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Universidade Federal Fluminense
Faculdade de Economia
Rua Tiradentes, 17 - Ingá - Niterói (RJ)
Tel.: (0xx21) 2629-9699 Fax: (0xx21) 2629-9700
http://www.uff.br/econ

esc@vm.uff.br

Amenidades e Fluxos Migratórios

Filipe Lage de Sousa

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Abstract

The influence of social amenities, positive or negative, on migration flows is an issue not yet fully covered by the literature. This paper investigates whether changing dwellings across cities is associated with violence using urban-urban migration data at municipality level. Results show that migration is affected by crime rates not only locally, but also when neighbouring effects are taken into account.

Resumo

A influência de amenidades sociais, positivas ou negativas, nos fluxos migratórios é um assunto pouco explorado pela literatura. Esse trabalho investiga se a mudança de residência entre cidades está associada à violência usando dados de migração urbana-urbana ao nível municipal. Os resultados mostram que a migração é afetada por índices de criminalidade não só locais, mas também quando efeitos de vizinhança são levados em consideração.

Keywords: Internal Migration, Amenities, Neighbouring Effects.

Palavras-Chaves: Migração Interna, Amenidades e Efeitos de Vizinhança.

JEL Classification: R23, O15, O18, J11, D62

Introduction

Migration is as old as human beings. Moreover, reasons for changing dwellings have not changed dramatically over the years, since the majority of moves relate to individual decisions about where to maximize utility by looking at economic, social and environmental aspects. The majority of these aspects has been studied in previous works, as shown in the survey of Greenwood (1997) and Lucas (1997). Nevertheless, some areas are not fully covered by the existent publications. A vein which has not been completely explored yet is whether amenities are linked to migration. This chapter contributes to the literature by investigating the relationship between migration flows and amenities/disamenities, especially violence.

Amenities are divided into two classifications: natural and social. Natural amenities depend on the geographic characteristics of a particular region, such as natural beauty, temperature and location. Social amenities result from interactions among individuals in a particular location. Natural amenities, in similar fashion to social amenities, vary across regions. However, the latter vary across time, while the former do not.[1] This is an important issue in understanding migration, since as social amenities change one region may change its status from that of a desirable place to that of undesirable one. Examples of social amenities/disamenities include *inter alia* varieties of entertainment (such as cinemas, theatres and shows, for example), pollution, congestion and violence.

Amenities may present an additional feature: neighbouring effects. Although natural amenities might show neighbouring effects, social amenities present relatively much more since these result from social interactions. Therefore, neighbouring effects

[1] Actually, natural amenities might vary across time; since one of the world's recent challenges is climate change. Social amenities are however much more time-variant than natural amenities. Therefore, assuming that natural amenities do not vary across time seems reasonable, as those may be considered static while comparing to social amenities.

of social amenities might be interesting to address as they are not restricted to the region where they are located. Social amenities may hence have an impact not only where they are located, but also in surroundings areas.

Violence is a social disamenity, which impacts on urban issues, as pointed out in Habitat (2007). According to this publication, people are even more affected by this disamenity in Less Developed Countries (hereafter referred to as LDC), including psychologically, socially and economically. Brazil is more than just a typical example of these effects because crime rates have achieved outstanding records. According to the UN Office of Drugs and Crime (UNODC), homicides rates in Brazil are one of the highest in the world, as it states: "Levels of small arms violence in countries at 'peace' can be as high, or even higher, than levels in war zones. For example, total gun deaths in the city of Rio de Janeiro between 1997 and 2000 exceeded conflict deaths in war zones such as Afghanistan, Sierra Leone and Uganda during the same period." in IANSA (2007), page 4.

Crime rates are not spread evenly over the country. As Carvalho, Cerqueira and Lobao (2005) and Waiselfisz (2007) have shown Brazilian violence is spatially concentrated in metropolitan areas. In 2007, the Brazilian federal government launched a national plan to tackle this issue, called PRONASCI,[2] which aimed to reduce crime rates in the 11 most violent metropolitan areas. Additionally to the criminality issue, Andrade, Santos and Serra (2000) findings show that the population in Brazilian medium size cities increased their participation in urban population from 9% in 1970 to 14% in 1996. As they are demographically less dense places, perhaps some migration towards these medium-sized cities might be associated with violence. Violence might thus have influenced people to migrate towards places with higher security.

[2] PRONASCI is an acronym for *Programa Nacional de Seguranca Publica com Cidadania* which means National Program of Public Security with Citizenship.

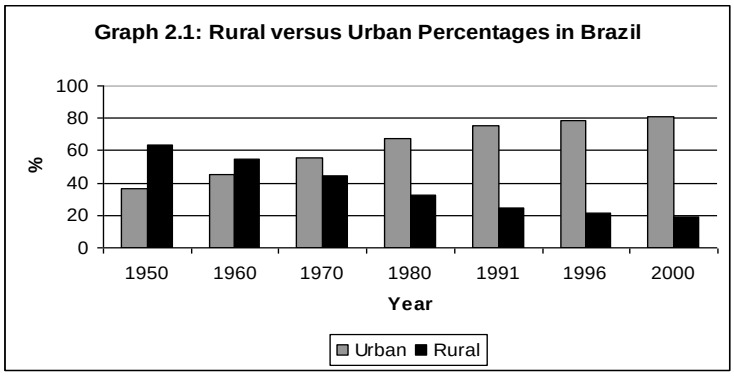
In order to investigate how migration decisions are associated to amenities/disamenities, especially violence, urban to urban migration flows between Brazilian cities[3] are used from 1985 to 2000. These linkages are tested not only locally but also their neighbouring effects. Results suggest that they seem to be associated. Disamenities tend to push migrants towards other cities, while amenities seem to pull them away. As it regards violence, local crime rates are negatively associated to migration flows, but neighbouring does also present similar pattern. Controlling for origin and destination characteristics, crime rates at origin seem to be more associated to migration flows than their value at destination. The rest of the chapter is structured as follows. The next section presents some stylized facts on migration and violence in Brazil. The empirical strategy is detailed in Section 2. Section 3 presents a data description, followed by results in Section 4. Finally, the last section concludes.

1. Some Facts about Migration and Violence in Brazil

1.a Migration in LDC and in Brazil.

Migration differs not only between rich and poor countries, but also across time. Most of the literature regarding migration in LDC investigates rural-urban migration, as summarized in Lucas (1997). Even recently, papers addressing this type of migration either theoretically (Chaudhuri (2000) and Basu (2000), for example) or empirically (Bhattacharrya (2002) and Saracoglu and Roe (2004)) have been common. The trend towards a more urban society is however also something common in LDC. In LDC countries, urban population was 29.6 % in 1980, by 2005 the percentage increased to 42.7% according to United Nations (2007). In South America, urban population was even more important, where 81.8% were living in cities in 2005 compared to 68.3% in 1980. Brazil is not an exception to these figures, as Graph 2.1 shows:

[3] Overall, there are 3,659 regional units.



Source: Brazilian Statistical Institute (IBGE)

Brazil has experienced a substantial change in people's residence status in the last 50 years. In the 50s, two out of three Brazilians were living in rural areas.[4] However, the urban population became larger than the rural in the 70s. It has steadily increased since and more than 80% of Brazilians live in cities nowadays. This indicates a strong urbanization process has occurred in this country. Nevertheless, it is not possible to infer whether migration from rural to urban contributed massively to this process.

There is extensive literature about migration in Brazil and only papers which are directly related to the present study are mentioned here. As mentioned earlier, medium-sized cities are becoming more representative in the Brazilian urban population. It is not clear however which demographic channel (migration, birth and/or death rates) explains this pattern. Contributing to this issue, Jannuzzi and Jannuzzi (2002) analyse migration, urban growth and real estate attractiveness of Sao Paulo, the economic centre. They find that Sao Paulo lost inhabitants due to the migration process which occurred from the 1980s onwards, as evidenced in Martine (1994) and Baeninger (2000). One of Jannuzzis's explanations is that housing prices are becoming substantially higher, especially for low income families. They evaluate the association between house prices

[4] The definition of urban population according to IBGE encompasses any person living in dwellings located in municipalities, villas or even isolated agglomerations of dwellings regardless their size, demographic density or any other criterion. Rural dwellings are those not situated in these urban areas.

