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 um aumento na migração de saída, apesar de mais relevante na primeira, o que pode indicar que os indivíduos não são capazes de avaliar corretamente se e como esse incremento de recursos é gasto, havendo portanto, uma tendência de saída para esse grupo de municípios. 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 an increase in out-migration, although the first seems more relevant, which could indicate that individuals are not able to correctly assess whether and how this increment of resources is spent and, therefore, an outward trend could be observed for this group of municipalities. Our results do not find evidence of welfare migration in Brazil.

Key-words: FPM, transfers, migration, welfare
JEL Classification: C10, H73, J10, O10, R10
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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 discussions, 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 to a lot of controversies. McAuliffe e Ruhs (2017) report that more than 740 million people had migrated within their own country of birth, which seems to indicate that it might be important to understand the reasons that make people leave their home cities, notably when public policy is being discussed. According to Drabo e Mbaye (2015) several channels 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 on welfare migration and public finance is very broad, ranging from welfare competition and strategic interaction models such as Tiebout (1956), Oates et al. (1972) and Brueckner (2000) to welfare migration models and empirical studies like Borjas (2011), Giulietti e Wahba (2013) and many others. All those studies tried to investigate how public finance and migration could be related. Overall findings indicate that migration could arise due to welfare spending, meaning that individuals could leave their home regions to a different one if the benefits of doing so are higher than its costs. At the same time, individuals could also leave their home regions if tax collection increase, raising the cost to keep living in a given area. These findings are particularly interesting when we explore how heterogeneous it could be since foster the in-migration of poor individuals could raise the fiscal burden for the other individuals, but fostering in-migration of highly educated individuals could raise tax collection and also the amount of income spent in a given municipality.

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 its 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 revenues. At the same time, a higher amount of revenues could be used to increase the quality of the public services, so that if we assume that individuals can compare and distinguish which location supplies better public services we could have a case of welfare migration. More formally, we have specified a Fuzzy Discontinuity Regression to identify the causal effect of an exogenous resource increase on different migratory measures.

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 such as Brollo et al. (2013) and Corbi, Papaioannou e Surico (2018). 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[1] as we seek to have a better understanding of the fiscal channel related to migration. In other words, we want to get more insight into how migration might be affected when facing an exogenous fiscal windfall via the municipality behavior over its 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 the population grows and per capita spending decreases, the incentive shifts to raise fiscal effort. Considering that public service quality might vary 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[2]. Gadenne (2017) found that governments spend increases in tax revenues more toward expenditures that raise 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 for welfare migration in Brazil, probably because individuals can't correctly evaluate how those revenue 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 a brief literature review and the institutional background and data. Section four discusses the estimation and the last section concludes.

1 Literature

The literature on welfare migration is very broad. 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 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 the 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 studies, 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

[1] 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

[2] To be able to assess more accurately how those forces influence municipality fiscal behavior, an origin, and destination approach is recommended because each observation is a destination and an 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.

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[3] 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 number of benefits supplied, it becomes more attractive to migrants, resulting in an inflow of people and an increase in the marginal cost of public services for 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 which 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)).

The literature on RDD and FPM discontinuities was used to assess different empirical questions and is growing rather fast. 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 on development indicators such as schooling per capita and literacy rates, which 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 labor 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 on 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 on if the benefits of new land-use regulations surpass it costs [4].

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

[4] Costs can be portrayed as zoning costs

2 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 the responsibility of a higher instance of the 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 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 the fiscal budget. There are two main types of transfers, Constitutional direct transfers, and indirect transfers, the former are the ones in 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 is 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 into account such change, the FPM program represented 35,4% of total revenues in both years 2000 and 2010 in our sample[6].

