tell us that the greater the population, the higher the probability of receiving more FPM transfers.

We follow Brollo et al. (2013) to estimate the causal impact of exogenous movements across population thresholds on migration outcomes. In other words, we use the theoretical transfers ($\hat{\tau}_i$) as an "instrument" assignment and the actual transfers (τ_i) as the observed treatment under imperfect compliance. Equations (1) and (2) display the "first stage" and

reduced form of our specifications.

$$\tau_i = f(P_i) + \alpha_\tau \hat{\tau}_i + \theta_t + \phi_{st} + u_i \tag{2}$$

$$y_i = f(P_i) + \alpha_y \hat{\tau}_i + \theta_t + \phi_{st} + \eta_i \tag{3}$$

where $f(P_i)$ is a high order polynomial in P_i, θ_t time fixed effects, ϕ_{st} state fixed effects, both errors u_i and η_i are clustered at the municipality level, y_i are our migration outcome measures (in-migration, out-migration and migration balance). The coefficient α_τ identifies the reduced-form (or first-stage) effect of theoretical transfers on actual transfers. The coefficient α_y identifies the reduced-form effect of theoretical transfers on the outcomes.

Considering the continuity assumption, FPM transfers must be the only factor that changes at the population thresholds. To make sure that no other policies are relevant we shall test that all other than FPM factors affecting migration are continuous at the cutoffs. As noted by Brollo et al. (2013) within the 6792-50940 population range there is only one exception, that is the 10,000 inhabitants, which is about the wage-cap between city counselors and state legislators. The authors also tested if the confounding policy would have any influence in their results and showed that it was not the case, since the results were not driven by the first cutoff (10189 inhabitants). The other situation that we should check is if there is some sort of manipulation on the running variable. Monasterio (2013) found some degree of manipulation when comparing TCU's estimates and IBGE's, so that the density is higher just above some cutoffs, which would be a potential problem for our identification. Brollo et al. (2013), Corbi, Papaioannou e Surico (2018), Mata (2015) and Gadenne (2017) presented evidences that results were not affected by any sort of manipulation in the running variable. Eggers et al. (2018) also provided instruments to address those problems.

Under the continuity assumption, we can estimate the causal effect of FPM transfers on migration. To do that we estimate:

$$y_i = f(P_i) + \alpha_y \tau_i + \theta_t + \phi_{st} + \eta_i \tag{4}$$

Equation (2) displays the first stage of the predicted FPM amount on the actual FPM. The second stage in Equation (4) estimates the effect of the FPM on migration. Equation (4) will be estimated for all our migration measures. Note that this strategy will only identify any effect for municipalities around the cutoffs and, besides this, only for the compliers, in other words, observations that receive larger transfers because of the FPM mechanism.