(represented by rent) and different types of measures, such as time spent on travelling to work, distance to downtown, population density, *inter alia*. Even though all of these measures are important to understand migration patterns, they use them only in a simple linear regression model which leads to bias estimated parameters, due to omitted variables. Additionally, they do not encompass violence. They conclude that people migrated to cities around Sao Paulo in order to avoid high house prices. Their paper provides one indication that migration towards medium size cities can be related to people leaving metropolitan cities.

The closest paper to this one is Vasconcellos and Rangel (2005). They analyse Brazilian migration patterns using the last two Census data as does this chapter.[5] They provide a detailed descriptive analysis of the migration process in Brazil during this period using city level data. Comparing both periods, the authors conclude that migration flows have remained the same within the period analyzed. They find moreover not only that 10% of Brazilians over five years of age have migrated from 1986 to 1991 and from 1995 to 2000, but also that people from the southeast and the northeast were the majority of them (65% in 1991 and 71% in 2000). The population of the southeast has the greater positive net result for migration flows in contrast with the population of the northeast which revealed the largest negative net result for migration flows. The average distance is slightly greater than 400 km, but more than 60% of migrants change their residence within 250 km, of which half (around 30% of the total) do so within 50 km. A reasonable part occurs from metropolitan cities towards their neighbours, which can be interpreted as individuals looking for better house pricing and/or better amenities. Another finding is that the level of intra-state migration (between cities within the same state) is significantly higher than the level of inter-state

[5] Section 2.4 explains the use of Census data instead of other sources.

movements (across cities in the same state). All of these together indicate that distance matters. Considering all possible migration flows, around 1% is non-zero. One issue not covered by these two papers just mentioned is the identification between rural and urban as origins and destinations, which is considered in this current chapter.

2.1.b Urban versus Rural

It is common sense that rural-urban migration is the standard pattern in LDC as Lucas (1997) states, but developing countries may present completely different migration flows. India, for example, is an exception to this rule. Skeldon (1986) shows that 57% of migration in India was rural-rural according to their 1981 Census. Focusing on rural-urban migration, Nelson (1976) argues Latin America differs from Africa/Asia by migration period status. In the latter, it is basically transitory and in the former, permanent. This explains partially why Latin America is much more urbanized than other parts in LDC. Considering this, it is possible to expect that rural-urban migration might be less important for migration flows in Latin America, especially in Brazil which presents higher urban rates. Table 1 shows Brazilian migration flows by distinguishing between rural and urban migration as origin and/or destination.

Table 1: Numbers and Percentage of Migration in Brazil

	1991		2000	
	Migrants (in millions)	%	Migrants (in millions)	%
Urban to Urban	8.0	62%	9.9	72%
Urban to Rural	1.1	8%	1.1	8%
Rural to Urban	2.3	18%	1.7	13%
Rural to Rural	1.5	11%	0.9	7%
Total	12.9	100%	13.7	100%

Source: Censuses of 1991 and 2000, elaborated by IBGE.

The table presents how migration from rural to urban still plays an important role, but it is more than evident that urban-urban is much more relevant than any other. While migration from rural to urban has decreased not only in volume (from 2.3 million

to 1.7 million), but also in share (from 18% to 13%), migration between urban areas has increased in both: volume and share. This issue is not investigated by Jannuzzi and Jannuzzi (2002) and it presents a completely different pattern between the two censuses analyzed, since urban-urban migrations become even more important than rural-urban. In total, around 13 million people change their residence every five years according to the two censuses, representing around 10% of the Brazilian population, as pointed out by Vasconcellos and Rangel (2005). Indeed, a volume of the entire Brazilian population changed their address to another city every half century after considering these figures. People move therefore 1.4 times during their lifetime if Brazilian life expectancy is considered.[6]

2.1.c Violence Issues

As it regards violence, the urban population is increasingly being affected by this disamenity, as reported in UN-Habitat (2007). According to this publication, urban violence is at the top of the agenda for people living in cities, especially in developing countries where a huge proportion of them live in poor areas with lack of infrastructure and labour opportunities. Another example of how much violence affects society is given by Soares (2006). He estimated the cost of violence in the welfare of 73 countries. His findings state that one year of life expectancy lost to violence is associated with a yearly social cost of 3.8% of GDP.

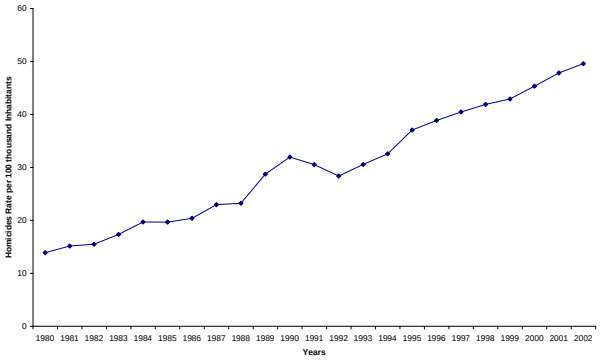
Across Latin American countries, and especially in Brazil, violence also represents an important issue in urban areas. Carvalho, Cerqueira, Lobao and Rodrigues (2007) states that the cost of violence has reached 5.09% of Brazilian GDP in 2004. Aside from economic issues, the UN-Habitat (2007) also mentions how the fear of violence affects people's life, since they state that even when crime rates reduce, the

[6] According to IBGE, Brazilian life expectancy was 70 years in 2000.

sense of insecurity may remain high, hence lessening people's quality of life. Social life can also be affected by violence. For example, more than 60% of Brazilians feel unsafe walking home at night, according to Nuttall, Eversley and Rudder (2002). Summing up, crime imposes economic, social and psychological negative effects in the Brazilian Society.

In order to have an idea of how violence has developed in Brazil, Graph 2 presents homicides rates per 100 thousand inhabitants from 1980 until 2002.

Graph 2: Brazilian Homicide Rates from 1980 until 2002



Source: SIM-DATASUS, Brazilian Health Ministry

As shown, there is an upward tendency of this crime over the whole period. It started at a rate of roughly 14 deaths per 100 thousand inhabitants and reached nearly 50 per 100 thousand inhabitants which represent an annual increase of 6%. This demonstrates how this issue has become so prominent for the Brazilian society over the last couple of decades.

The distribution of crime varies substantially across municipalities where some present reasonably low crime rates while others resemble armed conflict areas. In order to evaluate how violence is distributed across these regional units over the period, violence data is available; Table 2 reports statistics of the five-year average homicide rates from the 3,659 cities under study.

Table 2: Descriptive Analysis of Violence in Brazil

Homicides per 100 thousand inhabitants	1986-1991	1995-2000
Average	8.6	9.5
Median	5.6	6.1
Standard Deviation	10.2	11.6
Maximum	116	140
Minimum in Cities with Crime Record	0.24	0.34
Number of Cities with no Crime Record	624	524

Source: SIM-DATASUS, Brazilian Health Ministry

First, cities present on average lower crime rates compared to national figures, since homicides rates across cities are below 10 homicides per 100 thousand inhabitants while at the national level they are 26 from 1986-91 and 41 from 1995-00. This may represent higher crime rates in more populous regions. The upward tendency shown in Graph 2.2 is also noticed nevertheless at Table 2.2 by any descriptive statistics considered.

The average across municipalities has increased by one more death per year corroborated by an increase in the median as well. However, the increase has not been homogeneous across cities, since the standard deviation increased which means more heterogeneity across cities. Also the number of cities with no statistical record of homicide rates has reduced after a decade, as shown by the decrease in the number of cities with no crime record.

The minimum and maximum values observed also provide an indication of crime rates rising over the years in each locality. The maximum five-year average registered is from a city belonging to the Sao Paulo metropolitan region which may indicate that big metropolitan areas are in fact the most dangerous.[7] More generally, Carvalho et al. (2005) and Waiselfisz (2007) provide evidences that areas with high

[7] Sao Paulo metropolitan region is the most populated region in Brazil, and Diadema is the city where crime rates are beyond 100 homicides per 100 thousand inhabitants at both periods.

crime rates include the most important metropolitan areas, such as Rio de Janeiro and Sao Paulo. It is thus evident that the more populous regions are among those with the higher crime rates.

