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Amsterdam, 7-9 July 2011

Socio-spatial inequality in a pro-growth city, Santiago de Chile (1990-2009)

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Paper presented at the International RC21 conference 2011

Session: nr. 24, Housing and belonging in Latin American cities

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Abstract

Processes of neighborhood renewal and decline occur as cities evolve over time. Households' and firms' location decisions drive real estate market demand to particular areas, leading to periodical processes of change in neighborhoods' socioeconomic status. The aim of this paper is to analyze the uneven effects of the spatial growth of Santiago de Chile over the different parts of the city. During the past two decades, the city has grown in demographic and spatial terms, spreading the built-up area. An important feature of Santiago's growth pattern is that the new investments were highly concentrated in some opportunity areas, while much of the city received no investment. The residential areas were developed in the periphery, driven by the real estate market dynamic but also by a housing policy that systematically located its new developments in peri-urban areas. By contrast, the new investments for industrial, financial and service activities were located in the city centre, in order for firms to attain agglomeration economies. Santiago, as well as other Latin American cities, is to a large extent monocentric, and firms' localization dynamic reproduced the role of the CBD as the main economic node.

In this paper, we use panel data analysis to estimate how the spatial growth pattern affected the different areas of the city. In particular, we analyze the impact of the urban growth on income, local funding capacity and the provision of public goods by the municipalities that make up the metropolitan area (the so called *comunas)*. Our findings show that the metropolitan growth dynamic increased the gap between areas, reinforcing socio-spatial segregation in an already uneven city. The reason seems to be the investment/underinvestment cycle of the real estate market: the new investments cluster in some opportunity areas in order to obtain higher revenues; as a result, local income and local funding capacity rise and the provision of public goods within the *comuna* improves. This process makes future investments more profitable, reproducing the investment cycle in some areas, while other *comunas* are kept away from investment.

Introduction

Neighbourhoods are in constant change. Household's and firms' location decisions drive real estate demand to particular areas, causing regular processes of urban renewal and decline (Rosenthal, 2008). Families are attracted towards some neighbourhoods by their accessibility to workplaces and social infrastructures, the land rent, the state of conservation of the housing stock, the provision of urban amenities or the willingness to form a community with other people of similar social status or with the same willingness to pay for the provision of public goods (Rosenthal, 2008; Alonso, 1964; Tiebout, 1956). Similarly, firms locate in particular areas of the city depending on the accessibility to the urban market, the land rent or the provision of infrastructures, but also in order to attain *marshallian* and other external economies (Alonso, 1964; Marshall, 1920). The overall result is the concentration of real estate investment in some areas over a period of time, making the urban growth dynamic spatially uneven.

In Latin America these factors account also for families' and firms' location decisions, but other processes play their part too. Traditionally, households' distribution within the urban space was based on socio-economic characteristics. Wealthier families clustered with other families of the same status in central or, at least, well communicated areas, whereas poorer families lived in mature zones of the centre or the periphery (Griffin and Ford, 1980). In the past two decades, these traditional residential patterns have been combined with new patterns. From the 90's, typical North American urban forms for middle and high classes spread in many Latin American cities, such as suburban sprawl, large scale megaprojects, gated communities and other urban artefacts (shopping malls, urban entertainment centres, etc.) (Janoschka, 2002; Heinrichs et al., 2009; Borsdorf, 2003). Meanwhile, lower income families have remained in traditional central neighbourhoods, or on the contrary, have been displaced to newly urbanized areas of the periphery. The result of this location pattern is a fragmented urban landscape characterized by income based residential segregation.

As for household's location decisions, Latin America's functional structure has particular characteristics. Historically, Latin American cities have been functionally monocentric, although nowadays there is a trend towards a more fragmented and polycentric spatial organization (Rojas, 2005). However, in spite of the decentralization of some economic activities, most Latin American cities remain more centralized around a Central Business District (CBD) than European and North American cities. This organization pattern has significant consequences over firms' location decisions and commuting patterns, but also in socioeconomic terms as it influences labour market performance. As most dynamic businesses cluster in the CBD whereas low skilled workers remain segregated in peripheral or less accessible areas, commute time increases and labour market performance worsens for those living further out.

In this paper we analyze the impact of developing new floor space for residential and economic use on inequality between the *comunas* of the Santiago Metropolitan Area (SMA). Our hypothesis is that, because real estate investment is localized in particular areas, the spatial growth pattern of Santiago deepens socio-spatial inequalities. Over

the past two decades, in the SMA ten thousand hectares were set aside for housing and new economic activities. These were concentrated in just a few *comunas*, while much of the city received no investment. The residential areas were developed in the periphery, driven by the real estate market dynamic but also by a housing policy that systematically located its new developments in peri-urban areas. Meanwhile, the economic activities clustered in the CBD, thus reproducing the monocentric nature of Santiago. As we argue, the spatial concentration of new floor space for housing and economic activities deepened inequality between *comunas* and, as a side effect, affected residential segregation. Real estate investments increase local revenues through property taxes, which allow local governments to improve urban infrastructures and public goods. Therefore, developing new floor space is a source for inequality in the provision of public goods, but developing new floor space depends on housing demand and firms' location decisions, and not so much on local governments' initiatives. Additionally, it also impacts on household's distribution across urban space. Because the availability of public goods attracts wealthier families in a *Tieboutian* sorting type, the real estate market dynamic reinforces residential segregation.