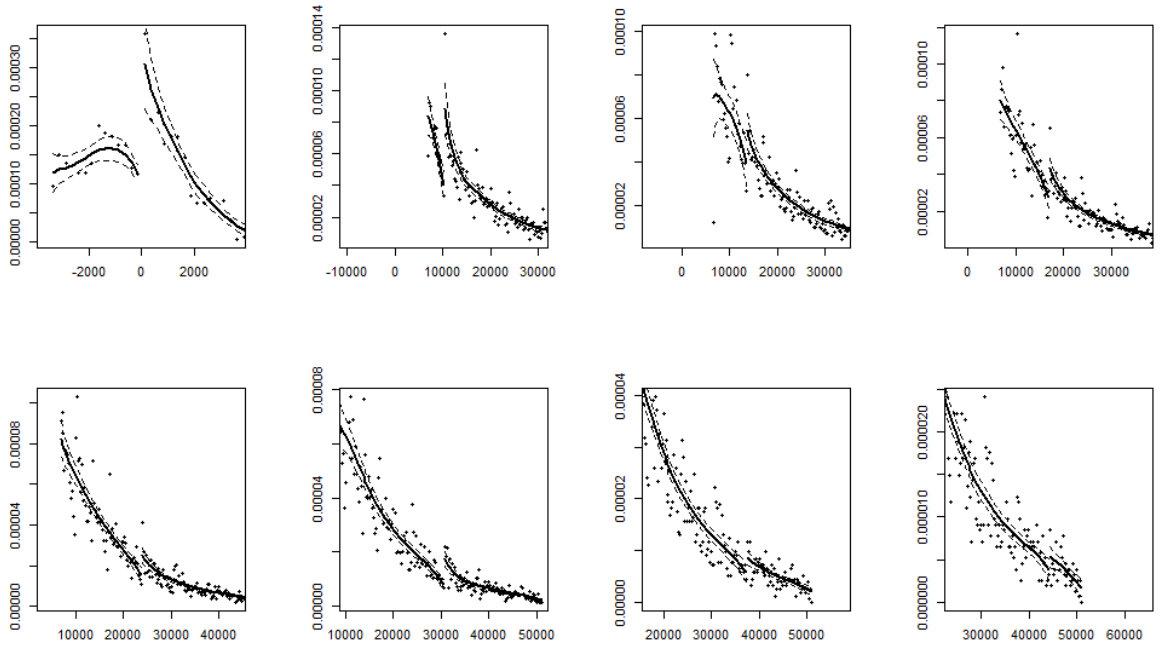

Figure 4 – MCcrary test for normalized cutoff and for each cutoff, 2000 and 2010.

As figure 4 displays the McCrary (2008) test. It shows some signs of manipulation, as pointed by Monasterio (2013). Previous studies about this theme usually had years other than census years for their data. Unfortunately we can only use the Brazilian census to identify individuals who migrated. The census years are more troublesome in this aspect because municipalities can actually observe their population and try to incentive migration if they realize that population estimates of the previous year are close to an upper cutoff. This evidence seems to be more concerning for 2010 and for the lower cutoffs. As shown by Lee e Lemieux (2010), a regression discontinuity design requires that individuals have *imprecise* control over the running variable[11]. If there is *precise* control over the running variable and it correlates with migration outcomes, then we can't estimate any causal effect. According to Eggers et al. (2018), we can also check for discontinuities by testing if the pre-treatment observable characteristics near the cutoff are similar. Mata (2015) showed no signs of evident jumps on pre-treatment characteristics, also Gadenne (2017) briefly explained how population estimates are constructed in Brazil and pointed that none of the previous studies indicating that population densities are higher just above the cutoffs found signs of deliberate manipulation in the IBGE's population estimates.

3 Estimation and Discussion

This section will evaluate how migration outcomes respond to exogenous changes in regional transfers. To do that we need to discuss some prior assumptions related to the empirical design. First, as we pointed on figure 3, there seems to be some sort of discontinuity due to the FPM scheme. Even though there is no need of perfect enforcement

[11] If individuals—even while having some influence—are unable to precisely manipulate the assignment variable, a consequence of this is that the variation in treatment near the threshold is randomized as though from a randomized experiment

for the fuzzy RD-design, some degree of enforcement must be present. Another condition is that municipal revenues and municipal expenditure, at least those more related to increase welfare perception[12], should also change at the cutoffs. Figure 5 provide a graphical illustration of this situation when pool all thresholds together by normalizing population size according to the distance of each municipality from the above or below threshold. There are evident jumps for both items, which shows that municipalities that just crossed a threshold does not collect more municipal taxes, even though they raise their expenditures. These findings are in accordance with a common stylized fact that credit this behavior to the guaranteed new influx of federal transfers.