Waiselfisz (2007) explores how geographically violent rates are distributed over Brazil. One of his findings show that the top 10% more violent cities concentrates more than 70% of all homicides rates in 2004. Moreover, these municipalities are generally big cities as those cities represent 42% of the Brazilian population. Taking into consideration the average homicide rate in 2004, those 10% more violent cities are four times more violent than the national figure.[8]

Although Waiselfisz (2007) shows graphically that violence is spatially concentrated, they do not test it statistically. Carvalho et al. (2005) not only present some maps to show this pattern, but they also investigate whether Brazilian homicides rates across municipalities are spatially correlated. Their findings back up the map evidence. This violence spatial correlation allows us to consider that violence might have neighbouring effects.[9]

Violence seems to impact not only where it occurs, but also in neighbouring areas. One example of how violence might affect economic measures, locally and/or in surrounding areas, is given by Gibbons (2004). Gibbons tries to investigate whether housing prices may be affected by violence. Using a neighbourhood data set, his results suggest that violence, locally and in surroundings areas, affects housing prices in London. Violence seems therefore to have its spatial effects on economic issues.

With regards to migration, violence might have a spatial effect due to some reasons. For example, even living in a city with low levels of violence, if neighbouring

[8] This explains why national figures present a higher increase in homicide rates, as shown in Graph 2.2, than the average homicide rates across municipalities, as Table 2.2 presents.
[9] In the Section 2.2.b, this assumption of crime spatial correlation is theoretically modelled by many papers having a diverse range of arguments to explain this pattern.

areas show high criminality records then inhabitants of this safer area might fear that sometime in the near future violence might increase in their locality. Therefore, spatial effects of violence may influence people's decision to migrate. Another feature is that people may work and live in different cities as happens in some metropolitan areas in Brazil. Although people may live in relatively peaceful areas, they may work in areas where criminality levels are higher. Therefore, facing more violence during the work day might affect people's decision to move to another area. If this happens, neighbouring effects of violence are influencing people's decision as to where to live.

Considering urban-urban is the most common type of migration for the Brazilian case, it is possible to analyze whether these movements are associated to amenities/disamenities, especially violence. The preliminary descriptive statistics presented in this section provide some indication this might be the case.

2. Empirical Strategy

The socio-economic phenomenon proposed in this chapter is to what extent amenities are correlated to migration flows. In order to capture this phenomenon, it is advisable to control for many other socio-economic variables aside from amenities. Before specifying the econometric equation, discussion on which variables might be important remains relevant.

Migration is a worldwide phenomenon, occurring in the developed or developing world, and individuals from both classifications might have similar incentives to migrate, but there are also relevant differences. For example, migration in developing countries is not fully explained by formal job opportunities since the informal sector plays an important role. In developed countries, access to affordable housing might act more as a substantial barrier than in poor countries where shanty towns are created by low-cost housing projects. Variables used to understand migration

should therefore be similar regardless of which particular region is investigated, yet some others must be included in order to adapt to the reality of each region.

The list of relevant variables to explain migration flows is described as follows: economic variables are discussed first, followed by amenities, social issues, infrastructure and finally particularities of the investigated region. First, it is important to have a variable which might represent the cost to migrate. In the migration literature, distance is used for this purpose since it represents not only financial costs but also time spent to actually migrate.

Another common economic issue for migration is wage disparities. Regional differences in wages create incentives for migration, since regions offering higher wages attract workers. Regions offering higher nominal wages might however have higher living cost, because of housing, for example. Therefore, the main variable should be real wages, rather than nominal wages. Skills necessary to work might differ between distinctive sectors. For example, skills needed to work in the service sector may be different than in the manufacturing sector. Disaggregating salaries among sectors may then be relevant. However, it is important to control for the importance of each sector in every municipality since higher wages in one locality may be biased by the existence of a single firm which hires too specific a skilled worker.

In order to control for how many job opportunities arise in each region, the unemployment rate may be considered to tackle this issue by signalizing which area may be creating fewer chances to work. The development of a particular location is also relevant to be taken into account since faster-growing regions tend to create more job opportunities. Subsequently, the growth of each region might also be relevant to include. According to the NEG literature, market potential is relevant to attracting migrants due not only to the existence of a greater labour market but also because it may

capture the effect of the number of varieties of goods and services in each location, since cities with higher market potential provide more of them to their consumers. Not only internal market might be relevant for migration decision but also external market. Some regions may be affected by an external shock, such as a boom in exports, and then using a measure to isolate the foreign shock effect may be relevant.

Aside from economic reasons, amenities/disamenities might be also an important factor to attract or to repel migrants, but some empirical work provides some results which bear out to be careful when incorporating them since they might be correlated to other economic variables, such as wages and/or housing prices. One part of the literature argues that wages may be able to incorporate many regions' attributes, which is the assumption underlined in the NEG models as they are the main factor to explain migration decisions. At first, people may find this assumption extremely strong, but it seems to be a good simplification of reality corroborated by some empirical studies, such as Rosen (1979). In his paper, Rosen addresses how amenities/disamenites for example might explain regional disparities in wages. He assumes that local attributes vary across cities, but not across time: climate is a good example that satisfies this assumption. He points out two types of places: desirable and undesirable. The desirable places generally have higher housing prices and lower wages relative to the undesirable places.

His model describes acceptance-wage gradient by a linear combination of the real productivity effect and pure taste effect. His conclusion is that cities with more amenities should consequently have lower wages in relation to places with fewer amenities. He also develops a bid-rent function which uses the same attributes (real productivity effect and pure taste effect) and his conclusion is that cities with higher amenities will have higher rents.

One of his assumptions is that people have different tastes; hence, they decide to live across cities according to their tastes. In order to evaluate his theoretical findings, Rosen performs an empirical test to evaluate how wages in most metropolitan areas could be explained by some city attributes by using individual-level data. First, he finds no difference using nominal or real wages. It should be pointed out however that wages are from metropolitan areas which do not have too many discrepancies of living cost between them. Regarding city attributes he uses a diverse range of measures from pollution, climate, crowding, and market conditions. For crime data he utilizes only the total crime rates from the FBI. Even though the author admits to having details of each criminal activity, he does not use this extra information. He uses only an average measure of all crimes and does not report what the types are and how he combined them. He finds that most of the attributes are significant to explain wages, such as pollution, climate, and market conditions. Crowding and crime do not provide robust results in affecting wages.

Some other papers address these similar issues and also include crime rates to be captured by wages, but different results emerge. While Berger, Blomquist and Hoehn (1987) find that an increase in violence reduces wages, Clark and Cosgrove (1991) and Blackaby and Murphy (1991) show the opposite. Hence, one conclusion which arises from these findings is that natural amenities might really be captured by wages, while social amenities not, especially violence.

If regional differences in wages may be explained by distinct city attributes, these findings on violence suggest that certain social amenities might not be properly reflected in salary disparities, since it is not clear how wages and violence, for example, are associated. Rosen explains his violence result by stating that the crime rate depends on the precise location within the area where it was committed. He overlooks however

other issues rather important to explain his findings. First, the two city attributes presenting unexpected results, crime and crowding, are not fixed over time and change according to population size. Wages may adjust to these characteristics, but there might be a period for this adjustment. In other words, it is not instantaneous. Salaries can only adjust to the last crime rate reported (time *t-1*) at time *t*, but this disamenity may have changed by time *t* when the adjustment occurs. Wages may not therefore capture perfectly these time varying amenities/disamenites, such as crime. Labour market frictions moreover may prevent this adjustment from occurring. Even if salaries could adjust instantaneously to these measures, crime rates might not represent people's fears. It was stated previously that even when crime rates reduce, perception of safeness might not change. People's feelings on security are therefore even more difficult to be captured by wages because it is not measurable. Furthering this argument, people react differently to these social amenities since some residents find a place more pleasant if they are able to see people walking on the streets constantly, while others prefer silent places. How people value these characteristics may differ quite substantially. This point is not fully covered by any of these papers mentioned beforehand, since none of them consider that some amenities (especially the social ones) vary across time. As a consequence, violence might play a role in migration flows.

Summing up, any natural amenity is already being captured by wages; therefore it is not needed to control for them. On the other hand, social amenities should be incorporated as explanatory variables.

Apart from economic reasons and amenities/disamenities, social issues may also be important. Social network is also a key variable for migrants, because it reduces the migration cost as those networks are able to inform newcomers about labour and housing markets, for example. The literature of migration uses the share of urban

population in each locality as a proxy, since this measure captures social interactions among people. In other words, the more people living in one area the higher the probability is of finding a relative and/or a friend who might help to smooth migration costs. This measure may also represent however other social amenity/disamenity occurred in a particular region. The bigger a place is, for example, the more services are provided, such as restaurants, bars, cinemas, theatres among others. It might also represent nevertheless disamenities, such as crime, congestion, and pollution. In order to isolate some of these amenities' interferences, some measures of them are required. Regarding the main focus variable of this chapter, violence - although the literature and empirical works show bigger metropolises tend to have higher crime rates - it is important to isolate violence to examine whether it is correlated to migration flows or not. Another social issue related to migration is gender. Overall, males tend to migrate more than females, which enables a creation of gender variable to capture this effect.

