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Large Scale Urban Projects: The State and Gentrification in the Belo Horizonte Metropolitan Region

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Abstract

This paper assesses the degree to which a series of large-scale urban projects along the North Axis of the Metropolitan Region of Belo Horizonte (MRBH), Brazil, may have triggered a process of gentrification since 2004. The North Axis is the poorest zone of the MRBH, and it has been the subject of multiple development and investments plans, under the concept of "Aerotropolis"—the globalized metropolis that has an international airport as the anchor for its development. Although initially proposed as Public-Private Partnerships (PPPs), state government had the central role in these projects and funded almost all. These investments include a series of large-scale urban projects, including the Green Line (Linha Verde) corridor, which connects the central city to the International Airport Tancredo Neves, and the relocation of the administrative offices of the state government (Cidade Administrativa de Minas Gerais, CAMG). All these plans and developments were sustained by major investments in road and service infrastructure, including a Bus Rapid Transit (BRT) system. Area plans and investments have likely increased land values and rents in the area, sparking concern about the gentrification of low-income households in and around the area.

Empirical results indicate that the large-scale urban projects such as the CAMG may have increased the land values in the study area at nearly 17 percent. On the other hand, the "MOVE" BRT system may have caused a 14 percent price drop in the study area. Regarding the potential gentrification process, empirical results rejected this hypothesis, mainly because the study area is a consolidated area and the high-income groups have not been attracted to the area.

The study generated the conditions to design and implement another study, focused more on land value increments indeed generated by area plans and investments, covering a wider area and the range of options local governments could consider recovering those increments. More research is necessary to clarify the effects of BRT systems on Latin American cities, a key concern on urban policy nowadays.

Keywords: infrastructure, land markets, spatial segregation, economic development.

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Large Scale Urban Projects: The State and Gentrification in the Belo Horizonte Metropolitan Region

Grandes Projetos Urbanos: O Estado e Gentrificação na Região Metropolitana de Belo Horizonte

Introduction

Large-scale urban projects (LSUP) are large, complex projects involving a myriad of agents, with a long-run horizon and impacts on millions of people. Overall, these projects typically exceed $1 billion and in the last decades have grown at high rates around the world –in the case of large infrastructure projects, the growth rate was about 1.5 percent to 2.5 percent a year in real terms throughout the 20th century (Flyvbjerg 2014). Due to their potential strength to break with previously established structures, trajectories and conventions, Hirschman (1958) called them "trait-making" and "privileged particles of the development process". In this sense, a key aspect of LSUP is their capability to change the socio spatial structure of the area where they are located by public or private actors (Lungo 2010; Lungo e Smolka 2010). In a global context in which competition no longer occurs only between national states, but increasingly between cities, different versions of LSUP have spread throughout the globe, including the Global South.

However, large-scale projects have ambiguous impacts, which led Flyvbjerg (2014) to introduce the so-called "megaproject paradox". On the one hand, there is a growth in the number, size, and amount invested in this type of project, with the potential positive effects related to scale economies, recovery of degraded areas, or the development of backward areas. On the other hand, there is vast empirical evidence of projects with cost overruns, schedule delays, benefits shortfalls, democratic deficit in their conceptions, socialization of costs and risks, privatization of profits, and planning for middle and high-income groups. All these negative effects become more pronounced when it comes to Latin America.

Among the criticisms directed at LSUP, it is questioned whether these projects increase the social polarization of cities, segregating them and triggering processes of gentrification of the affected areas. This work defines gentrification as the displacement of a low-income population from its area of residence and/or the occupation of this area by high-income populations. The supposed causal nexus begins with the introduction of a LSUP in a poor or decadent area of a city, implying an increase in land values in the affected areas, leading to the expulsion of the more socially vulnerable populations and attracting high-income groups. The relationship between LSUP and gentrification in urban areas has been discussed over the last decades, albeit in a fragmented and scarce way for Latin America (Sabatini, Robles, e Vásquez 2009; Betancur 2014; Zuk et al. 2015). Many of these studies do not explain or attempt to quantify the transmission channel from public investment shocks to the gentrification process, that is, they do not discuss the creation of land value increments. In this sense, recognizing that State interventions can generate such a mass of value is a fundamental point in contemporary urban policy (Turok 2016). More widely, the relationship between the State, LSUP and gentrification is an important aspect for a better understanding of the problem. As Smith (2002, 1996) pointed out

in his seminal work, where "gentrifiers" go, generally the State, land developers and banks have arrived before.

In this panorama, this work explores the Northern portion of the Belo Horizonte Metropolitan Region (MRBH) as a case study to investigate, through empirical evidence, the relationship between LSUP, land value and gentrification**.** From 2003 to 2015, state government created a marketing campaign for this region, labeling it as the "North Vector". For this reason, we adopt the term "North Vector" (NV) throughout this work. The MRBH is the third largest urban agglomeration in Brazil, with 34 municipalities and more than 5 million inhabitants, and has undergone rapid urbanization that added irregularly urbanized areas with high social polarization –a typical case of Brazilian and Latin American metropolises. The NV is the poorest zone of the MRBH and it has been the subject of multiple LSUP since 2004, including the Green Line ("*Linha Verde"*) corridor, which connects the central city to Tancredo Neves International Airport (TNIA), and the relocation of the administrative offices of the state government, Administrative City (*Cidade Administrativa de Minas Gerais, CAMG*). The NV Master Plan for the area has also promoted and allowed for private development that could help accomplish a vision for the area under the concept of "Aerotropolis" (the city that develops around an international airport). According to the policy makers interviewed in this research project, the main purpose of the state government was to establish TNIA as the main airline hub in South America, and to foster the new economy sectors in the MRBH, such as aerospace and air defense, biotech and ICT. Therefore, there was a declared economic reasoning behind all these LSUP. All of these plans and developments were sustained by major investments in road and service infrastructure. One of the main projects implemented is the Bus Rapid Transit system ("MOVE" BRT,). Simultaneously, Belo Horizonte was one of the FIFA's Confederation Cup (2013) and World Cup hosts (2014), which led to the upgrade of the Governador Magalhães Pinto Stadium ("*Mineirão*"), also located in the NV.

Some of these projects will not be detailed in this study. Some because they are outside the selected study area, others because they have not been completed or even started. All the LSUP were planned in a context of globalization, economic restructuring, economic growth (until 2014), falling income inequality, credit expansion for low income housing, skyrocketing real estate prices, booming financial markets, overvalued exchange rates, and aging populations. After 2015, the greatest economic crisis in Brazilian history began, with important inflections in public policies. These characteristics of the studied period are discussed throughout this work. As mentioned before, it is fundamental to keep in mind that these LSUP are a result of a specific state government (represented by Aécio Neves', Antônio Anastasia's and Alberto Pinto Coelho's terms), all members of the same political party, who governed Minas Gerais state from 2003 to 2015. Nonetheless, this work does not detail political science's or political philosophy's aspects of these investments, focusing on urban economics, economic geography and urban planning. Herein, our main purpose is to assess the impacts of the LSUP over the study area, focusing on land markets and population. Future works may give the appropriated attention to political aspects of these LSUP, for example, using interviews with entrepreneurs and technocrats that were done during this research project.

In view of the large area potentially affected by the mentioned LSUP, and based on the time and resources available, we chose to limit this research to a specific geographic area contained in the

NV. To illustrate the size of the potentially affected area, the beginning of the BRT corridor and Green Line is about 40 km from the TNIA. Taking also these two landmarks as references, one of the main expansion areas of gated communities in the NV, *Serra do Cipó*, is about 100 km far from them. Therefore, in order to present updated empirical evidence, and given the focus suggested by the Lincoln Institute of Land Policy on the topic of gentrification, we selected the area where the poorest population and the major LSUP are located. This area is described in the next section.

This study used a number of datasets to bring empirical evidence to the analysis and to attempt to answer the key research questions. Quantitative and qualitative methods were employed, as well as counterfactuals exercises.
Employment data (from the Annual Report of Social Information "*RAIS*") was used to analyze regional labor market dynamics and to answer the question: does the MRBH have potential gentrifiers? In light of the existing literature (especially Betancur, 2014), this question is a first step for research on gentrification. Based on the restructuring process of the regional economy and the high and middle-income levels of the MRBH, the existence of potential gentrifiers cannot be rejected.

We used 2000 and 2010 Census data to search for evidences of changes in the study area demographic profiles and establish comparisons with other peripheral areas of the metropolis. Average monthly income, density, age and homeownership levels showed the rise of income of the poorest population, the drop of inequality, the aging of all groups, and the rise of homeownership levels in the time period analyzed. Therefore, it is possible to affirm that the living standards rose in the study area between 2000 and 2010. However, the NV did not grow more than other low-income regions, such as the Southwest (Barreiro, Ibirité, Sarzedo) or East (Sabará). In other words, comparative analysis brought evidence that the improvement of living standards in the NV was not necessarily caused by the LSUP in the area, but due to a wider context of improvements of living standards in urban peripheries in several regions of the MRBH.

Nonetheless, census data has three major limitations in face of the main objectives of this research. First, this research started in 2017 and the last Census occurred in 2010 –seven years of outdated information. Second, it is impossible to check if the rising in the living standards happened to the same residents or if it is an evidence of an influx of new ones. Third, many crucial questions of this research are not available in the Census data. Facing these challenges, we decided to apply a survey in the study area. This new data identified how long each family lives in the same dwelling and asked other specific questions. 897 questionnaires were applied in the 2017 first semester. Empirical evidences brought by this data reinforced the perception of rising living standards in the area from 2004 to 2015, mainly due to federal social policies, such as the minimum wage rise policy. The federal housing program "Minha Casa Minha Vida" (MCMV) probably was one of the main causes of the increase in home ownership level in the area, both for old residents and new ones. Possibly, young people born in the study area could afford their own property around their families' homes –a preference trait captured by the fieldwork. Most of the residents in the study area have been living there for more than 10 years, and most of them do not plan to move from there. On the other hand, it is possible to identify an influx of new low and middle-income families to the area. These three datasets (2000 and 2010

Censuses and our survey) helped to weaken concerns about gentrification within the study area in the time period analyzed.

To assess the impact of the LSUP on land values, the land value tax databases (*ITBI*) of Belo Horizonte provided very relevant information from 2009 to 2017. This data showed a higher rate of growth of real estate prices in the NV than the average of Belo Horizonte. Notwithstanding, other peripheral areas had higher rates of growth than the NV. We used differences-in-differences models to assess the impacts of the major LSUP on land values within the study area. To check robustness, we tested fifteen different models, varying controls and the definition of the study area. The main findings indicate that LSUP, such as Shopping Estação and CAMG, had a positive impact on land value and on apartment's prices within the study area. MOVE (BRT) had a negative impact on land value and apartments' prices, a finding corroborated by the fieldwork when residents often criticized this transport investment.

An econometric approach was also used to analyze internal characteristics of the study area, specifically the variables with stronger correlations with the price per square meter. Significant results were found for variables such as the buildings' age, the year of the transaction, some of the construction quality variables, the land regulation parameters and the presence of the Pampulha Lagoon. We explored three samples, one for apartments, one for houses and another for commercial real estate. These different samples reinforce the relevance of zoning laws and macroeconomic cycles to explain real estate and land prices.

The next section updates and reviews the academic and policy literature on LSUP, land values and gentrification. Section 3 defines, explains and updates the datasets and the geographic area of analysis used for the study. Section 4 defines, explains, and discusses the results of the tools used to analyze the impacts of the interventions. Finally, section 5 concludes and traces research avenues for a better understanding of the relationship of LSUP, land value and gentrification in Latin American metropolises.

Literature Review

Large Scale Urban Projects (LSUP)—"*Grandes Projetos Urbanos*" (GPU)

Large-scale urban projects (LSUP) are understood as interventions in specific and unique sectors of the city that have the capacity to produce socio-spatial transformations and which, as a result, also produce changes in the structure of land prices in its immediate and mediate environment (Lungo 2010). The term's definition, however, varies significantly among authors, who define LSUP from several aspects. Other terms have also been used in the large projects' literature. According to the Merriam-Webster Dictionary, the term "megaproject" was first used in 1976 (Flyvbjerg 2014, p.2). "Megaproject" is a concept most often used in Anglo-Saxon language literature. Also, terms such as large urban project, large urban intervention, large urban development projects (LSDUP), or even flagship project have been used (Sánchez et al. 2014; Ultramari and Rezende 2007; Cuenya 2011a; Flyvbjerg 2014b; Leick 2015).

As for the LSUP's origin, they reflect the new dynamics of the economy –better defined since the 1970s (Ultramari 2006) –which was frustrated by the inability of urban management to produce interventions capable of generating socioeconomic changes (Ultramari and Ciffoni 2014). This assessment accompanies the crisis of both Keynesian State and Fordist industrial production (Almeida et al. 2015, Friedmann 1987). However, the term LSUP has been used since the 1990s as part of a new phase of contemporary urbanism: the so-called "Urban Renaissance", a phase in which cities have been reinforcing their roles as political actors and have been seeking greater global prominence among the current competition, building the "most pioneering" works, the "most sophisticated" buildings and the technologically "most advanced" interventions (Ultramari and Rezende 2007, Monié and Vasconcelos 2012). Nonetheless, many cities that invested in LSUP still perform poorly in terms of economic growth or economic development, as well as many LSUP rose doubts since its conception. Due to these facts, recent research has been finding evidences of the eventual failure of LSUP as a development policy, such as tech parks, enterprise condominiums for high-tech firms, smart cities, creative cities and so on. As Pugh, MacKenzie, and Jones-Evans (2018) note, "techniums" (high-tech condos) are turning out to be "emptiniums" (empty condos because of the failure of the LSUP) in peripheral countries.

In addition, it is understood that the LSUPs have been used as tools of value for cities, since they have been produced with the purpose of increasing inclusion in the world circuit of capitalist valorization (Sánchez et al. 2014). This attempt is commonly approached by the literature through the emphasis given to the fact that LSUP serve as potential promoters of competitiveness between cities in a global economic market (Zaitter and Ultramari 2010; Leick 2015), which over the past thirty years has been undergoing economic, social and institutional restructuring (Cuenya 2011a). On the other hand, the LSUP may have relevant effects over land value through speculation, but without any effect over the cities' economic structure or productivity.

It should be noted that LSUP frequency and values have not only increased in recent years, but also show a growth trend for the coming years. The McKinsey Global Institute (2013) estimated that overall spending on infrastructure will average $3.4 trillion per year between 2013 and 2030–roughly 4 percent of the world's GDP–with most of this amount going to LSUPs. Infrastructure spending has never reached such high levels, prompting The Economist (2008) to call the phenomenon "the biggest investment boom in history" (Fyvbjerg 2014). However, many of these forecasts were overestimated, as well as the potential of transformation of the economy of cities. Regarding the sort of changes that the LSUP may generate. We highlight three of them. The first and foremost is the raise in land rent that these interventions can generate in the strategic areas where they are implemented (Cuenya 2011, Sarue 2014). These areas are generally those that have been relegated and degraded over time, but they are strategic from the point of view of accessibility and the potential for recovery. They are also characterized by large extensions of land and, therefore, conditions to house new uses and provide urban transformation. Because they are initially degraded and decayed areas, their values are often low, but they can increase dramatically depending on the physical and functional transformation that the LSUP promotes. For this reason, they are called "opportunity areas".

The second change provided by the LSUP relates to the functional and spatial aspects of the urban centrality. After all, one of the LSUP's principles is precisely to create favorable environments, in which companies can find infrastructure, forms of transportation and services

that enable them to operate on a regional, national and/or international scale. Thus, from the supply-side point view, it is expected that companies in sectors that can be classified as belonging to the "new economy" gain greater conditions for productivity improvement.

The third change provided by LSUP is changes in the logic of public space management mechanisms. State takes on a new role in this type of work: a promoter role, oriented toward a private sector logic, more specifically toward land profitability. After all, LSUP management, by requiring different negotiating bodies–public and private actors—has as one of its purposes to ensure the interest of companies in the profitability of real estate capital since it is necessary to make the project attractive to investors. This change accompanies the trend of new urban policies, which has as one of its characteristics a strong support for private capital to carry out interventions aimed at the revitalization of cities (Cuenya 2004; Cuenya 2011).

Among LSUP's characteristics, the multiplicities of political and economic agents involved in their planning and execution phases are highlighted by important authors (Harvey 2005; Freitas 2015). It can be said that the formation of public-private partnerships (PPPs) and complex coalitions are basically a prerequisite for LSUP implementation (Sanchez et al 2004, Flyvbjerg 2006, Ultramari and Rezende 2007). On this matter, emerges a debate on what motivates the formation of coalitions around these projects, which are considered difficult to be made. The interest of the private sector, especially of real estate capital, is clearly one of the motivators for this coalition, which is accompanied by public sector's need for revenues.

Fyvbjerg (2014) divides the motivators of these coalitions into four strands ("the four sublimes"). The first is the works' technological aspect, since they allow engineers and architects to develop ever larger and more innovative projects. The second is the political aspect, which is found not only in the fact that politicians have the possibility of constructing equipment associated with their causes, but also may gain visibility by having their names associated with a LSUP. The third characteristic is the LSUP's economic aspect, which allow earnings for various agents, such as entrepreneurs, contractors, construction workers, consultants, among others. The fourth and last feature is the LSUP's aesthetics: the construction of projects this size is usually accompanied not only by a modern design but by an iconic image for the city, which is well-seen by a large part of the population.

The formation of coalitions, however, does not exempt the LSUP from facing recurrent challenges, significantly discussed in the literature. Among the various challenges for LSUP development, we highlight three. The first is related to the fact that there is no pattern between LSUP and the technologies used, leading planners to see their projects as unique and preventing them from learning from other projects (Flyvbjerg 2014). The second challenge is due to the large amount of financing involved, which leads to problems such as the main agent and rent seeking (Eisenhardt 1989, Stiglitz 1989, Flyvbjerg, Garbuio and Lovallo 2009). This may be one of the factors that generate attractiveness to the private sector. On the problem of the principal-agent, it is known that the companies contracted to build the LSUP have a greater level of information compared to the level of information that the public sector and society in general usually have. Therefore, it is possible that the company overestimates costs and deadlines for its own benefit, since the aim of the company (agent) is to maximize its profit and not to promote the collective benefit as, theoretically, it is the public sector's main purpose. In the case of rent-

seeking, companies benefiting from LSUP may have extraordinary advantages (economic rent) compared to competitors who, because of another location, cannot benefit from the community-funded project. Finally, it is worth mentioning that the delivery of projects this size is subject to the so-called "black swans", which are rare events but with a very high negative potential outcome (Taleb 2010 apud Flyvbjerg 2014).

Land value—"Valor da terra"

The issue of land and the distribution of surplus among capitalists, landlords and other economic agents has been part of the economic science at least since the seventeenth century. Beginning with the physiocrats, the debate developed from the standpoint of the leading classical authors, namely Adam Smith, David Ricardo and Karl Marx (Almeida, Monte-Mór 2017). From Smith's theorizations, David Ricardo developed his theory on differential land rent, exploring the connection between land rent and the overall rate of profits. According to the author, the fertility differential between lands impacts its value. In this way, the value of the best quality land is higher than the marginal land's value, since the products produced in it are sold at the same prices, but with a lower cost of production, which reflects its capacity to generate higher income from the land (Lenz 2007).

Karl Marx made headways by introducing to the debate not only his version of the theory of differential rent but incorporating two issues: absolute rent and monopoly rent, which arises from land private ownership and consumer demand for privileged spaces. The author divides the concept of differential rent in two parts. In the type I differential rent, Marx works the concepts of land's fertility and location in relation to the markets. The type II differential rent is the result of capital investments for land productivity improvements and its location in relation to the market (Almeida and Monte-Mór 2017; Navarro and Suzuki 2010).

After the classical economists and Marx, the concept of land rent was converted to the urban case. Urban land surplus value is an alternative concept used in the literature, which refers to the valuation of private land originated by the urbanization process. The process of capturing surplus value in this model is related to the land value increase apart from any owner's effort (Jorgensen and Furtado 2006). Henry George's (1992) inspiring book refers to this phenomenon. In this panorama, an elementary question is to understand how the collective effort becomes land rent for the owners. The literature on the subject brings evidence that administrative and regulatory changes can have major impacts on land value in a region.

As for the context of urban surplus value generated by the State's interventions, the main transmission channel of investments for land value is through the anticipation of the land rent flows brought to present value. In other words, the LSUP raises expectations about the rent that might be obtained from those land plots (Almeida and Monte-Mór 2017). This occurs due to the anticipation of future rent made by entrepreneurs in the construction sector, who assume they can sell the real estate they will produce at higher prices.

An example from the literature on this subject is the case of Itaboraí's Petrochemical Complex, in the state of Rio de Janeiro, Brazil. In that town, before the Complex's construction works began (2009) a land parcel was sold for about US$14/m², and after its beginning (2010) for about

US$55/m². The so-called urban multiplier–the price per m² ratio between land prepared for urban uses and its preexisting uses in the rural form in urban fringes–is generally estimated above 4. This means rural land in metropolitan peripheries more than quadruples its value when turned into urban land. Smolka (2013) estimated the increase in land value by 400 percent due to the conversion of rural to urban land in Latin American context. As will be shown below, in some portions of the Belo Horizonte metropolitan North Vector (NV), there is evidence that the urban multiplier can be estimated between 3 and 20 for the most distant city areas, and 2 for the areas closer to the capital.

A major LSUP effect on land pricing is the ability of these projects to change the average collective opinion on the area–that is, the urban convention over the area. Broadly speaking, urban convention is this collective point of view about a certain neighborhood, according to the theory written by Abramo (1994, 2007). Since LSUP can change the metropolis' socio-spatial structure, such projects may cause areas previously considered as degraded, peripheral, unhealthy, or unknown to be better seen by real estate entrepreneurs and potential residents. As fieldwork has indicated in this survey, there are residents who stated that before the LSUP in the NV, in MRBH, that area was seen as "nothing" or "far from everything".

As well as there are multiple interpretations for the concept of land surplus value, several definitions appear in the literature when the topic discussed is its capture or recovery. According to Jorgensen and Furtado (2006), the recovery of urban land value is defined as a public action on the appropriable economic surpluses of urban land rent. In the authors' view, it is natural that market allocates surpluses to private owners. In this way, the public authorities need to draw up interventions that adjust this conformation, transferring the surplus to the community.

According to Bartrusis (2006) *apud* Monte-Mór and Almeida (2010), insofar as the State acts to induce land value increases, it is also necessary to provide instruments for the recovery of at least part of this valuation, in order to avoid that resources from the community are transformed exclusively into private gains. Smolka and Amborski (2000) define the capture of land surplus value as the process to which the public power totally or partially recovers the increment of land value attributed to the community effort, excluding the actions of the owners.

From these and other interpretations on the subject, various instruments available to the State to carry out the process of capturing land value come out. The best known of these is the property tax, proposed by the English economist Henry George. George, as stressed by Lenz (2007), advocated taxation of what was not produced by human effort, such as land ownership –a privilege granted to a narrow class. In this sense, the author considered the income of a property derived solely from the collective effort and, therefore, taxable from land value.