The remainder of the paper is divided into four sections. In the next section, we open a theoretical discussion about households' and firms' location decisions and its impact on processes of area renewal and decay. In section 3 we focus on the spatial growth pattern of Santiago, which is characterized by the concentration of real estate investment in particular areas. In section 4, we state our hypothesis about the relationship between the real estate investment dynamic and socio-spatial inequalities within the SMA, and we test this hypothesis by using panel data. Finally, we conclude the paper with a discussion on how to correct the real estate market failures and increase investment in deprived areas, in order to reduce socio-spatial inequalities and face residential segregation.

Location decisions and processes of urban renewal and decay

According to the literature, there are broadly two set of explanations for household's location decisions and associated processes of urban change, those that focus on urban characteristics and those that emphasize resident's externalities. Among the former stand ecological models, which explain neighborhoods' improvement or decline as part of a natural, deterministic process based on rational, economic choices (Pitkin, 2001). On the other hand, the theories that focus on resident's externalities show how other neighbor's behavior also affects household's location decisions and neighborhood change. Neighbors' behavior have positive or negative effects on individual outcomes, so resident's would like to move to areas where neighbors are thought to bring positive externalities with them and to avoid those who generate negative externalities.

Models that explain residents' choice depending on neighborhood characteristics argue that, as housing and individual preferences change over time, families move to neighborhoods that satisfy their preferences, leading to processes of area development or, conversely, decay. One of these models is Alonso's bid rent theory (Alonso, 1964).

According to this theory, households bid for housing depending on transportation costs and land rent. That is, there is a trade-off between being closer to the city center (where transportation costs are lower) and choosing a neighborhood far from the city centre, but where the urban land is cheaper. This model also helps to explain households' distribution across urban space based on socio-economic characteristics. Assuming that the higher the income the higher the preference for land and the lower relative commuting costs, high income families will seek suburban neighborhoods whereas low income households will chose central areas. In the longer term, neighborhoods evolve naturally due to residents' location decisions, as residents trade off relatively cheaper housing farther from the center against the accessibility of the city centre (suburbanization). Conversely, the downtown could also be subject to area renewal, if residents' value centrality and accessibility rather than space (gentrification).

Other ecological explanations focus on dwellings' physical deterioration to explain households' spatial distribution and processes of urban decay. As dwellings become obsolete in the course of time, pass on to people with lower income (the so called, "filtering process"); this pushes other residents to migrate and leads to further neighborhood decline, as residents' socioeconomic status change. In Hoyt's classic model (Hoyt, 1933), as properties age and maintenance cost raise, owners invest less and move to new housing, mainly in the periphery. After a certain time, the well-to-do residents that migrate to the suburbs are replaced by low-income households in a *downward succession* process (Skifter Andersen, 2003) and, thus, neighborhood cycle down in economic status.

Tiebout (1956) also explains households' distribution across the urban space as a function of particular local attributes. According to Tiebout, neighborhoods differ from each other in the availability and the quality of local public goods, such as schools, parks, police protection, roads or parking facilities. City residents choose where to live "voting with their feet" for communities providing the best mix of local public goods and taxes given their preferences and income. That is, people sort themselves into different jurisdictions based on their tastes for local amenities and their willingness to pay for urban attributes. As local amenities and preferences change over time, areas will evolve depending on their capacity to attract different family types. Usually, the attractive features of the suburbs and the willingness to avoid inner city problems push middle and high classes out of central cities. Families form new residential areas in the suburbs *in part to create communities comprised of households with the same willingness to pay for the provision of public goods (…)* and in part *to exclude those who are thought to bring with them either negative fiscal externalities (free riders on tax payments) or negative peer externalities (like higher crime rates or lower school quality*) (Nechyba and Walsh, 2004, pp. 182).

Therefore, according to Tiebout's model residents sort themselves looking for neighborhood attributes, but this sorting also depends on other residents' willingness to pay for the provision of local public goods, which brings us closer to the second set of explanations. These explanations focus on resident's externalities as the reason for location decisions and neighborhood change. Residents behave in such a way that generates positive or negative external effects to their neighbors (like good school performance *vs.* crime), attracting new neighbors or, conversely, pushing away former

residents. In other cases, migration decisions do not depend on their neighbors' behavior but on their attributes, such as socioeconomic status or ethnicity.

The alleged negative (or positive) externalities caused by other residents are known in the literature as *neighborhood effects*. Neighborhood effects are basically community influences on individual, social or economic outcomes. The literature has identified child and adolescent outcomes associated with concentrated disadvantage (school dropout, child maltreatment, adolescent delinquency), health related problems (homicide, infant mortality, low birthweight, suicide and other social outcomes (worst labor force activity, family disruption; in other words, the evidence suggests that there are geographic "hot spots" for crime and problem related behaviors and that such hot spots are characterized by the concentration of multiple forms of disadvantage (Sampson et al., 2002). The rationale for neighborhoods' cycle down in the social scale is that, if poor neighborhoods do have these negative effects, it is expected to occur that those living in them are highly likely to want move out of them. In the long run, population turnover cause a spiral of decline, further weakening social structures and resulting in higher population turnover that reinforces this negative cycle (Anderson and Brama, 2004, cited by (van Ham and Clark, 2009)).