As people move to places to maximize their utility, measures of infrastructure may also be relevant to include. One social infrastructure which might be relevant is health access, since places with good access to health care might be important for migrants' decision, especially if they care substantially about violence. Another relevant social infrastructure is education as some migration decisions are made in order to get access to higher degrees, as happens with people moving to undertake a university degree. Measures of physical urban infrastructure may also be convenient to include as controls. It is thus important to use that infrastructure information in order to evaluate how migration is affected by them.

Regarding some particularities about this specific country, two emerge. One common issue related to migration decision in Brazil is job opportunities in the government sector. As those are generally in the state or federal capital, a measure to

capture this type of migration seems to be necessary. As said previously, informal sector plays an important role in developing countries and Brazil is not an exception to this rule. It should be relevant to control for this country's particularity.

2.a The Econometric Model

Generally, migration is empirically investigated by using the gravity equation where information of origin and destination might be used to explain it. The econometric specification changes however depending on the hypothesis made. If the hypothesis assumes people have decided to migrate from where they live and the only uncertainty is where to migrate, then the econometric specification should have information only from destination as explanatory variables, as shown in Cushing (1989). Poncet (2006) and Crozet (2004) are examples of this approach. Both papers derive their econometric specification based on this hypothesis where individuals compare cities' characteristics of all possible destinations. As a consequence, their equation to be estimated is a restricted model of a gravity-type (benchmark) adapted to the NEG framework. Their model was used as a starting point to construct the econometric specification of this chapter and the version used is presented in equation 2 using the main variables investigated.


(2)

where, $shm_{ijt} = \frac{mig_{ijt}}{\sum_{it} mig_{ijt}}$ is the share of migrants from origin *i* to destination *j*; $wagmanu_{jt-1}$ is the average real wage of manufacturing sector at destination *j* at *t-1*; $wagserv_{jt-1}$ is the average real wage of service sector at destination *j* at *t-1*; $unempl_{jt-1}$ is the unemployment rate at destination *j* at *t-1*; $dist_{ij}$ is the distance between *i* and *j* ; $shpop_{jt-1}$ is the share of urban population from destination *j* in the Brazilian as

a whole at *t-1*; $MP_{j,t-1}$ is the market potential at destination *j* at *t-1*; $viol_{j,t-1}$ is the violence measure at destination *j* at *t-1*; $PX_{j,t-1}$ is any social amenity attracting migrants (number of bars, restaurants and theatres, for example) at destination *j* at *t-1*; $NX_{j,t-1}$ is any social disamenity repelling migrants (such as congestion, and pollution) at destination *j* at *t-1*; $u_{ij,t}$ is the error term.

As discussed above, the migration literature states that distance is negatively correlated to migrations flows since the farther a region is, the more costly it is to move, not only in financial terms but also regarding time. According to the theory, real salaries and market potential should be positively associated with migration. People will therefore move towards cities with higher real wages and bigger economies. Labour market and migration literature say the unemployment rate should be negatively correlated to migration flows since jobless regions do not attract migrants. Social amenity should attract migrants, while disamenity repel them. Finally, violence should be negatively associated with migration, because people might tend to move to places with more security. To sum up, parameters are expected having the following signs:

- $\beta_1, \beta_2, \beta_6, \beta_8$ greater than zero;
- $\beta_3, \beta_4, \beta_7, \beta_9$ negative.

The only parameter which does not have a straightforward expected sign is β_5. It will be greater than zero when amenities (such as social network, represented by relatives and friends) overcome disamenites (like pollution or other types of crime), otherwise a negative sign might appear.

As was pointed out by Plane (2004), there is a lack of use of spatial models in the migration literature which is a problem because migration flows between any pair of regions are also potentially influenced by neighbouring characteristics from origin and

destination. And the disamenity analyzed here is not an exception to this rule. Section 1.2.b provides empirical evidence of violence spatial correlation in Brazil. Additionally, Section 2.2 presented theoretical models explaining that crime has its spatial interactions. Therefore, violence may affect people's well being not only locally but also at surrounding areas. Spatial issues of violence might be thus an important issue in this investigation.[10] Improvements in the econometric specification are introduced in order to include spatial effects of violence since the effects of this disamenity spread across surrounding areas. The following model is eventually proposed in equation 3.


(3)

Where *W* is a spatial matrix to taking into account neighbouring effects on migrations flows. For spatial lag, two types of matrices are used: contiguity; and four nearest cities. The reason of using the contiguity matrix is fairly obvious, since places surrounded by violent neighbours may not be considered as a destination for migrants. One possible criticism is that not only contiguous municipalities should be considered since two cities separated by a bay or river, for example, might have much more interaction because a bridge connects them than another two sharing a border.[11] Therefore, using the four nearest cities matrix overcome this shortcoming.[12]

One might argue that neighbouring effects should be considered in other variables, yet other drawbacks emerge on doing so. First, some variables do not have any spatial interaction, such as population density, since it is not clear that places highly

[10] The average distance between the contiguous neighbors across these localities is around 30 km and 95% of these distances are below 74 km. It is therefore possible for an individual to move residence across these cities without quitting his/her job, which enables the use of spatial neighboring effects.
[11] One example is Rio de Janeiro which has many more connections to Niteroi (which is on the other side of Guanabara Bay) than to Itaguai, which is a contiguous neighbour.
[12] The mode from contiguous neighbours is four and this explains why four nearest other cities are considered instead of three or five, for example.

densely populated should affect their neighbours. For example, cities in the suburbs around a metropolis should not necessarily suffer from it. Second, the spatial lag of other measures might be highly correlated to some others. One example is the spatial lag of other positive amenities: entertainment measure. The spatial lag of entertainment measure is being captured by market potential. Including these spatial effects might only interfere in market potential results. Last, but not least, there is no certain agreement on using spatial correlation in empirical research, as noted by Wooldridge (2002) "For better or worse, spatial correlation is often ignored in applied work because correcting the problem can be difficult" (page 6). Having those points in mind, it seems reasonable to assume that only violence might have spatial interactions as theoretical and empirical papers have already evidenced, as shown theoretically in Section 2.2 and evidenced empirically in Section 1.2.b.

Another feature is that origin information may be essential for migration analysis. If so, the unrestricted traditional gravity equation should also be estimated. In order to provide a robustness check, a traditional gravity equation is also estimated using equations 2.2 and 2.3. Indeed, some differences from the previous model emerge. One difference is that the dependent variable is not divided by the sum of destination. In other words, the migration measure should only be the migration between *i* and *j*, and not a ratio. The figure is divided however by the total migration flows for each period in order to avoid any time trend.[13] The new dependent variable is described in equation 4.

$$shm_{ijt} = \frac{mig_{ijt}}{\sum_{t} mig_{ijt}} \qquad (4)$$

[13] As shown in Section 1, urban-urban migration increased substantially from 1991 to 2000 either in nominal terms or in share. Therefore, it is important to control for this time trend. Including just a time dummy is an option in which results do not present different outcomes. For simplicity, this chapter show only results using the dependent variable divided by the total migration flows.

Another change lies in the explanatory variables which now need to have not only the destination values, but also the correspondent measure in the origin. The market potential has for example two values in the econometric specification: one for origin and another for destination, where the destination is described as a pulling factor and the origin as a pushing factor.

The focus variable of this chapter, violence, is endogenous because it is not clear whether violence impacts migration flows or the other way around. Another issue is that the violence measure used here does not represent all crimes; moreover, it is the fear of crime which leads people to other places, and not crime rates. These shortcomings lead to biased estimates of the parameter related to this measure. It should therefore be tackled by using instruments in an IV estimation. Valid instruments should be those which can only affect dependent variable through the endogenous variable. Therefore, the exclusion restriction implied by any instrumental variable regression is that, conditional on the controls included in the regression, instruments have no effect on migration flows, other than their effect through violence. One potential instrument may be some policy intervention which affects directly the independent but not the dependent variable, apart from through endogenous variable.