Smolka and Amborski (2000) describe the policies of land value capture as coming from fiscal and regulatory instruments. Fiscal instruments are converted into revenue by the public authorities through the collection of taxes and contributions, while the use of regulatory instruments involves various applications such as changes in norms and urban regulations. The capture of land value in modernity goes beyond the traditional forms of taxation. As highlighted by Monte-Mór and Almeida (2010), the current debate is established in the legal, political and

economic spheres, where the ideas of redistribution, equity and social land management are present.

Finally, it should be noted that tools for capturing land value are still largely unknown by many policy makers in the NV and the application of such instruments, allowed by the Brazilian legislation, in several municipalities was not even proposed by ignorance.

Gentrification—"Gentrificação"

Until the mid-twentieth century, the spatial dynamics of US metropolises were largely explained by the Chicago school's sociological-ecological approach. Authors such as Burguess (1925) and Park (1925) pointed to a monocentric city occupied by different social groups in concentric rings. The emergence of the regional science since the 1950s, materialized by the pioneering work of Walter Isard, also reflected this vision of space and the process of urbanization of North American metropolises. The trade-off between accessibility and space was seen as sufficient to explain the intense process of suburbanization that had been taking place in the postwar period. New spaces were created in the direction of escaping the central areas of the city, which was facilitated by better road systems and the mass consumption of the individual car. Such a process is often called *white flight*. As Harvey (2014) points out:

> (…) That dystopian vision [regarding city centers] has been strongly associated with a long-cultivated habit on the part of those with the power and privilege of running far from the city centers as possible. Fueled by a permissive car culture, the urge of get some money and get out has taken command. Liverpool's population fell by 40 percent between 1961 and 1991, and Baltimore City's fell from close to one million to under 700,000 in the same three decades (Harvey 2014, 4–5).

However, contrary movements began to be noticed in the 1960s. Glass (1964) elaborated a seminal work based on the observation of a return to the city by the upper classes. A series of characteristics repeatedly appeared in these urban changes, such as a revitalization of deteriorated neighborhoods and the consequent displacement of the previously resident families. The families that occupied these revitalized spaces were of a higher socioeconomic level, resembling the British rural nobility, the *gentries*, hence the term *gentrification*. Glass' description on the process of gentrification allows us to understand that gentrification was triggered by the deindustrialization of central areas. These areas went from deindustrialized to decayed; from decayed to "underground", frequented by low-income youths and infant artists; from "underground" to "cool", when that agglomeration starts to gain scale and becomes recognized by more diverse social groups; and finally, from "cool" to "fashion", as the areas reverse their social status (or urban convention). Then, highly qualified young people integrated into more modern and sophisticated economic sectors become demanders of the area (Cardoso 2013, Betancur 2014).

The restructuring of neighborhoods under the process of gentrification is commonly understood as a process of displacement of former residents, by various factors. The direct displacement occurs from the rising prices of land in these spaces, due to the new demand for these locations.

Rising real estate prices may prevent former residents from having financial conditions to stay there, especially those living in rented homes. In addition to this process, there is also indirect displacement, which acts to make life in the neighborhood unbearable for the former residents. When there is a typical gentrification process, a new daily life is implemented in these localities, and the established social relations are dissolved. Although these changes may be attractive to new residents, the loss of social and identity connections repels former residents. This implies new services that do not correspond to the habits of consumption of the old residents, neighbors that do not have proximity and identification, being different in several aspects and that, therefore, does not establish relations. Thus, the indirect displacement, equally uncontrollable by the residents of the area affected by a process of gentrification, ends the complete transformation of the neighborhood (Marcuse 1985).

Several authors have been discussing the theme of gentrification over the last decades. In order to clarify the subject, it is useful to separate the literature on gentrification into two major groups of authors or approaches. One approach focuses on the action of capital, which aims to maximize profits in urban spaces. Another approach has as main determinant for gentrification the structural changes of the industrial society.

The fundamental contribution of Neil Smith's critical approach (1979, 1996, 2002) is to address the role of capital as the main agent of gentrification. In contrast to neoclassical views, which encompasses all theories that seek to understand the process as a change in consumer preferences, Smith understands that it is the search of capital for higher rates of profit in cities what determines urban dynamics. However, this does not mean that other agents are not decisive for gentrification, since it is a process with many specificities. Among the necessary arrangements, the author discusses the participation of the State and of the classes that will occupy the spaces to be revitalized. The role of the State is to provide a favorable environment for the invested capital, providing property rights, financing conditions and complementary services for the revitalization of the neighborhood. According to Smith, the State has also a necessary role in legitimation, defending the idea that investments will bring about benefits to the city. These characteristics may be observed in many LSUP in the form of public-private partnerships (PPPs).

Neil Smith's theory explains that gentrification corresponds to an ideological process, oriented and planned. The deterioration of the neighborhoods drops the land value and of real estate therein. However, land value is not completely determined by what is built on it, but mainly by its potential use. When land is too cheap in a decayed urban area, profits prospected by the revitalization of these areas will be very high compared with a non-decayed urban area. Hence, capital may make high profits promoting a gentrification process. This difference between land value before the area's transformation and land value after the area's transformation is called rent gap.

On the other hand, the theoretical framework that seeks to explain gentrification from structural changes emphasizes the patterns of economic development and the form of accumulation. In the cities called post-industrial[1] by some authors, the most qualified jobs (cognitive and science-

[1] Soja (2000) explicitly criticizes the term "post-industrial" because he understands that contemporary cities continue to be characterized to a large extent by the industrial logic. For this author, a more appropriate term is "post-Fordist,"

based functions) gained relevance, demanding agglomeration economies in the related sectors. In the long preceding period, between 1930 and 1980, characterized by the Keynesian State and the Fordist industry in the developed countries (Almeida et al. 2015), the work was massified and standardized. These changes have created built environments that are now seen as unpleasant, such as industrial cities and industrial districts. This pattern of development led to the production of working-class neighborhoods and large housing estates in the suburbs, as in the case of Latin American countries. On the other hand, after the 1980s, the high-technology and advanced services sectors, which demand more specialized workers, started to exhibit high growth rates. The sectors known as FIRE (finance, insurance and real estate) also outperformed in the last decades. As these more dynamic sectors typically clustered in city centers, due to the relevance of agglomeration and urbanization economies. Housing and office space demand growth has also outperformed in these centralities. The workers and managers with this sort of insertion in the job market have become the potential gentrifiers (Betancur 2014).

With this new productive structure, new habits of consumption and space reproduction flourish. Demand for more customized and sophisticated goods has been growing, such as sophisticated restaurants, cultural centers and cafes (Ley 1986). Several authors highlight the role of culture, notably artists, in the process of gentrification. For Ley (1986), artists represent the vanguard of the process of gentrification. They seek more accessible, more unstructured neighborhoods to establish their homes and create an active cultural environment in those localities. This new experience makes spaces attractive for the installation of other more specialized services, as well as to higher classes that seek these experiences. Local real estate, therefore, has increased in their prices, and the area becomes expensive for the old residents' income level (Zukin 1987).

In addition to theoretical and empirical questions, the different approaches to gentrification have acquired distinct and relevant normative connotations. These normative aspects have elicited discussions in the academic literature on the subject. On the one hand, productive and/or speculative capital is understood as an agent, and the resultant of its action on the spaces of cities is seen as perverse, implying the expulsion of the most vulnerable (Betancur 2002; Diniz and Véras 2017). On the other hand, there is the emphasis on the benefits brought about by revitalization of declining areas. In this view, despite some inconveniences, the result is understood as a sign of prosperity for the inhabitants of the city and marked by the rise of a middle class, as in Caulfield (1994). In this case, the concept of gentrification is avoided. Latin American authors such as Sabatini, Robles and Vásquez (2009) see possibilities for gentrification to increase social diversity of neighborhoods, although they also highlight the dangerous of displacement or loss of identity.

The most used terms, as an alternative to the term gentrification, is social mix. It represents the understanding that neighborhoods may be experiencing a mix of cultures from residents of diverse backgrounds and social strata. This diversification is seen as beneficial for the city as a whole, as it fosters the exchange of experiences and knowledge, enhancing the entrepreneurial character that cities assume in the 21st century in a context of global competition[2]. In this way,

indicating that there is a change in the industry standard, with the loss of relative importance of heavy industries of mass production and relative importance of industries based on the new techno-economic paradigm of communication and information technologies.

[2] On international competition between cities, see Rolnik (2015).

the return of the upper classes to the urban centers creates a trickle-down process, where an economic elite takes on the vanguard role in economic growth and the results obtained overflow to all levels of society. In addition, the prevalence of the services sector over the transformation industry sector and the more intense urban space experience by its inhabitants have been key factors, according to the literature (Freeman and Braconi 2004, Lees 2008 and Glaeser 2011). Within urban economics, Edward Glaeser's work (for instance, Glaeser and Maré 2001), which has been called "city triumphalism" by its critics, stands out in this line. Richard Florida's works is also noteworthy, with the concept of "creative class" to refer to workers employed in the sectors of the "new economy" (Florida 2002)–and who are singled out as potential gentrifiers by the critical authors. Florida et al. (2017) understand the city as an engine of economic growth and innovation (innovation machine). Researches incorporate the concepts and seek to observe how market forces act in the territory, aiming at a free economic environment for business to thrive (Glaeser and Gottlieb 2006; Bailey et al. 2015). These approaches tend to give priority to supply-side variables, such as human capital, although empirical evidence has been showing that "firms comes first", meaning, demand-side variables have been prominent in economic development (Storper 2013).

In contrast, the critical view remains to be seen in the elitist character of the gentrification process, where low-income populations have no decision-making power and are ruled out by the urban dynamics of the market. Concerns go toward how these populations are affected, even if they somehow benefit marginally. In addition, resistance movements occur, directly or indirectly, seeking a greater voice in the decision-making guidelines and the maintenance of their life patterns, seeking to maintain the type of community in which they are accustomed to live. It should be noted that eviction actions are often led by the State itself (Vigdor, Massey and Rivlin 2002, Shaw 2008, Atkinson and Easthope 2009).

Therefore, the field of research on gentrification remains wide open. Questions are still relevant and not conclusive. The displacement of people is still under discussion. One of the contemporary guidelines discusses the extent to which the term gentrification can explain experiences of urban transformation in peripheral countries.

Although there are similarities, especially in the Chinese evidence (Ley and Teo 2014, Shin 2016), the difficulty of understanding these phenomena in contexts of the Global South persists (Visser and Kotze 2008; Betancur 2014; Siqueira 2015). In the case of Latin America, where cities can be understood as a hybrid of pre-Columbian, colonial, mercantilist, industrial, and post-industrial traits, processes of alteration of accumulation regimes may become dominant but do not erase the traces of previous time periods.

Investigating the specificity of the hypothesis of gentrification for Latin American cities, Betancur (2014) points out that:

> Deregulation and privatization opened the doors to speculative transactions enhancing financialization and money markets. As in the North, the industry of space boomed. In the housing front, capital focused first and foremost in new projects for middle to upper classes (e.g., vertical and horizontal gated communities, urban sprawl, office campuses, tourism, shopping centers, culture,

> and entertainment venues), further commoditizing cities, again as per their form and level of incorporation to global circuits. Still, different from the North, regime shift was limited by the region's underdevelopment and the complexity of hybrid land and property markets with high levels of informality, a large population working in this sector, and limited market capacity. As a result, restructuring has lagged the North (Betancur 2014, p. 4).

In addition to productive restructuring being less intense in Latin America than in the USA, Canada and Europe, the particularities of land use and land occupation in this region led to many of the new real estate developments and the LSUP associated with them to be localized in peripheral areas, and not in the old historical centers. In this sense, it is fundamental to realize that:

> (…) Meanwhile, rather than taking over and transforming historical centers and CBDs as in the North, globalization created its own spaces, sometimes nearby, sometimes scattered, often assuming the form of real estate islands resting to the centrality of traditional central areas. In the absence of sufficient, well-paid employment opportunities for a majority of the population, cities cannot afford to do without the employment and housing that central areas provide to the lower-income population. Under the circumstances, they cannot be removed without causing major traumas while posing formidable challenges to gentrification. In short, old downtowns and centrally located neighborhoods do not have the same rent potential and attractiveness of those in the North (Betancur 2014, p. 4).

In addition, the labor market of Latin American cities has produced fewer potential "gentrifiers" than the labor market of cities in developed countries. This fact plays a key role on the demand side of the real estate market on the continent:

> In turn, the emergence of gentrifiers is a function of the size and the concentration of high-service jobs in CBDs and of city's role in and penetration by newly dominant accumulation regimes. Although growing in Latin American cities, mainly in Brazil, Mexico, Argentina, Chile, and Colombia, the share and compensation of such jobs are far lower than in the North and, again, clustered outside old downtowns. Meanwhile, cities continue to be majority lower income exhibiting the most skewed income distributions in the world. Middle classes are far smaller in Latin America than in the North: World Bank estimates put them at 30 percent in 2012 — roughly the same size of those living below the poverty line. (…) Added to this is the mediation of culture with the *new classes* reoccupying centrally located areas in the North and their Latin American counterparts being lured by exclusive new gated communities, high-rises, high-end clusters (e.g., Santa Fe in Mexico City), and other developments away from the CBD. Research suggests that the populations attracted to central area living consist mainly of students, households qualifying for public incentives (case of Santiago), nontraditional, moderate-income households, retirees, and some intellectuals and artists. (...) Although upper- and middle-class relocation outside central areas has been a historic constant, it did not take over low-income

> neighborhoods; only recently has it taken place near peripheral low-income settlements forming gated "islands of privilege in seas of misery (Betancur 2014, p. 4-5.).

Thus, as highlighted by Betancur's work (2014), gentrification in Latin America presents itself with at least four striking features:

1. Economic restructuring in Latin America has been less intense than in other parts of the world;
2. Central areas have less potential to generate land value than in developed countries;
3. Removing poor populations from areas of strategic appeal to investors are formidable challenges to gentrification; and
4. In Latin America new real estate for elites, such as gated communities, have been located preferentially in the peripheries.

As the data of this research demonstrate, these specific characteristics of the Latin American cities are present in the case study conducted for the North Vector of the MRBH.

Study Area, LSUP and Data

This section provides information on the study area, the large urban projects (LSUP) carried out in it and the datasets used for understanding the phenomena. It adopts an approach that goes from general to specific. Thus, it presents the basic grounds for a minimum understanding of MRBH and its recent transformations.

Study Area

The study area is composed of parts of the municipalities of Belo Horizonte, Santa Luzia and Vespasiano. According to Table 1, the majority of the population in the study area is located in Belo Horizonte. The total amount of inhabitants of the study area is 428,607. In addition, it shows that the average income of the head of household of Belo Horizonte is almost twice as high as in the other localities. As a reference base, the minimum wage in 2010 (at 2017 values) is R$795.60. Therefore, the average income of the study area is over twice higher than the minimum wage. It illustrates how MRBH has a higher income than the Brazilian average, mainly due to the low levels of small towns.

Table 1: Population and Income Within the Study Area (2010)

Cities	Population	Average Income (in R$)
Belo Horizonte	255,800	2045.45
Santa Luzia	103,956	1280.37
Vespasiano	68,851	1116.69
North Vector	**428,607**	**1759.26**

Source: Own elaboration from the 2010 Census - IBGE.

There are about 5 million residents in the MRBH. It is the 7th most populous metropolis in Latin America and the 3rd in Brazil. MRBH is composed of 34 municipalities, including the capital itself, Belo Horizonte, and its area encompasses 9640 km².

The geographical area called "North Vector" does not officially exist. That is, in official political divisions, such as municipalities, the Minas Gerais state government or the federal government, there is no spatial unit called "North Vector".

One of the findings of this research is that the policy makers who planned the North Vector's LSUP also did not call the area that way at the beginning of their project. According to an interview given by one of the main policy makers, the name came out in October 2003–from a conversation between him and the international professor and consultant John D. Kasarda, author of the Aerotropolis concept. This conversation took place in an event at the "Ouro Minas" Hotel, located on Avenida Cristiano Machado, part of the current Green Line. The primary idea was an expression that showed designs that "vectorized", in the sense of giving a direction.

> This answered a (sic) demand from the state regarding the development of that region that was not called North Vector. There was the North part, dormitory: Neves, Pedro Leopoldo. Lagoa Santa, a region of second residence for higher income people. And a road to the North, to the [Serra do] Cipó.
>
> (...) It came out of a conversation. This was an effective application of building a line of reasoning capable of having an intervention in this region, and that this would lead to this change of pattern in Metropolitan Region's economic structures, not only looking at the MRBH, but also to attend the market of the southeastern region of Brazil. This brings us back to the reality of the dimension from which 65 percent of Brazil's GDP is generated.
>
> (...) We held an event in October 2003 here in BH. Kasarda, talking about what was to come, in a very didactic way, what would be the new wave, the fifth wave that would come from the airport infrastructure, which had to do with the airport industry" (Interview held on May 3, 2017)[3].

[3] We kept the interviewee as anonymous. Future works may explore these interviews.

Given this fact, this research began its analysis from empirical observations of satellite images and fieldwork in the affected areas, as well as by locating the main LSUPs. The area to be potentially affected by LSUPs was too extensive for the deadlines and resources available for this research. Therefore, a decision was made to restrict the study area to a more specific area, which is described below. In Figures 1 and 2, the following stand out:

- BRT corridors in yellow;
- Linha Verde in green;
- North Beltway ("Rodoanel Norte") in blue;
- Cidade Administrativa de Minas Gerais (CAMG) at point A;
- Venda Nova region (part of Belo Horizonte) at point B; the "Vilarinho" BRT station and the subway; road junction of Pedro I Avenue, Cristiano Machado Avenue and the beginning of the MG-010;
- Pampulha region at point C, in the starting point of Pedro I Avenue, north of Pampulha Lagoon and Pampulha airport;
- São Benedito district (part of Santa Luzia) at point D; and
- The study area in white lines.

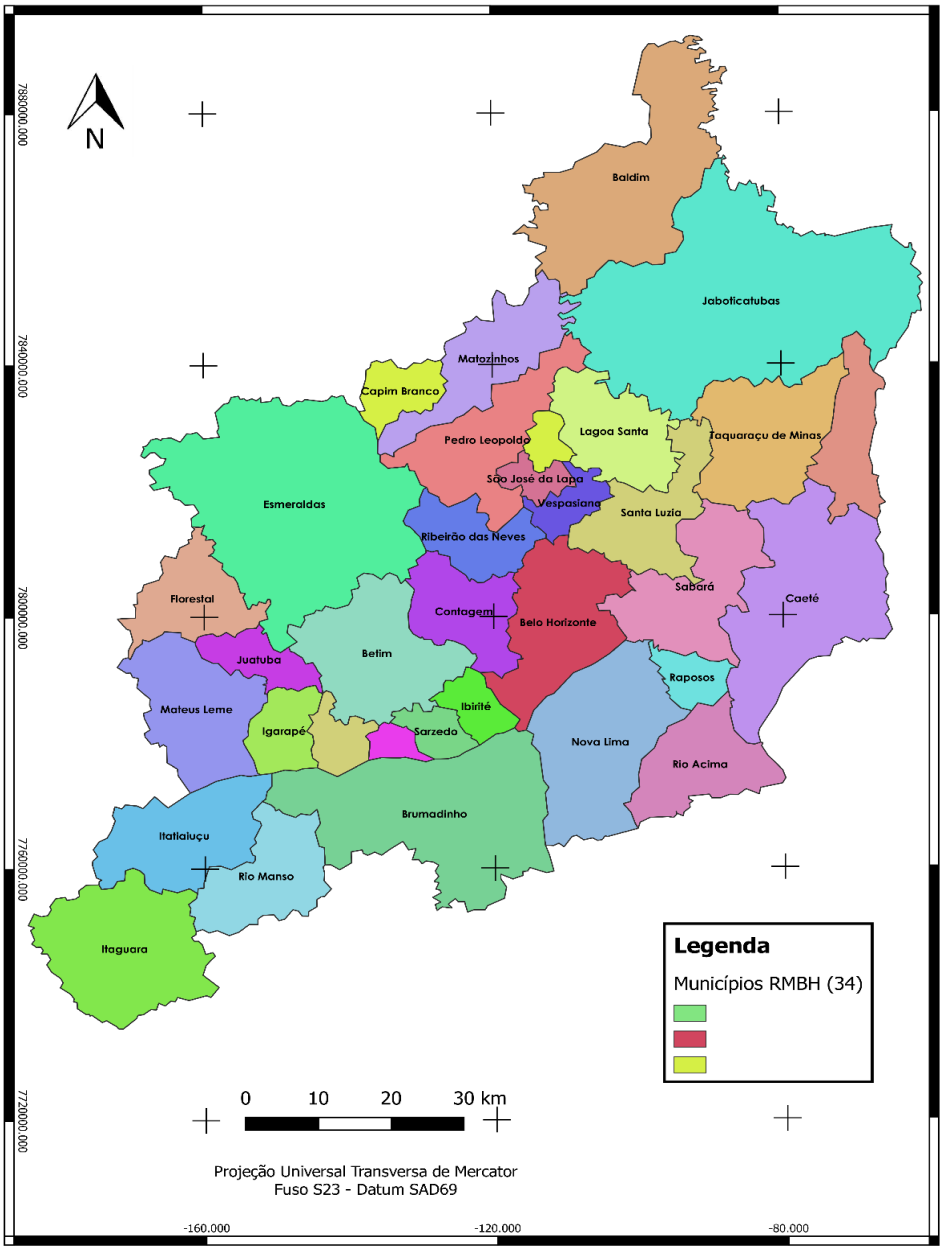
North Beltway ("Rodoanel Norte") is shown with wide edges because its layout is not yet announced in detail and its works have not yet begun. Information on this approximate route was obtained directly from the MRBH Development Agency (ARMBH), a state government agency. Therefore, the North Vector's portion studied in this research is situated to the south of the planned route for the future North Beltway; to the north of Pampulha Lagoon and Waldomiro Lobo subway station; and along the axes of Pedro I Avenue, Cristiano Machado Avenue, Brasília Avenue (in Sao Benedito) and the Green Line. For the municipality of Belo Horizonte, the study area includes parts of three administrative regions: Pampulha, Venda Nova and Norte. For the municipality of Santa Luzia, the study area includes only the district of São Benedito. For the municipality of Vespasiano, the part included in this research refers only to the southern portion, located to the south of the future Beltway and to the north of Belo Horizonte and Santa Luzia.

The choice of this spatial cut is justified by three criteria:

- It is the area with the highest LSUP concentration (in the North Vector context);
- It is the area with the highest population concentration of lowest income; and
- The points located at the ends of the study area are no more than 7 km from the axes of the avenues and highways related to the analyzed LSUP.