Rosenthal (2008) found that both factors, the filtering process due to the obsolescence of dwellings and neighbors' externalities account for changes in neighbors' socioeconomic status. However, they do it in different ways. *Whereas externalities arising from a neighborhood's socio-demographic composition are most pronounced in the short run (i.e. a decade), the influence of the age distribution of the housing stock is very persistent over several decades* (Rosenthal, 2008, pp. 834). This might be because often the housing demand is not linear, but exponential within some thresholds. As long as prices stand between some thresholds, prices will be stable as there will be dynamic forces that drive them back. However, if a shock drives prices above (or below) a level, these stabilizing forces will no longer work and the area will either take off (gentrification) or go into decline (Meen and Meen, 2003). As a result, changes in neighbors' socioeconomic status or ethnicity will strongly boost (or, conversely, constraint) the housing demand in the short run, whereas neighborhood change in the long run is more dependent on housing stock's and urban infrastructures' obsolescence or renewal.

Neighborhoods evolve depending on households' migration decision, but also on firms' localization dynamic. Firms' distribution determines the functional form, influencing commuting flows, urban labor market organization and neighborhood level socioeconomic life. However, unlike households, firms look for other urban attributes in their location decisions within cities. Alonso's bid rent theory explains firms' location also as a function that depends on transportation costs and land rent; firms that value accessibility would bid higher for locations in the city center, whereas those that value land would cluster in the periphery where the land is cheaper and plots are bigger.

Although accessibility to the urban market and the land rent are important, nowadays other firms' externalities are said to play the key role for firms to concentrate in particular parts of the city. Firms cluster in order to obtain *marshallian* and other external economies, such as specialized labor force, lower transaction costs, shared

services and, especially, knowledge spillovers (Marshall, 1920; Malmberg and Maskell, 2002). The latter are particularly important in contemporary learning economy, where knowledge is the fundamental resource and, consequently, learning the most important process (Lundvall, 1992; OECD, 2001). As evolutionary and institutional theories had shown, knowledge generation, adoption and diffusion are socially embedded interactive processes that depend on the institutional context (Lundvall, 1992; Amin, 2001). At the local level, proximity allows interaction between firms as they develop rules, routines and conventions (Storper, 1995), a "shared language", which favors knowledge and its outcome, innovation, to spread among the local production system (Asheim and Coenen, 2006). In other words, firms obtain external advantages by clustering close to each other, which makes the spatial concentration of economic activities a key feature of contemporary urban organization.

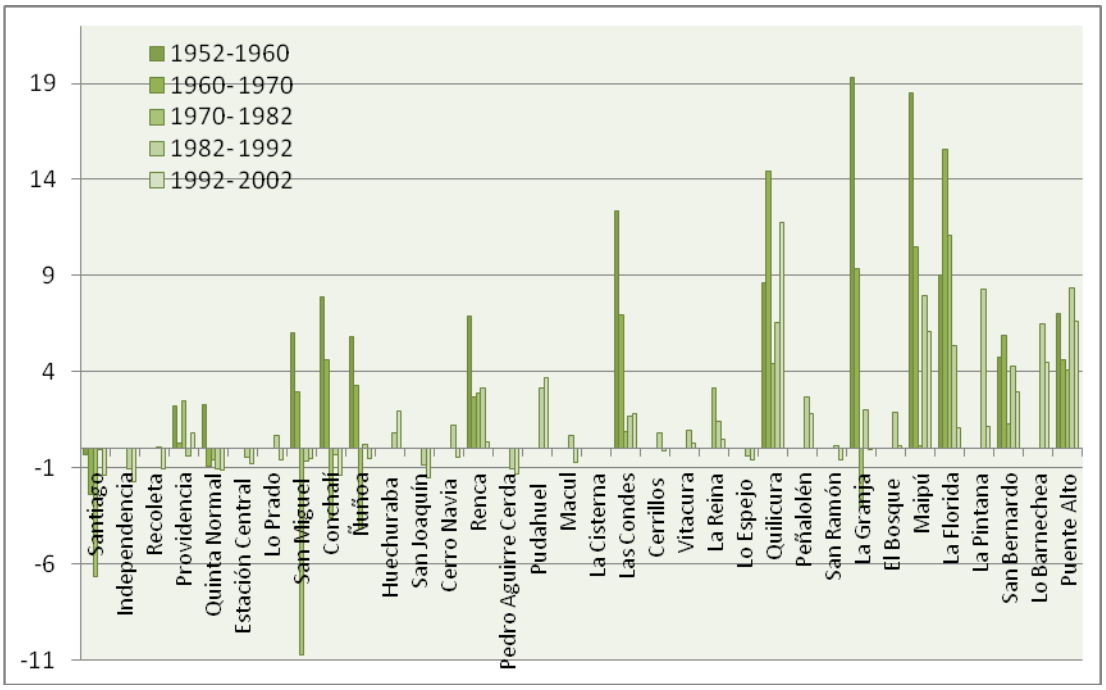
All in all, household and firms look for different urban attributes and social environments in their location decisions. As urban conditions and families' and firms' preferences change over time, some neighbors develop whereas other areas engage in a spiral of decay, making the urban growth dynamic spatially uneven.

The growth of Santiago

Much of these processes help to explain the particular growth pattern of the Santiago Metropolitan Area (SMA) in the past few decades. According to the 2002 census, Santiago is a metropolitan region[1] of 5.5 million inhabitants, 35% of the total population of Chile. From the fifties, the population of the SMA has grown four million, extending the built-up area more than 50.000 hectares. But the spread of the urban area during the past sixty years was not only driven by the demographic growth, but also by the shift in the residential location pattern, from the central area to the most remote *comunas*. This location pattern is shown in Figure 1, where the *comunas* are ranked according to the distance from the city centre to show that the nearby *comunas* had negative population growth rates, especially in the eighties and nineties, whereas the more remote ones had positive rates.