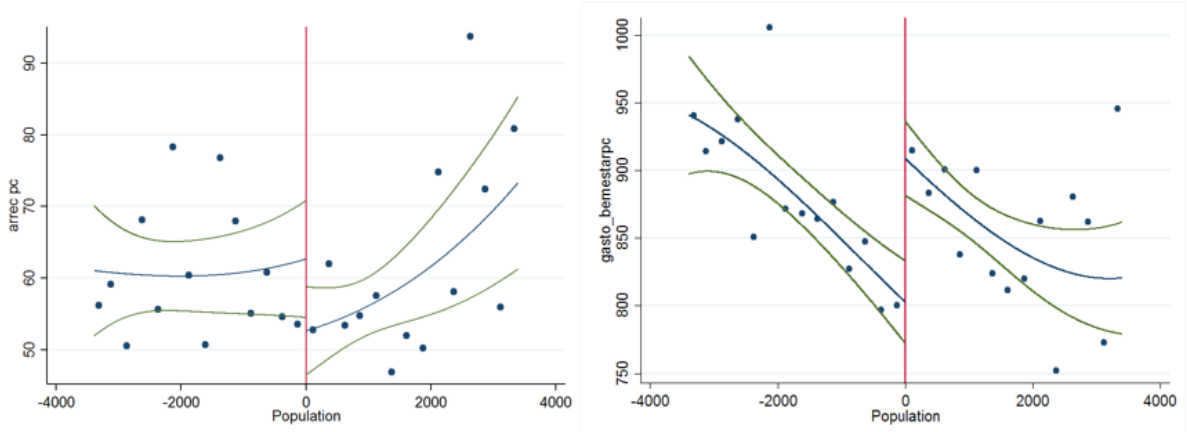

Figure 5 – Municipal revenues per capita (left) and municipal expenditure per capita related to welfare perception (right).

Table 2 estimates the first-stage and the reduced-form regressions of in-migration and out-migration measures. We control for a third-order polynomial in population size, as well as year and state dummies. Each column in the heading represents the dependent variable (outcome) and each cell present the estimate coefficients of theoretical transfers. The row "Overall" estimates the effect across all thresholds (1-7). To explore some degree of heterogeneity, the next rows focus on the pooled thresholds of 1-3, 4-7 and each threshold. To obtain those estimates we interacted equations (2) and (3) with a full set of dummies ranging from the midpoint below to the midpoint above every FPM threshold, as portrayed by Brollo et al. (2013).

Column (1) reports the estimated first-stage coefficient of theoretical on actual transfers. As pointed before, there must be some level of enforcement and the highly significant estimates, most of them near to 1[13], show that enforcement isn't perfect, but rather strong. The remaining columns report the reduced form effects of theoretical FPM transfers on migration outcomes, which are, in-migration and out-migration for total individuals, high educated individuals and vulnerable individuals. Overall effect points to a reduction in the number of migrants who enter a given municipality based on a increase of theoretical transfers. Our estimates seem to show that any increase in local revenues aren't spent on services and public goods that individuals could notice, which could be due to the fact pointed by Gadenne (2017) that the type of revenue matters when municipal governments decide on how to spend any revenue increase. On the other hand, out-migration estimates show that high educated individuals seem to leave their

[12] Expenditures in health, sanitation, education, culture, public pension, assistance and public security
[13] R^2 is around 0.9-0.92

municipalities when facing exogenous increases on theoretical FPM transfers. This evidence could indicate that high educated individuals are capable to better track how public funds are spent and, in case of a transfer increase, which was not spent to boost welfare, might decide to leave a given city.