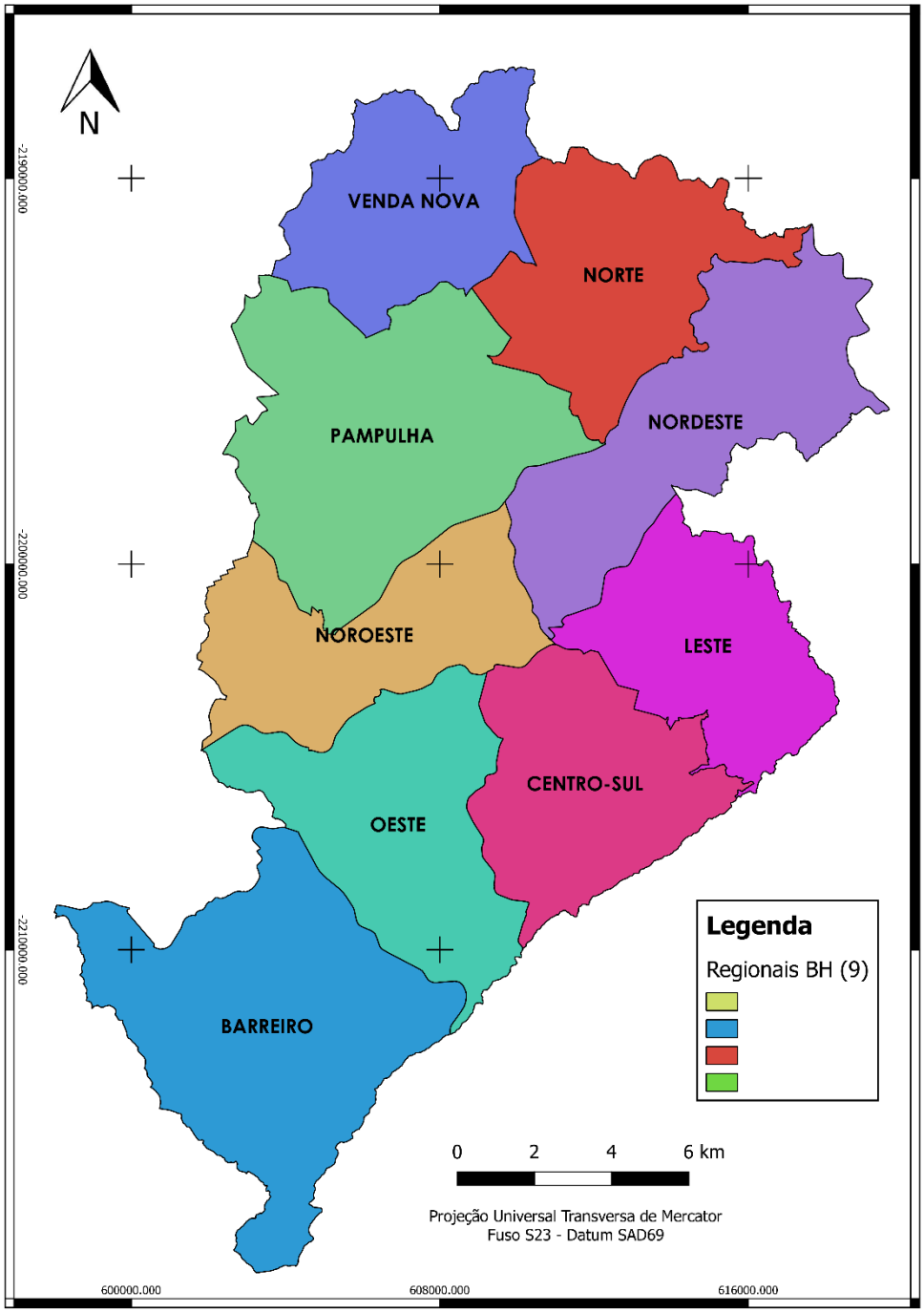
Thus, the study area of this research is defined. Given the inherent difficulties in understanding this type of research for those who have never been to the study area, the following images are presented to help with the description of the area. Defined the study area, we will move on to the description of the main LSUP.

Map 1: Political Map—MRBH (2017)



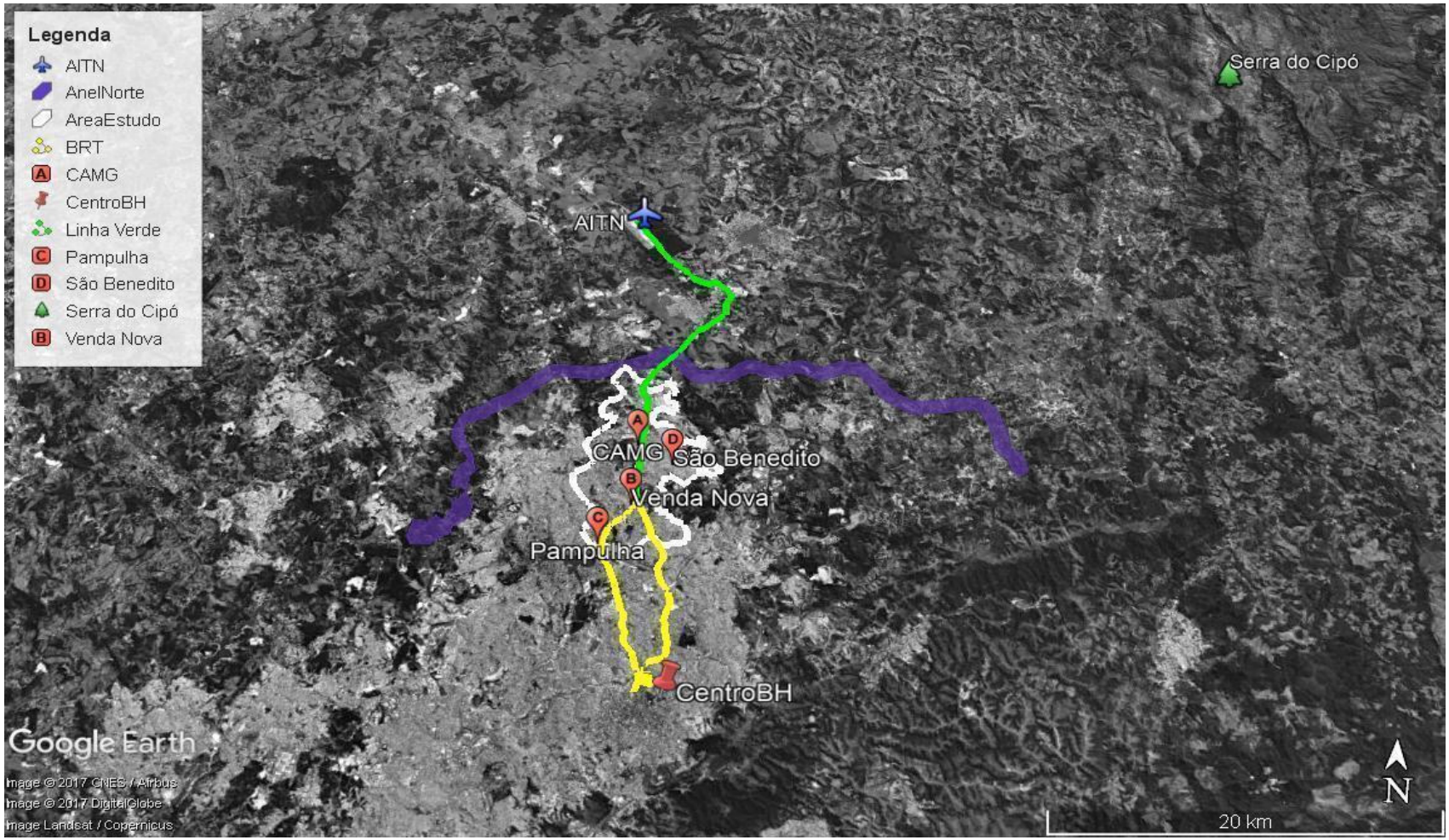
Source: Authors (Renan P. Almeida)

Map 2: Belo Horizonte's Administrative Regions



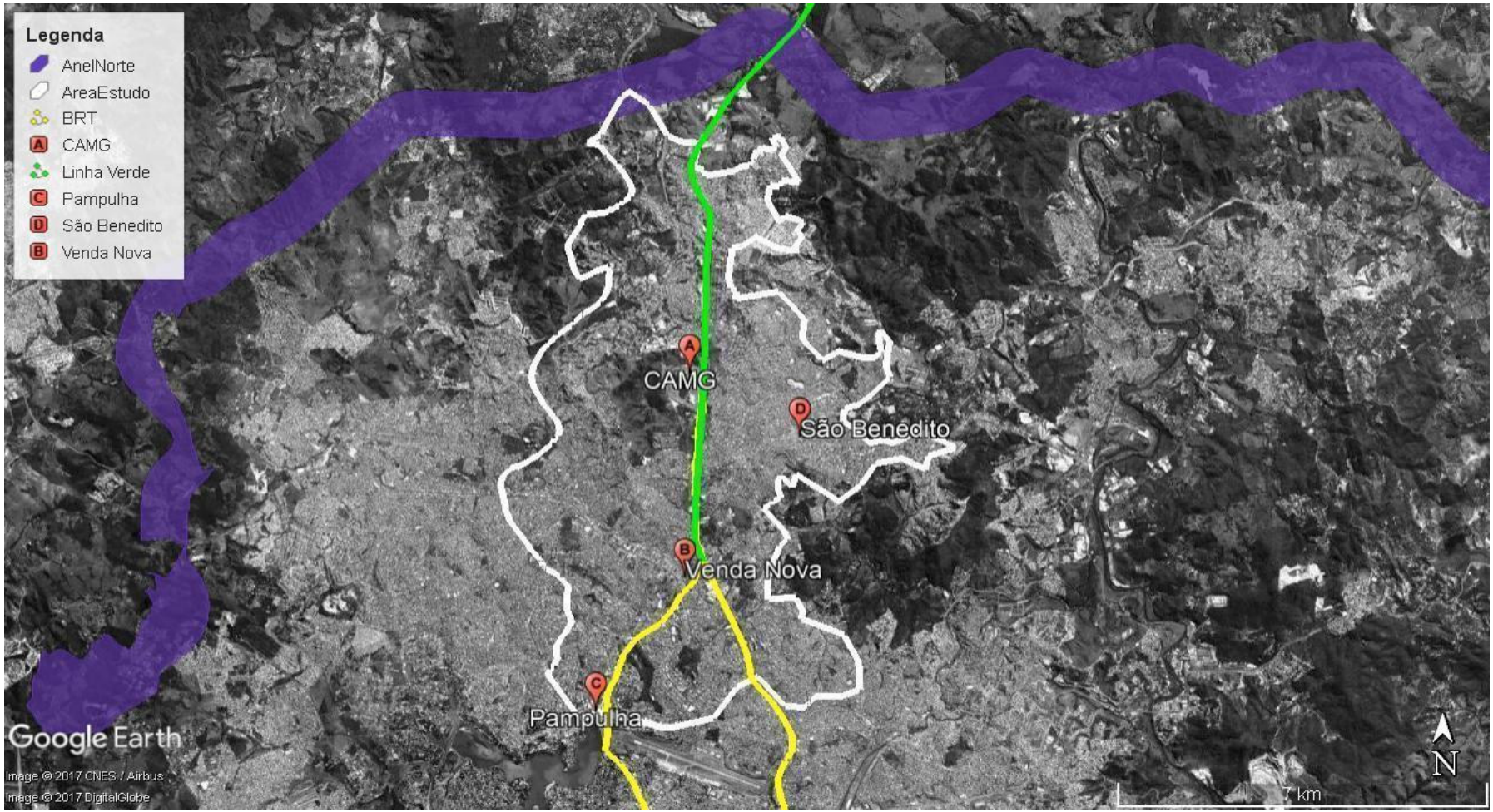
Source: Authors (Renan P. Almeida)

Figure 1: MRBH, AITN, North Beltway, BRT, Green Line, Study Area and Serra do Cipó



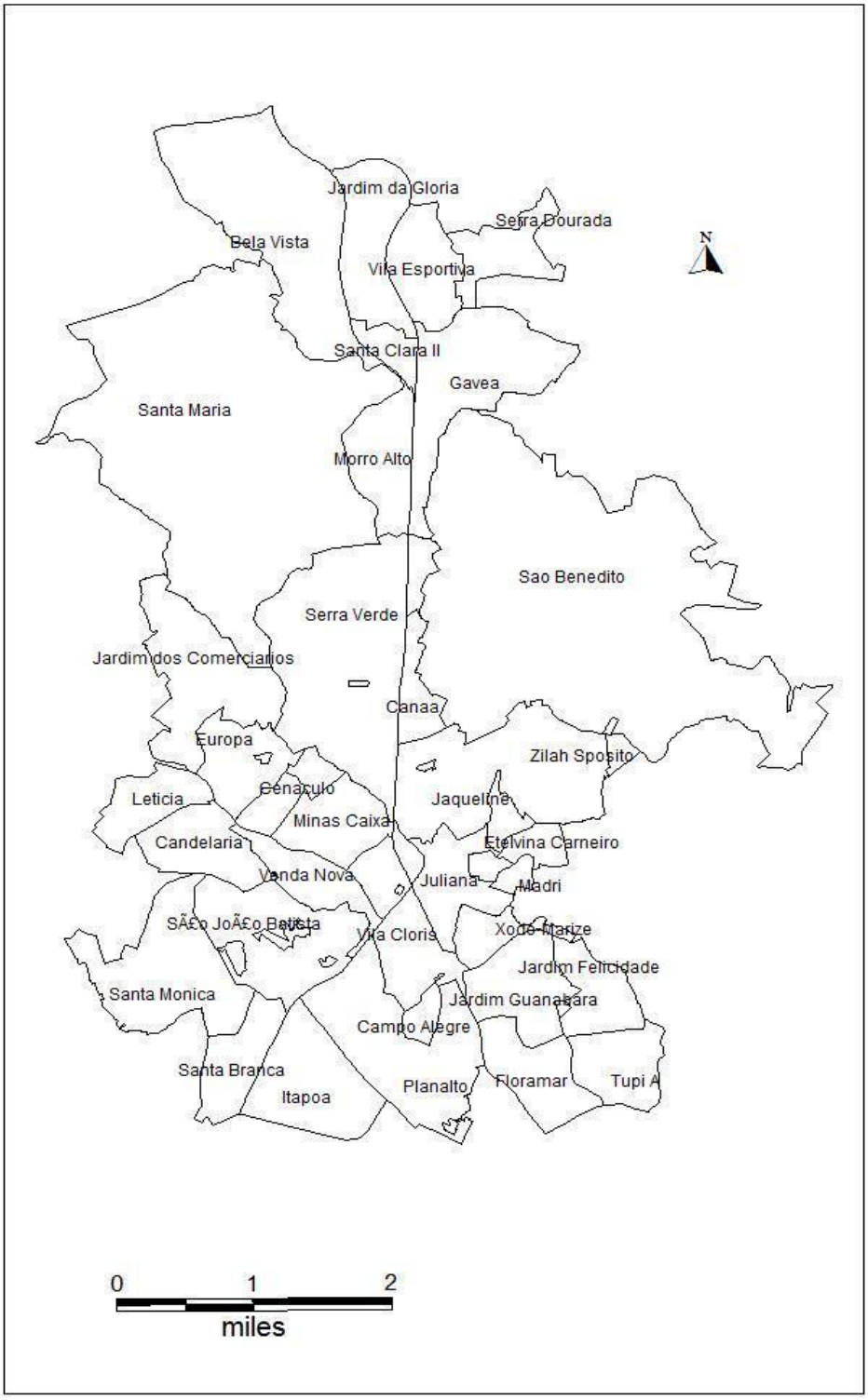
Source: Own elaboration on Google Earth

Figure 2: Study Area



Source: Own elaboration on Google Earth

Figure 3: Study Area and Selected Neighborhoods



Source: Own elaboration

Picture 1: Gávea II Neighborhood – Vespasiano (2017)

Traditional buildings (left). Outdoor announcement "Soon: Shopping Center". Buildings of construction company MRV in the background (center, right).

Source: Clarissa Veloso (August 2017)

Picture 2: São Benedito's District – Santa Luzia (2017)

View from the São Benedito's District in Santa Luzia. Source: Clarissa Veloso (August 2017)

Picture 3: Gávea II Neighborhood – Vespasiano (2017)

Buildings of the construction company Precon (center, right) in the middle of older residences.

Source: Clarissa Veloso (August 2017)

Picture 4: Gávea II Neighborhood – Vespasiano (2017)

Precon's (construction company) residential buildings. Source: Clarissa Veloso (August 2017)

Picture 5: View from Santa Clara II Neighborhood – Vespasiano (2017)

Green Line junction with MG-424 in Vespasiano. Source: Clarissa Veloso (August 2017)

Picture 6: View from Serra Dourada Neighborhood – Vespasiano (2017)

The Serra Dourada neighborhood divides walls with the Alphaville Minas Gerais, which can be seen right at the bottom of the photo.

Source: Clarissa Veloso (August 2017)

Picture 7: Partial View of North Vector – Belo Horizonte (2017)

Portions of the Venda Nova and Pampulha regions (center) in Belo Horizonte. Source: Clarissa Veloso (August 2017)

Picture 8: Partial View of North Vector (2017)

The Serra Verde neighborhood (bottom, left); the Green Line (center); neighborhoods of Canaã and Juliana and part of the São Benedito's District (top).

Source: Clarissa Veloso (August 2017)

Picture 9: Pedro I Avenue – Belo Horizonte (2017)

Graffiti at the beginning of Pedro I Avenue, in the Pampulha region. South point of the study area. Source: Clarissa Veloso (August 2017)

Picture 10: Pampulha station (BRT) – Belo Horizonte (2017)

South point of the research study area. Source: Clarissa Veloso (August 2017)

Table 2: LSUPs in North Vector

	Cost (in billion Reals)	End of the interven-tions	Beginning of the interven-tions	Description
Green Line	0.5	2009	2005	The Green Line Project is composed of three interventions: on Boulevard Arrudas, along Cristiano Machado Avenue and along MG-010 Highway, totaling 35.4 km in length. It connects BH, Vespasiano, Santa Luzia, Lagoa Santa and Jaboticatubas. Its proposal is to improve the connectivity between the central area of Belo Horizonte and the AITN.
***Cidade Administrativa de Minas Gerais* (CAMG)**	1.7	2010	2005	The CAMG, elaborated by the Brazilian architect Oscar Niemeyer, is the new headquarters of the government of Minas Gerais and its structure is composed of six buildings, totaling 270 thousand square meters of constructed area. It is located in the Serra Verde neighborhood, Belo Horizonte, where it borders two other municipalities: Vespasiano and Santa Luzia. State government initial decision was to locate it in the west side of the city, but in face of problems with land acquisition, it went for the Serra Verde neighborhood.
Tancredo Neves's International Airport (AITN)	0.35	2016	2015	Tancredo Neves's International Airport, in Confins, is the largest airport of RMBH and, since its construction, future expansions have been projected. From the large projects in the North Vector, the AITN improved its access, being the central undertaking of all this planning. In a partnership between Infraero and the State Government, it was planned to expand the airport, transforming it into an industrial airport, as well as a commercial airport, connecting it to the high-tech industrial logistics to be developed around it.
BRT (*MOVE*)	1.06	2014	2012	The MOVE corridor is mainly along Antônio Carlos, Cristiano Machado, Pedro I, Paraná, Santos Dumont and Vilarinho avenues, connecting the center of Belo Horizonte to the Northern portion of the city. It is worth mentioning that the system also has the extension denominated MOVE Metropolitano, which has stations in another 8 municipalities of the Metropolitan Region.
Shopping Estação	0.22	2012	2010	*Shopping Estação* is a large mall located in the Venda Nova region, Belo Horizonte. It has a strategic position, located in a confluence of three great avenues, Cristiano Machado, Pedro I and Vilarinho. It also integrates a transport hub with the subway terminal, buses and the *MOVE* system. It is located 13 km from downtown. The construction area is 33.982m^2 and has 206 stores.

Source: Own elaboration based on research (see references at the end of this report)

Picture 11: Cidade Administrativa de Minas Gerais (CAMG) – Belo Horizonte (2017)

In the foreground, the Palácio Tiradentes (right) and the Edifício Gerais (left). In the background, the Green Line and part of the São Benedito District in Santa Luzia. Source: Clarissa Veloso (August 2017)

Picture 12: Bus Rapid Transit System "MOVE". Monte Castelo station – Belo Horizonte (2017)

BRT station at the beginning of Av. Pedro I. A location further south from the research study area. Source: Clarissa Veloso (August 2017)

Picture 13: Green Line, Pedro I Avenue and Cristiano Machado Avenue (2017)

Beginning of the Green Line (top); junction of the Pedro I and Cristiano Machado avenues, in the Venda Nova district (center); the Shopping Estação (bottom, right). Source: Renan Almeida (August 2017)

Picture 14: Tancredo Neves International Airport (TNIA) after its expansion

Source: Renan Almeida (February 2018)

Picture 15: TNIA's Emptiness After Expansion

The emptiness of the airport one day before the Carnival (one of the most important national holidays). Source: Renan Almeida (February 2018)

Data Description

RAIS—Job Market

The Annual Report of Social Information (RAIS) is an administrative document of Brazilian government that is compulsory for all establishments with annual frequency. The objective is to capture information about companies and employment. This information, although moved by administrative reasons, has consolidated over time as a kind of survey of the formal labor market.

The RAIS has national coverage and can be disaggregated to the municipal level.

In this research the employment data of the RAIS is used to meet two objectives:

- Present evidence of the economic cycles in the MRBH since 1985 and its productive restructuring; and mainly,
- Answer the question: are there potential gentrifiers in MRBH?

The employment has often been used as one of the main variables in the analysis of urban and regional economics. The employment structure, analyzed from the economic sectors, is useful to understand important aspects of urban dynamics and land use in a given metropolis.

In the present study, the dynamics of employment over time is particularly interesting because it brings evidence of the potential formation of "gentrifiers" over time. As pointed out in the literature review on gentrification, the presence of potential "gentrifiers" is one of the structural conditions for this phenomenon. As Betancur (2014) points out in a reflection on the global economy, after the 1970s, the high-tech and advanced services sectors, which demand more specialized workers, started to have high growth rates. In addition, the conjunction of sectors known as FIRE (finance, insurance and real estate) also grew their share on GDP and employment. In general, people connected to these sectors have enough resources to materialize the gentrification in an area. Therefore, the analysis of the employment structure of the MRBH from 1985 to 2015 sheds light on the possible gentrification in the NV.

It is also important to note that in some cases the data used refers to the entire MRBH because, within a metropolis, there is typically a high level of commutation and pendular migration. Some authors even define the territorial limits of a metropolis or city region through the commutation area (Parr 2005).

However, before discussing the evidence that the RAIS data bring to this research, it is critical to make a caveat. These data provide information for formal sectors only. As widely known, Latin American metropolises are characterized by high rates of informality in the labor market. Nonagricultural informal jobs in Latin America average about 51 percent of all jobs compared to 16 percent in Western Europe and 14 percent in the USA, and the informal economy averages 41 percent of GNP in Latin America compared to 17 percent in OECD countries. As an additional perspective, informal employment figures in countries like Brazil and Mexico are 60 and 55 percent, respectively (Betancur 2014).