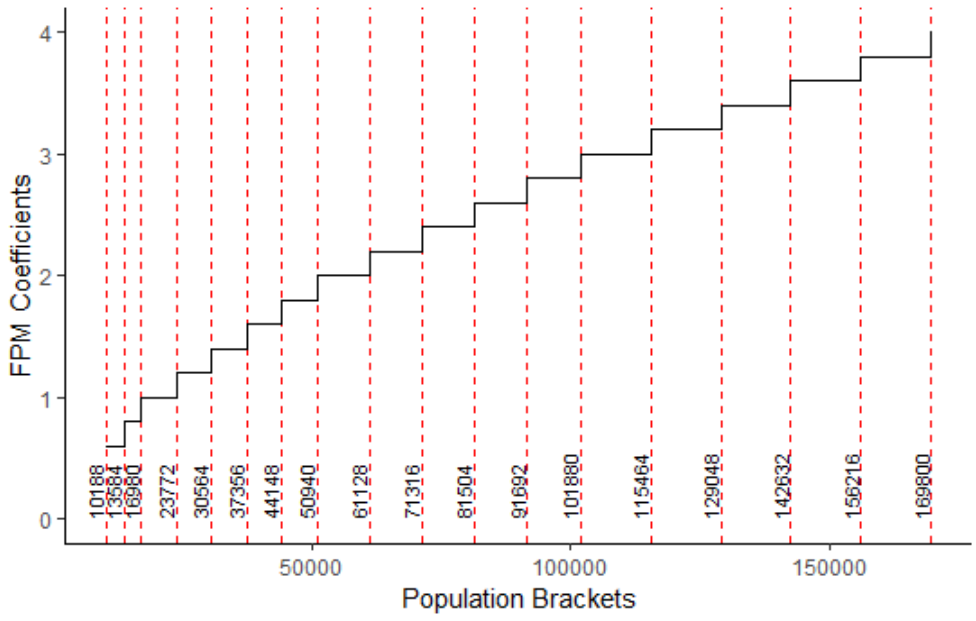

Figure 1 – FPM Scheme based on population brackets

The regulation for the FPM program came from the National Tax Code, or *Código*

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

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

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 to a coefficient rule determined by population brackets. The coefficients and population brackets are presented in figure 1.

The resource allocated to the FPM fund is distributed as 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 on its population. Finally, the amount of FPM transfers received by municipality i in state 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.

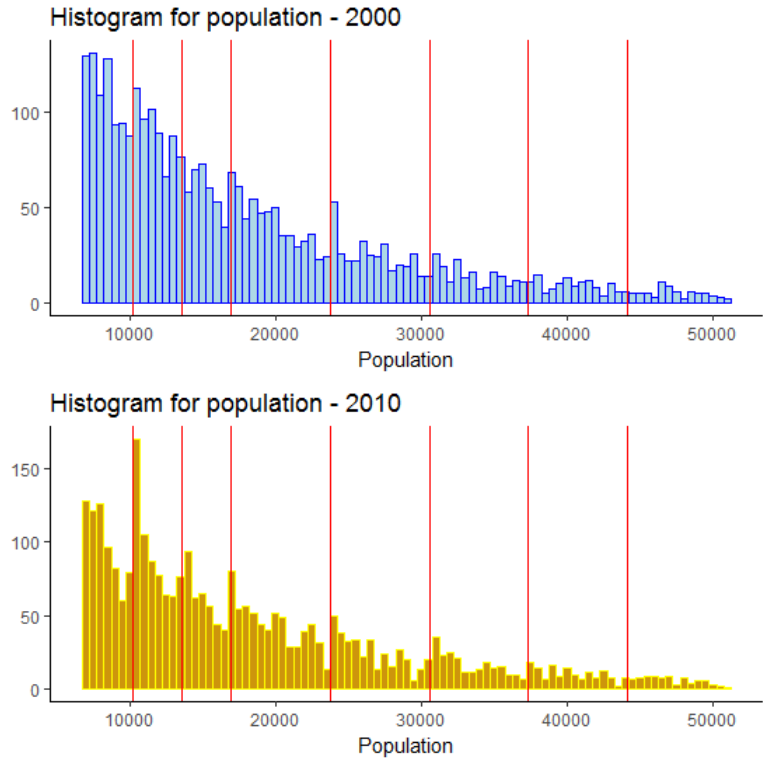

Figure 2 – Histogram for years 2000 and 2010

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 sharing rule based on population brackets that were perfectly enforced. The reason we compute this variable is for our empirical strategy to be explained in the next section.

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

Municipal fiscal data was collected on the National Treasury's website, *Tesouro Nacional - FINBRA*. It includes variables related to public expenditures and revenue 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 two different measures of migration, in-migration and out-migration. Both variables were calculated for the role sample (in_mig_tot and out_mig_tot), high educated individuals(in_mig_b and out_mig_b)[8] and vulnerable individuals(in_mig_p and out_mig_p)[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.[11]

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 from 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. Years 2000 and 2010.

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.