Investment on security is a potential instrument, since it may only affect migration flows via its effects on violence. State governments are responsible for practically most of the Brazilian police system. The percentage of security expenditures on each state budget may be hence used to instrument violence. Although this might represent a response to criminality increase, some precautions are taken trying to avoid it. One strategy was taking information lagged in time. Therefore, only the level of security expenditure 5 years before Censuses is used for this purpose. By taking it lagged in time, government expenditures on security are previous violence records and

migration flows. Therefore, time lagged information of security expenditure could be correlated with the violence measure, which may have a direct effect on migration flows. One additional feature of this instrument is its regional dimension which is actually larger than the unit used in this study (city level). It makes this instrument even more exogenous, since cities within the same state are considered similar, when they are actually much more heterogeneous, including in violence terms. Another issue is related to the spatial dimension of violence, since increasing crime rates in one city might be explained by the reduction in a neighbouring city. A government intervention in a broader geographical scale is able to tackle this issue.

This empirical approach might capture the effect of government expenditure on migration flows, but working through other channels. Furthermore, other variables might be correlated with security expenditure and migration flows. In order to tackle those issues, additional instruments might be used. Inequalities measures might be potentials instruments, since regions with worst income distribution may increase social tension, and therefore, more crimes. However, it is not feasible to think that someone might tend to move towards a poor city with lower inequality index, just because they would be equal everyone. Inequalities measures, such as Theil and Gini, at municipality level as well as at State level are hence used to instrument the violence measure, since they might affect migration flows only through violence. Two-Stage Least Squares (2SLS, henceforth) method is then performed using these instruments, security expenditure and inequality measures, as well as any combination of them, as they may serve as valid instruments, since they must be uncorrelated to migration flows, except through violence which is included in the equation explaining the dependent variable.

As migration decisions are influenced by observable and unobservable characteristics, it is relevant to control for unobservable issues as well. One way to deal

with that is by estimating using fixed effects. Depending on which equation is estimated, you may use different fixed effects. Equation 2.2 is a restricted model where only destination characteristics are important for migration decisions, fixed effects at destination seems to be the most appropriate in this specification. On the other hand, estimating the traditional gravity equation uses information of destination and origin. Therefore, it is relevant to control for unobservable characteristics not only at destination but also at origin. Using pair-wise fixed effects might therefore control for all unobservable characteristics at origin and destination which may affect migration flows. Controlling for unobservable characteristics presents a cost: it is not possible to use any time invariant observable characteristic. For example, this restriction imposes eliminating distance in the traditional gravity equation. As my main variable of interest (violence) varies in time, fixed effects may be interesting to estimate as well.

Another drawback faced by this work, which leads to biased estimated parameters, is the non-existence of migration flows between some regions. The intuition behind this bias is that having information only from non-zero migrations flows, "undesirable" destinations are not considered and their attributes are discarded. Therefore, evaluating migrations decisions using only information of chosen places might lead to biased estimates, since information of non-chosen cities has not been taken into account. Santos Silva and Tenreyro (2006) show an alternative to estimate when zeros are present in a gravity equation. Their methodology is to estimate the econometric specification by a Poisson Pseudo-Maximum Likelihood where the dependent variable remains in its level (not in log) and the explanatory variables are taken in logs. Results from Santos Silva and Tenreyro (2006) show that estimating a gravity equation by Poisson with zeros or not demonstrate no substantial difference. The main reason why truncation has little effect in this case is that observations with zero

migration correspond to pairs for which the estimated value of migration is close to zero. The corresponding residuals are hence also close to zero and their elimination from the sample has limited impact.

Summing up, the empirical strategy uses the OLS results as a benchmark. Since violence is an endogenous variable, 2SLS procedure is implemented using government expenditure on security and inequality measures as instruments. As migration may be influenced by unobservable characteristics, fixed effects are performed. The concern of biased estimation due to zero migration flows on a gravity equation is sorted out by using Poison Pseudo-Maximum Likelihood where only non-zero migration flows is taken into account. [14] All of these methods are used not only when estimating a restricted form, as used in previous studies mentioned earlier, but also by estimating the traditional gravity equation.

3. Data Sources

First, sources for such an analysis should be analyzed beforehand. Nunes and Matos (2005) compare two sources of information to analyse migration, where one is based on a sample of formal workers (*RAIS*) and the other based on the Census. One advantage of using Census data is that it has the broadest information since it includes all individuals, from formal to informal workers, all ages, including children and retired people, and so on. Nevertheless, Censuses are taken only every 10 years which limits the number of years. On the other hand, *RAIS* is annual, representing a substantial advantage compared to Censuses, especially because Censuses' data do not contemplate any migration within five years prior to the information collecting year. [15] Nunes and Matos conclusions show that depending on the source of data, there are substantial differences in the results and conclusions. They state that long-distance migrations are

[14] Estimation including zeros is not feasible for all information (more than 26 million observations). A random sample of 500 thousand is used however for robustness check.
[15] Census migration data are related to where people were living five years prior to the Census.

more prominent on the Censuses than in *RAIS*. This is an expected outcome since some people move long distances in Brazil to work in the informal sector at their destination. In order to investigate whether violence affects migration, one should take into account not only workers, but also those who work in the informal sector, retired people, and others. Census data seem therefore to be the most appropriate for investigating the issue proposed by this chapter after balancing pros and cons from each source.

The best data to evaluate this impact are at the individual level, but they are not available. However, regional data can properly answer the research question of this chapter. The focus characteristic (violence) to explain migration affects not only who has been victimized but also relatives and friends. The level of violence in each location influences moreover the whole society by being published regularly in local press, such as radio, newspaper and TV. Even when someone is not related to the victim, he/she might be influenced by what happened to someone else just by being informed about the crime committed. Using regional level data can therefore satisfactorily evaluate whether violence is correlated to migration flows.

Considering which spatial unit better captures these effects, the higher geographical desegregation the better the analysis is, especially since neighbouring effects are investigated. City-level information is the most appropriate regional data available, but shortcomings exist. There were more than one thousand cities emancipated during the 90s. The Brazilian Applied Economical Research Institute (*Instituto de Pesquisa Economica e Aplicada* – [*IPEA*]) has created a classification called comparable minimum areas (*Areas Minimas Comparaveis* – [*AMC*]) by using the city level data from the whole period. This new regional unit comprises 3,559 locations over the period investigated.

Brazilian Population Census provides the main migration flow data for this chapter. From the 1991 and 2000 Censuses, there is information on where people lived five years before the Census year. It is thus possible to build a migration matrix between localities by identifying origin and destination status of urban or rural. Share of urban population uses the same source as migration flows.

For salaries, I use some figures of the economical census from 1985 which includes manufacturing and services. And from 1996, I use the Government Registration of Firms (*Cadastro Central de Empresas* [CEMPRE] – from IBGE), which has a limited set of information, such as salaries and number of employees, from all active manufacturing and service firms in Brazil. Although they represent two different data sources, they have exactly the same sample: all manufacturing and service firms in Brazil. Due to data availability, it is possible to distinguish wages into two different sectors: manufacturing and services.[16]

The non-existence of living cost at a much disaggregated level appears as a barrier to create real wages for empirical research. Combes, Duranton and Overman (2005) and Sudekum (2007) pointed out however that housing prices determine living cost when trade freeness is low. This is indeed the case under this study since no trade cost exists (apart from transport cost) within the Brazilian economy. Average housing prices at each location are therefore used as a measure of living cost sourced by IPEA. Even though it looks like a rough proxy, it has been shown theoretically viable, empirically tested by Sudekum (2007) and it is the only data available.

The number of homicides per 100,000 inhabitants in each locality is used as a measure of violence. This information is available from the Mortality Integrated System (*Sistema Integrado de Mortalidade*, acronym SIM) of database of the Brazilian Health

[16] It is also feasible to obtain wages from the agriculture sector, but the focus here is urban-urban migration and this sector does not operate in urban areas.

Ministry, called Health Database (*Bando de Dados do Sistema Unico de Saude* – DATASUS*)*. Data comprise from 1980 until 2002. Only information about the five years before the census is taken into consideration since it is within this period that people change dwellings. The average of homicide rates over five years before the census data collection year is thus used as a measure of crime rate as well as the level five years before Censuses. Not only violence where it occurs was used in this work, but also its spatial lag by using contiguity matrix or four nearest neighbours, as explained in Section 2.3.

Controlling for other social amenities, two further variables are utilized as covariates. The number of firms in the service sector, including bars, restaurants, theatres, is used to control for social positive amenities as an entertainment measure. Population density measure is utilized to capture other disamenities, such as congestion and pollution, sourced by IBGE. Additionally, a quadratic in population density is used in order to pick up turning points.