This feature is intensified in low-income and precarious areas of the metropolises, as in parts of the geographic study area defined in this report. Thus, it is important to keep in mind that the data discussed provide empirical evidence only for the formal market.

Demographic Census 2000 and 2010

In Brazil, the Demographic Census is conducted by IBGE every ten years. The applied questionnaire has several subjects in order to draw the profile of a population.

In this research, the Censuses data were used to answer the following question: was there a change in the demographic profile of the study area from 2000 to 2010? This is the period in which the announcements and initial construction works of the major LSUP analyzed in this survey occurred.
From the analysis of the variables on average monthly income, age, dwelling property status and residents, it is possible to find important elements to answer that question.

Fieldwork

Since the next IBGE's Census is supposed to happen only in 2020 and the previous one occurred in 2010, this survey lacked up-to-date data on the NV residents' profile. Besides the simple fact that the data of 2010 is outdated, the time period 2010–2017 was relevant in the terms of this research. In addition to the fact that the inauguration of the analyzed LSUPs occurred only after 2010, the Brazilian economy experienced significant growth in the same year (GDP real growth of 7.5 percent), followed by a drop in real interest rates between 2012 and 2014, and a deep economic and political crisis as of 2014. Thus, there are many motivations to assume that significant changes occurred between 2010 and 2017.

In addition to comparing the profile of residents between 2010 and 2017 based on Censuses, this field survey also allowed to add specific questions on the research theme. In this way, a series of questions were made regarding new and old residents, neighborhood changes, intent to move out or not, and neighborhood services.

Overall, 897 questionnaires were applied within the previously identified study area (see Maps 1 and 2).

Both in the number of questionnaires applied by neighborhood or region, and in the distribution of household typologies–house, apartment, or shack–we sought to approximate as much as possible the proportions in accordance with those of the 2010 Census.

The questionnaire has three parts. In the first part, a table was drawn up with information about the residents of the household where the interviewee resides, such as the age of the residents, sex, occupation and the place where they work. Afterwards, some questions are asked about their home, such as typology, condition of occupation, family expenses on five categories (water, energy, telephone, groceries and property taxes) and family transportation properties (cars, motorcycles and bicycles). In the last part, the questions seek to capture internal dynamics about the region where the interviewee has resided in the last ten years, such as the existence (or non-

existence) of a pattern of population displacement in the neighborhoods. We also questioned about the presence of new neighbors or even if they knew the reasons for the change of those who left the region in the last ten years. In addition, there are some questions about how the neighborhood's retail market has evolved over the past ten years: if the interviewee believes that there is a weak retail market in the neighborhood and of what type of products or services are most missing. Finally, there is an open question about the effects of the main LSUP (CAMG, Green Line, airport expansion) in the region.

ITBI

Among the Brazilian municipal legislations, a taxation affects all transactions of real estate and property. This tax, called Inter-Vivos Property Transfer Tax (ITBI), defines a rate to be collected by the municipal authority based on the value of the property. This database is useful for analyzing the real estate dynamics of the region and capture aspects of the land value increases in the area.

ITBI is not appropriate to evaluate repeated sales as is the usual practice in empirical housing market studies in the United States because it does not bring information on the same property throughout time. On the other hand, it offers much more accurate information than usual data sets that are constructed using asking prices, since ITBI informs the real price of the sale, and not only an asking price that may vary due to negotiation.

For the study area analysis, it concerns the Transactions Report, where all characteristics of the transmitted properties are recorded, such as the zoning code in which it is located, as well as the neighborhood, transaction value, month, prevailing construction type and the construction quality.

With this information, it was possible to draw an analysis of the local real estate market, observing the neighborhoods dynamics and compare them with the situation of the city as a whole. This promotes "quasi-experimental" aspects to the research, when comparing the evolution of areas affected by "treatment" areas (LSUP) and non-impacted areas.

The data is available only for Belo Horizonte. The observation period corresponds to the transactions of properties registered in the municipality from 2009 to 2017. There are approximately 220 thousand recorded transactions from January 2009 to July 2017, an average of 26 thousand transactions per year.

New Land Developments: Land Market Dynamics Through AMRBH's Data

The Belo Horizonte Metropolitan Development Agency (*Agência de Desenvolvimento da Região Metropolitana de Belo Horizonte* – AMRBH) is a state autarchy created by the Complementary Law 107, on January 12, 2009. It is the MRBH's land regulation institution, which allows public and private land developers to operate. For every new land development project with given characteristics such as a minimum size, developers need to require the "*Anuência Prévia*", an official document allowing that project, which implies a tax payment collected by the AMRBH. Most of the projects do not need this document, mainly because of the size of the land plot. Due

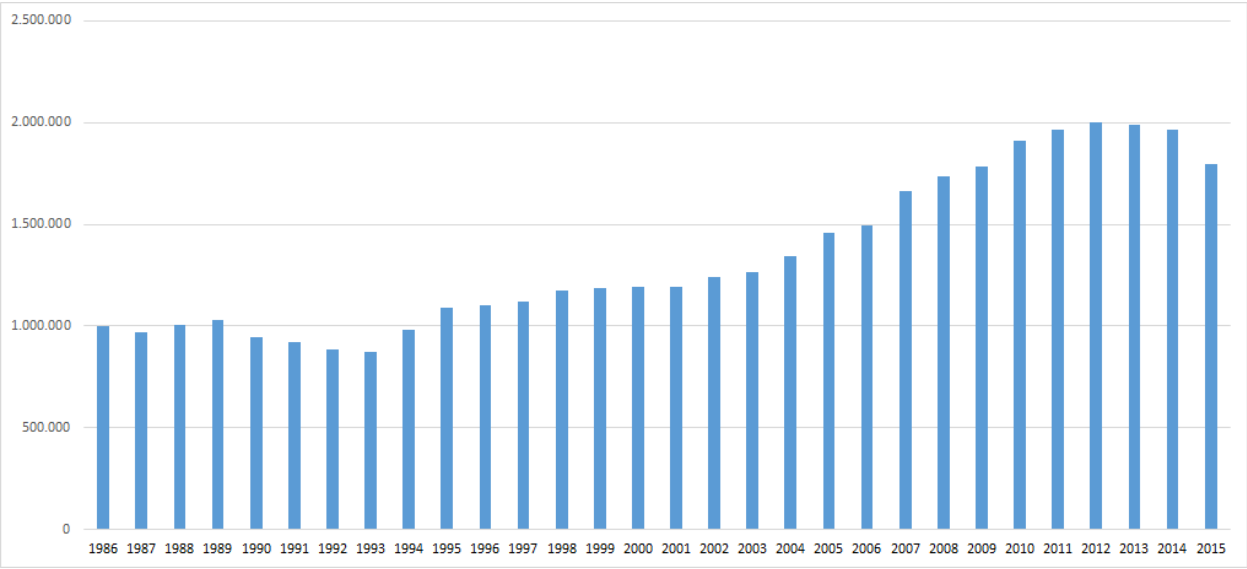
to this tax, AMRBH provided a dataset for this research informing all the new land development projects that required "*Anuência Prévia*" from 2011 to 2016. Herein, we used three types of projects: "diretrizes" (the early stage of land development); "loteamentos" (the final stage, when urbanization takes place within the area); and "desmembramentos" (when a land plot is divided). The 2011 data presented several problems, so it was excluded from the analysis.

Data Analysis

RAIS—Job market

Chart 1 shows the evolution of formal employment for the MRBH between 1986 and 2015. In simple terms, three phases can be observed, reflecting the Brazilian macroeconomic cycles. Formal employment fell between 1986 and 1994, a period characterized by hyperinflation, trade liberalization and 'redemocratization' (after the military dictatorship between 1964 and 1985). Between 1994 and 2002, formal employment increased overall, although there was a decline between 1998 and 2001. This period is characterized by inflationary stabilization, exchange rate appreciation, privatization and a series of institutional changes influenced by what is conventionally called neoliberalism. From 2003 to 2015, formal employment presented values significantly higher than in the previous phases, reaching its peak in 2012, and a downward trend between 2012 and 2015. This phase is characterized by the growth of Brazilian agricultural and mineral exports, the expansion of the monetary and credit bases and the greater integration of the Brazilian and the *Minero* economy into the Chinese economy (Libânio 2010, Gontijo 2010). As this work discusses in more detail in the section regarding Census' analysis, the growth of the real minimum wage and the creation and intensification of social policies of income distribution are crucial phenomena of this phase, which may be connected with the rise of the Workers' Party to the federal government. In this panorama, formal employment grew from around 1.25 million in 2003 to 2 million in 2012 only in the MRBH.

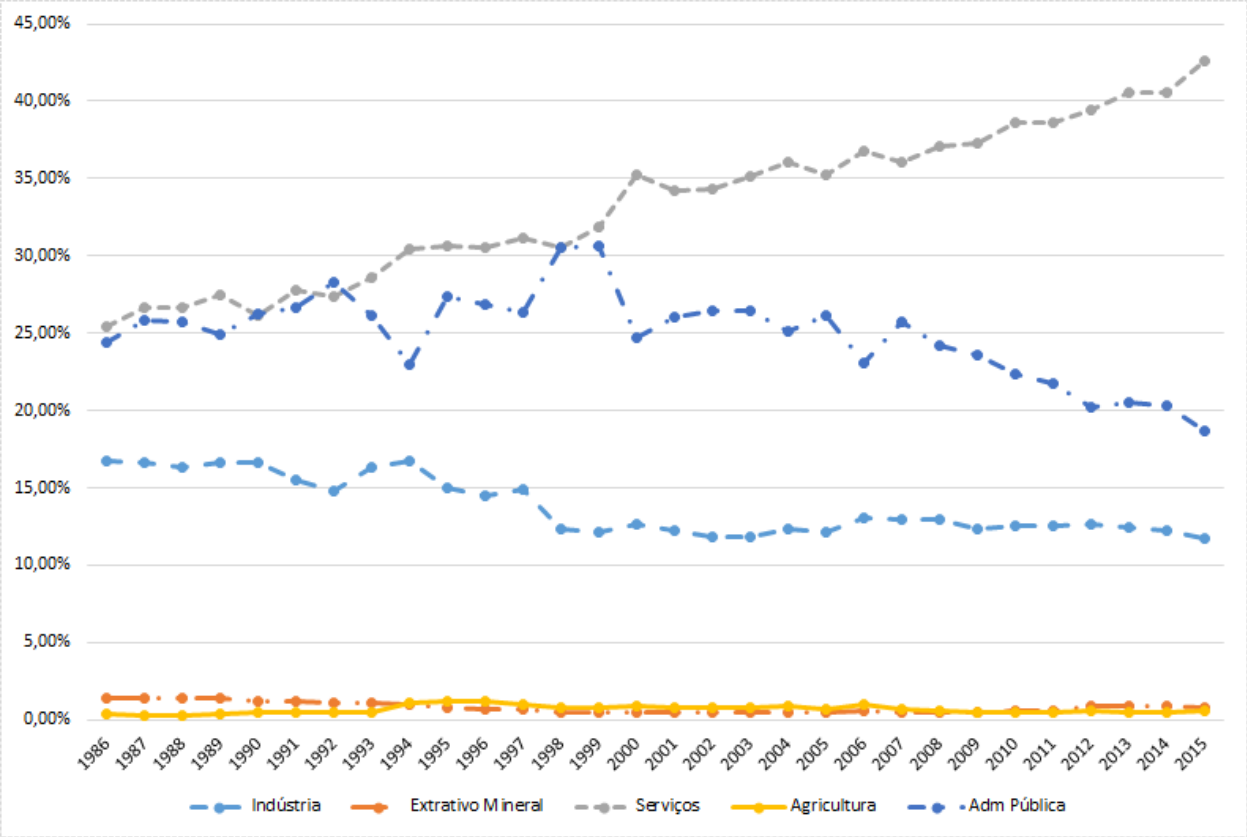
Chart 1: Formal Employment in MRBH (1986–2015)



Source: Own elaboration based on RAIS data

Analyzing the sectoral data, the nuances of these phenomena become clearer. Chart 2 segregates the formal economy of MRBH into five major sectors. The services sector corresponds to an aggregation of the health, education, wholesale and retail[R2], professional technical administration and the financial sectors. The industry is composed by sectors of non-durable consumer goods, intermediate goods, capital goods, and durable consumer goods. Public administration represents the aggregation of direct and indirect administration jobs at all levels of government (municipality, state and federal). In addition, data from the mineral extraction and agriculture sectors are presented.

Chart 2: Large Sector Participation in Formal Employment – MRBH (1986–2015)



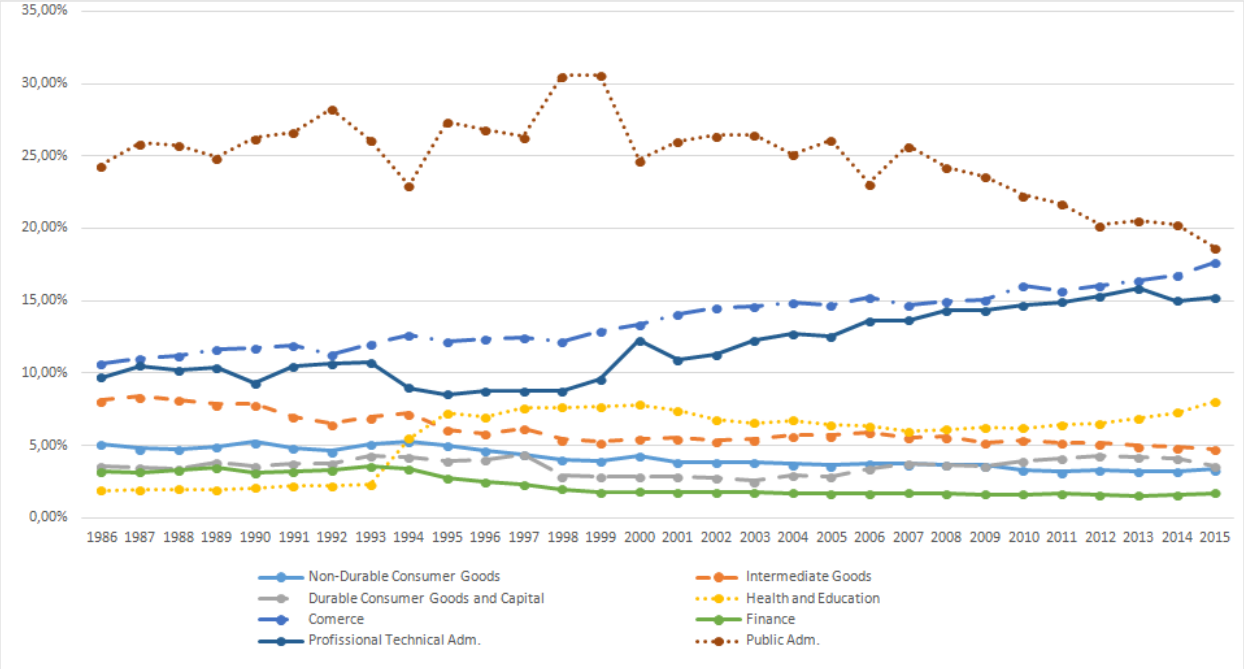
Source: Own elaboration based on RAIS data

Chart 2 illustrates the expressive and continued growth of the service sector in MRBH over the time period analyzed, as industry and public administration lose relative share in employment. While at the beginning of the time series, services and public administration sectors accounted for about 25 percent of the total employment each, at the end of the period, the first corresponded to more than 40 percent and the second to less than 20 percent. Meanwhile, industry lost about 5 percentage points (pp) in the employment share. The mineral extraction and agriculture sectors were included in this analysis because they are historically related to the Minas Gerais' economy and because they have gained attention in the academic and public policy debate over the last

decade in Brazil. However, each of them did not present more than 1 percent of formal employment participation in 2015.

Refining the analysis, Chart 3 depicts more disaggregated data. The first is the public administration sector, whose share of total employment fell from 25 percent to 18 percent over a time period analyzed of 30 years. This drop is evident from 1999 onwards and has become a constant drop since 2006. The second sector that stands out is commerce (wholesale and retail), which grew from around 10 percent in 1986 to a share close to 17,5 percent in 2015. The growth rate of this sector has increased since 1999. The third sector that stands out is the professional technical administration sector (administration and real estate retail, securitization and professional technical services), which starts the time series with a share of 10 percent of total employment. This sector reaches a share of approximately 15 percent by 2015. After relative stability between 1986 and 1993, the share of this sector fell between 1994 and 1998, and strongly increased from 1999 to 2013.

Chart 3: Sectorial Share in Total Employment (%)—MRBH (1985–2015)



Source: Own elaboration based on RAIS data

Within the industrial sector, two trends are perceived. For the most technologically advanced industry, referring to durable consumer goods and capital goods, composed by sectors like mechanical industry, electrical and communications material and transport material, there is relative stability throughout the time period, representing about 3.5 percent of total employment. Between 1986 and 2004, there was a drop of about 1 pp. For the intermediate and non-durable consumer goods sectors, relatively less technology-intensive, there were significant decreases over the time period.

The intermediate goods sector (non-metallic mineral products, metallurgical industry, paper and printing, rubber, leather and tobacco, and chemical industry) had about 8 percent of the total share of employment in 1986, and 4.75 percent in 2015. The intermediate goods sector was especially important for the Minas Gerais' economy throughout its industrialization process, mainly in the steel, metallurgy and cement sectors. The non-durable consumer goods sector, which is not very knowledge-intensive, had a share of 5 percent in 1986 and 3.34 percent in 2015. Within this sector are included the sectors of wood and furniture, textiles, footwear, and food and beverages. It is important to note that within the non-durable sector there are significant differences in the time period: while the beverage and food sector has grown strongly, more than tripling the absolute number of employees, the textile and shoes shrank very significantly.

Healthcare (medical, dental and veterinary services) and education have, together, a peculiar dynamic. From 1993 to 1995 their combined share increased from just over 2 percent to around 7 percent. Thereafter, they have relative stability in the total share of employment, with an upward trend at the end of the time series and a share of approximately 8 percent in 2015.

In the case of the financial sector ("financial institutions", i.e., credit institutions, insurance, capitalization, banks), there is relative stability between 1986 and 1993. From 1994, there is a marked decline until 2002. Thus, the financial sector loses about 2pp in share of employment over three decades.

The construction industry showed a sharp drop between 1985 and 2003, when it recovers. From 2012 to 2015, a downward trend can be observed. By 2015, this industry had a share of about 8 percent of the total formal employment of MRBH.

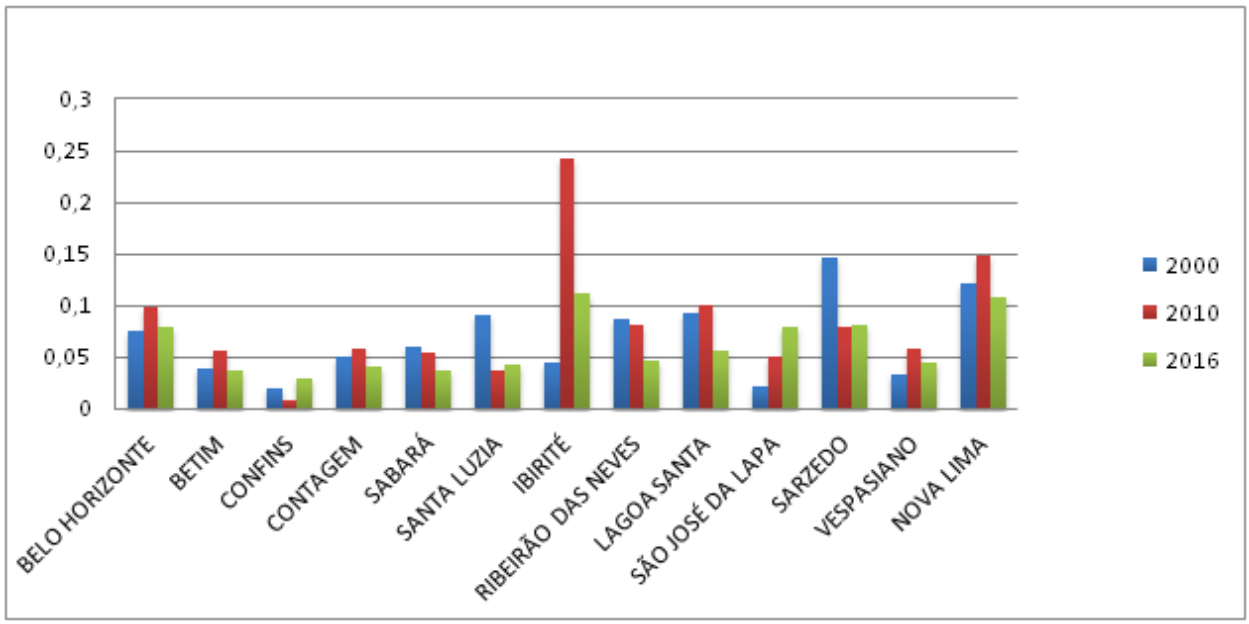
Using RAIS' micro data, we draw a picture of the evolution of the share of employment in the construction industry in relation to the total employment of some municipalities of the MRBH. To find the municipal employment in the construction industry, we grouped the following sectors of economic activity of the CNAE:

i) 41: Building construction, which includes the construction of buildings for residential, commercial, industrial and other uses;
ii) 42: Infrastructure works, including motorways, urban roads, tunnels, supply networks, electricity lines, and sanitation; and
iii) 43: Specialized services for construction, including land leveling, installation of machinery for building operation, infrastructural services and finishing services.

As Chart 4 depicts, only Lagoa Santa stands out within the NV (in the *lato sensu* of NV) in terms of the average share of employment in the construction industry. São José da Lapa is the only one within the NV that showed consistent growth from 2000 to 2016. Ibirité and Sarzedo (Southwest Vector) have shares much higher than the average of the MRBH, the former peaking in 2010 and the latter in 2000. These numbers correlate with the very high-income growth observed from 2000 to 2010 in these municipalities (see next section). Nova Lima (Vector South) also stands out. As it is well known, both in academia and in real estate market, many high-income gated-communities and high-rises have been located in Nova Lima, making this municipality the main expansion area of the elites in the MRBH (Costa et al. 2006; Almeida,

Monte-Mór, and Amaral 2017). Nonetheless, the reasons why land developers have been reshaping Nova Lima's landscape has nothing to do with the LSUP that this research discusses – it is a result mostly of private sector dynamics. This same idea is true for the case of the Southwest Vector.

Chart 4: Proportion of Employment in Construction by Municipality



Source: Own elaboration based on RAIS data

Although construction employment in Belo Horizonte does not exceed more than 10 percent of total employment in the municipality, this municipality accounts for the largest part of construction employment in the MRBH (as in almost any other sector). Belo Horizonte's share in construction employment fell from 83 percent in 2000 to 77 percent in 2016. The other metropolitan municipalities with the largest share in construction employment in 2016, are Contagem (6 percent), Betim (3 percent) and Nova Lima (4 percent).

Using the locational quotient (LQ)[4] to analyze each municipality for construction industry within MRBH, we observed that only two municipalities kept the locational quotient higher than one in three years: Belo Horizonte and Nova Lima. Within NV's municipalities, only Lagoa Santa had a LQ higher than one in two years: 2000 and 2010. Santa Luzia (2000), Matozinhos (2016) and São José da Lapa (2016) had LQ higher than one for only one year.