[11] We also computed a third measure, population balance, which is the difference between the first two measures. Some tests are reported in the Appendix section.

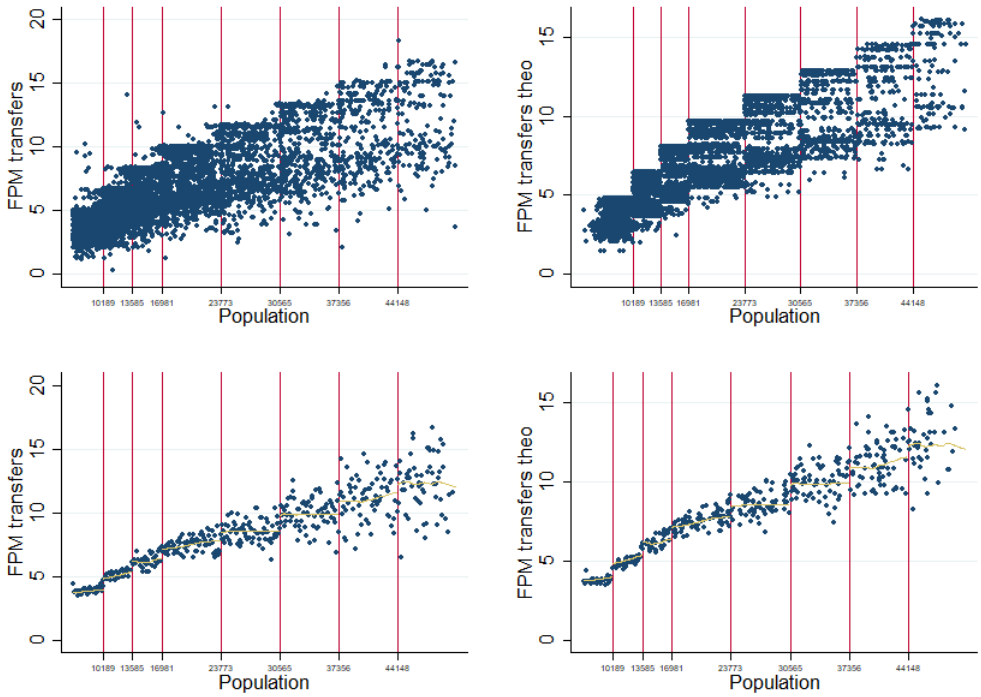

Figure 3 – FPM transfers by population and averaged over 100 inhabitants

Notes: Left panels display scatterplots of Actual FPM transfers versus population size. Right panels display theoretical FPM transfers versus population size. Bottom panels averaged FPM transfers over 100-inhabitant bins plus running-mean smoothing performed separately in each interval between two thresholds. Years 2000 and 2010.

Figure 3 explores this relationship and tries to shed some light on 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.

3 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 in figure 3, there is imperfect compliance with 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 tells 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.

We also estimated those equations with two bandwidths (2.5% and 5%), meaning that local linear regressions include all municipalities within a 2.5 and 5 percent bandwidths of a normalized population cutoff.