Table 2 – Reduced-Form Effects: FPM Transfers and Migration Measure

	(1) fpm_actual	(2) in_mig_tot	(3) out_mig_tot	(5) in_mig_c	(6) out_mig_c	(8) in_mig_p	(9) out_mig_p
Overall	0.971***	-2.98e-05***	-2.38e-06	-3.69e-07*	8.55e-07***	-8.71e-06***	-6.45e-06***
	(0.0136)	(3.36e-06)	(2.06e-06)	(2.04e-07)	(1.36e-07)	(1.01e-06)	(7.45e-07)
Thesholds 1-3	0.568***	-2.20e-05***	8.89e-06***	-6.46e-07***	-3.67e-07	-5.70e-06***	4.01e-06***
	(0.0754)	(4.34e-06)	(2.62e-06)	(2.01e-07)	(2.40e-07)	(1.41e-06)	(9.72e-07)
Thesholds 4-7	0.665***	-2.06e-05***	-3.88e-06	-2.87e-07	4.66e-07*	-5.91e-06***	-4.94e-06***
	(0.0789)	(3.93e-06)	(2.81e-06)	(1.82e-07)	(2.63e-07)	(1.09e-06)	(8.46e-07)
Treshold 1	0.998***	8.11e-06***	1.64e-05***	2.54e-06***	1.83e-06***	-1.67e-05***	-7.06e-06***
	(0.0140)	(2.41e-06)	(1.53e-06)	(1.24e-07)	(8.86e-08)	(9.44e-07)	(5.90e-07)
Treshold 2	1.011***	-4.97e-06*	1.21e-05***	1.79e-06***	1.49e-06***	-1.64e-05***	-6.50e-06***
	(0.0156)	(2.83e-06)	(1.73e-06)	(1.35e-07)	(9.03e-08)	(1.18e-06)	(6.39e-07)
Treshold 3	1.075***	1.71e-05***	7.18e-06***	2.24e-06***	1.54e-06***	-7.90e-06***	-8.40e-06***
	(0.0130)	(3.46e-06)	(1.52e-06)	(1.63e-07)	(8.72e-08)	(1.26e-06)	(6.11e-07)
Treshold 4	1.092***	-5.22e-06	-8.25e-07	1.23e-06***	1.71e-06***	-1.19e-05***	-1.29e-05***
	(0.0171)	(5.62e-06)	(2.03e-06)	(1.29e-07)	(1.20e-07)	(1.35e-06)	(8.10e-07)
Treshold 5	1.069***	-1.12e-06	2.14e-06	1.60e-06***	2.00e-06***	-1.06e-05***	-1.14e-05***
	(0.0240)	(3.07e-06)	(2.68e-06)	(1.79e-07)	(1.84e-07)	(1.24e-06)	(9.12e-07)
Treshold 6	1.130***	-8.84e-06**	-5.24e-06	1.41e-06***	1.78e-06***	-1.15e-05***	-1.42e-05***
	(0.0242)	(4.39e-06)	(3.71e-06)	(2.59e-07)	(2.18e-07)	(1.15e-06)	(1.55e-06)
Treshold 7	0.566***	9.22e-07	-6.74e-06	1.17e-06***	1.05e-06**	-6.59e-06***	-8.89e-06***
	(0.110)	(3.35e-06)	(5.23e-06)	(3.56e-07)	(4.63e-07)	(1.70e-06)	(1.96e-06)

Notes: Reduced-forms effects of theoretical FPM transfers and migration measures. Each cell reports the estimated coefficient of theoretical FPM transfers - controlling for a third-order polynomial in normalized population size, year dummies, and state dummies. The coefficient of the "Overall" are obtained with all thresholds; the heterogeneity coefficients in other rows are obtained interacting our regressions with a set of population-interval dummies. Theoretical and Actual transfers are expressed at 2010 prices. We use years 2000 and 2010 and we cluster errors at the municipality level. *** p<0.01, ** p<0.05, * p<0.1

In-migration and out-migration for total individuals seem to be more relevant in the lower thresholds, even though in-migration also is significant for the role sample. Different from high educated individuals, the general behavior is that increases in theoretical transfers are related to reduction in both measures for the overall effect, which means that municipalities aren't attracting new people, but at the same time, are retaining those who already live there. This pattern doesn't hold for thresholds 1-3, where it seems that the new revenue also increase the number of out-migrants. When we look for more vulnerable individuals, the behavior is different, since they seem to leave and also not enter a new municipality with a higher share of federal transfers in its budget. This evidence seems rather conflicting, but it shows that poor individuals tend to stay where they currently are, probably due to the increase of cash transfers programs in Brazil, such as the *Bolsa Família* program, which is a national program to help poor individuals that match its requirements.