1The Santiago Metropolitan Area (SMA) covers the 32 *comunas* of the Santiago province, plus San Bernardo and Puente Alto. Santiago is divided at the local level into districts, called *comunas*, which have prerogatives for urban transport management inside the *comuna*, land use policy, urban planning and local development policies.

Figure 1. Population growth rate for the comunas of the SMA, 1952 – 2002



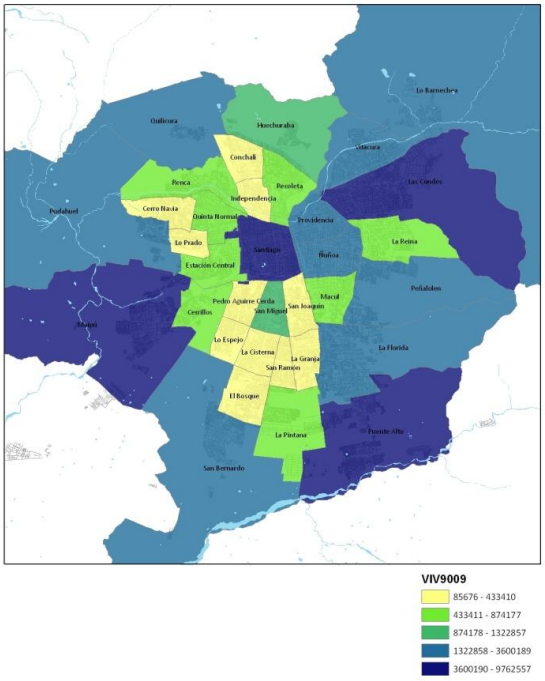
Source: Data from 1952, 1960, 1972, 1982, 1992 and 2002 census (National Statistics Institute)

The spread of the SMA has continued during the past two decades. Between 1990 and 2008, over 9.500 hectares were intended for residential, industrial or commercial use[2]. Besides, the new urban land was highly concentrated in some opportunity areas; in fact, nearly 90% of the new floor space for residential use was located in fifteen *comunas* and about 50% in just four of them. The new residential developments were located in the city centre and the periphery, while the first and the second urban rings around the central *comuna* of Santiago almost received no investments (Figure 2). In the central area, the city government launched urban renewal policies to counter suburbanization (see Rojas, Rodriguez Villaescusa, & Wegelin (2004) for a discussion), but still the wealthy northeast (Las Condes, Vitacura, Lo Barnechea) kept on attracting new residents. The urbanization of this area was characterized by low density, suburban residential developments and the emergence of new *urban artifacts*, such as shopping malls and urban entertainment centres. In fact, like in other Latin American cities, the urbanization of Santiago's periphery is leading to new residential patterns, such as low-density suburban sprawl, the construction of large scale megaprojects and the emergence of gated communities (Heinrichs et al., 2009; Hidalgo, 2004).

2 This data includes both, the transformation of former non-urban land into urban land (*greenfield* development), and the reuse of urban floor space for new residential developments or to host economic activities (*brownfield* development).

Meanwhile, the growth of the south and the west was boosted by the housing policy. In Chile, the housing facilities provided by the state have been extensive because its main objective was to reduce the housing deficit, no matter the living conditions or the localization; actually, from the fifties between the half and two thirds of the homes provided each year were built, commissioned or financed by the state (Tokman, 2006). But the housing policy spread the city limit by urbanizing formerly rural areas, given that public housing was systematically located in the periphery where the urban land was cheaper and plots were bigger. Moreover, the emphasis on reducing the housing deficit led to new forms of social exclusion due to the allocation of low income families in sites that already exhibited disadvantageous conditions and the low quality of the buildings (Hidalgo, 2007).