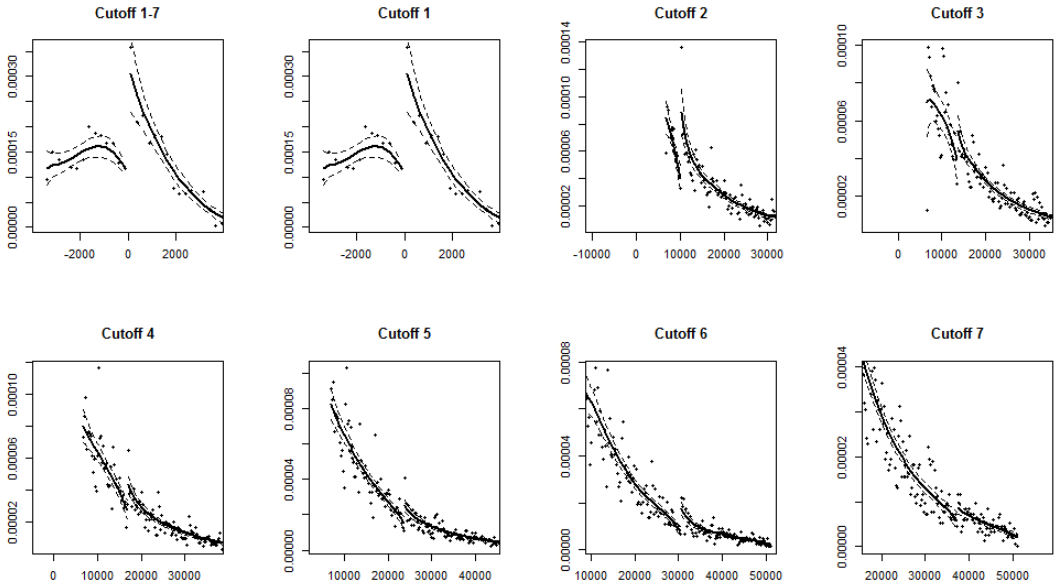

Figure 4 – MCcrary test for normalized cutoff and for each cutoff, 2000 and 2010.

Notes: The density test is described by McCrary (2008). The data on population is from the 2000 and 2010 Brazilian Census. The cutoffs are given by the FPM distribution rule.

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 the lower cutoffs. As shown by Lee e Lemieux (2010), a regression discontinuity design requires that individuals have *imprecise* control over the running variable[12]. 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 out 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.

4 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 in figure 3, there seems to be some sort of discontinuity due to the FPM scheme. Even though there is no need for perfect enforcement for the fuzzy RD-design, some degree of enforcement must be present. Another condition is

[12] 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

that municipal revenues and municipal expenditure, at least those more related to increase welfare perception[13], should also change at the cutoffs. Figure 5 provides 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 do 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.

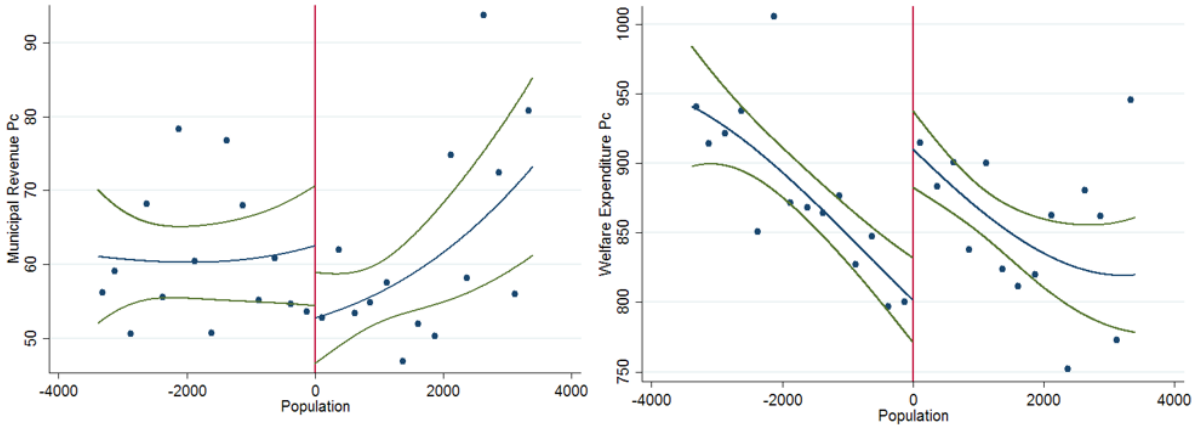

Figure 5 – Municipal revenues per capita (left) and municipal expenditure per capita related to welfare perception (right).

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 presents 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[14], 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, highly educated individuals, and vulnerable individuals. Overall effect points to a reduction in the number of migrants who enter a given municipality based on an 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 individuals seem to leave their municipalities when facing exogenous increases on theoretical FPM transfers and that is especially more relevant for high educated individuals than for poor individuals, which seem to display

[13] Expenditures in health, sanitation, education, culture, public pension, assistance, and public security

[14] R^2 is around 0.9-0.92

an opposite behavior. This evidence could indicate that highly educated individuals are capable of 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 Measures