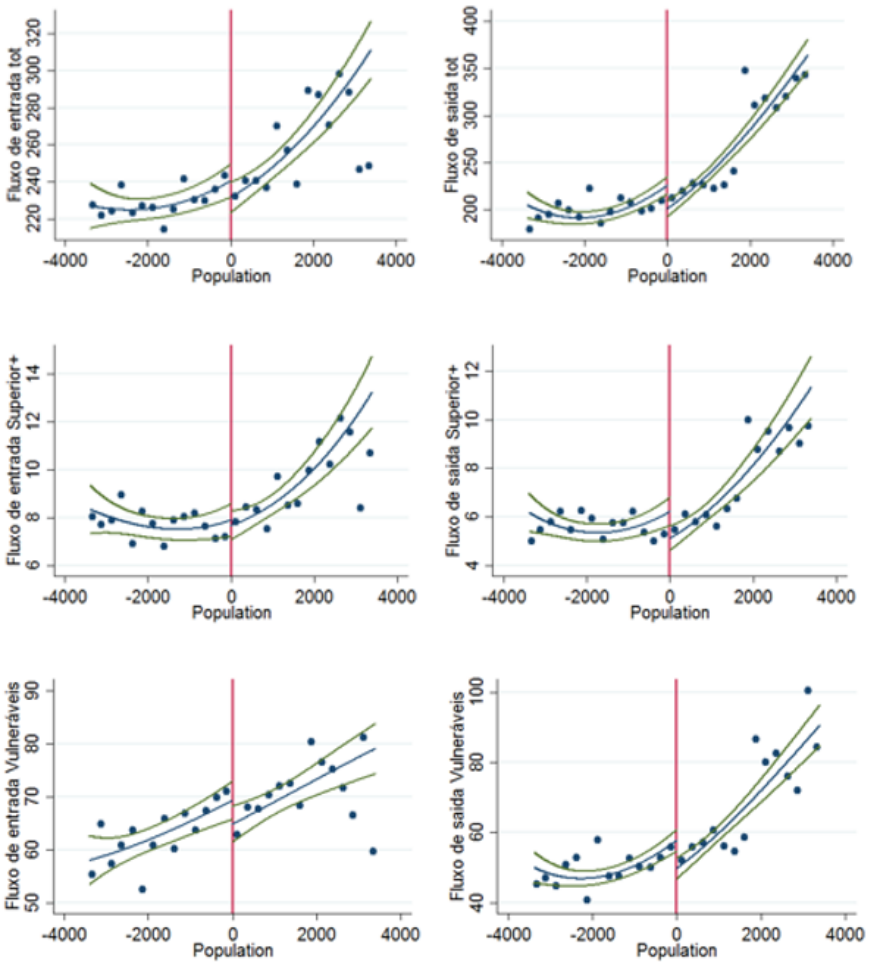

Figure 6 – From left to right: In-migration, out-migration for total individuals (top), high educated individuals (middle) and vulnerable individuals (bottom).

Figure 6 provide graphical representation of the discontinuities of the migration outcomes[14]. We pool the seven thresholds together by normalizing population and build symmetric intervals around each threshold. Overall, out-migration plots displays relevant discontinuities at zero, but the same does not apply to in-migration, where a clear jump (and statistically significant at 95%) is only found for vulnerable individuals. There seem to be jumps on the total individuals, but statistical significance isn't the ideal, on the other hand, there is no evident jump for high educated individuals that in-migrate due to a increase in theoretical transfers.

[14] Population balance can be found at the Appendix section.