Figure 2. Spatial concentration of new residential floor space

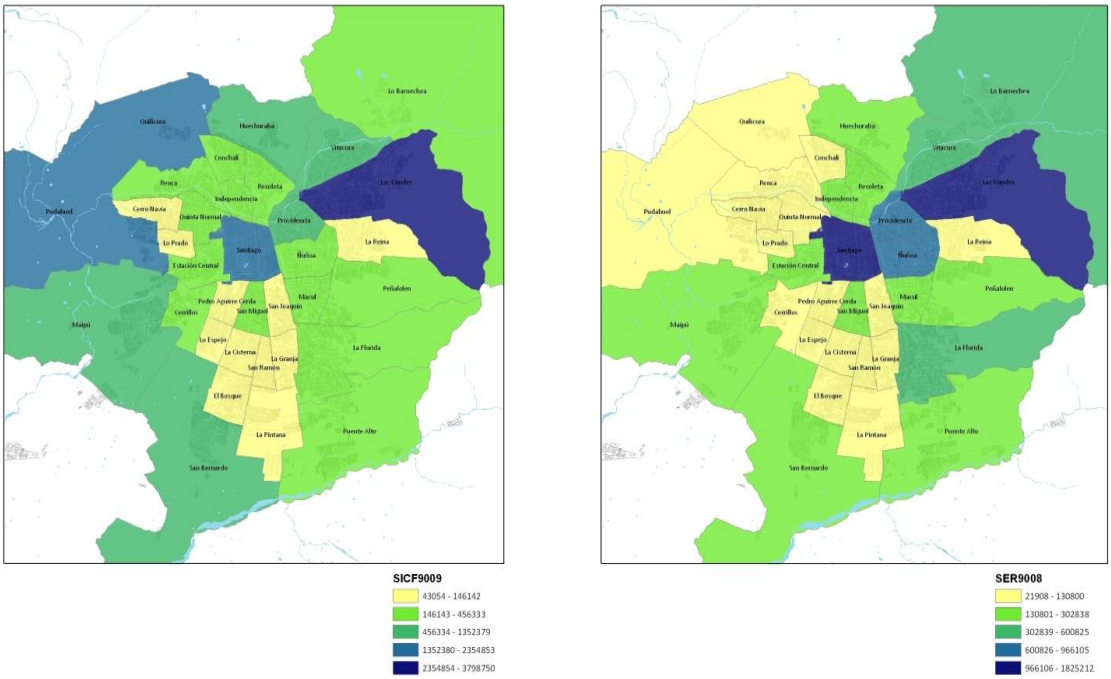


The new investments for economic activities were also concentrated in particular areas: just seven *comunas* hosted 64% of the new floor space for industrial, commercial and financial activities and 68% of the new floor for services, whereas fifteen *comunas* received less than 10% of the new developments for economic activities. The new industrial land was developed in the east (Quilicura, Pudahuel), where a new industrial park was developed around the highway (Ducci and Gonzalez, 2006), and the centre (Santiago, Las Condes). Meanwhile, services clustered in an enlarged CBD, composed by the central *comuna* of Santiago and the eastern *comunas* of Las Condes, Providencia and Ñuñoa (Figure 3).

Agglomeration economies stand for the spatial concentration of land for economic use.. Historically, the central *comuna* of Santiago hosted financial and commercial activities, but in the nineties the CBD extended towards the northeast, creating what the *santiaguino's* call "Sanhattan". This area, which spreads along the wealthy *comunas* of Providencia and Vitacura, attracts commuters from all over the metropolitan area to the

financial activities, but also to others essential for the reproduction of the urban economy (stores, cafés, restaurants, housework, etc.). Actually, despite the complexity of mobility flows, Santiago is a monocentric city where more than 40% of the commute trips at peak hours end in this enlarged CBD (SECTRA, 2006). Therefore, firms' localization dynamic over the past two decades reinforced the role of the city centre as the main economic node, despite the decentralization of some industrial activities towards the east.

Figure 3. Spatial concentration of new floor space for industrial, commercial and financial activities (left) and for services (right)



The spatial growth of Santiago during the past two decades has gone hand-in-hand with increasing socio-spatial segregation (Sabatini et al., 2001; Dammert, 2004). Nowadays Santiago stands among the most unequal cities in the world, with an income based GINI of 0.55 (UN-HABITAT, 2010). Spatially, the city is divided in socio-economic terms: richest *comunas* cluster in the northeast, whereas the poorest spread to the south and the northwest. Residential segregation in Santiago, as well as in other Latin American cities, has historical roots, but it seems that the driving forces of the spatial outgrowth have deepened its dimension and characteristics. Since the public housing policy located the new developments in the periphery, low-income families were systematically clustered on the urban fringe. Meanwhile, the liberalization of the land market allowed sprawling forms of suburban residential development or, conversely, returned to some parts of the downtown (the central comuna of Santiago) leading to gentrification processes. However, this residential location pattern spread the city and increased the gap between areas, thus reinforcing socio-spatial segregation in an already uneven city.

Growth, spatial inequality and residential segregation in the SMA

In this section we analyze the uneven effects of the spatial growth pattern of Santiago over the different areas of the city and the opportunities of the citizens. Our hypothesis is that the spatial concentration of new floor space reinforces socio-spatial inequalities through the real estate market dynamic. On one hand, because real estate investment clusters, the gap between *comunas* increases through local governments' financial capacity. Real estate investments increase local funding trough property taxes, which allow *comunas* to improve local public goods and renew urban infrastructures. On the other hand, the real estate market leads to a spatial distribution of households based on socioeconomic characteristics. Wealthier families look for accessibility in the renewed central areas or the social and environmental amenities of the suburbs, while low-income families remain in areas where there is no reinvestment. Thus, the real estate market's investment/underinvestment cycle deepens socio-spatial inequalities between *comunas* and reinforces residential segregation in an already uneven city.

In order to test our hypothesis we develop Models 1 to 3, which account for the relationship between the urban growth dynamic and socio-spatial inequalities within the SMA. These are panel data models that correct fixed effects to prevent double causality problems; that is, they allow to see that is the independent variable which influences the dependent variable and not vice versa. Furthermore, we use models that correct fixed effects by year and *comuna* rather than cross section models to avoid possible bias. Cross section models could be biased if there are omitted and unobservable variables for the *comunas* that could be correlated with the independent variable. Therefore, by controlling for fixed effects, in these models we correct all the characteristics that do not change over f_i time and all the shocks that could affect every *comuna* each f_t year.

$$Log\ (municipal\ revenues)_{i\,t} = \alpha + \beta\ Log\ (new\ floor\ area)_{i\,t} + f_i + f_t + \varepsilon_{i\,t} \qquad (1)$$

i = 1,….N; t= 1,…T; where f_i *represent fixed effects at comuna level and* f_t *fixed effects for the period 2001-2008*

$$Log\ (green\ areas)_{i\,t} = \alpha + \beta\ Log\ (budget\ availability)_{i\,t} + f_i + f_t + \varepsilon_{i\,t} \qquad (2)$$

i = 1,….N; t= 1,…T; where f_i *represent fixed effects at comuna level and* f_t *fixed effects for the period 2001-2008*

$$Log\ (average\ household\ income)_{i\,t} = \alpha + \beta\ Log\ (budget\ availability)_{i\,t} + f_i + f_t + \varepsilon_{i\,t} \qquad (3)$$

i = 1,….N; t= 1,…T; where f_i *represent fixed effects at comuna level and* f_t *fixed effects for the period 2001-2008*

Model (1) estimates the relationship between new floor area and revenues, to test if developing urban land increases comunas' revenues. Therefore, municipal revenues is the dependent variable and the new floor area developed between 2001 and 2008 is the independent variable The expected outcome is a positive relationship, so developing urban land would increase *comunas'* financial resources and thus the gap between them. As shown in Tables 1, 2 and 3, the model is significant, so developing urban land increases municipal revenues; regarding the different land uses, residential floor space increases municipal revenues more than economic floor space (see the Annex).