	(1) fpm_actual	(2) in_mig_tot	(3) out_mig_tot	(4) in_mig_b	(5) out_mig_b	(6) in_mig_p	(7) out_mig_p
Overall	0.971***	-160.4***	51.59***	1.959	11.35***	-20.62***	-2.002
	(0.0136)	(24.66)	(14.84)	(2.016)	(1.276)	(3.736)	(2.489)
Thesholds 1-3	0.568***	-146.4***	53.04***	-7.399***	-4.269*	-13.97***	11.13***
	(0.0754)	(26.20)	(19.95)	(1.652)	(2.465)	(4.231)	(2.706)
Thesholds 4-7	0.665***	-91.18***	28.14	2.516	7.063***	-14.29***	-0.915
	(0.0789)	(25.43)	(21.60)	(1.780)	(2.730)	(3.632)	(2.153)
Treshold 1	0.998***	38.26***	54.33***	12.83***	12.40***	-18.74***	-4.441**
	(0.0140)	(12.28)	(10.49)	(0.741)	(0.705)	(2.813)	(1.878)
Treshold 2	1.011***	3.836	50.18***	10.19***	11.45***	-22.12***	-4.868**
	(0.0156)	(13.67)	(12.70)	(0.738)	(0.743)	(3.666)	(2.356)
Treshold 3	1.075***	-19.61	30.99***	9.694***	11.84***	-17.70***	-8.284***
	(0.0130)	(16.44)	(11.43)	(0.819)	(0.722)	(3.424)	(2.187)
Treshold 4	1.092***	-9.240	35.53**	10.98***	16.62***	-18.75***	-10.66***
	(0.0171)	(29.06)	(14.99)	(1.047)	(1.173)	(3.932)	(2.704)
Treshold 5	1.069***	11.27	70.45***	15.62***	20.66***	-20.02***	-7.886**
	(0.0240)	(31.15)	(21.16)	(1.895)	(1.780)	(7.373)	(3.685)
Treshold 6	1.130***	-60.55	16.28	13.70***	19.08***	-19.95***	-14.25***
	(0.0242)	(45.24)	(28.07)	(2.735)	(2.064)	(6.392)	(4.854)
Treshold 7	0.566***	23.38	-27.89	11.74***	10.88**	-10.37**	-11.61***
	(0.110)	(31.70)	(37.68)	(3.746)	(4.643)	(5.255)	(4.278)
Observations	6154	6154	6154	6154	6154	6154	6154

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 in R$1000000 at 2010 prices. We use the years 2000 and 2010 and we cluster errors at the municipality level. Specifications (2)-(3) report estimates for total individuals, (4)-(5) highly educated individuals and (6)-(7) poor individuals (R$250 or less/month). *** 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 out-migration is also significant for most of the sample. The general behavior for highly educated individuals is that increases in theoretical transfers are related to increases in both measures, particularly when we evaluate each threshold, which means that municipalities are attracting new people, but at the same time evasion is increasing. This pattern doesn't hold for thresholds 1-3, where it seems that the new revenue decrease the number of out-migrants. When we look for more vulnerable individuals, the behavior is different, since they seem to not leave and also not enter a new municipality with a higher share of federal transfers in its budget. This pattern 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.