Table 3 – IV Estimates: Migration Measure

	(1) in_mig_tot	(2) out_mig_tot	(3) in_mig_c	(4) out_mig_c	(5) in_mig_p	(6) out_mig_p
Overall	-3.07e-05***	-2.45e-06	-3.80e-07*	8.80e-07***	-8.97e-06***	-6.64e-06***
	(3.46e-06)	(2.11e-06)	(2.10e-07)	(1.40e-07)	(1.05e-06)	(7.69e-07)
Thesholds 1-3	-3.58e-05***	7.52e-06*	-8.71e-07***	-1.37e-07	-9.61e-06***	1.58e-06
	(4.73e-06)	(4.22e-06)	(2.94e-07)	(3.76e-07)	(1.60e-06)	(1.01e-06)
Thesholds 4-7	-3.13e-05***	-4.85e-06	-4.65e-07*	6.39e-07*	-8.94e-06***	-6.75e-06***
	(3.99e-06)	(4.24e-06)	(2.63e-07)	(3.68e-07)	(1.16e-06)	(8.59e-07)
Treshold 1	-6.88e-05***	1.58e-05**	-2.29e-06***	-7.62e-07	-1.68e-05***	7.56e-06***
	(7.47e-06)	(6.80e-06)	(4.77e-07)	(5.96e-07)	(2.34e-06)	(1.73e-06)
Treshold 2	-5.85e-05***	1.15e-05**	-1.60e-06***	-3.33e-07	-1.64e-05***	3.78e-06***
	(5.62e-06)	(4.89e-06)	(3.48e-07)	(4.18e-07)	(1.89e-06)	(1.27e-06)
Treshold 3	-3.02e-05***	6.27e-06	-8.05e-07***	-1.19e-07	-7.43e-06***	9.42e-07
	(5.57e-06)	(4.14e-06)	(3.12e-07)	(3.61e-07)	(1.87e-06)	(1.06e-06)
Treshold 4	-4.60e-05***	-1.09e-06	-1.46e-06***	1.72e-07	-1.10e-05***	-3.96e-06***
	(7.39e-06)	(4.03e-06)	(2.83e-07)	(3.40e-07)	(1.87e-06)	(1.10e-06)
Treshold 5	-3.79e-05***	1.68e-06	-8.18e-07***	6.26e-07*	-9.95e-06***	-3.63e-06***
	(4.49e-06)	(4.05e-06)	(2.79e-07)	(3.34e-07)	(1.54e-06)	(1.15e-06)
Treshold 6	-4.02e-05***	-4.90e-06	-7.90e-07***	4.79e-07	-1.02e-05***	-6.34e-06***
	(4.83e-06)	(4.22e-06)	(2.95e-07)	(3.13e-07)	(1.31e-06)	(1.47e-06)
Treshold 7	-2.89e-05***	-1.23e-05	1.59e-07	8.21e-07	-1.17e-05***	-9.95e-06***
	(7.15e-06)	(1.15e-05)	(7.15e-07)	(9.11e-07)	(2.15e-06)	(2.17e-06)

Notes: Effects of FPM transfers on migration measures. Each cell represent the estimated coefficient of actual FPM transfers (instrumented with theoretical FPM transfers) - controlling for a third-order polynomial in normalized population size, year dummies, and state dummies - in a regression where the dependent variable correspond to each column heading. Theoretical and Actual transfers are expressed at 2010 prices. We use years 2000 and 2010 and we cluster errors at the municipality level. *** p<0.01, ** p<0.05, * p<0.1

Table 3 estimates the baseline IV regressions indicated in equation (4) where theoretical transfers are used as instruments for actual transfers. Again we control for a third-order polynomial in population size, year and state dummies. Point estimates seem slightly higher than firs-stage coefficients and out-migration also seems less relevant, since their statistical significance drops a lot for columns (2) and (4). Estimates for total individuals who in-migrate displays a negative impact of actual transfers throughout all thresholds and this effect seem to be consistent for all combinations of thresholds tested. For the Overall effect, an increase in R$100 thousand causes in-migration to be reduced in about 3 people, which translates in a decrease of 1,1 percent increase in in-migration.

In-migration and out-migration of poor individuals seem to replicate the first-stage signs, but only for the higher thresholds. Lower thresholds, when statistically significant, reinforces the non-migration behavior by those individuals. Out-migration for high educated individuals are only significant for the overall effect, even though estimates are very low. Again the same pattern was replicated in the IV-setup.