The violence measure may not capture all crimes committed in a city, such as burglaries and thefts; therefore population size may be capturing other types of crime jointly with social network. Summing up, most of the amenities and disamenites will be captured by other measures: natural amenities by salaries; social network and other crimes by population size; social amenity by entertainment measure; and social disamenity, such as pollution and congestion, by density measure. Controlling for all these measures, homicide rates are cleaner to capture only this type of violence.[17]

Percentage of males in each city may also be used to capture any gender issue related to migration, since men are more likely to migrate according to the pools.

[17] Apart from a logical justification, crime rates do not show much correlation within these measures exposed for example, violence and population density were not highly associated since it shows a linear correlation of only 0.24, for the Brazilian case.

Market Potentials are created by using GDP measures provided by IPEA for the period analyzed. Distance was calculated by using the Great Circle Formula from each region centre point. Finally, considering that some export regions might be attractive for migrants, then exporting status is created by assuming that a city which has exported more than a certain amount during the years of 2003-04 might have been an exporting region since 1985.[18]

Infrastructure measures are described as follows. For health access, the number of doctors per inhabitant and the percentage of highly qualified nurses catalogued by UNDP are used in the estimation process. The number of years spent on schooling and percentage of illiterate people in each locality is used to control for education infrastructure. Regarding physical infrastructure, the percentage of dwellings with electricity, water supply and sewage is utilized for this purpose.

Distance to the state capital and to the Brazilian capital (Brasilia) are other variables which might be used to capture any movement related to job opportunity in government institutions, since some people move to the capital to start a career as a civil servant. In order to capture the informal sector, the amount of money deposited in the bank might be utilized for this purpose because it is quite common for people working in this sector to have banking or saving accounts. Most of the other variables used in this chapter have also Censuses as a source, such as housing prices, share of urban population, housing infrastructure, *inter alia*.

4. Econometric Results

Only places, as stated previously, where migration between two localities was greater than zero are taken into account for econometric results in this section. Even though this restriction on the data reduces the sample substantially, there are still more

[18] The threshold used to create this dummy for exporting status was US$ 500 billion. Other measures were used, such as US$ 1 trillion and US$ 1 billion, but results remained practically similar.

than 100 thousand valid observations for the two years investigated.[19] Poisson pseudo-maximum likelihood does not present a substantial difference when estimating with or without zero, as discussed earlier.[20] Most of the explanatory variables are normalized by national figures.[21] An unemployment rate of a region *j*, for example, is divided by the Brazilian unemployment rate. This avoids some national time trend (such as recession and/or inflation) which may be associated with changes, but it does not remove time changes between localities.[22] However, time dummy is also included to pick up any other time trend not presented in the observable variables. Before presenting any outcome, it is important to mention that standard errors are robustly estimated throughout this whole section.

Table 3 shows results from the restricted model presented in Equation 2 estimated by OLS (1st column), 2SLS (2nd and 3rd columns),[23] Destination Fixed Effects (4th column) and Poisson Pseudo-Maximum Likelihood (last column).

[19] Some regions have no doctor; therefore it is not possible to take log. This observation is therefore discarded. Levels, instead of log of the variable, are also used for estimation to overcome this issue and similar results emerge (available upon request).
[20] Results from a random sample of 500 thousand migration flows from all observations, including zeros and non-zeros, are available upon request.
[21] Exceptions are those time invariant, such as distances and dummy variables.
[22] Results using pair-wise violence differentials were also estimated and outcomes just corroborate results presented in this section. However, they cannot identify whether violence is a pulling factor at origin and/or a non-pushing variable at destination. Therefore, having variables identifying levels of violence at origin and destination help to understand how crime rates might affect people's choice in a migration context.
[23] The second column shows results using only the percentage of state expenditure on security while the third column presents outcomes using the previous instrument added to inequality measures (Gini and Theil) and other death rates (suicide rate and death victims in car accidents).

Table 3: Restricted Model Results

Panel A: Regression Results					
Dependent Variable	(i)	(ii)	(iii)	(iv)	(iv)
Share of Migrants	OLS	2SLS	2SLS	FE Dest.	Poisson
Violence	0.04	-0.712	-0.461	0.007	-0.085
	(0.016)**	(0.196)***	(0.158)***	(0.023)	(0.021)***
Observations	150,992	150,992	150,992	150,992	150,992
R-squared	0.32	0.25	0.29	0.34	0.10
Panel B: First Stage Results					
Instruments used	-	Security Expenditure	Sec. Expenditure & Gini Index	-	-
First Stage R-squared	-	0.03	0.04	-	-
First Stage F-stat.	-	4,401	2,835	-	-
Over-identification test	-	-	12.6	-	-

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Before focusing on the interested variables (amenities), an overview of other variables is essential. In general, results show the majority of the variables are relevant to explain migration flows, since most of the estimated parameters are significant,[24] but not all of them have the expected sign. While distance presents the negative and significant sign in all procedures, market potential does not show robust results. This result about market potential might be partly explained by the fact that real wages are included in the econometric specification. Wages in services seem to attract migrants because it has a positive and significant value in 2SLS, but non significant in other methods. Manufacturing real wages however mainly present the wrong sign, apart from fixed effects approach. Similar outcomes are found nevertheless in Crozet (2004) in which services tend to explain more internal migration than manufacturing sector.

[24] Similar results are found for example in Poncet (2006) for China case.

Some other variables show interesting results. Distance to state and federal capitals also present very robust results showing the closer a city is to any capital, the more people migrate to these localities.[25] This may represent some migration related to labour opportunities in State or federal governments, as mentioned earlier, where people move to the capital after being enrolled as a civil servant. The economic performance of a region, measured by the increase in GDP, seems not to matter for migration flows, because no association between them is found. Apart from fixed effects approach, urban size of the destination presents a negative and significant sign which corroborates findings by Andrade et al. (2000) on the increased importance of medium-sized cities in an urban population.[26] This outcome may be interpreted as the other non controlled negative amenities (such as pollution) are greater than any other positive one, social network for example. People may have tended to avoid large cities for the period analyzed.

Entertainment amenity and population density (representing a disamenity) present expected signs, but results are not robust. While entertainment amenity appear positive and significant only in Poisson and 2SLS (using security expenditure as instrument), population density is negative and significant solely in FE at destination. Those results suggest that people seem to be avoiding more dense areas (where congestion is more evident) and willing to live in areas with more entertainment options. Although those results are not robust, they might provide us some weak evidence that social amenities might have a correlation to where people decide to live.

Our focus variable, violence, has a positive and significant sign in the OLS results, but the parameter estimated might be biased. It is hence important to instrument

[25] As distances to state and federal capital are time invariant, they drop when fixed effects at destination is included.
[26] Urban size is endogenous to migration flows. However, migration flows are small compared to total population.

it to see whether this positive association changes. After using instruments in the 2SLS, it is possible to notice that violence becomes negative and significant, despite the number of instruments are used. Nevertheless, some more diagnosis should be done in order to evaluate the adequacy of those instruments. Some conditions should be met, which are: instruments should be sufficiently correlated with the endogenous variable, which is violence; instruments should meet exclusion restriction.

First Stage results of IV procedure present some evidence whether instruments are statistically correlated to the endogenous variable. Security measure can explain only a small part of the variability of the endogenous variable, since R-square of the first stage is only 0.03. This is partly explained by the fact that instrument is at State level, while violence is at city level. When other instruments of city level are included, available at column (iii), R-squared increases slightly. Nevertheless, instruments are statistically relevant to explain violence since p-value of the t-statistic of the parameters estimated is significant at any level. F-statistic of first stage backs up those findings as shown in Table 2.3. Staiger and Stock (1997) formalized the definition of weak instruments, but researchers have found that any F-statistic in the first stage exceeding 10 would lead to the conclusion that instruments are sufficiently strong. Therefore, instruments used in this work would be considered strong following Staiger and Stock (1997) definition, since F-statistic are far beyond the threshold mentioned.