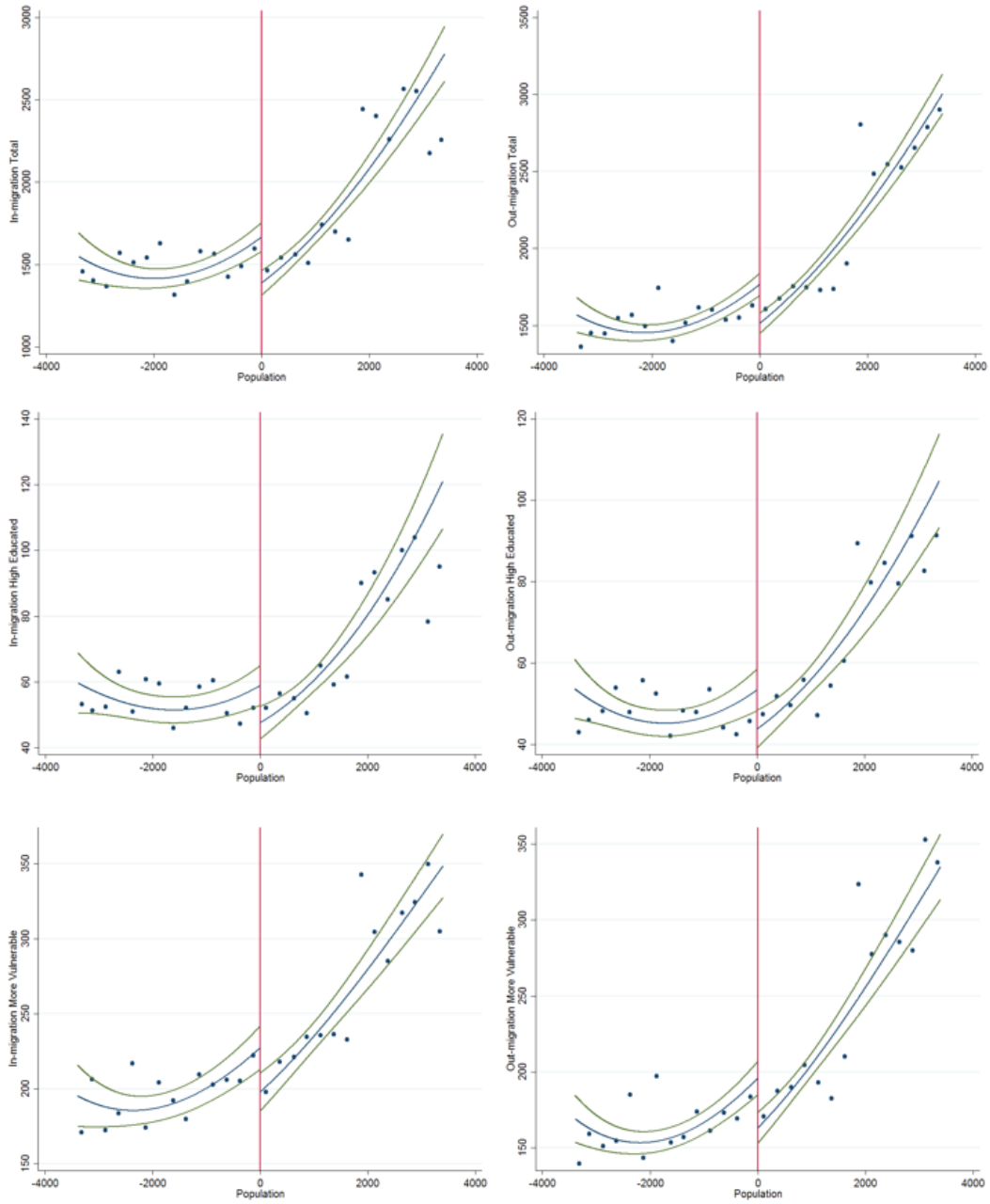

Figure 6 – From left to right: In-migration, out-migration for total individuals (top), high educated individuals (middle) and vulnerable individuals (bottom).

Both results are interesting in different ways because they reveal that increases in revenues could encourage mobility for highly educated individuals and, at the same time, might not influence any locational decision by poor individuals, which could happen due to a series of reasons: 1) The minimum monetary cost required to leave is greater than what a given individual is capable to afford, meaning that poor individuals do not migrate because they do not have the monetary resources to do it. 2) As said before, the increase in cash transfer programs probably also increased the cost to leave a given municipality, since now that person will benefit from the program in any city, meaning that there are fewer reasons to migrate in search of welfare improvement related to fiscal expenditure and 3) some sort of "myopia effect" which could be translated into the inability to perceive where and how any extra revenue is spent, so that if there is any improvement in welfare, individuals can't track it.

Figure 6 provides a graphical representation of the discontinuities of the migration outcomes[15]. We pooled the seven thresholds together by normalizing population, built symmetric intervals around each threshold and averaged over 250-inhabitants bins. The central line is a spline third-order polynomial in population size and lateral lines are the 95 percent confidence interval. Overall, out-migration and in-migration plots display relevant discontinuities at zero.