Model (2) estimates the relationship between *comunas'* budget availability and the distribution of local public goods. Developing new floor space increases local revenues (Model 1), so the next step is to see whether the availability of financial resources improves the provision of local public goods. For this purpose, we use the amount of green areas as a proxy of local public goods, so budget availability is the independent variable and the surface area of green areas is the dependent variable. According to model (2), there is a significant positive relationship between these variables; a 1% increase in *comunas'* revenues between 2001 and 2008 increased the surface area of green areas by 0.41% (see the Annex, Table 4).

Model (3) estimates the relationship between budget availability and the average income of the *comuna*. Our purpose is to see if local financial resources attract wealthier families through the provision of local public goods, thus influencing the socio-spatial distribution of households. Put it in another way, we want to test if there is a *Tieboutian* sorting type where *comunas* attract wealthier families by providing local publics goods, given that the provision of green areas is related with the budget availability (Model 2). Therefore, per capita budget availability is the independent variable and *comunas'* average household income the dependent variable. Model (3) is significant and according to it a 1% increase in the budget availability between 2001 and 2008 rose by 0.30% *comuna's* average household income (see the Annex, Table 5).

Discussion and concluding remarks

Over the past two decades the SMA grew at a stable rate, but the growth was spatially uneven. The new residential areas were localized in the east and the south driven by the housing policy, while the wealthy northeast was boosted by suburban residential developments. On the other hand, the economic activities kept on clustering in the city centre, thus reproducing the monocentric nature of Santiago. Meanwhile, the first and the second urban rings, where more than two million people lived, almost received no investment for new residential developments or to locate economic activities.

This growth dynamic is leading to new forms of socio-spatial exclusion and residential segregation through the local fiscal revenues and the residential location pattern of wealthier families. Real estate investment goes to the new opportunity areas, the renewed city centre where gentrification processes take place, and the periphery, through the housing policy or suburban, scattered residential developments. But the real estate investment dynamic deepens inequality among *comunas* by increasing local fiscal revenues, which allows local authorities to improve public goods and urban infrastructures. What is more, it also attracts high income households searching for the quality of urban infrastructures and amenities. Wealthier families seek to form a community with other families of the same socioeconomic status, which deepens income based socio-spatial segregation in an already strongly segregated city. Besides, the process is self reproducing; because real estate investments raise *comunas'* income through fiscal revenues and by attracting wealthier residents,

investments obtain increasing returns, thus finding incentives for reproducing the investment cycle.

Firms' localization pattern follows a different dynamic, since agglomeration economies stand for the concentration of businesses in the city centre, but it also has socio-spatial consequences. First, as for residential use, developing new urban land for industrial or service activities deepens income based inequality by increasing local governments' revenues and thus, the capacity for renewing and improving urban infrastructures. Second, the spatial concentration of economic activities reinforces a mobility pattern from the periphery to the city centre in a city where more than 40% of work-trips at peak hours end in the CBD. However, it does not affect all the same, since mobility within *comunas* depends on the specific urban characteristics (Gainza and Livert, forthcoming). On one hand, monocentricity means that commute time increases with the distance from the city centre, so commuters living in the peripheral *comunas* are more affected by firms' localization choices. On the other, commuters from the overpopulated *comunas* spend much more time travelling due to the traffic congestion and the reduced accessibility to the city centre, despite commuters using mass transit. Third, the spatial clustering of jobs affects the labour market performance by disconnecting labour demand and supply. The spatial mismatch hypothesis suggests worst labour market outcomes of minorities who are disconnected from the new employment centres (Kain, 2004). Although the standard approach focuses on racial minorities' (mainly Blacks) difficulties for accessing suburban job opportunities (Gobillon et al., 2007), in Latin America income based segregation accounts for the disconnection of part of the labour force. Nevertheless, the mechanisms of spatial mismatch work the same way. Low skilled workers remain segregated in peripheral or, at least, less accessible areas, whereas much of the employment clusters in wealthier areas. As a result, those living further from the employment areas of the city centre and high class suburbs perform worse in the urban labour market than those living closer.

All in all, our analysis suggests that real estate investment dynamic increases socio-spatial inequalities and reinforces residential segregation. These real estate market failures could be addressed in different ways. One way could be by improving redistribution mechanisms among *comunas*. In Chile, municipal revenues come from four sources: property taxes, commercial licenses, municipal permits and traffic permits. This is the reason why real estate market dynamic and firms' commercial activities stand at the core of fiscal disparities within *comunas*. However, there are redistribution mechanisms, above all the Municipal Fund (Fondo Común Municipal), which transfers fiscal revenues from wealthier to poorer *comunas*. Nowadays, *comunas* pay to the Municipal Fund 62.5% of traffic revenues and 60% of property taxes, 65% in the case of the wealthiest (Santiago, Providencia, Las Condes and Vitacura). Therefore, it seems there is room for improving redistribution by increasing richer *comunas'* contributions.