[4] The locational quotient (LQ) is a prominently used method in urban and regional economics. In our study, it compares the shares of construction employment of each municipality with its total employment and the relative share of construction employment in all MRBH. So, if a municipality has an LQ higher than one, it means that the proportion of construction employment in that city is higher than the proportion of construction employment in the MRBH as whole.

RAIS data also allow us to explore how employment in construction industry evolved compared with general employment in the MRBH. While in the period 2000-2010 total employment increased over 60 percent in the MRBH, employment in construction rose 104 percent. From 2010 to 2016, the negative effects of the economic crisis can be clearly perceived. General employment fell 10 percent and employment in construction dropped over 30 percent. As we can infer, construction employment in MRBH has a cyclical behavior.

Partial Conclusions

Are there potential gentrifiers in the MRBH?

Yes. The MRBH underwent a relative structural change since the 1980's and probably has enough effective demand to change neighborhoods patterns –if parts of the high-income social groups decided to move to certain places.

Has the "North Vector" been presenting high concentrations of construction firms and jobs?

No. The South and Southeast regions of this metropolitan area have been standing out as the main sites for construction activity.

2000, 2010 Census and 2017 Fieldwork

The variable "average monthly nominal income of the head of permanent household" allows for an analysis of the evolution of family income over the time period between 2000 and 2010. Map 3 uses Census tract data and the spatial units to represent the neighborhoods that we constructed. This map informs monetary values in 2017 Brazilian Reais (BRL) (1 US$ = R$3,28 on 03/18/2018). The highest relative income areas are concentrated to the south of the study area (Pampulha region) for the two time periods. The areas in the extreme north (Cipriano, Bela Vista, Serra Dourada and Gávea neighborhoods in Vespasiano) ascended in the hierarchy of relative income in the area, from a low level to a middle level. The district of São Benedito had an important extension of the areas of high and middle-income and of the areas of low-income. Finally, the extensive low-income areas to the north (surrounding the Morro Alto and Palmital neighborhoods in Vespasiano and Santa Luzia, respectively) remain relatively stagnated.

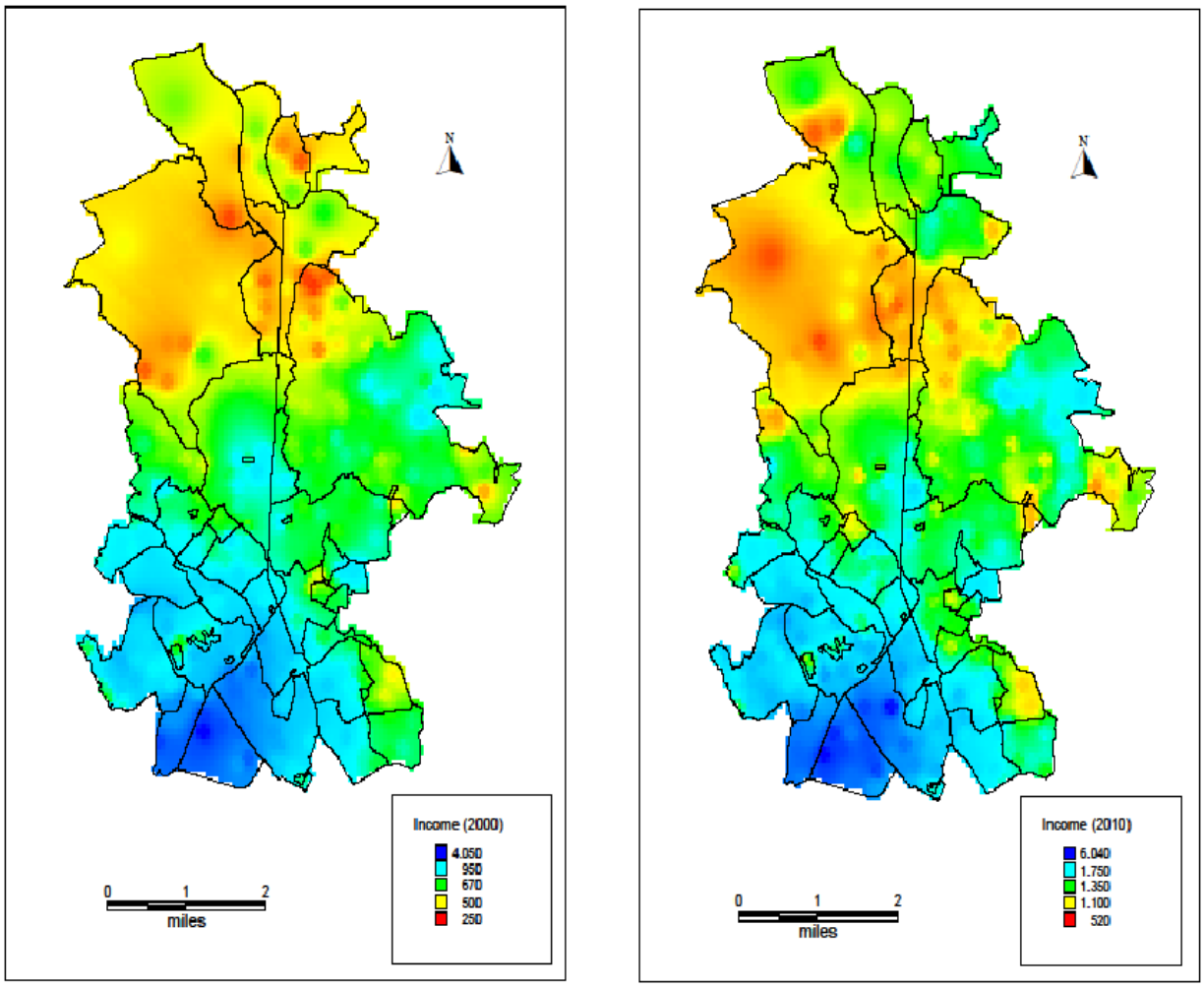
We compared this data with the information obtained in the survey conducted in 2017. Faced with the difficulty presented in the pilot project of the survey to obtain more accurately information about the average monthly income of the families, we chose to use the variable average expenditure of families. Respondents were reluctant to reveal income or reported it inaccurately. Although they are different variables, they are highly correlated variables, as Map 4 depicts. In this map, the polygons inform average expenditure values of families for the areas. Due to a smaller number of observations, we did not use Census tracts as the spatial unit, but the neighborhood.

Map 4 depicts relevant evidences: the expansion of the middle-income groups to the northwest portion of the study area (Serra Azul, Jequitibá and Santa Maria in Vespasiano); the rise of the

northern part of the study area (Santa Clara II neighborhood, Vespasiano, in the intersection of the Green Line with MG-424) for a middle-upper income level; and the rise of neighborhoods in the southeast portion of the study area (northern BH, Juliana neighborhoods, Jaqueline, Etelvina Carneiro) to the middle-upper income level.

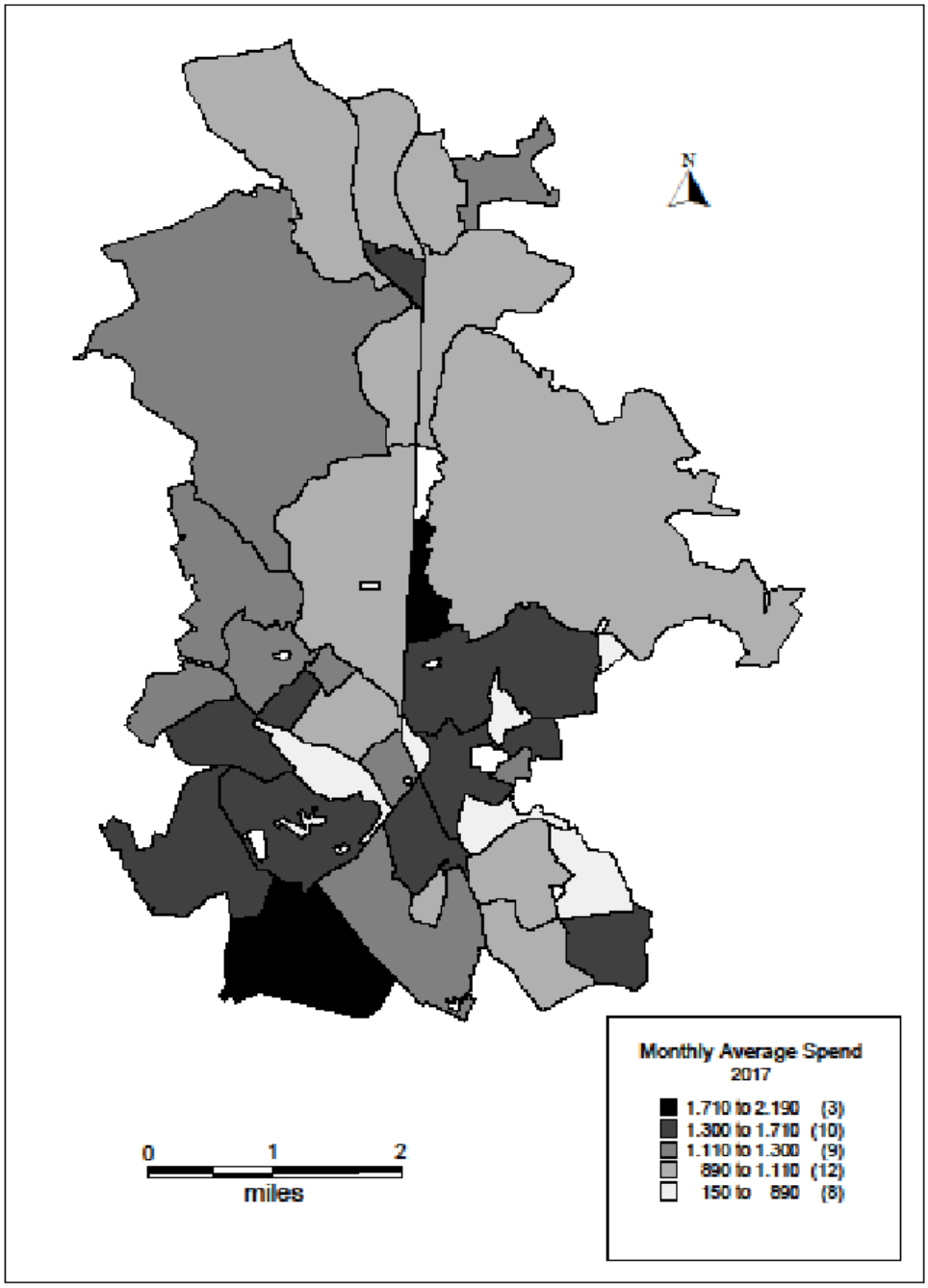
Map 5 informs the dynamic of one of most classical variables in urban economics analysis, population density. Usual in Latin American urbanization patterns, the slums and informal areas are the ones with the highest densities. From 2000 to 2010, the density increased in the southern portion (Itapoã neighborhood, Pampulha region) and the southeast portion (North region of Belo Horizonte). It also took place in the northern portion of the study area (Santa Clara II, Gávea II, Vila Esportiva and Jardim da Glória, in Vespasino). Curiously, Venda Nova neighborhood lost density, a result also observed by Diniz and Véras (2017). However, we suppose that this latter result may be interpreted as an evidence of rising income levels of the residents, which made it possible for younger people to acquire their own home in other regions, and not as a gentrification process as those authors interpreted it.

Map 3: Average Monthly Income—Study area (2000–2010)



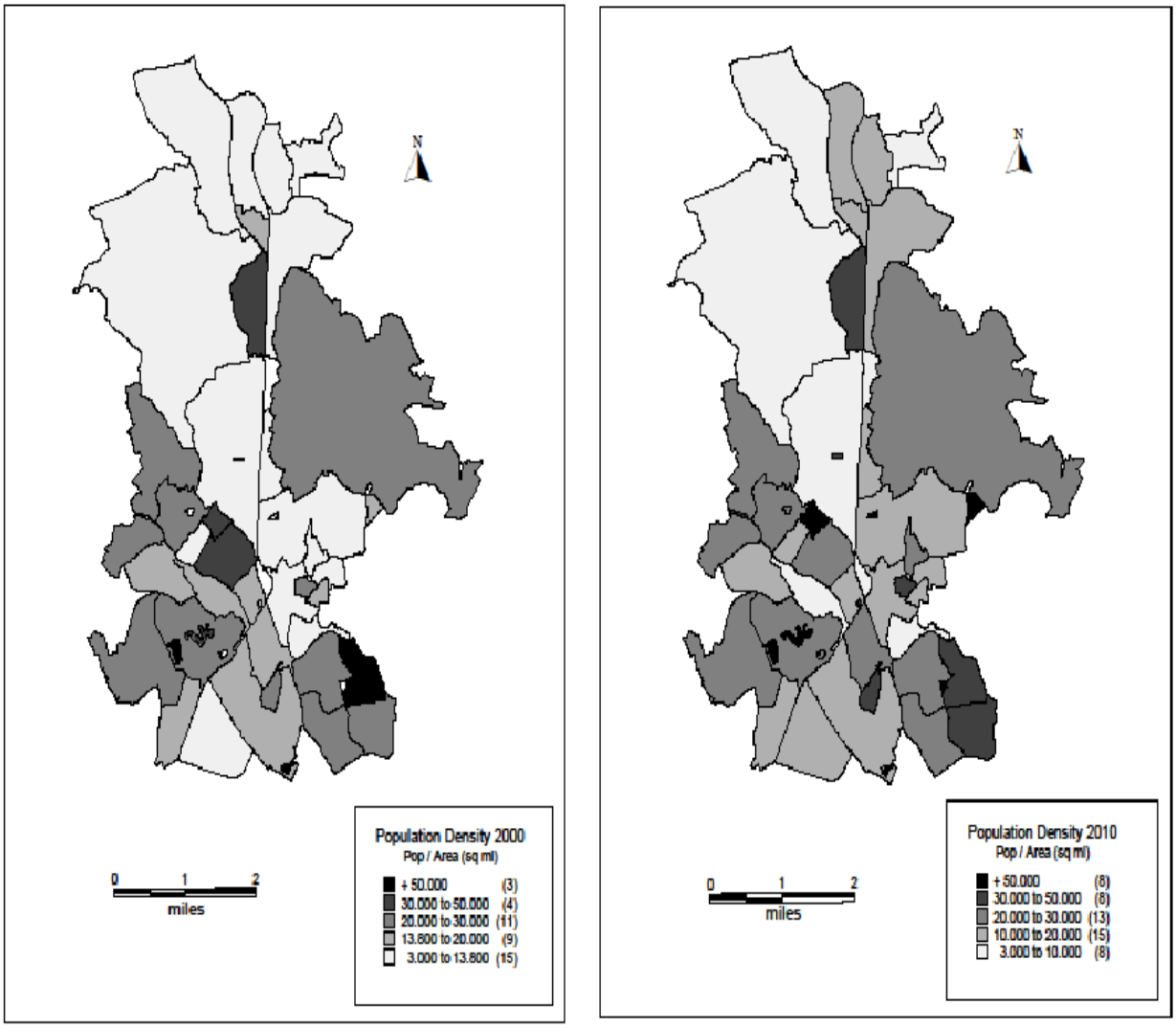
Source: Own elaboration based on Census data

Map 4: Average Monthly Expenditure—Study area (2017)



Source: Own elaboration

Map 5: Population Density—Study area (2000–2010)



Source: Own elaboration based on Census data

Table 3: Population and-Income Comparisons Between the Study Area and Other Regions: 2000 and 2010

Regions	Population 2000	Population 2010	Population Growth 2000–2010	Income 2000 (in R$)	Income 2010 (in R$)	Income Growth 2000–2010
Belo Horizonte*	1,995,173	2,111,429	6%	2014	3531	75%
Santa Luzia*	78,987	98,245	24%	734	1427	94%
Vespasiano*	25,107	35,218	40%	965	1740	80%
Study Area	**386,291**	**428,607**	**11%**	**969**	**1759**	**81%**
Northeast	272,187	290,392	7%	1494	2697	80%
Carvalho de Brito	70,995	76,363	8%	697	1452	108%
East Vector	343,182	366,755	7%	1096	2074	89%
Ibirité	132,232	158,736	20%	576	1252	117%
Sarzedo	17,213	25,778	50%	772	2907	276%
Barreiro	261,214	281,975	8%	883	1682	91%
Southwest Vector	410,659	466,489	14%	744	1947	162%
Minimum Wage	-	-	-	151	510	238%

*Except the study area.

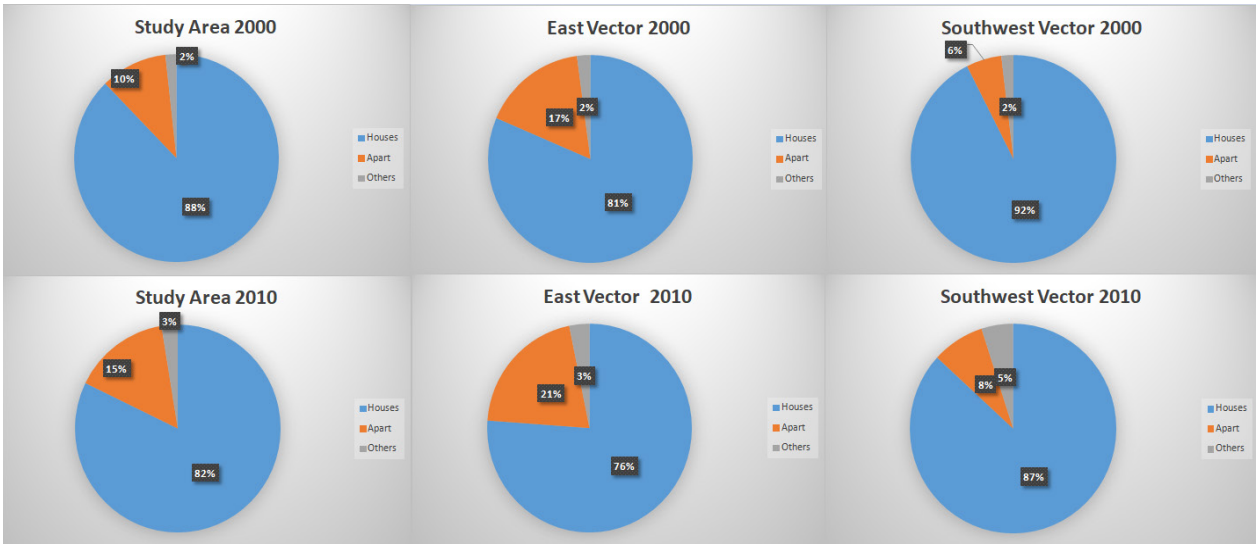
Source: Own elaboration based on Census data

To establish comparisons with other peripheral areas in the MRBH, we created an East Vector, which contains Belo Horizonte's northeast region and the contiguous portion of the municipality of Sabará (Carvalho de Brito), and a Southwest Vector, which contains Belo Horizonte's Barreiro region, the contiguous municipality of Ibirité and the adjacent municipality of Sarzedo. We selected these vectors because they have similarities with the North Vector, being historically popular and low-income peripheral regions. Almeida (2015a) and Almeida, Monte-Mór and Amaral (2017), using a cluster analysis of real estate markets of the MRBH, classified Ibirité, Sarzedo, Vespasiano and Santa Luzia within the same cluster (same typology).

Table 3 summarizes the levels and growth rates in average incomes and population for the selected areas and vectors from 2000 to 2010. In general, the poorest the area the higher the rate of income growth. The study area had the lowest rate of income growth (81 percent) among the three vectors (the Southwest grew 91 percent and the East grew 86 percent). Belo Horizonte (except the study area) had the lowest rate of income growth, although it has a much higher level than any other selected region for both time periods. The minimum wage rate of growth shows how federal labor market policy was relevant to explain the rise of income in the peripheries between 2000 and 2010.

Sarzedo, Ibirité, Vespasiano (except the study area) and Santa Luzia (except the study area) had higher population growth rates than the study area. The study area's population growth of 11 percent is, basically, due to Belo Horizonte's portions within the study area. Therefore, these statistics bring evidences to support the hypothesis that the LSUP did not make the study area to grow more than other peripheral areas in the MRBH.

Chart 5: Household Typology in Three Peripheral Areas for 2000 and 2010

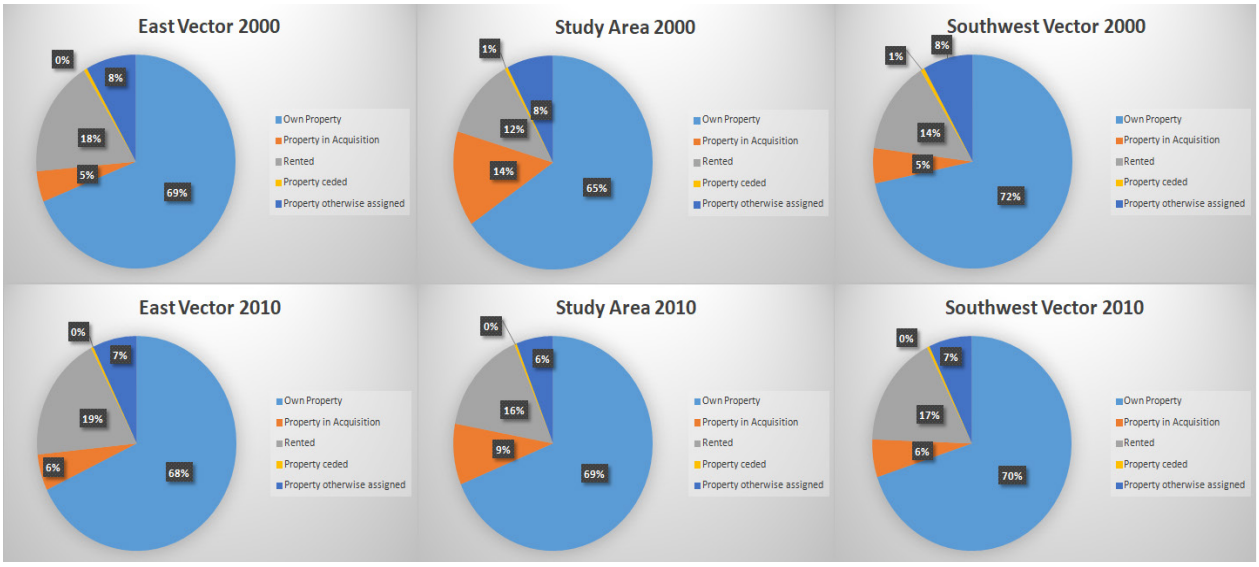


Source: Own elaboration based on Census data

Other comparisons also corroborate the idea that the study area behavior was not substantially different from other peripheries. The drop in the percentage of houses and the rise in the percentage of apartments were a generalized phenomenon in the metropolitan peripheries, as Chart 5 depicts. Regarding home ownership variables (as can be seen in Chart 6), all the selected

regions had essentially the same dynamics: the rise of the percentage of already paid own homes, the rise of rental percentage, and the drop of lent homes. The study area behaves slightly different in the percentage of families who were paying mortgages, a percentage that rose in the other two vectors.