Table 3 – IV Estimates: Migration Measures

	(1) in_mig_tot	(2) out_mig_tot	(3) in_mig_b	(4) out_mig_b	(5) in_mig_p	(6) out_mig_p
Overall	-165.1***	53.11***	2.017	11.68***	-21.23***	-2.061
	(25.43)	(15.25)	(2.070)	(1.320)	(3.866)	(2.556)
Thesholds 1-3	-212.1***	74.06**	-6.666**	-0.653	-23.42***	11.66***
	(32.91)	(31.01)	(2.685)	(3.698)	(5.566)	(3.705)
Thesholds 4-7	-142.7***	44.66	3.009	9.783***	-21.63***	-0.409
	(30.42)	(31.00)	(2.668)	(3.648)	(4.874)	(3.173)
Treshold 1	-297.6***	121.0**	-14.51***	-7.332	-29.42***	25.79***
	(51.73)	(49.68)	(4.526)	(5.838)	(8.800)	(5.872)
Treshold 2	-230.6***	96.09***	-9.019***	-2.454	-29.30***	16.28***
	(37.71)	(36.11)	(3.183)	(4.088)	(6.983)	(4.680)
Treshold 3	-219.3***	68.67**	-7.362***	-0.810	-22.83***	10.40***
	(35.39)	(30.50)	(2.782)	(3.515)	(5.891)	(3.754)
Treshold 4	-188.8***	68.21**	-4.615*	4.608	-22.89***	6.471*
	(42.38)	(29.50)	(2.711)	(3.331)	(5.852)	(3.774)
Treshold 5	-150.7***	97.78***	1.463	9.825***	-23.83***	7.136
	(38.85)	(30.43)	(2.822)	(3.281)	(8.112)	(4.434)
Treshold 6	-195.3***	42.59	0.564	8.540***	-22.14***	0.167
	(44.85)	(31.27)	(3.049)	(3.036)	(6.552)	(4.666)
Treshold 7	-91.62	-23.28	9.939	11.43	-22.54**	-8.598
	(69.05)	(83.40)	(7.558)	(8.999)	(10.50)	(7.494)
Observations	6154	6154	6154	6154	6154	6154

Notes: Effects of FPM transfers on migration measures. Each cell represents 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 corresponding to each column heading. Theoretical and Actual transfers are expressed in R$1000000 at 2010 prices. We use the years 2000 and 2010 and we cluster errors at the municipality level. Specifications (1)-(2) report estimates for total individuals, (3)-(4) highly educated individuals and (5)-(6) poor individuals (R$250 or less/month). *** 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 higher than first-stage coefficients and out-migration also seems less relevant, since their statistical significance drops a lot for column (4). Estimates for total individuals who in-migrate displays a negative impact of actual transfers throughout all thresholds and this effect seems to be consistent for almost all combinations of thresholds tested. For the Overall effect, an increase of R$1 million causes in-migration to be reduced to about 165 people, which translates to a decrease of 5.1 percent in in-migration. At the same time, an increase of R$1 million causes out-migration to increase in about 53 individuals, or 2.1 percent.

Those results are in line with the first stage estimates and seem to show that revenue increases from federal transfers do not attract people, on the contrary, it seems to expel current residents, which might indicate that not only individuals do not perceive any welfare improvement, but also seem to believe that this new revenue might not be spent on any type of welfare increasing service at all, meaning that other factors, such as corruption could be important to understand this behavior.

[15] Population balance can be found in the Appendix section.

The in-migration of poor individuals seem to replicate the first-stage signs, contrary to out-migration outcomes, which show similar behavior to the other groups, that is increases in federal transfers causing increases out-migration measures. Lower thresholds, when statistically significant, do not reinforce the non-migration behavior by those individuals, since in-migration seems to decrease while out-migration seems to increase. Out-migration for highly educated individuals is only significant for the overall effect and higher thresholds, even though estimates are very low.

Table 4 – Reduced Form and IV Estimates for 2.5% and 5% Population Bandwidths

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A - Reduced Forms						
	fpm_actual	in_mig_tot	out_mig_tot	in_mig_b	out_mig_b	in_mig_p	out_mig_p
Overall (2.5%)	0.989***	-191.4***	125.7***	-2.579	6.794***	-16.76**	11.41**
	(0.0282)	(37.41)	(30.91)	(2.337)	(2.374)	(8.069)	(5.196)
Overall (5%)	0.967***	-198.2***	73.49***	-3.000	8.437***	5.008	-27.43***
	(0.0217)	(30.97)	(21.96)	(2.772)	(1.826)	(3.934)	(6.265)
	Panel B - IV Estimates						
Overall (2.5%)		-193.6***	127.1***	-2.609	6.872***	-16.95**	11.54**
		(38.38)	(30.75)	(2.343)	(2.358)	(8.126)	(5.194)
Overall (5%)		-205.0***	75.99***	-3.102	8.725***	-23.19***	5.179
		(32.49)	(22.56)	(2.848)	(1.878)	(6.257)	(4.042)

Notes: Local Effects of FPM transfers on migration measures. Overall (2.5%) restrict the estimation with a bandwidth of 2.5% around of the normalized population cutoff. Overall (5%) restrict the estimation with a bandwidth of 5% around of the normalized population cutoff. Each cell represents 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 corresponding to each column heading. Theoretical and Actual transfers are expressed in R$1000000 at 2010 prices. We use the years 2000 and 2010 and we cluster errors at the municipality level. Specifications (2)-(3) report estimates for total individuals, (4)-(5) highly educated individuals and (6)-(7) poor individuals (R$250 or less/month). *** p<0.01, ** p<0.05, * p<0.1

Table 4 presents two variants of the Overall effect previously calculated, which restrict estimation in the neighborhood of the seven cutoffs using two bandwidths (2.5% and 5%). Estimates seem very similar to the previous estimation, but slightly higher, indicating that results are locally relevant.