However, this is not sufficient to establish that instruments are valid, since orthogonality condition should be also met. Moreover, if there is more than one instrument, however, two-stage least squares provides asymptotically efficient estimates of the parameter on the endogenous independent variable compared to a just identified IV estimation. As it is known, when the equation is just identified, such as in the second column, it is not possible to perform over-identification tests. Then, security expenditure

and Gini index at municipality level create a set of instruments to perform over-identification tests, as shown in the third column of Table 2.3. Since the number of instruments exceeds the number of endogenous regressors, 2SLS is over-identified, allowing for a test of the exogeneity of this instruments' set. The tests of over-identifying restrictions yield more disappointing results. Over-identification tests show instruments fail to meet all conditions necessary for validation of instruments, since p-value of a chi-square at 12.6 with 1 degrees of freedom is nearly zero. Different sets of instruments have presented similar result, such as using other inequality measure (Theil index) and also other spatial scale for Gini index (State level). Summing up, all sets of instruments used fail on over-identification tests. One possible explanation is that instruments might be affecting the dependent channels apart from the violence measure used in this estimation process. Another feasible justification might be reverse causality. In other words, perhaps violence may have been caused by migration flows. Additionally, those outcomes also raise question on whether security expenditure also meet the orthogonality condition, although it is not possible to perform over-identification test with this instrument solely. As a matter of simplicity, outcomes using only security expenditure as instrument will be shown in further tables, since this variable presents some economic intuition to act as an instrument.

As IV results are not reliable and other issues should be addressed, two further methods are implemented. Fixed effects present different results from OLS and IV. Controlling for unobservable characteristics at destination, violence becomes non-significant to explain migration flows. In the last column, Poisson Pseudo-Maximum Likelihood results show that violence is negative and significant, which might suggest that people might moving towards cities with lower crime rates.

Considering this restricted model, outcomes suggest violence may be relevant in explaining to where people migrate: cities with lower crime rates tend to attract more migrants than their counterparts. The migration literature suggests that fear of crime leads people to move towards medium-sized cities, even though the level of crime could be similar between origin and destination. Brazilian case presents however that the level of violence may represent these fears, since results suggests that it is negatively correlated to migration flows. It is thus not only a perception of violence, but actually their values which are correlated to people's decision to change dwelling across cities.

One may argue that migration flows might have distinct patterns depending on how far the two localities are apart. Housing prices, for example, might be much more relevant for changing dwellings between cities which are less than a certain limit than for those beyond this threshold. On the other hand, long-distance migration flows might be more related to differences in nominal wages than short ones, because people can change job from one city to another but not dwelling. As it regards amenities, especially violence, there might be some differences as well because migration flows might be more strongly correlated at short distances than long ones, since people may change only where to live and not where they work. Following Table 3 format, Table 4 presents results[27] splitting by migration below and beyond 100 km[28] isolating the effect of housing prices and nominal wages. For parsimony, results only for the most relevant variables in this study are presented in Table 4.

[27]Columns (i) and (v) present OLS results. Columns (ii) and (vi) present 2SLS using only Security as instrument. Columns (iii) and (vii) show FE at destination. Finally, columns (iv) and (viii) show Poison pseudo-maximum likelihood outcomes.

[28]One hundred kilometres is chosen as a threshold for two reasons. First, 95% of the distances between contiguous cities are below 75 km. Second, 60% of the migration flows occurs underneath 250km, where half of them below 50km. Thus, this limits of 100km represents not only a reasonable amount of the migration flows but also migrants who may have changed residence but not job.

Table 4: Restricted Model Results by Short and Long Migration Flows

Panel A: Regression Results								
Dependent Variable	Under 100km				Beyond 100km			
Share of Migrants	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Violence	-0.341	-0.602	0.02	-0.257	0.07	-0.603	0.00	-0.057
	(0.033)***	(0.115)***	(0.035)	(0.033)***	(0.019)***	(0.170)***	(0.026)	(0.030)*
Observations	26,067	26,067	26,067	26,067	124,925	124,925	124,925	124,925
R-squared	0.37	0.36	0.55	0.10	0.27	0.21	0.31	0.07
Panel B: First Stage Results								
R-squared	-	0.05	-	-	-	0.03	-	-
F-stat.	-	1,475	-	-	-	4,182	-	-

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Regarding the main difference in the explanatory variables from the first econometric results, nominal wages in the service sector seems to matter more for long distance migration flows than for short distance. Manufacturing nominal wages appear again not presenting robust results. House prices below 100km present negative expected sign, apart from destination fixed effects, while beyond this threshold only Poisson shows the negative expected sign. This result corroborates the finding of Jannuzzi and Jannuzzi (2002) in which housing price is the main factor to explain migration in the Sao Paulo metropolitan region. Overall, wages and housing prices present expected outcomes, which the latter seems to be more relevant for short distance, while the former for long distance. Distance still plays an important role regardless of whether migration flows are short or long distance.

One important difference is regarding urban population size. Although migration flows are correlated to less populated places beyond 100 km, the contrary occurs underneath this threshold. This means that people in short distances tend to move

towards bigger cities, while in long distance they tend to migrate towards smaller cities. The strength of social network is greater than the negative amenities when cities are mainly neighbours while the opposite happens in long distance migration flows. One explanation for this outcome may be that people who are in surrounding cities may be also affected by these negative amenities at their origin cities; then moving towards a bigger city seems not bother them.

As it regards violence, outcomes present pretty similar results which mean that people are moving towards safer places.[29] Comparing the strength of this association, it is possible to infer that a greater correlation is found at a short distance than at long by looking at Poisson results. Considering these results, crime rates at short distance is nearly twice correlated than those at long distances.[30] Violence affects more migration flows under 100 km than beyond this threshold. This is an expected outcome since some migrants are able to move only their residence (from a violent city towards a safer one) rather than both, job and dwelling, in long distances.

Results obtained so far do not consider origin characteristics. Some part of the literature argues that what really matters is destination attributes because people do not value the characteristics of origin since the decision to move is already made. The destination attributes are therefore much more relevant to evaluate than origin. However, the variable investigated here, violence, is a disamenity where origin might be more relevant than destination. In other to check whether more violent cities tend to repel people, a traditional gravity equation is estimated for this purpose. Some slight differences emerge for this exercise as stated previously. First, the dependent variable cannot be the share of migrants but rather the total migrants. In the end, the dependent

[29] Results from IV estimation under 100 km should be analyzed with care, since security measure is at a state level. Results on this issue have therefore become positive, perhaps because this instrument does vary substantially under this threshold.

[30] Considering the 95% confidence interval, the upward limit of long distance is around -0.11 and the downward limit for short distance is -0.19.

variable turned out to be a percentage of migration *i* to *j* in the total migration flows of year *t*, as explained in Section 2.3. Second, all variables which are used at destination should also be utilized for origin. In order words, share of population, for example, from origin and destination is included in the estimation process. Third, as origin variables are also included, and then fixed effects should consider not only unobservable destination characteristics but also origin ones. In order to consider both, pair-wise unobservable attributes are controlled in the fixed effects approach.[31] Table 5 shows a summary of the results of a traditional gravity equation.[32]

Table 5: Traditional Gravity Equation Results

Panel A: Regression Results					
Dependent Variable	(i)	(ii)	(iii)	(iv)	(iv)
Share of Migrants	OLS	OLS	2SLS	FE Pair-wise	Poisson
Violence		0.011	-0.085	-0.037	0.004
		(0.004)***	(0.028)***	(0.020)*	(0.011)
Violence Origin		0.062	0.053	0.052	0.097
		(0.004)***	(0.020)***	(0.019)***	(0.012)***
Observations	275,308	113,307	113,307	113,307	113,307
R-squared	0.26	0.28	0.28	0.02	0.06
Panel B: First Stage Results					
Instruments	-	-	Security Exp.		
R-squared (Dest / Origin)	-	-	0.04 / 0.06	-	-
F-stat. (Dest / Origin)	-	-	2,152 / 3,567	-	-

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

In order to show that control variables do not change their results substantially, distance remains significant and negative. Estimating only with distance and urban

[31] FE has created more than 100 thousands pair-wise, leaving around 10 thousand observations which are used to estimate parameters needed.
[32] The full table is available upon request.

population size, there is no clear evidence whether urban population size at origin and destination have different signs. Only with OLS urban population does have the expected significant sign at destination, but not at origin. After controlling for all other characteristics, urban population turns out negative at destination and positive at origin in all methods analyzed. Negative amenities appear to overcome social network even after controlling for origin attributes since it has a significant and negative sign at destination. Looking at both results (origin and destination), it is feasible to infer that these outcomes corroborate once more the stylized fact that people are moving from metropolitan cities towards medium-sized cities.