On the role, results pointed to a higher effect of actual transfers over in-migration than out-migration. As it seems, municipalities up to 50940 inhabitants that are granted with more transfers does not use them in a way that the average individuals are capable to notice any welfare improvement and, for that reason, they are not compelled to leave their current city. Welfare migration does not find support on our results.

Conclusion

Welfare migration theory provides several insights about how individuals would behave when facing adversities in their home regions. It is a common strategy to look for better opportunities and better conditions to live, however migratory flows have intensified in recent years, becoming a major concern for public police. To shed some light over this

topic, we used a fiscal rule in Brazil that provided exogenous variation to identify the impact of a increase in federal grants over migration measures. We found little support of welfare migration in Brazil, since individuals seem to not be able to correctly evaluate how this revenue increase is spent.

Our empirical strategy follows a growing literature over Regression discontinuities with the FPM law. Our contribution to this literature is to explore it's particularities to evaluate migration measures, more specifically, welfare migration outcomes. Also, to our knowledge, this is the first paper that attempted to estimate causal impacts of FPM transfers with migration data from the Brazilian census. Mata (2015) estimated his results using data from population growth and housing market for São Paulo state only. Our results comes from municipalities in all states of Brazil.

We do realize the need to better discuss how the migration and fiscal channel works, therefore for the next steps we'll explore some robustness checks and, at the same time, make sure that our identification strategy is correct. We believe that addressing those issues, our claim will be stronger, since we have to deal with the low external validity of a regular RDD, even more when a fuzzy setup was used.

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ANNEX A – Tables and Figures

Table 4 – Migration Variables means

Population	in-mig_tot	out-mig_tot	mig-b_tot	in-mig_c	out-mig_c	mig-b_c	in-mig_p	out-mig_p	mig-b_p
6793 - 10188	187,91	123,37	64,55	5,53	3,09	2,44	53,13	30,34	22,8
10189 - 13584	219,19	160,13	59,07	6,4	3,87	2,53	65,06	40,49	24,58
13585 - 16980	251,95	198,53	53,41	8,04	4,94	3,1	72,08	50,18	21,9
16981 - 23772	241,72	249,94	-8,23	8,95	6,82	2,13	64,42	63,43	0,99
23773 - 30564	251,55	310,25	-58,7	8,87	8,41	0,46	71,58	82,5	-10,92
30565 - 37356	313,95	387,25	-73,3	13,51	12,71	0,8	78	90,84	-12,84
37357 - 44148	366,9	457,41	-90,51	16,64	14,85	1,8	90,01	108,62	-18,61
44149 - 50940	440,97	524,01	-83,04	22,87	19,69	3,18	94,63	117,89	-23,27
Total	284,27	301,36	-17,09	11,35	9,3	2,06	73,61	73,04	0,58

Notes: In-migration (in-mig), out-migration (out-mig) and population balance (mig-b) variables for total individuals (total), high educated individuals (c) and vulnerable individuals (p). All data retrieved from the Brazilian census of years 2000 and 2010.