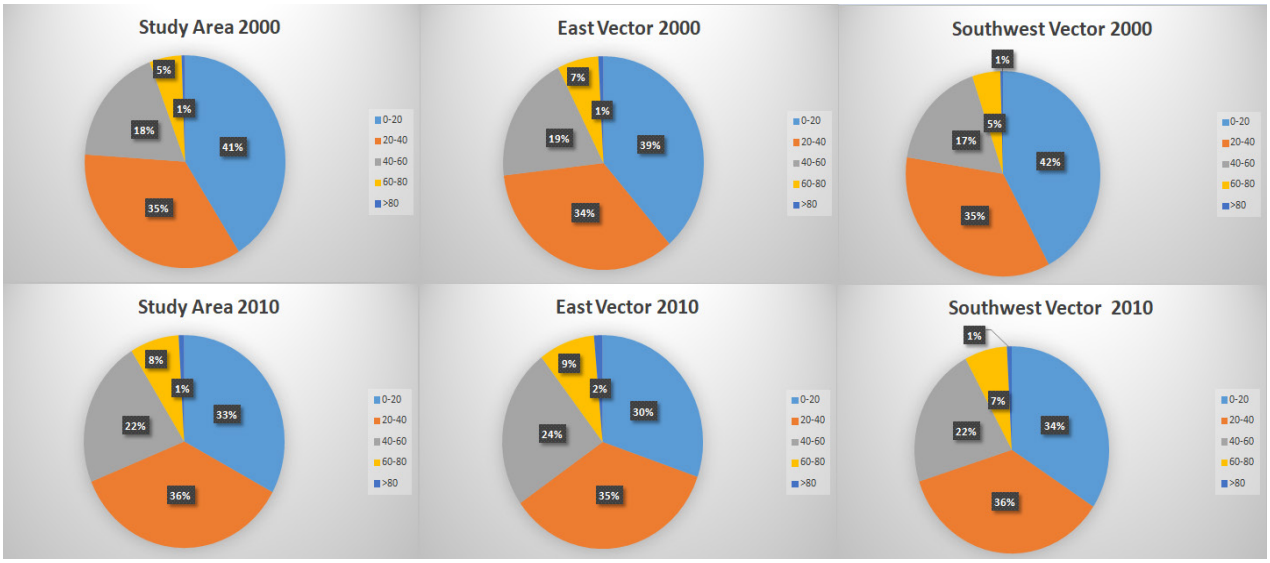
Chart 6: Home Occupation Condition in Three Peripheral Areas for 2000 and 2010



Source: Own elaboration based on Census data

Finally, demographic data depicted in Chart 7 shows the aging of population in all selected regions. It is important to note that in all three regions the percentage of population younger than 40 years old was higher than 73 percent in 2000, and higher than 65 percent in 2010. People older than 60 years represent only 6 percent in 2000 and 9 percent in 2010, in the study area. One of the implications of these numbers, interpreted together with the rate of home ownership, is that the study area is a relatively consolidated area –young families living in their own homes. Real estate developers have relatively few options to buy land plots that are vacant due to elder residents who passed away. It will probably take many decades to increase the possibility of significant updates in ownership structure within these areas.

Chart 7: Population Age Ranges in Three Peripheral Areas for 2000 and 2010



Source: Own elaboration based on Census data

Partial Conclusions

Is there evidence of displacement of low-income populations in the study area?

No. The low-income families seem to be concentrated in the same neighborhoods where they were at the beginning of the LSUP.

Why may it be happening?

The areas where low-income families live have high population densities and most of them declare to have the ownership of their homes. Moreover, low-income families had very high rates of income growth from 2000 to 2010, much higher than upper-middle income families. It may be correlated with the federal minimum wage policy. Furthermore, in 2000 nearly 80 percent of the residents in the study area were younger than 40 years old. These facts increase the possibility of non-changes in the study area for decades and illuminates how it is a relatively consolidated area.

Is there evidence that high-income families are occupying the study area?

No. The income levels within the study area are still much lower than other areas in the metropolitan region (such as Belo Horizonte's Center-South region or Nova Lima's gated communities). Within the study area, the richest portions are still essentially the same, such as the Pampulha region, composed by upper-middle income families. The novelty is the emergence of middle classes families in the North region of Belo Horizonte (east of the Green Line) and in the northern portions within the study area, in previously less densely occupied neighborhoods in Vespasiano. Therefore, lower-income families probably are not being displaced, but they have

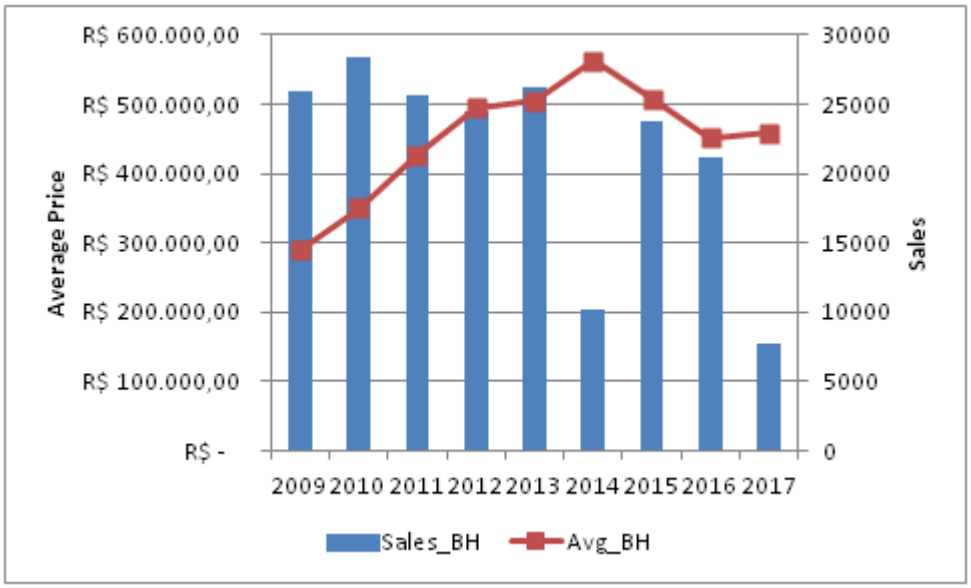
been seeing empty plots being occupied by middle-income neighbors and some old neighbors upgrading their homes.

ITBI—Real Estate Market Dynamics

ITBI's data analysis is crucial to provide evidence for this study. This data enables comparisons between the study area and the city, as well as comparisons with other parts of the city. Graph 1 depicts the real estate prices cycle from 2009 to 2017. It also depicts the number of sales (columns). Both prices and number of sales showed the effects of the Brazilian economic and political crisis after 2014. For 2017, data was available only up to May.

Graph 2 depicts a comparative exercise, comparing average prices and number of sales for the study area and Belo Horizonte (without the study area). We constructed time series for residential and commercial real estate (using 2009 = 100 and deflating monetary values using IGP-M[5].) For 2017, we extrapolated the number of sales (for the 2nd semester).

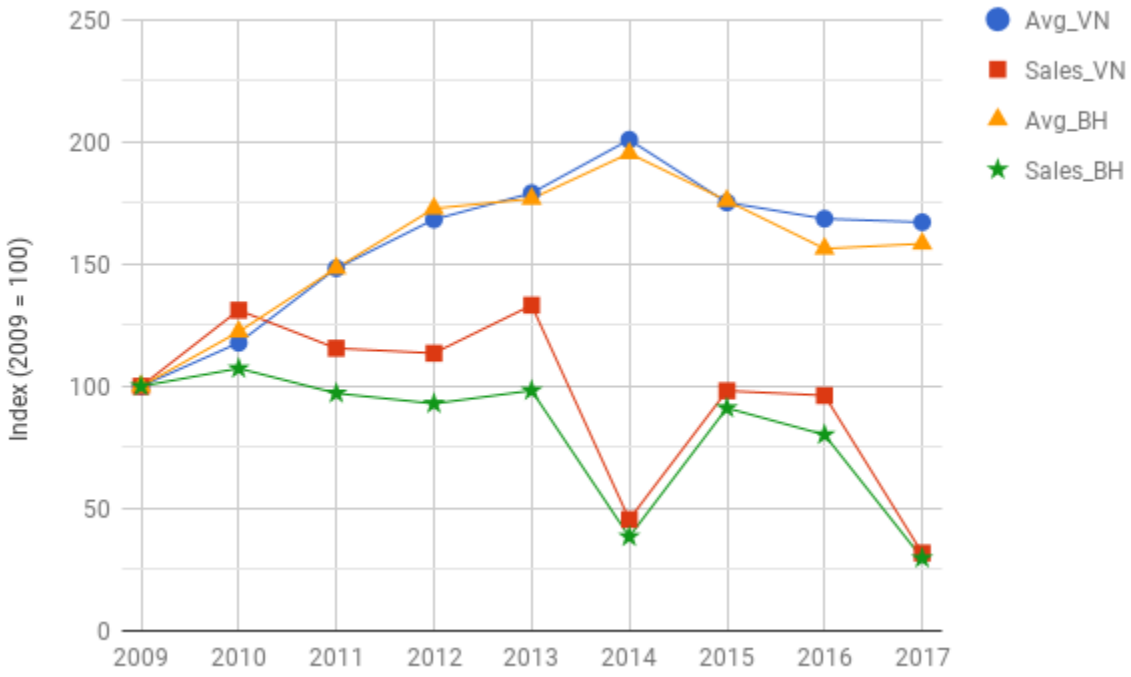
Graph 1: Average Price and Number of Sales in Belo Horizonte (January 2009–May 2017)



Source: Own elaboration using ITBI data

[5] General average prices index, which is calculated by Fundação Getúlio Vargas (FGV). It is the most used index for real estate market in Brazil.

Graph 2: Average Price Growth and Transactions Growth—Study Area and BH (2009–2017)



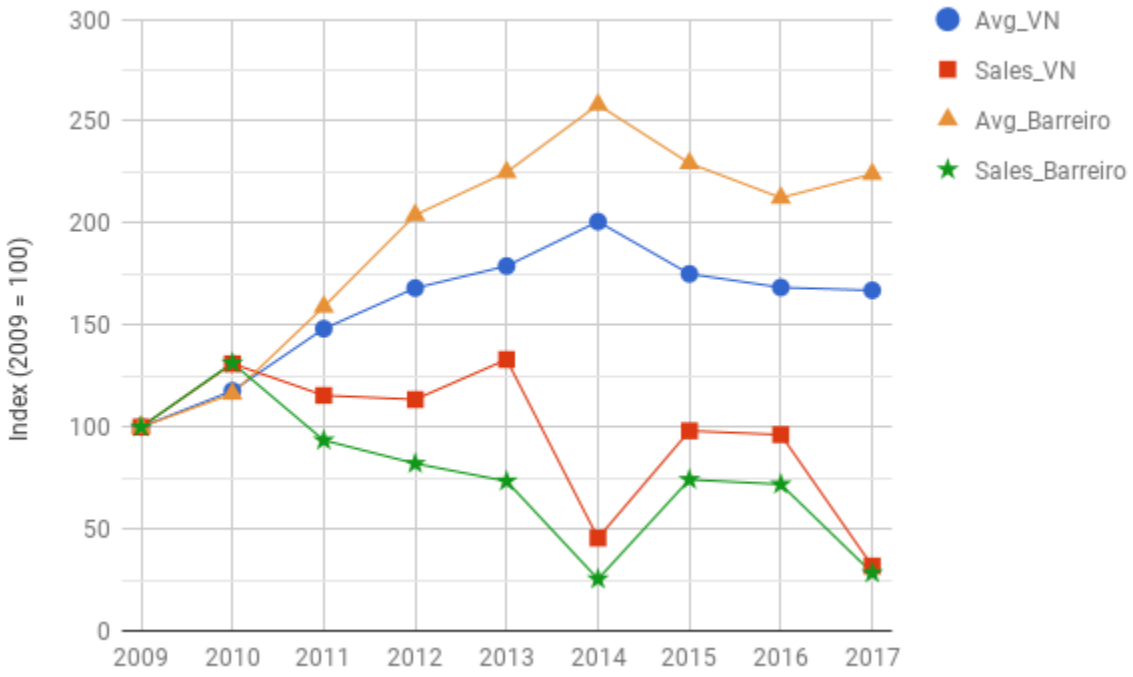
Source: Own elaboration based on ITBI data

The real growth rates of the study area's average prices, considering residential and commercial real estate, are about the same as the average of BH, although they decreased a little less from 2014 to 2017. The prices indexes increased around 100 percent from 2009 to 2014. From 2014 to 2017, these indexes fell around 30-40 percent.

The real estate sales growth rates of the study area followed, essentially, the same trends of BH. However, sales grew more in the study area than in BH from 2009 to 2014, and also fell more from 2013 to 2017. This data shows evidence of low price-elasticity of real estate supply, with prices varying more than quantities.

Comparing the study area with other peripheral and low-income area helps to check robustness. In the case of the Barreiro region, located in the south-west region of BH, similar trends may be observed. Nonetheless, in Barreiro the average prices grew more (2009-2014) and fell less (2014-2017). This fact may be interpreted as an evidence that the LSUPs in the study area were not the key determinant for the real estate dynamic in the region. As mentioned before, the rise of the low-income and middle class in the Brazilian peripheries due to federal policies and macroeconomic scenario from 2003 to 2014 may be a better predictor to what happened in these areas than local policies. Furthermore, the Graph 3 brings evidence that the study area is a peripheral area with higher land supply than the Barreiro region (an old industrial neighborhood), a fact often cited by land developers in the city.

Graph 3. Average Price Growth and Transactions Growth—Study area and Barreiro (2009–2017)



Source: Own elaboration based on ITBI data

In this panorama, ITBI data corroborates other empirical evidences brought by the construction industry employment (RAIS) and macroeconomic variables. From 2003 to 2010, when state government announced most of the LSUPs, the real estate dynamics was still less intense. In this time period, the secondary market (older properties) had a very relevant participation in the number of total sales. After 2010, there was a very significant increase of real estate activity, with prices peaking in 2014 and the number of sales in 2010.

In face of these evidences, we ran two groups of econometric analysis[6][7]. The first used dataset exclusively for the study area, trying to address questions about the characteristics of the real estate within the study area. We employed regression analysis to identify if the properties closer to the main axes have statistically significant higher average prices than properties more distant from the main axes. Other variables, such as construction quality, zoning and age described key aspects of the study area. We modeled the main amenity within the study area.

The second econometric analysis is a counterfactual exercise in which we estimated differences-in-differences (DID) models to test if the LSUP had significant effects over real estate prices. In

[6] We ran all regressions in R software. We used typical ordinary least squares (OLS) as estimation method. Although we did not identify strong reasons to suppose the presence of endogeneity *a priori*, Generalized Moments Method (GMM) may be used in future works to improve estimations.

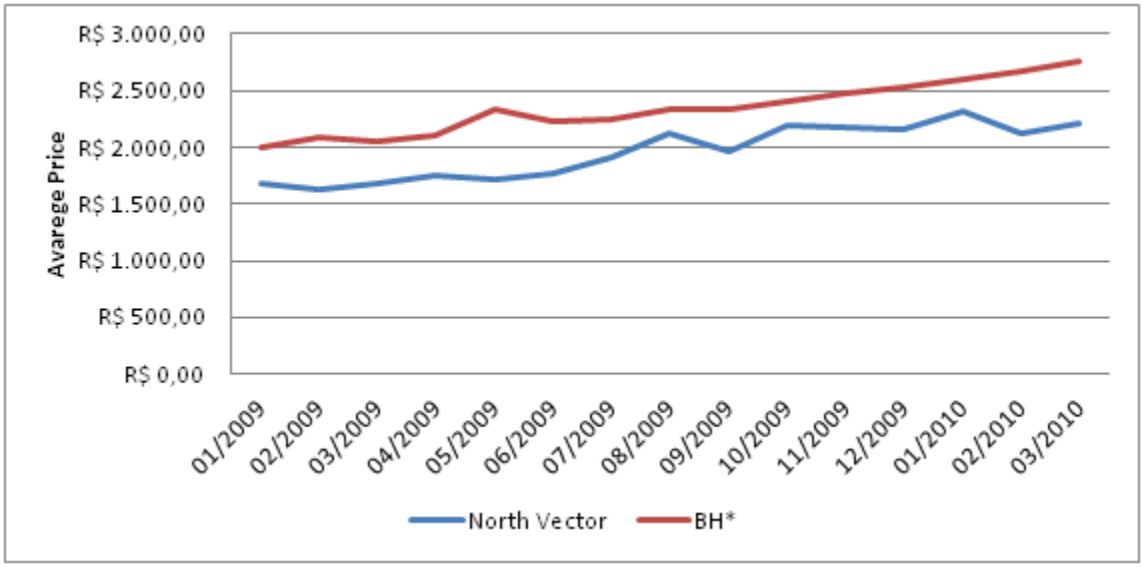
[7] Due to intuition and Breusch-Pagan heteroscedasticity test, we used heteroscedasticity-robust standard errors for both groups of regressions.

this case, the comparison included the entire city, which provided more than 200 thousand observations using pooled data from January 2009 to July 2017. We could use a panel data analysis, but it would be an unbalanced panel and we would lose many degrees of freedom[8]. This approach has been frequent in the literature (Maciel and Biderman 2013). The effects of three main LSUP over prices were tested: the CAMG (Administrative City), the Shopping Estação and the MOVE BRT. We selected these LSUP because they are within the study area and they are among the most cited by residents and entrepreneurs. Many LSUP advertised by state government from 2004 to 2015 are unknown by residents and entrepreneurs, such as the "Fashion City", the "Medical City", the CTCA (Air Force tech training institution) and other investments and plans surrounding the airport (AITN).

We did not model the anticipated effects of announcements of each LSUP because we do not have available data. The Green Line corridor was not modeled due to the uncertainty around its delivery, its long extension (beyond the study area and beyond the available data) and longtime duration of this project. Future works may give attention exclusively to it.

The DID methodology requires that the parallel trends assumption holds true. It means that before the treatment, the trends in each group (control and treatment) were similar (Winke 2017). As Graphic 4 depicts, this assumption is verified to real estate prices in our samples.

Graph 4: Real Estate's Average Prices Before Deliveries of LSUP



BH* = Belo Horizonte without study area

Source: Own elaboration based on ITBI data

[8] Future work on this dataset can use a spatial panel econometric analysis to try to improve estimations.

Variables Description

- Log of the real estate price ("*logp*") is the logarithm of the deflated price per sqm. Following Cheshire and Sheppard (1995), Maciel and Biderman (2013) and Winke (2017) about the estimation of linear hedonic land price model, we adopted a log-linear specification[9].
- Construction quality ("*P"*) is a categorical variable. The *Prefeitura de Belo Horizonte* (PBH) classifies real estate accordingly with the number of rooms, number of bathrooms, parking space, construction material, covering of paint, etc. It varies from Pattern 1 (P1), the lowest ranked, to Pattern 5, the highest ranked. A P1 dwelling is a very modest home while P4 and P5 are luxury homes.
- The distance ("*radius*") from the main transport axes variable indicates if the observation is located 0.5 km away from the avenue; between 0.5 km and 1.5 km from it; or more than 1.5 km away from the main avenue. In urban economics, on one hand, it is hypothesized that the closer to the main transport axes, the higher the accessibility, so the higher the real estate price. On the other hand, transport axes may generate negative externalities due to noise and air pollution. Therefore, we do not know *a priori* which effect dominates. This variable was used only in the first econometric analysis.
- Construction year variable ("*construction.year"*) indicates when the real estate was built.
- "*Zoning*" (ZAP, ZAR2, ZEIS1, etc.) indicates the zoning parameters that rules the potential of construction in each land parcel. Belo Horizonte's zoning law defines land use homogeneous zones. Zoning restrictions may affect real estate prices due to the effects on land rent, which net present value forms the land price[10].
- "*East&West"* variables indicate in which side of main transport axes a real estate is located or if it is located in the center of the neighborhood. It means the lanes that guide to downtown or to neighborhood directions. We used this variable only in the first econometric analysis.
- Year of transaction "*year.sold*" indicates when the sell-buy transaction of the property happened.
- Pampulha ("*PAMPU"*) is a dummy to model the main amenity within the study, the Pampulha Lagoon. Descriptive analysis and fieldwork indicated that this amenity exceeds the effects of any other amenity within the study (local squares, parks, etc.) Moreover, there were not many changes in the amenities levels during the time period analyzed. Still, some land use zones work as amenities variables, because they define the location of an environmental protection zone. This variable was used only in the first econometric analysis.
- The "*plot.area*" variable shows us the total area of the plot where the real estate is located.
- We modeled each neighborhood as a factor ("*neighborhood"*). Drawing from Abramo (1994, 2007), the average price within each neighborhood varies accordingly to the level of neighborhood externalities, which the theory explains based on the concept of urban convention –an average collective opinion on that neighborhood. This concept advances the spatial representation of cities from a monocentric-rings structure to a kaleidoscope of

[9] Authors make this suggestion because the errors may be non-normal in the estimation of hedonic land price models.
[10] For a detailed discussion on this, see Guigou (1982) and Almeida and Monte-Mór (2017).

externalities, where the distance from the CBD or any other concentration of jobs is not the main explanatory variable to real estate prices. Besides this theoretical basis, we also have empirical evidence that Belo Horizonte has a spatial representation more adherent to a mixture of externalities than to a monocentric city regarding real estate prices (see Almeida 2015; Almeida, Monte-Mór and Amaral 2017).As usual in DID models, we used a time-specific variable for each new intervention (*CAMG, MOVE* and *SHOP*). Furthermore, we used a *dummy* to capture if the real estate is located within the study area or not ("*SA*"). The DID coefficients are obtained by estimating the joined effect of being in the study area and each intervention ("*Invertion*SA*").

First Econometric Analysis (Study Area)

We run econometric models for each main real estate typology, meaning apartments, houses and commercial real estate. The sample for apartments contained 9881 observations, the one for houses 3693, and the one for commercial properties 459 observations.

The general regression equation has the following format:

$$Log(Y_i) = \beta_0 + \sum_{j=1}^{J} \beta_j Z_{ij} + \sum_{n=0}^{N} \theta_n W_{ni} + \mu_i \quad (1)$$

where Y_i is the log of the real state price per sqm; β_0 is the model's intercept; Z_{ji} represents the continuous variables, β_j the respective coefficient, such as the year that each real state was constructed and the terrain area where the real state is located; W_{ni} are the *dummies* or categorical variables for the model and θ_n their respective coefficients. The dummies and categorical variables used in this first econometric analysis are *construction quality* (P); *zoning*; *east&west*; *radius*; *year_sold* and *PAMPU*.

The estimated equation follows:

$$\log(price) = \beta_0 + \beta_1 construction.year + \beta_2 plot.area + P'\theta_1 + zoning'\theta_2 + east\&west'\theta_3 + radius'\theta_4 + year.sold'\theta_5 + PAMPU'\theta_6 + \mu_i \quad (2)$$

In general, the variables had the expected sign and almost all were statistically significant at 1 percent confidence level. Furthermore, we tested four models for each typology to check robustness.