Another way to reduce socio-spatial inequality would be to correct real estate market failures and foster investment in areas where market agents and firms find no incentives. Regarding economic activities, a more dispersed and polycentric job distribution could have positive effects, not only by increasing *comunas'* revenues, but also by encouraging a more balanced mobility pattern and by bringing closer labour

market demand and supply. Nevertheless, there are two open questions. First, firms seek localization advantages in their location decisions and these depend on proximity to other firms, meaning the conditions and the scale of localization economies should be considered. Second, the decentralization of work-places is a necessary but not sufficient condition, since the scatteration of work-places would not have positive effects if jobs and households remain mismatched. Thus, the question is also how to encourage investment closer from labour market demand, especially low-income *comunas*. Nevertheless, the positive effects should be counterbalanced, not only over trip-times and labour market performance, but also in reducing segregation through more compact communities.

As for residential developments, land use policy could encourage investment in depressed areas to improve the living conditions and, as a side effect, attract new residents. Encouraging socially mixed neighbourhoods has become a major policy issue in several North American and European cities. The leitmotiv for social mix policies is to reduce residential segregation by attracting new residents from upper classes. Nevertheless, they have also been criticized for having overwhelmingly negative effects for low-income groups that exceed the alleged benefits (Cheshire, 2009; Davidson, 2008; Lees, 2008). The movement of middle-income groups into low-income neighborhoods boosts real estate market and increases housing prices, causing a gentrification process that displaces original residents (Atkinson, 2004). In social terms, the inflow of higher income families into low-income areas does not necessarily mean greater social interaction, but on the contrary it could deepen a micro(segregation) within the neighborhood. Usually, gentrified neighborhoods do not result in socially cohesive communities but in *"tectonic" juxtapositions of polarized socio-economic groups* (Lees, 2008, pp.2458). That is, far from promoting social interaction, the attraction of higher income families through urban renewal initiatives can just reduce "the scale of segregation" (Sabatini and Brain, 2008).

Although these critics seem reasonable, especially in the European and North American context, the positive effects on Latin American cities should be counterbalanced. First, by encouraging middle-income residents to locate in the city center, the pressure towards peri urban growth could be limited. This would have environmental benefits (reduced mobility, lower land consumption), but also economic (lower pressure on public services) and social advantages (revitalization of central areas). Second, attracting middle income families to central areas could match labor market demand and supply, if jobs follow residents in their location decisions. Thirdly, mixing different income groups could reduce segregation which, despite the aforementioned risks, could have benefits on the social opportunities of poorer families. By bringing closer different social classes, poor *comunas* of the first and second urban rings could be renewed, since real estate investments would follow middle income families' migration. This would have several benefits for these poor *comunas* on local financial capacity, the provision of public goods and the spatial distribution of households, as our models showed. Moreover, the renewal process could be self sustained, since it seems that the same mechanisms that make real estate investment to go away from these areas while they suffer from underinvestment, would reverse once the first investments get attracted.

Several mechanisms could be used to foster investment in areas suffering from underinvestment. Direct investment, zoning policy, tax exemptions and other stimuli for private investment could reorient firms' location decisions. Equally, the housing market could be boosted by renewing urban infrastructures, promoting new urban land for residential developments and providing subsidies for middle income families. In this regards, there is a previous experience in Santiago. During the 90s and 00s, the central *comuna* of Santiago carried out a program to attract residents to the city center; reversing the pattern from being a *comuna* that almost received no investment to stand among those with higher housing demand (Rojas et al., 2004). In this sense, similar programs could be launched in other poor *comunas* that have the attractive features of the city center (accessibility, urban infrastructures), but lack an organized housing demand. Obviously, the main obstacle is how to stimulate middle-income residents' housing demand in low-income areas. However, it should be considered that often housing demand is not linear but on the contrary, it increases exponentially above a threshold; once the first residents get attracted, new families would have incentives for locating in the area. As a result, these programs could have a multiplier effect boosting the real estate market, and thus engaging in a vicious circle of urban renewal.

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Annexes

$$Log\ (municipal\ revenues)_{i\,t} = \alpha + \beta\ Log\ (new\ floor\ area)_{i\,t} + f_i + f_t + \varepsilon_{i\,t} \qquad (1)$$

i = 1,….N; t= 1,…T; where f_i *represent fixed effects at comuna level and* f_t *fixed effects for the period 2001-2008*

Table 1. New floor area for services and municipal revenues per capita 2001-2008

	Dependent Variable: Log. Municipal income per capita								
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2001-2008**
Constant	1,04 (1,20) [0,24]	1,27 (1,81) [0,08]	-0,15 (-0,24) [0,81]	1,48 (1,98) [0,06]	2,62 (2,71) [0,01]	0,99 (1,03) [0,31]	0,75 (0,75) [0,46]	1,19 (1,38) [0,18]	3,27 (28,95) [0,00]
Log. New floor area for services	0,26 (2,28) [0,03]	0,25 (2,97) [0,01]	0,40 (5,48) [0,00]	0,23 (2,71) [0,01]	0,10 (0,94) [0,36]	0,30 (2,91) [0,01]	0,32 (3,17) [0,00]	0,29 (3,12) [0,00]	0,03 (2,30) [0,03]
R2	0,13	0,24	0,40	0,19	0,03	0,30	0,30	0,27	Within 0,03 Between 0,37 Overall 0,22
N	34	34	34	34	32	33	33	34	267
Fixed effects	No	No	No	No	No	No	No	No	Yes

( ): t-test; [ ]: p-value

Table 2. New floor area for industry, commerce and financial activities and municipal revenues per capita 2001-2008