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 do not use them in a way that the average individuals are capable to notice any welfare improvement and, for that reason, they are compelled to leave their current city. Welfare migration does not find support for 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 policy. To shed some light on this topic, we used a fiscal rule in Brazil that provided exogenous variation to identify the impact of an increase in federal grants over migration measures. We found little support for 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 its particularities to

evaluate migration measures, more specifically, welfare migration outcomes. Also, to our knowledge, this is the first paper that attempted to estimate the 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 come 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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APPENDIX A – Tables and Figures

Table 5 – Migration Variables means

Population	in-mig_tot	out-mig_tot	in-mig_b	out-mig_b	in-mig_p	out-mig_p
6793 - 10188	809.85	849.63	23.40	22.64	113.03	87.41
10189 - 13584	1074.63	1160.10	32.42	30.46	158.26	127.43
13585 - 16980	1371.27	1463.00	43.88	39.73	199.32	160.65
16981 - 23772	1785.43	1941.82	64.63	58.56	245.12	218.48
23773 - 30564	2407.09	2573.05	88.91	79.36	336.84	302.42
30565 - 37356	3081.89	3223.24	136.20	120.25	382.62	339.07
37357 - 44148	3604.59	3831.58	168.63	141.40	415.57	402.83
44149 - 50940	4360.72	4433.88	231.24	190.18	449.08	442.09
Total	2311.93	2434.54	98.67	85.32	287.48	260.05

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 the years 2000 and 2010.

Table 6 – RF Effects and IV estimates for population balance

	(RF1) popb_tot	(RF2) popb_b	(RF3) popb_p	(IV1) popb_tot	(IV2) popb_b	(IV3) popb_p
Overall	-212.0***	-9.390***	-18.62***	-218.2***	-9.667***	-19.17***
	(29.93)	(1.767)	(4.225)	(30.86)	(1.820)	(4.362)
Thesholds 1-3	-199.4***	-3.130	-25.10***	-286.1***	-6.013**	-35.08***
	(34.03)	(2.020)	(4.548)	(43.46)	(2.971)	(6.231)
Thesholds 4-7	-119.3***	-4.547**	-13.38***	-187.3***	-6.775**	-21.22***
	(35.45)	(2.253)	(3.935)	(42.55)	(2.988)	(5.599)
Treshold 1	-16.07	0.429	-14.30***	-418.6***	-7.180	-55.21***
	(17.13)	(0.662)	(3.373)	(71.32)	(4.647)	(9.983)
Treshold 2	-46.34**	-1.265*	-17.25***	-326.6***	-6.565**	-45.58***
	(19.28)	(0.761)	(3.935)	(52.26)	(3.319)	(7.623)
Treshold 3	-50.60**	-2.142***	-9.416**	-287.9***	-6.552**	-33.23***
	(20.40)	(0.752)	(3.991)	(45.77)	(2.850)	(6.589)
Treshold 4	-44.77	-5.634***	-8.085	-257.0***	-9.224***	-29.37***
	(37.40)	(1.174)	(4.950)	(54.41)	(2.844)	(6.825)
Treshold 5	-59.18	-5.035***	-12.13	-248.5***	-8.363***	-30.96***
	(39.17)	(1.851)	(8.047)	(49.29)	(2.821)	(8.657)
Treshold 6	-76.83	-5.381**	-5.696	-237.8***	-7.976***	-22.31***
	(55.79)	(2.411)	(7.626)	(56.33)	(2.881)	(7.522)
Treshold 7	51.27	0.855	1.245	-68.34	-1.496	-13.94
	(48.08)	(3.606)	(6.042)	(107.5)	(7.899)	(12.83)

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 the years 2000 and 2010 and we cluster errors at the municipality level. *** p<0.01, ** p<0.05, * p<0.1