Table 5 – Reduced-Form Effects and IV estimates for population balance

	(RF1) popb_tot	(RF2) popb_c	(RF3) popb_p	(IV1) popb_tot	(IV2) popb_c	(IV3) popb_p
Overall	-2.75e-05***	-1.22e-06***	-2.26e-06*	-2.83e-05***	-1.26e-06***	-2.33e-06*
	(4.14e-06)	(1.82e-07)	(1.24e-06)	(4.26e-06)	(1.88e-07)	(1.28e-06)
Thesholds 1-3	-3.09e-05***	-2.79e-07	-9.71e-06***	-4.34e-05***	-7.34e-07**	-1.12e-05***
	(4.92e-06)	(2.40e-07)	(1.38e-06)	(6.23e-06)	(3.16e-07)	(1.82e-06)
Thesholds 4-7	-1.67e-05***	-7.53e-07***	-9.75e-07	-2.65e-05***	-1.10e-06***	-2.19e-06
	(4.85e-06)	(2.47e-07)	(9.62e-07)	(5.90e-06)	(3.01e-07)	(1.42e-06)
Treshold 1	-8.30e-06***	7.07e-07***	-9.60e-06***	-8.46e-05***	-1.53e-06***	-2.44e-05***
	(2.99e-06)	(1.09e-07)	(1.11e-06)	(1.03e-05)	(4.92e-07)	(2.88e-06)
Treshold 2	-1.71e-05***	2.96e-07**	-9.95e-06***	-7.01e-05***	-1.27e-06***	-2.01e-05***
	(3.39e-06)	(1.24e-07)	(1.25e-06)	(7.61e-06)	(3.62e-07)	(2.16e-06)
Treshold 3	9.87e-06***	7.01e-07***	5.02e-07	-3.65e-05***	-6.86e-07**	-8.38e-06***
	(3.82e-06)	(1.32e-07)	(1.44e-06)	(6.97e-06)	(3.11e-07)	(2.14e-06)
Treshold 4	-4.39e-06	-4.76e-07***	9.95e-07	-4.49e-05***	-1.63e-06***	-7.04e-06***
	(6.69e-06)	(1.39e-07)	(1.71e-06)	(9.07e-06)	(3.02e-07)	(2.26e-06)
Treshold 5	-3.25e-06	-3.99e-07**	8.26e-07	-3.96e-05***	-1.44e-06***	-6.32e-06***
	(4.32e-06)	(1.85e-07)	(1.51e-06)	(6.10e-06)	(2.87e-07)	(1.82e-06)
Treshold 6	-3.60e-06	-3.71e-07	2.66e-06	-3.53e-05***	-1.27e-06***	-3.88e-06**
	(6.00e-06)	(2.48e-07)	(1.74e-06)	(6.54e-06)	(2.96e-07)	(1.78e-06)
Treshold 7	7.66e-06	1.27e-07	2.30e-06	-1.66e-05	-6.62e-07	-1.75e-06
	(6.17e-06)	(3.60e-07)	(1.51e-06)	(1.39e-05)	(7.86e-07)	(3.06e-06)

Notes: Reduced-forms effects of theoretical FPM transfers (RF) and IV estimates (IV) of migration measures. Each cell reports the estimated coefficient of theoretical FPM transfers - controlling for a third-order polynomial in normalized population size, year dummies, and state dummies. The coefficient of the "Overall" are obtained with all thresholds; the heterogeneity coefficients in other rows are obtained interacting our regressions with a set of population-interval dummies. Theoretical and Actual transfers are expressed at 2010 prices. We use years 2000 and 2010 and we cluster errors at the municipality level. *** p<0.01, ** p<0.05, * p<0.1

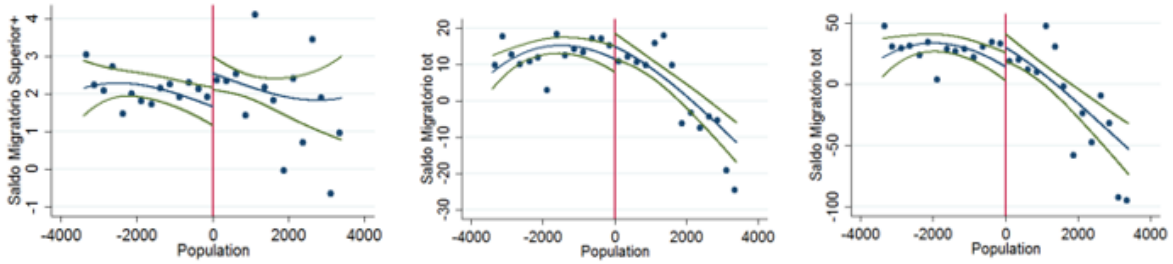

Figure 7 – From left to right: Population balance for total, higher educated and more vulnerable individuals (R$250/month).