	Dependent Variable: Log. Municipal income per capita								
	2001	2002	2003	2004	2005	2006	2007	2008	2001-2008

Constant	-0,18 (-0,20) [0,11]	1,13 (1,67) [0,11]	1,02 (1,28) [0,21]	0,88 (1,18) [0,25]	0,43 (0,60) [0,56]	1,86 (1,92) [0,64]	0,51 (0,44) [0,66]	0,42 (0,53) [0,60]	3,18 (30,7) [0,00]
Log. New floor area for industry, commerce and financial activities	0,38 (3,97) [0,00]	0,26 (3,39) [0,00]	0,27 (2,98) [0,01]	0,29 (3,45) [0,00]	0,36 (4,22) [0,00]	0,20 (1,85) [0,07]	0,35 (2,77) [0,01]	0,35 (4,11) [0,00]	0,04 (3,56) [0,00]
R2	0,33	0,19	0,18	0,21	0,35	0,09	0,22	0,31	Within 0,04 Between 0,35 Overall 0,23
N	33	33	33	34	34	34	34	34	268
Fixed effects	No	No	No	No	No	No	No	No	Yes

( ): t-test; [ ]: p-value

Table 3. New floor area for housing and municipal revenues per capita 2001-2008

	Dependent Variable: Log. Municipal income per capita								
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2001-2008**
Constant	1,31 (2,25) [0,03]	1,16 (1,89) [0,07]	0,75 (1,05) [0,30]	0,00 (0,00) [0,99]	-0,42 (-0,49) [0,63]	0,19 (0,22) [0,82]	-0,12 (-0,13) [0,90]	-0,12 (-0,12) [0,90]	2,69 (16,3) [0,00]
Log. New floor area for housing	0,20 (2,97) [0,01]	0,23 (3,26) [0,00]	0,26 (3,58) [0,00]	0,33 (3,83) [0,00]	0,37 (4,20) [0,00]	0,33 (3,89) [0,00]	0,36 (4,22) [0,00]	0,36 (3,68) [0,00]	0,08 (5,04) [0,00]

R2	0,17	0,23	0,27	0,29	0,36	0,31	0,32	0,29	Within 0,12 Between 0,33 Overall 0,28
N	34	34	34	34	34	34	34	34	272
Fixed effects	No	No	No	No	No	No	No	No	Yes

( ): t-test; [ ]: p-value

$$Log\ (green\ areas)_{i\,t} = \alpha + \beta\ Log\ (budget\ availability)_{i\,t} + f_i + f_t + \varepsilon_{i\,t} \qquad (2)$$

i = 1,….N; t= 1,…T; where f_i *represent fixed effects at comuna level and* f_t *fixed effects for the period 2001-2008*

Table 4. *Comunas'* budget availability and green areas per resident 2001-2008

	Dependent Variable: Log. Green areas per resident by *comuna*								
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2001-2008**
Constant	-2,24 (-5,30) [0,00]	-1,97 (-3,75) [0,00]	-1,69 (-6,26) [0,00]	-1,43 (-3,53) [0,00]	-1,50 (-5,19) [0,00]	-1,76 (-5,73) [0,00]	-2,12 (-5,76) [0,26]	-1,57 (-3,62) [0,00]	-0,77 (-2,14) [0,04]
Log. *Comunas'* budget availability per resident	0,74 (7,72) [0,00]	0,69 (6,31) [0,00]	0,63 (10,52) [0,00]	0,56 (6,43) [0,00]	0,60 (9,40) [0,00]	0,63 (9,27) [0,00]	0,70 (9,00) [0,00]	0,59 (6,66) [0,00]	0,41 (5,07) [0,00]
R2	0,60	0,28	0,52	0,38	0,62	0,51	0,56	0,42	Within 0,08 Between 0,63 Overall 0,47

N	27	32	34	34	32	32	34	30	255
Fixed effect	No	No	No	No	No	No	No	No	Yes

( ): t-test; [ ]: p-value

$$Log\ (average\ household\ income)_{i\,t} = \alpha + \beta\ Log\ (budget\ availability)_{i\,t} + f_i + f_t + \varepsilon_{i\,t} \quad (3)$$

i = 1,….N; t= 1,…T; where f_i *represent fixed effects at comuna level and* f_t *fixed effects for the period 2001-2008*

Table 5. *Comunas'* budget availability and average household income by *comuna* 2001-2008

	Dependent Variable: Log. Average household income by *comuna*								
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2001-2008**
Constant	11,62 (16,2) [0,00]	10,66 (17,5) [0,00]	10,28 (13,3) [0,00]	10,31 (13,4) [0,00]	10,95 (18,7) [0,00]	10,85 (19,9) [0,00]	10,78 (18,5) [0,00]	10,62 (16,6) [0,00]	12,07 (41,2) [0,00]
Log. *Comunas'* budget availability per resident	0,37 (2,01) [0,05]	0,65 (4,11) [0,00]	0,71 (3,77) [0,00]	0,70 (3,75) [0,00]	0,58 (4,16) [0,00]	0,58 (3,96) [0,00]	0,58 (4,47) [0,00]	0,61 (4,35) [0,00]	0,30 (4,51) [0,00]
R2	0,24	0,55	0,58	0,56	0,57	0,55	0,57	0,54	Within 0,14 Between 0,57 Overall 0,51
N	34	34	34	34	34	34	34	34	272
Fixed effects	No	No	No	No	No	No	No	No	Yes

( ): t-test; [ ]: p-value