Entertainment amenity presents a significant expected sign at destination and negative at origin only when OLS, 2SLS and Poisson are implemented. This outcome represents the traditional behaviour of gravity equation where origin attributes are centrifugal forces towards destination with a centripetal one. Population density, used as a proxy for congestion, present some results (2SLS and FE) at destination showing that people are avoiding densely populated regions. On the other hand, this disamenity has a positive sign at origin in all methods implemented, which means that this attribute may be more relevant as a pushing factor at origin than a pulling factor at destination.

Violence now seems to act much more as a pushing factor at origin than as a pulling factor at destination. Crime rates at destination do not present significant negative results only by using Poisson, which might be a reasonable indication that people are moving towards cities with lower violence records. Crime rates at origin show however significant positive outcomes in all methods. These findings suggest the level of violence at origin might be more important in explaining migration flows than its level at destination. Combining with the urban population result, it is feasible to

conclude that metropolitan areas where crime rates occur more often are definitely repelling people towards smaller and safer places, which are medium-sized cities.

As discussed previously, neighbouring effects of violence might be relevant in explaining migration flows because violence affects people's well being not only locally but in surrounding areas as well. The main explanation is due to social interaction of violence. Table 6 shows a summary of the results with spatial lag variable using the contiguity matrix.[33] The first four columns present results using the restricted gravity equation while the last four show outcomes using the traditional gravity equation.

Apart from FE in the restricted equation, urban population continues showing for example the significant negative sign at destination. Positive and negative amenities do not change their previous interpretation after the inclusion of this new variable disregard the model adopted.

As it regards violence, it is important to mention that the inclusion of spatial lag remove the negative significant sign of local crime rates in all methods considering the restricted equation. The spatial lag do not show robust result for security as a pulling factor at destination, since only in the Poisson using the restricted equation. Outcomes change however at the traditional gravity equation. Once more, crime rates at origin appear to act as a pushing factor for migrants much more robustly than as a pulling one at destination, not only locally but also in neighbouring areas. This corroborates the fact that violent places or those surrounded by areas with high levels of criminality are repelling people to other places, which might have lower offences registered at police stations.[34]

[33] For simplicity, only results of amenities and distance are shown in Table 6. Full outcomes are available upon request.
[34] Similar results are found by estimating with 4 nearest cities which are available upon request.

Table 6: Neighbouring Effects Using Contiguity Matrix

Panel A: Regression Results								
Gravity Equation Type	Restricted Gravity Equation				Traditional Gravity Equation			
Dep. Var.: Share of Migrants	OLS	IV	FE	Poisson	OLS	IV	FE	Poisson
Violence	0.06	0.66	-0.01	-0.04	0.01	-0.39	-0.04	-0.01
	(0.023)**	(0.82)	(0.03)	(0.03)	(0.01)	(0.228)*	(0.024)*	(0.02)
Spatial Violence Contiguity	-0.03	-0.91	0.01	-0.07	0.00	0.24	-0.01	-0.01
	(0.02)	(0.65)	(0.03)	(0.030)**	(0.01)	(0.17)	(0.03)	(0.02)
Violence Origin					0.04	-0.97	0.02	0.06
					(0.006)***	(0.572)*	-0.02	(0.018)***
Spatial Vio Origin Contiguity					0.03	0.97	0.07	0.06
					(0.006)***	(0.558)*	(0.024)***	(0.019)***
Observations	141,727	141,727	141,727	141,727	101,270	101,270	101,270	101,270
R-squared	0.32	0.26	0.34	0.10	0.28	0.14	0.03	0.05
Panel B: First Stage Results								
R-Square (Destination)	-	0.03	-	-	-	0.04	-	-
F-Stat. (Destination)	-	2,488	-	-	-	1,132	-	-
R-Square (Origin)	-	-	-	-	-	0.06	-	-
F-Stat. (Origin)	-	-	-	-	-	1,753	-	-
R-Square (Spatial Dest.)	-	0.06	-	-	-	0.07	-	-
F-Stat. (Spatial Dest.)	-	4,357	-	-	-	1,858	-	-
R-Square (Spatial Origin)	-	-	-	-	-	0.07	-	-
F-Stat. (Spatial Origin)	-	-	-	-	-	1,934	-	-

(a) Robust standard errors in parentheses; (b) * significant at 10%; ** significant at 5%; *** significant at 1%

As discussed in Section 3, one possible criticism is that not only contiguous municipalities should be considered but also their closest neighbours, which may not be

contiguous. In order to tackle this issue, Table 7 shows results using the four nearest neighbours' matrix to construct the spatial lag violence.[35]

Urban population continues to have the expected outcome. Population density and entertainment amenity show less results from before although the same interpretations, which is they tend to expel people from places with more congestion and less entertainment options towards others with the opposite values.

Regarding violence itself, the neighbouring effects also change violence findings where the spatial lag at destination seems to be more negatively correlated to migration flows than at the local level. In the traditional gravity equation, crime rates at origin, locally or spatially, appear to continue to be positively associated to outward migrants. In order words, these findings suggest that criminality figures from where people are moving from seem to be positively correlated to migration flows not only locally but also spatially. On the other hand, places surrounded by safer municipalities appear to be attracting more inhabitants than those with lower criminal records solely.

Considering both matrices to construct the spatial lag, overall findings suggest that neighbouring effects seem to be associated to migration flows and they do not eliminate the effects of local violence, especially at origin.

[35] A table containing all parameters estimated is available upon request.

Table 7: Neighbouring Effects Using Four nearest Neighbours Matrix

Panel A: Regression Results								
Gravity Equation Type	Restricted Gravity Equation				Traditional Gravity Equation			
Dep. Var.: Migrants Share	OLS	IV	FE	Poisson	OLS	IV	FE	Poisson
Violence	0.09	6.50	0.00	0.04	0.01	1.56	-0.04	0.03
	(0.024)***	(17.69)	(0.03)	(0.03)	(0.005)*	(2.98)	(0.022)**	(0.02)
Spatial Violence Nearest	-0.06	-4.37	0.01	-0.15	0.00	-1.02	0.00	-0.04
	(0.022)***	(10.54)	(0.03)	(0.029)***	(0.01)	(1.85)	(0.02)	(0.020)**
Violence Origin					0.04	1.67	0.03	0.06
					(0.005)***	(3.39)	(0.02)	(0.020)***
Spatial Vio Origin Nearest					0.04	-1.66	0.04	0.07
					(0.006)***	(3.42)	(0.022)*	(0.021)***
Observations	150,483	150,483	150,483	150,483	112,661	112,661	112,661	112,661
R-squared	0.32	0.27	0.34	0.10	0.28	0.15	0.03	0.06
Panel B: First Stage Results								
R-Square (Destination)	-	0.03	-	-	-	0.04	-	-
F-Stat. (Destination)	-	2,279	-	-	-	1,153	-	-
R-Square (Origin)	-	-	-	-	-	0.06	-	-
F-Stat. (Origin)	-	-	-	-	-	1,987	-	-
R-Square (Spatial Dest.)	-	0.06	-	-	-	0.08	-	-
F-Stat. (Spatial Dest.)	-	5,203	-	-	-	2,477	-	-
R-Square (Spatial Origin)	-	-	-	-	-	0.08	-	-
F-Stat. (Spatial Origin)	-	-	-	-	-	2,501	-	-

(a) Robust standard errors in parentheses; (b) * significant at 10%; ** significant at 5%; *** significant at 1%

5. Conclusion

This chapter investigates whether amenities/disamenities, especially violence, are correlated with urban-urban migration flows between Brazilian cities. Not only violence was used to explain it, but also other amenities and disamenities, such as

population density and entertainment varieties as well as many social and economic variables.

Amenities investigated in this chapter present interesting results. Entertainment amenities seem to be an important pulling factor for migration flows which means that people do migrate towards cities with larger options of restaurants, shops, and others. Disamenities, such as congestion, appear to be the pushing force representing people's desire to move to less densely populated cities. Urban population outcomes corroborate Andrade et al. (2000) findings in which medium-sized cities are increasing their participation in the Brazilian urban population since larger places are repelling inhabitants towards smaller cities. Therefore, the negative part of larger areas, such as pollution and other crimes, appears to overcome most of the positive part, social network, for example.

Looking at violence, the results suggest it is negatively correlated to Brazilian migration flows. Places offering lower levels of crime rates tend to have more people moving towards them. Neighbouring effects are also tested and outcomes show cities with high violence in their surrounding territories do not attract migrants. Additionally, cities surrounded by violent places also repel people towards other places. It is therefore safe to conclude that it is not possible to exclude criminality to explain the movement of people throughout all of the Brazil.

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