As Table 4 informs for the apartments sample, the construction quality was statistically significant at 1 percent level to explain the prices. The marginal effect of being classified as level "P4" was around 7 percent, and as level "P5" around 50 percent. These levels of construction quality are still uncommon within the study area, which may explain these magnitudes.

Regarding the distance from the main transport axes, we found a puzzling result, because the most distant (more than 1,5 km) apartments have higher average prices than apartments closer (between 0.5 km to 1.5 km). If this result holds true, accessibility to the main axes (Av. Pedro I, Av. Cristiano Machado and Green Line) is not a key variable to explain positive correlations regarding apartment's prices within the study area. These coefficients were statistically

significant at 1 percent level. This result also brought motivation for not using the distance from transport axes in the DID estimation.

Apartments age coefficient was also statistically significant at 1 percent level, indicating that each year old decreases the average prices at nearly 1,8 percent. Interpreting this result as a depreciation rate, it means that the lifetime duration of an apartment would be around 55 years[11].

Zoning variables were statistically significant at 1 percent level for "ZAR-2" (restricted density zone) and "ZP2" (environment protection zone). This result is very relevant for debates on zoning laws, since developers usually argue that restrictions will increase the land price. In this sample, the higher the restriction, the lower the price.

"East" and "West" variables had negative and statistically significant at 1 percent level coefficients. These results indicate that apartments located in the middle of the neighborhoods correlates with higher average prices within the study area. The year's variables capture the effects of macroeconomic cycle over the real estate prices, indicating that the prices peaked in 2014. These coefficients were statistically significant at 1 percent level for all the years (from 2009 to 2017). Finally, we modeled the main amenity within the study, the proximity to the Pampulha Lagoon. Being located in the Pampulha region within the study area increased the average price of apartments by more than 40 percent. The Pampulha Lagoon certainly exceeds the effects of any other amenity within the study (local squares, parks, etc.).

Table 4: Regression Results of Log Price Around Apartments, Houses and Commercial Real Estate

	(1) Apartments	(2) Houses	(3) Commercial
(Intercept)	-2.71E+01***	-4.24E+01***	-4.38E+01***
	(<2.2E-16)	(<2.2E-16)	(8.97E-09)
Construction quality 2	-2.47E-01***	3.93E-01***	7.97E-02
	(<2.2E-16)	(<2.2E-16)	(4.67E-01)
Construction quality 3	-9.75E-02***	6.08E-01***	3.41E-01**
	(1.71E-09)	(<2.2E-16)	(2.01E-02)
Construction quality 4	8.61E-02***	6.26E-01***	1.76E+00***
	(2.26E-05	(<2.2E-16)	(<2.2E-16)
Construction quality 5	5.24E-01***	3.01E-01***	x

[11] As usual in depreciation analysis, when residual values equal zero, the asset is still physically able to be used. Depreciation in this case has more to do with accounting measures.

	(1) Apartments	(2) Houses	(3) Commercial
	(<2.2E-16)	(3.97E-12)	
0.5km< distance <1.5km	-6.72E-02***	-1.02E-01***	-1.30E-01
	(2.42E-14	(9.85E-08)	(1.06E-01)
distance >1.5km	2.78E-01***	-1.85E-01***	-5.82E-01***
	(<2.2E-16)	(6.58E-10)	(1.35E-05)
Construction year	1.78E-02***	2.45E-02***	2.56E-02***
	(<2.2E-16)	(<2.2E-16)	(3.38E-11)
ZAR2	-3.54E-01***	-3.49E-01***	-2.69E-01**
	(<2.2E-16)	(<2.2E-16)	(4.65E-03)
ZCVN	1.77E-02	8.16E-02	2.36E-01.
	(6.17E-01)	(2.70E-01)	(6.56E-02)
ZEIS	x	-2.80E-01*	x
		(4.13E-02)	
ZP1	1.27E-01	-1.22E-01	-3.67E+00***
	(5.79E-01)	(5.59E-01)	(1.93E-08)
ZP2	2.69E-01***	-1.32E+00***	x
	(<2.2E-16)	(<2.2E-16)	
East	-2.20E-01***	-2.32E-01***	-5.81E-03
	(<2.2E-16)	(<2.2E-16)	(9.62E-01)
West	-4.11E-01***	-2.91E-01***	2.80E-01*
	(<2.2E-16)	(<2.2E-16)	(1.41E-02)
2010	1.87E-01***	3.25E-01***	3.39E-01**
	(<2.2E-16)	(<2.2E-16)	(4.30E-03)
2011	3.58E-01***	5.85E-01***	5.00E-01***
	(<2.2E-16)	(<2.2E-16)	(5.15E-04)
2012	4.17E-01***	6.78E-01***	4.75E-01***
	(<2.2E-16)	(<2.2E-16)	(7.28E-05)
2013	5.08E-01***	8.30E-01***	9.27E-01***
	(<2.2E-16)	(<2.2E-16)	(2.55E-12)
2014	5.77E-01***	8.87E-01***	8.85E-01***
	(<2.2E-16)	(<2.2E-16)	(3.92E-10)
2015	5.40E-01***	8.44E-01***	5.67E-01***

	(1) Apartments	(2) Houses	(3) Commercial
	(<2.2E-16)	(<2.2E-16)	(4.43E-06)
2016	4.22E-01***	7.76E-01***	7.48E-01***
	(<2.2E-16)	(<2.2E-16)	(8.74E-10)
2017	3.77E-01***	7.16E-01***	5.12E-01*
	(<2.2E-16)	(<2.2E-16)	(1.72E-02)
PAMPU	4.11E-01***	3.29E-01***	-1.39E-01
	(<2.2E-16)	(<2.2E-16)	(1.45E-01)
terrain.area	-7.01E-06***	6.98E-05***	-3.70E-06
	(<2.2E-16)	(<2.2E-16)	(9.01E-01)
N	9881	3693	459
Adjusted R-squared	0.6784	0.6428	0.7086
F-Statistic	907.3***	277.8***	54.03***
	(df = 23; 9,857)	(df = 24; 3668)	(df =21; 437)

Notes: Heteroscedasticity-robust standard errors in parenthesis with "." for p <0.05, * for p <0.01, ** for p <0.001 and *** for p = 0

Table 4 also shows estimation results for the houses sample. Almost all variables were statistically significant at 1 percent level. Construction quality maintained the expected sign and magnitude, although "P4" coefficient was higher than "P5", which may be explained due to the micro numerosity of P5 houses within the study area. In this sample, the previously mentioned puzzle does not hold, with more distant houses from the main transport axes having lower average prices. House ages have a higher estimated impact than the one in the apartments sample, a 2.5 percent decrease per year. Zoning also has significant impacts for houses. East and west variables were also statistically significant at 1 percent level and had negative coefficients for the houses sample. The annual variables were also statistically significant at 1 percent level and had higher impacts for houses, whose price also peaked in 2014, within the study area. The locational coefficient for the Pampulha region is lower for houses (around 30 percent) than for apartments, probably because the most common typology surrounding the lagoon are houses.

Finally, Table 4 shows estimation results for the commercial real estate sample. Construction quality ("P3" and "P4") have higher estimated impacts. In this sample, the more distant from the main transport axes, the lower the average prices. Being located more than 1.5 km from the main axes decreases the average prices in almost 60 percent. It makes sense in the case of commercial real estate; whose preferred location tends to be along the main axes. Aging had also the expected sign and was statistically significant at 1 percent level, meaning that each year old decreases the average prices in 2.5 percent. Zoning restrictions also had negative impacts over prices and were statistically significant but, in this sample, being in the commercial zone of

Venda Nova ("ZCVN") increases the average prices by nearly 25 percent. The East variable was not statistically significant, while the West variable (downtown direction) was statistically significant at 10 percent level. Annual estimated effects were also statistically significant at 1 percent level but, for this sample, average prices peaked in 2013. The Pampulha variable was not statistically significant, indicating that the proximity to the lagoon is relevant only for residential land uses.

Second Econometric Analysis (DID Models)

We ran the DID models using samples for apartments (147,670 observations); houses (26,705) and commercial real estate (19,053).

The regression equation has the following format.

$$\log(Y_i) = \beta_0 + \sum_{j=1}^{J} \beta_j Z_{ji} + \sum_{n=1}^{N} \theta_n W_{ni} + \sum_{u=1}^{U} \propto_u T_{ui} + \gamma_1 SA_i + \sum_{f=1}^{F} \delta_f \left(T * SA_{fi}\right) + \mu_i \quad (3)$$

$$\log(price) = \beta_0 + \beta_1 construction.year + \beta_2 year.sold + \beta_3 plot.area + P'\theta_1 + zoning'\theta_2 + neighborhood'\theta_3 + \propto_1 CAMG + \propto_2 MOVE + \propto_3 SHOP + \gamma_1 SA + \delta_1(SA * CAMG) + \delta_2(SA * MOVE) + \delta_3(SA * SHOP) + \varepsilon \quad (4)$$

In general, the variables had the expected sign and most of them were statistically significant at 1 percent level. Moreover, we tested fifteen different specifications to check robustness. The main results hold on all the specifications and the magnitude of the coefficients is similar.

As Table 5 informs, in the sample for apartments, the DID coefficient was statistically significant at 1 percent for the inauguration of the Shopping Estação and the CAMG and at 10 percent level for the MOVE BRT. The estimated impacts of the Shopping's inauguration over apartments prices within the study area is around 4 percent, the higher DID coefficient we found in this sample. The estimated impacts of the CAMG was around 3 percent, whilst MOVE BRT decreased average prices within the study area by nearly -2 percent.

Table 5: Regression Results of Log Price for Apartment, Houses and Commercial Real Estate

	(1) Apartments	(2) Houses	(3) Commercial
DIDCAMG	2.80E-02**	4.58E-02	2.41E-02
	(2.08E-02)	(1.49E-01)	(8.01E-01)
DIDMOVE	-1.78E-02*	2.23E-03	-1.05E-01
	(4.11E-03)	(9.25E-01)	(2.82E-01)
DIDSHOP	3.95E-02**	-9.04E-03	9.15E-03
	(1.21E-07)	(-7.17E-01)	(9.31E-01)
N	147,669	26,705	19,053
Adjusted R-squared	0.4705	0.6131	0.7004
F-Statistic	481.7***	119.8***	170.4***
	(df = 273; 147,395)	(df = 356; 26,348)	(df = 263; 18,789)

Notes: Heteroscedasticity-robust standard errors in parenthesis with "." for p <0.05, * for p <0.01, ** for p <0.001 and *** for p = 0

These coefficients make sense in face of the fieldwork experience. When we asked residents if they noted impacts of the LSUP over their neighborhood, one of the most frequent answer was related to the MOVE BRT, showing their disapproval. Many local bus routes that connect a neighborhood to downtown no longer exist, leading users to take two buses now. Users affirm that it increased the travel time and, in many cases, the tariffs. In general, it seems to exist a negative consensus around the MOVE BRT in Belo Horizonte.

On the other hand, it is easy to justify why the Shopping Estação generated such 4 percent increase in apartment's prices in the study area. The shopping center provided a number of services and retail options to residents, strengthening the urban centrality of the area. Moreover, it is physically integrated with final metro station and buses station (Estação Vilarinho), which increases the shopping accessibility.

CAMG also had a significant and positive impact over apartments' prices in the study area, although smaller than the Shopping Estação's impacts. One possible explanation is that most of the residents do not interact with CAMG, and most of the public servers and technocrats who work there, do not live in the study area. Therefore, it is harder for real estate market to capitalize the potential benefits of CAMG due to its disconnection with the surrounding area. As we observed in the fieldwork, most of the residents never went to CAMG. Nevertheless, the enormous public area for outdoors activities, the aesthetic aspect and the expectations that CAMG created may be enough to explain the 2.8 percent prices increases that it promoted in the study area.

We also tested a different definition of the study area. One may argue that the LSUP had a wider territorial impact, such as the preliminary study conducted by Nabuco, Fonseca and Legroux

(2017), who used the entire Pampulha, Venda Nova and North regions as study area. Adopting these three regions as the study area, the DID coefficients were not statistically significant for CAMG and MOVE BRT. It was still statistically significant at 1 percent level for the Shopping Estação. The estimated effect was a 1.1 percent apartment's price increase. Therein, it shows the limited impact over apartments' prices of CAMG and MOVE BRT, at least in Belo Horizonte municipality.

As the section that analyzes the new land developments into metro area discusses, a significant part of the land value created by the LSUP might be captured in municipalities such as Vespasiano, Lagoa Santa and Jaboticatubas. In these municipalities, there were rural land parcels that were urbanized and there is not the same rigidity of control over the built environment, such as in Belo Horizonte.

Table 5 also informs the DID coefficients for the houses and commercial samples. In these samples, DID coefficients were not statistically significant. Thereby, we can infer that these three LSUPs had different impacts depending on the kind of market. Commercial real estate market in Belo Horizonte is still highly concentrated in the Center-South region. Housing markets is much more spread, but the main concentrations of high-priced houses are not within the study area.

We also estimated LSUP effects over land value properly. Table 6 informs the DID coefficients for this estimation. We tested two study area definitions, one using the previously study area described throughout this work, and a second for an expanded study area, composed by Pampulha, Venda Nova and North regions.

Table 6: Regressions Results of Log Price for Land Plots Sample—Study Area and Expanded Study Area

	(1) Study Area	(2) Expanded Study Area
DIDCAMG	1.73E-01***	9.58E-02***
	(1.86E-06)	(2.85E-05)
DIDMOVE	-1.47E-01***	-6.14E-02*
	(6.80E-06)	(1.21E-02)
DIDSHOP	-4.58E-02	-5.34*
	0.17	(1.67E-02)
N	11590	11590
Adjusted R-squared	0.7487	0.735
F-Statistic	107.9***	103***
	(df = 323; 11,266)	(df = 315; 11,274)

Notes: Heteroscedasticity-robust standard errors in parenthesis with "." for p <0.05, * for p <0.01, ** for p <0.001 and *** for p = 0

The estimated impacts of the CAMG and MOVE BRT over land values were statistically significant at 1 percent level and had the same sign that in the apartment's sample. However, the impacts were higher for land markets, in which the CAMG increased the average prices in 17 percent and MOVE BRT decreased in 14 percent. In the expanded study area, CAMG had an almost 10 percent impact and MOVE BRT a negative 6 percent impact (although statistically significant at 10 percent level). The Shopping Estação's effect was not significant in the first definition of study area and significant only at 10 percent in the expanded area.

It is also worth mentioning that our estimation using the sample for Belo Horizonte showed that the other controls are key explanatory variables for the real estate prices in the city. Models had a good explanatory power, measured by R^2 and the adjusted R^2, and based on the literature. The coefficients related to location, zoning and construction quality have the higher magnitudes and are statistically significant at 1 percent level in general. Being located in a neighborhood such as Belvedere (in the southern portion of the city) results in a more than 70 percent price increase for apartments, while being located in neighborhoods such as Alto Vera Cruz, Nazaré and Monte Azul may result in a more than 55 percent price decrease for apartments[12]. As Belvedere, the São Luiz neighborhood (in Pampulha) also showed one of the highest positive and significant coefficients, bringing evidence of relevant suburbanization of wealth in Belo Horizonte (see Almeida 2015). On the other hand, there is still a very relevant agglomeration of high-priced neighborhoods in the south portion of the city, in neighborhoods such as Lourdes, Santo Agostinho, Savassi, Anchieta, Sion, Santo Antônio and Carmo (around 20-30 percent estimated coefficients for apartments). Zoning variables brought evidence that the higher the restriction (or the lower the floor-area ratio), the lower the price. As mentioned before, this result is very relevant for zoning laws debates. For instance, being located in a ZEIS-2 (low-income social protection zone) may result in almost 22 percent price decrease and in a ZAR-2 (restricted density zone) may result in nearly 7 percent price decrease for apartments. Construction quality showed expected results. If an apartment has the construction quality classified as "P4", there is a 20 percent average price increases. If it is a "P5", the estimated result is around 40 percent.

As it is natural to be said in any econometric estimation, all these results demand further investigation and should be interpreted cautiously. Due to the relevance of the BRT MOVE investment, this LSUP certainly requires more research on its effects in the city structure and real estate markets.

Partial Answers: Did the LSUP Rise the Land Value Within the Study?

Yes. The DID models brought evidence of a statistically significant impact because of the inauguration of CAMG, Shopping Estação and MOVE BRT, depending on each real estate market analyzed. Considering apartment's sample, the Shopping Estação had the higher estimated effect, a 4 percent price increase. CAMG may have generated a 2 percent price increase in the study area. On the other hand, MOVE BRT may have caused a 2 percent price decrease. Considering the land plot's sample, CAMG caused a 17 percent price increase and MOVE BRT caused a 14 percent price drop. Nevertheless, the LSUP does not seem to have significant impacts on houses and commercial markets.

[12] Selecting only neighborhoods with coefficients that were statistically significant at less than 1% level.

Fieldwork: Displacement Analysis

This section analyzes the fieldwork data (survey) for the residents' profile in 2017. Our main aim is to answer the following questions: are there evidences of a gentrification process within the study area? Moreover, if so, where did low-income residents displaced by gentrification move to?

In the face of the preliminary evidence brought by the analysis of the questionnaire data, essentially, the answers are that there is no gentrification process within the study area and low-income residents have not been displaced to anywhere. What we observed, indeed, was the permanence of low-income residents in areas where they have lived for a long time: 63.88 percent of the residents interviewed have lived in the same place for more than 15 years.

Table 7: Period When Residents Moved to the Neighborhood

Period	Frequency	percent total
Natives*	207	23,08
Before 2004	366	40,8
2004-2010	138	15,38
2011-2017	186	20,74
Total	**897**	**100**

*People who declared that were born in the area.

Source: Own elaboration from fieldwork data

As a matter of fact, there is evidence of migratory flows towards the area without necessarily implying a displacement of previous residents. About 49 percent of 510 interviewees said they met new residents in the neighborhood. As Table 7 suggests, the influx of residents to the study area increased from 2011 to 2017—a time period that includes the peaks of real estate prices and construction employment (2010-2014).

Thus, new questions arise: why did new residents move to the study area? Where did they come from? We explore these questions at the end of this section.

In order to evaluate the hypothesis that residents of the region suffered pressures to move, whether due to economic or other reasons, residents were asked if they intended to move from their current dwelling and 30.5 percent of the respondents answered affirmatively. The main

reasons cited were moving to a home of their own; violence; lack of infrastructure in the neighborhood; to improve life standards; to look for opportunities elsewhere; dislike the region; and to go back to hometown (countryside). Of all these reasons (Table 8), none seems to be directly related to a displacement flow. More importantly, many of the answers revealed the income increases (observed through Censuses' data): a group of residents moved or intends to move because now they are richer and can afford their own property and better neighborhoods. Therefore, the federal social policies implemented up to 2015 seem to still have some positive impacts over the low and middle-income residents in the study area.

Table 8: Reasons to Move from the Current Residence

Motive	Frequency	Percent	Cumulative Percent
Home ownership	32	13,50	13,50
Violence	29	12,24	25,74
Lack of infrastructure	24	10,13	35,86
Improve life standards	23	9,70	45,57
Looking for opportunities	21	8,86	54,43
Dislike	19	8,02	62,45
Go back to countryside	16	6,75	69,20
Bad location	12	5,06	74,26
Leave family environment	12	5,06	79,32
Looking for tranquility	9	3,80	83,12
Go near the family	9	3,80	86,92
Tourism	9	3,80	90,72
Go near workplace	9	3,80	94,51
Marriage	8	3,38	97,89
Live in a house	5	2,11	100,00
Total	**237**	**100,00**	

Source: Own elaboration from fieldwork data

Analyzing the residents who do not intend to move (69.5 percent of the sample), social relations is a strong reason not to move. An attachment to the region is perceived either by family relations within the locality or by dwelling ownership. The main reasons cited, specifically, were roots that they have in the neighborhood; liking the place; the neighborhood is a quiet place; the neighborhood has retail nearby; and dwelling ownership (see Table 9). Once again, the interventions in the region do not seem to have altered in a forceful way the experience in these neighborhoods to the point of getting residents disturbed. On the contrary, the perception about the neighborhood seems to remain the same.

Table 9: Reasons to Stay at the Current Residence

Motive	Frequency	Percent	Cumulative Percent
Roots	105	20,04	20,04
Likes the place	98	18,70	38,74
Quiet place	91	17,37	56,11
Commerce nearby	51	9,73	65,84
Home Ownership	43	8,21	74,05
Neighborhood is good	29	5,53	79,58
Financials	29	5,53	85,11
Good coexistence	24	4,58	89,69
Other (ex. because not; no interest)	14	2,67	92,37
Family nearby	13	2,48	94,85
Close to workplace	12	2,29	97,14
Just arrived	6	1,15	98,28
Entrepreneurship in the region	2	0,38	98,66
Cheap rent	2	0,38	99,05
Don´t pay a rent	1	0,19	99,24
Relationship	1	0,19	99,43
Age	1	0,19	99,62
Is renovating the property	1	0,19	99,81
Eviction	1	0,19	100,00
Total	**524**	**100,00**	

Source: Own elaboration from fieldwork data

Deepening the survey analysis, it is possible to differentiate the degree of satisfaction of each neighborhood. Therein, one can perceive diverse impacts within the study area and its hierarchical structure. Among the neighborhoods with more than five observations, *Xodó Marize* and *Etelvina Carneiro*, in Belo Horizonte, and *Jardim D'aliana*, in Vespasiano had the highest rates of dissatisfaction, where around 60 percent of respondents want to move. Conversely, there are neighborhoods where all respondents are satisfied and do not intend to move. These neighborhoods are *Europa*, *Planalto*, *Santa Cruz*, in Belo Horizonte, and *Serra Dourada*, in Vespasiano. Interestingly, the neighborhoods *Serra Dourada* and *Jardim D'aliana*, with opposite rates of dissatisfaction, are neighbors. This result may be due to the recent construction of hundreds of buildings in the *Serra Dourada*, while *Jardim D'aliana* has remained with a precarious infrastructure and old real estates. Since the *Serra Dourada's* residents are still paying for their home acquisition, they do not plan to move. Curiously, these disapproval rates do not correlate with neighborhoods' income levels. Table 10 summarizes this information, restricting to neighborhoods with more than 5 observations for this question.

Table 10: Question About Intention to Move

Neighborhood – City	Yes (%)	No (%)	No. of observations
Xodó Marize – Belo Horizonte	60	40	5
Etelvina Carneiro – Belo Horizonte	60	40	5
Jardim D'aliana – Vespasiano	57,1	42,9	7
Nova York – Belo Horizonte	54,5	45,5	11
Tupi A – Belo Horizonte	50	50	8
Baronesa – Santa Luzia	50	50	14
Londrina – Santa Luzia	50	50	22
Asteca – Santa Luzia	46,7	53,3	15
Santa Mônica – Belo Horizonte	42,9	57,1	7
São João Batista – Belo Horizonte	42,5	57,5	40
Palmital – Santa Luzia	40	60	20
Cristina B – Santa Luzia	40	60	5
Juliana – Belo Horizonte	37,5	62,5	16
Jequitibá – Vespasiano	37,5	62,5	8
3ª e 4ª Seção – Vespasiano	37,5	62,5	8
Gávea I – Vespasiano	37,5	62,5	8
Serra Verde – Belo Horizonte	37,0	63,0	54
Jardim da Glória – Vespasiano	36,7	63,3	30
Jardim dos Comerciários – Belo Horizonte	36,4	63,6	33
Santa Branca – Belo Horizonte	36,4	63,6	11
Parque São Pedro – Belo Horizonte	35,7	64,3	14
Minas Caixa – Belo Horizonte	35,3	64,7	17
Jardim Europa – Belo Horizonte	33,3	66,7	21
Candelária – Belo Horizonte	33,3	66,7	18
Vila Esportiva – Vespasiano	33,3	66,7	6
Itapoã – Belo Horizonte	32	68	25
Morro Alto – Vespasiano	30,8	69,2	13
Letícia – Belo Horizonte	30	70	10
Canaã – Belo Horizonte	29,4	70,6	17
São Cosme – Santa Luzia	27,3	72,7	33
Jaqueline – Belo Horizonte	25,6	74,4	39
São Benedito – Santa Luzia	23,7	76,3	93
Cristina C – Santa Luzia	20	80	10
Floramar – Belo Horizonte	19,2	80,8	26
Nova Pampulha – Vespasiano	19,0	81,0	21
Cristina A – Santa Luzia	18,75	81,25	16
Santa Clara – Vespasiano	18,2	81,8	11
Jardim Guanabara – Belo Horizonte	16,7	83,3	18
Gávea II – Vespasiano	16,7	83,3	18
Serra Azul – Vespasiano	16,7	83,3	6
Vila Clóris – Belo Horizonte	5,9	94,1	17
Planalto – Belo Horizonte	0	100	12
Europa – Belo Horizonte	0	100	10
Serra Dourada – Vespasiano	0	100	12
Santa Cruz – Vespasiano	0	100	9

Source: Own elaboration from fieldwork data

With respect to the residents with intentions to move from the current dwelling, we asked where they would move to. For interviewees who said they intend to move, not everyone indicated where they would go to, but the observations collected already give an indication of the destination place. As Table 11 indicates, it seems that the intention is to move to better neighborhoods within the NV. The most cited neighborhoods were *Planalto*, *São Benedito* and *Venda Nova*. They also mentioned Belo Horizonte's downtown. In this question, it is worth to note that maybe a part of the interviewees interpreted the question as where they would like to live, and not as a concrete plan or intention to move.

Table 11: Intention to Move to (locations)

	Frequency	Percent	Cumulative Percent
Planalto – Belo Horizonte	10	8,4	8,4
Same Neighborhood	9	7,56	15,97
São Benedito – Santa Luzia	8	6,72	22,69
Venda Nova – Belo Horizonte	6	5,04	27,73
Centro – Belo Horizonte	6	5,04	32,77
Santa Mônica – Belo Horizonte	4	3,36	36,13
São João Batista – Belo Horizonte	4	3,36	39,5
Boa Vista – Belo Horizonte	3	2,52	42,02
Tupi – Belo Horizonte	2	1,68	43,7
Cidade Nova – Belo Horizonte	2	1,68	45,38
Pampulha – Belo Horizonte	2	1,68	47,06
Floramar – Belo Horizonte	2	1,68	48,74
Baronesa – Santa Luzia	2	1,68	50,42
Vila Esportiva – Vespasiano	2	1,68	52,1
Other cited neighbourhoods	57	47,9	100
Total	**119**	**100**	

Source: Own elaboration from fieldwork data

Based on all these observations, the evidence does not corroborate the hypothesis of gentrification in the study area. In general, people in the sample expected to keep on living in the same dwelling they live, and when they plan to move, they plan to move within the study area. Social relations and income growth (on the last decade) seem to offset eventual increases in costs of living.

Investigating the origin of the new residents, we observed that most of them came from the study area. Among the most cited neighborhoods of origin, only 4 do not belong to NV (*Sagrada*

Família, *Aparecida*, *Santa Tereza* and *Lagoinha*, neighborhoods composed of residents of similar social strata.) Considering the main reasons for moving (Table 12), we found home ownership; marriage; job; improvement of living standards; better housing; family reasons; and divorce. In this panorama, the study area seems to be an area with available new real estate for young families.

Table 12. Reason to Have Moved to NV

	Frequency	Percent	Cumulative Percent
Home Ownership	204	30,18	30,18
Marriage	99	14,64	44,82
Workplace nearby	51	7,54	52,37
To improve life standards	41	6,07	58,43
To a better house (owned or rented)	33	4,88	63,31
Family	29	4,29	67,60
Divorcement	24	3,55	71,15
Family problems	20	2,96	74,11
Location	18	2,66	76,78
Expropriation	18	2,66	79,44
Rent	17	2,51	81,95
Leave an apartment to a house	10	1,48	83,43
Liked the neighborhood	10	1,48	84,91
Was looking for tranquility	8	1,18	86,09
Financial difficulties	8	1,18	87,28
Illness	7	1,04	88,31
Violence	7	1,04	89,35
Unemployment	7	1,04	90,38
Rural exodus	7	1,04	91,42
Other	58	8,58	100
Total	**676**	**100**	

Source: Own elaboration from fieldwork data

From year 2007, it can be seen whether housing flows diverge on both the motivation and the origin of the residents. It does not seem, however, that 2007 is a turning point. The main places of origin continue to be from the NV itself, as can be seen in Table 13.

Table 13: Where Residents Came From

	Frequency	Percent	Cumulative Percent
Region	192	21,40	21,40
São Benedito – Santa Luzia	29	3,23	24,64
Venda Nova – Belo Horizonte	19	2,12	26,76
Serra Verde – Belo Horizonte	14	1,56	28,32
São João Batista – Belo Horizonte	14	1,56	29,88
Planalto – Belo Horizonte	11	1,23	31,10
Floramar – Belo Horizonte	11	1,23	32,33
Not specified	11	1,23	33,56
Jardim Europa – Belo Horizonte	10	1,11	34,67
Palmital – Santa Luzia	10	1,11	35,79
Santa Mônica – Belo Horizonte	9	1,00	36,79
Mantiqueira – Belo Horizonte	9	1,00	37,79
Tupi – Belo Horizonte	7	0,78	38,57
Sagrada Família – Belo Horizonte	7	0,78	39,35
Juliana – Belo Horizonte	7	0,78	40,13
São Bernardo – Belo Horizonte	7	0,78	40,91
Cachoeirinha – Belo Horizonte	7	0,78	41,69
Santa Clara – Vespasiano	7	0,78	42,47
Jardim Guanabara – Belo Horizonte	6	0,67	43,14
Candelária – Belo Horizonte	6	0,67	43,81
Letícia – Belo Horizonte	6	0,67	44,48
Aparecida – Belo Horizonte	6	0,67	45,15
Baronesa – Santa Luzia	6	0,67	45,82
Vila Esportiva – Vespasiano	6	0,67	46,49
Jardim da Glória – Vespasiano	6	0,67	47,16
Céu Azul – Belo Horizonte	5	0,56	47,71
Santa Tereza – Belo Horizonte	5	0,56	48,27
Jaqueline – Belo Horizonte	5	0,56	48,83
Lagoinha – Belo Horizonte	5	0,56	49,39
Santo André – Belo Horizonte	5	0,56	49,94
Santa Amélia – Belo Horizonte	5	0,56	50,50
Santa Efigênia – Belo Horizonte	5	0,56	51,06
Minas Caixa – Belo Horizonte	5	0,56	51,62
Padre Eustáquio – Belo Horizonte	5	0,56	52,17
Copacabana – Belo Horizonte	5	0,56	52,73
Itapoã – Belo Horizonte	5	0,56	53,29
Eldorado – Contagem	5	0,56	53,85
São Paulo	5	0,56	54,40
Other cited neighbourhoods	409	45,60	100
Total	**897**	**100**	

Source: Own elaboration from fieldwork data

Partial Answers: Did the LSUP Trigger a Gentrification Process in the Study Area?

No. The evidence in this section is in line with the rest of the research. The survey with residents did not provide evidence of a relevant movement of displacement from the region. Moreover, the housing dynamics seem to be very centralized in the region itself, where the residents seek to ascend in the hierarchical structure of the NV, without abandoning the territory they are accustomed to and where they have their social networks and roots. Federal policies increased minimum wages and social protection programs from 2003 to 2015, which also probably helped to avoid any displacement. Moreover, the elites do not seem to be interested in moving to the study area.

New Land Developments: Land Market Dynamics Through AMRBH's Data

The year of 2012 was still irrelevant for the analysis due to the quite small number of observations –AMRBH was a new autarchy (created in 2009) and the data reflects this fact. The AMRBH analyst who provided the data confirmed it. From 2013 to 2016, it shows cyclical behavior, as many other datasets in this work. On 2014, the series peaked, and since 2015, the Brazilian huge economic crisis deeply affected land developers. More importantly, Table 14 informs that the NV accounts for more than 40 percent of all the land development projects from 2012 to 2016. Maps 6 and 7 illustrate this phenomenon. Three main aspects must be noted: the NV is clearly the main axis of expansion in the region; the land developments within the NV follow the Green Line road (MG-010); and the land development showed a "leap-frog" pattern, "leaping" over the research area and reaching northern portions of the MRBH (specially the municipality of Lagoa Santa). This latter observation has a very strong implication for this work: the land development pattern identified and, consequently, the potential gentrification, does not mean displacement of low-income families within or in contiguous areas to the NV. It means a "leap" of land value and wealth over the low-income areas and the creation of new high-income gated communities in the NV, occupying areas previously empty.Table 14 depicts the dynamics of land development in MRBH.

Table 14: Land Development in MRBH

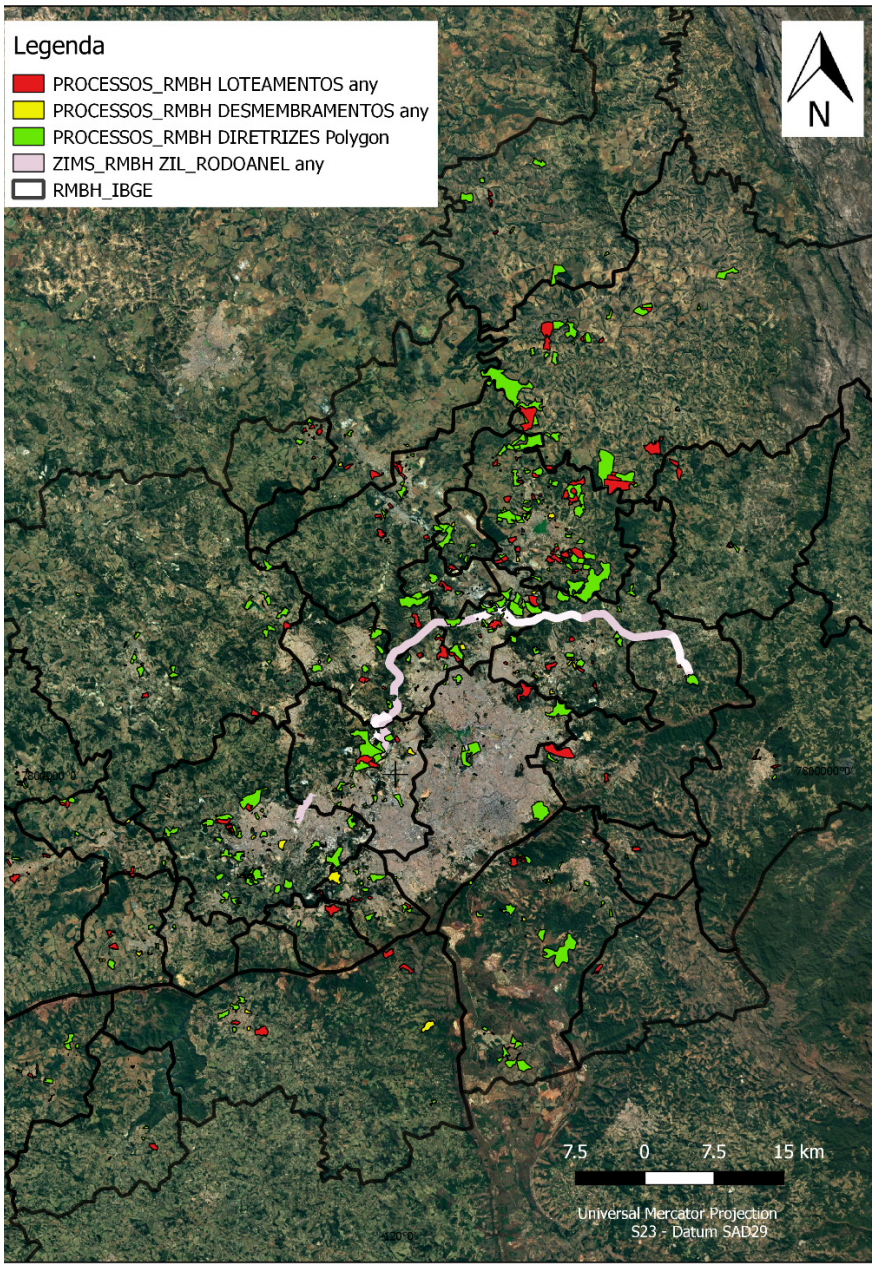
	Processes		
	MRBH	**North Vector**	
2012	2	1	50%
2013	221	95	43%
2014	237	91	38%
2015	191	82	43%
2016	65	28	43%
Total	**716**	**297**	**41%**

Source: Own elaboration from AMRBH data

Another major trend that may be grasped from the data is the type of land development in the area. Most of new projects are still in the phase of "*Diretrizes*", meaning in the early beginning. "*Loteamentos*", the final phase, accounts for less than 50 percent. It opens possibilities for tremendous changes in land use in the metropolitan region and in the NV in the next decade, depending on the degree and speed of the country's economic recovery, as well as the region's own economic dynamics.

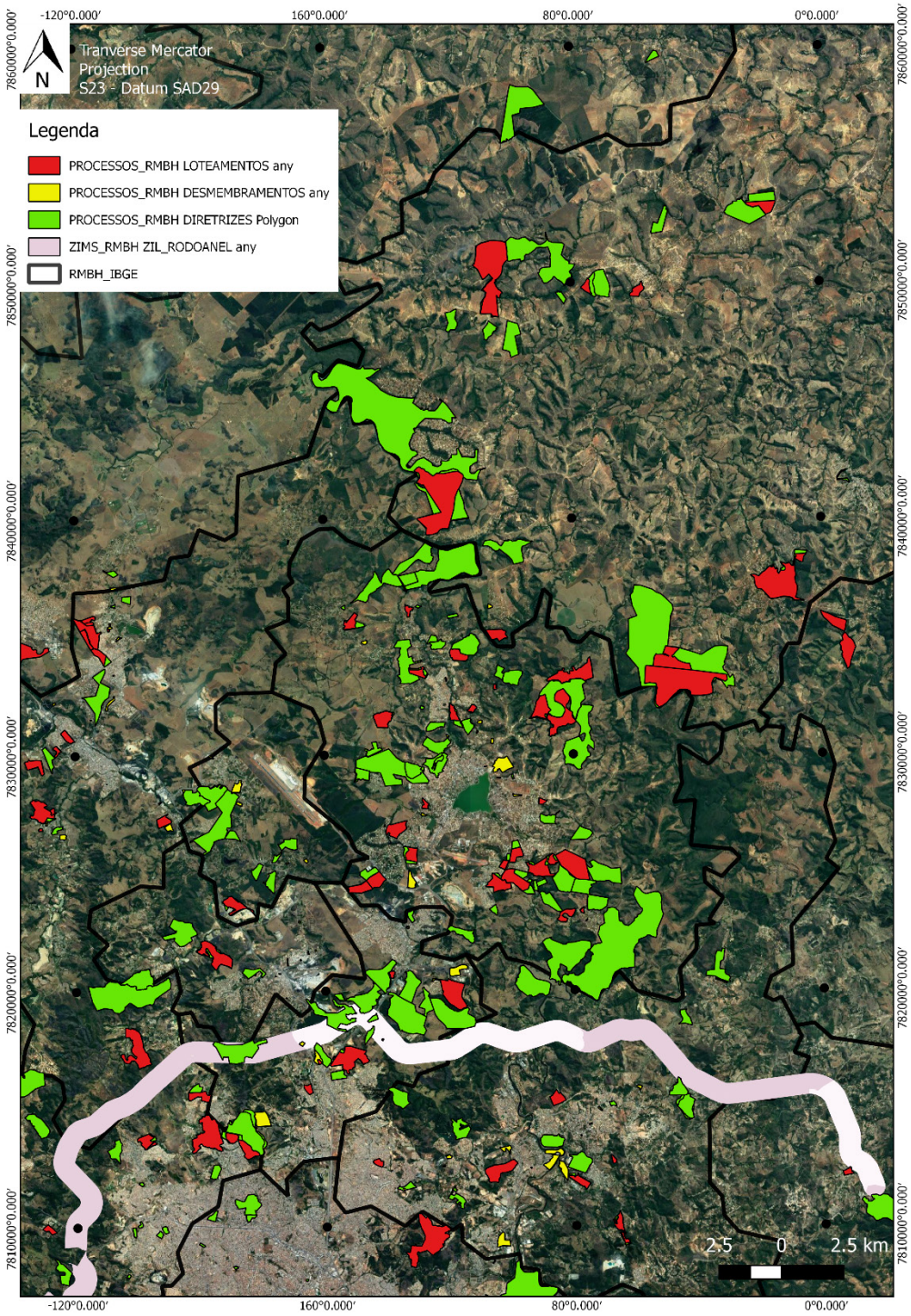
Among the new land developments, it is worth mentioning some of the largest projects, such as "Reserva Real" (the entire project has more than 10 million square meters); the "Moradas do Lago/Residencial Monjolos" (with more than 2.5 million square meters); the "KST VN3" (with almost 2 million square meters); and the "Canto da Siriema" project (with almost 2 million square meters). In addition, these new developments are residential ones, located in the municipality of Jaboticatubas, 75 km from Belo Horizonte's downtown and 50 km from AITN and CAMG, connected by the Green Line corridor. Jaboticatubas is the main access to "Serra do Cipó" National Park, a protected green area with several waterfalls. Other large-scale residential developments are taking place in the municipalities of Lagoa Santa and Pedro Leopoldo. Outside the NV, "C-Sul" land development is the major projected, located in South Vector of the metropolitan region.

Map 6: New Land Developments in the MRBH



Source: Authors (Renan P. Almeida) with ARMBH data.

Map 7: New Land Developments in the MRBH (zooming in the North Vector)



Source: Authors (Renan P. Almeida) with ARMBH data.

Conclusions and Avenues for New Research

Large-scale urban projects can change cities' structures. Notwithstanding, academics and policy makers need to consider local contingencies. The rigidity of the built environment, the collective opinion and the social relationships rooted in the territory may not interact with or might even resist to these projects. LSUP may improve citizens' living standards if the infrastructural investments are compatible with the residents' requirements, as well as LSUP may displace low-income people making them lose their roots and social networks. A third way is also possible, when LSUP neither improve life, neither displace, simply do not interact with residents.

In this panorama, the LSUP implemented by the state government in the so-called "North Vector" of the Metropolitan Region of Belo Horizonte, from 2004 to 2015, increased significantly land values in the affected area. Therefore, land value capture and betterment levies could have been used to finance a part of these investments, reducing the fiscal crisis that the state government has been facing since their implementation. State government spent more than R$ 3 billion (more than US$ 1 billion) on these LSUP. Nonetheless, on one hand, policy makers still demonstrate ignorance on land value capture instruments; on the other hand, property taxes in Brazil are controlled by municipalities, whereas the state government made those investments.

Despite land value increases in the study area, the LSUP do not seem to be displacing the poor residents who live there. The study area has shown rising living standards measured by income levels, as do other peripheral regions, probably due to federal distributive policies from 2003 to 2014. Most residents do not intend to move out. New low and middle-income residents are being attracted to the area, but the majority also has roots in the region. Social relations and social conventions seem to predominate in families' residential decisions, rather than land or transportation costs. The area is a consolidated region, and if real estate developers attract the elites to the area, they probably will live in gated communities –fortified enclaves– such as Alphaville. These small islands of wealthy people probably will not displace low-income residents, although they might include a few of them as domestic servants.

From a broader perspective, if the state government's main purpose was to promote economic development through LSUP, these investments have been showing very limited results. There is a tremendous disconnection between the investments and their users. Minas Gerais' exports are characterized by low added-value and high volume, such as iron ore, coffee and steel, which means that airport infrastructure does not fit into this economic logistic structure. Urban transportation investments focused on large avenues and highways designed mainly for cars, while the metropolitan region lacks mass transportation options. Residents and entrepreneurs criticized the BRT system. Many local bus routes that connect neighborhoods to downtown no longer exist, leading users to take two buses now. Users affirm that the BRT increased travel time and tariffs, in many cases. State government did initiate the construction of a light train (VLT) projected to the area neither the North Beltway ("Rodoanel Norte"). Considering the administrative offices, CAMG also shows a disconnection between residents who live around it and the profile of technocrats who work there.

Nonetheless, some of these investments may have a relevant role in promoting a new urban centrality in the Northern region of Belo Horizonte, promoting job opportunities and avoiding

commuting to the central city, as proposed by the Metropolitan Plan[13]. The CAMG already dis(re)located thousands of works from the central city. Despite its problems, the BRT is still a relevant mass transportation option in many Latin American cities (Rodriguez, Tovar 2013; Rodriguez, Mojica 2008). Its success depends fundamentally on the way it operates, on tariff levels and on the possibilities of integration with other transportation modes. Displacement of low-income residents may be avoided by strengthening the local economy, mostly based on popular economy, and by not ignoring their existence in the name of high-tech dreams.

Finally, this work opens some avenues for further research. A significant part of the land value generated by these LSUP probably "leaped" over the low-income areas and has been privately captured by real estate developers in Northern municipalities. Therefore, a future research may assess these impacts on municipalities other than Belo Horizonte. A detailed study on how exactly to recover the land value created is also necessary.

BRT's impacts and evaluation are also necessary to provide a better understanding of transport investment in Latin American cities. Further research may investigate in more detail if the BRT's impacts on land value were, indeed, negative. Regarding transportation, it is also relevant to assess if the LSUP discussed here had a significant impact on land value near metro stations that previously existed.

Finally, the discussion on how to strengthen and empower a peripheral urban centrality is a crucial topic related to this work. What is the appropriate urban equipment to be provided in peripheries? How to finance them and how may economic development plans interact with the popular economy? These are key questions for Latin American cities.

[13] The Metropolitan Plan of Belo Horizonte—PDDI/RMBH, elaborated by the UFMG - Universidade Federal de Minas Gerais, between 2009-2011, proposes three new metropolitan centralities of the RMBH, one of them in the NV. See www.rmbh.org.br for more information.

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