Do High-rise apartment condos equally revalue the neighboring housing? An analysis of Ñuñoa, Santiago de Chile.

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Many studies have analyzed the market premium enjoyed by houses located within gated communities; nevertheless little or no attention has been paid on the impact that such a sort of development produces on the surrounding housing market. This question becomes very important in the cities in which gated communities or other common interest communities, aimed to medium and high socioeconomic groups, are traditionally confined to low incomes enclaves. Salcedo & Torres (2004) and Caceres & Sabatini (2004), from a qualitative perspective, have suggested that this social proximity produces various benefits like improvement of value expectations of land from the original settlers, among others.

In this research, using a hedonic pricing model based on information of detached houses sold in Ñuñoa between 2002 and 2004, attempt to measure the impact that has been produced by High-rise condos recently built on the sale price of such houses. The results suggest that a medium sized condo produces a revalorization of 4.7% in the houses that surround it, although this impact is quite local. The spatial analysis of data, through a geographically weighted regression model (GWR), reveals that the revalorization is higher in those areas where wealthier families use to live, in that way the most creditworthy householders further increase their asset's value. Therefore, the condominiums being built on Ñuñoa can increase the municipal revenues derived from land taxes, nevertheless the revalorization of the housing stock is far from being uniform, reinforcing the value of the most values properties around them.

Key words

Real Estate values, hedonic prices, GWR, gated communities, high-rise condos

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1. Introduction

The transformation of the city promoted by the change of the urban plans (e.g. to improve degraded areas) or by the spatial self-organization process of the activities (e.g., decentralization / replacement) has its maximum expression at the real estate redevelopment. According to DiPasquale & Wheaton (1996), the land is redeveloped when it previously has been acquired with existing constructions which are substituted. This occurs when the potential value of land, according to their location (usually central) and its floor area ration (typically increased by changes in the master plan or “natural” increases in the surroundings), is higher than the value of the land according to its actual use, i.e. effectively consolidated by the building (Roca, 1986) plus the value of the existing building (including the cost of demolition). So, the "historic" density is replaced by an "upgraded" one.

However, the redevelopment doesn’t involve only an "upgrade" of density, but a change in the buildings typology, since for each net density corresponds a specific type of architectural structure. If we combine the fact that new buildings incorporate trends in tastes, habits, needs and possibilities of contemporary society, the result is a radical transfiguration of the city. That may be greater if the area is endowed with new facilities and infrastructure under public or private treasuries, therefore, generating a comprehensive redevelopment impact on the socio-professional structure of the zone (i.e.: gentrification).

The aim of this paper is to try to measure the impact on the spatial formation of real estate values produced by the residential redevelopment of parcels (generally single-family homes) to create high-rise condominium buildings (usually multi-family) with some characteristics of gated community. The main purpose of this research is to inquiry whether this impact is homogeneous throughout the neighborhood, or conversely, tends to benefit particular socioeconomic groups. Also it discusses how this impact decreases with the distance and whether there are economies of scale.

With these objectives in mind the rest of the paper is organized as follows: 1) first, it is described the types of high-rise condos within the Common-Interest Housing Communities framework proposed by McKenzie (2003); 2) then, a short review of literature that has tried surveying the impact of these new housing developments on urban values is offered; 3) in the next section, the case of study, data and the model used are presented; 4) then the results are discussed and 5) the paper ends summarizing the work done.

2. Common Interest Housing Communities and new forms of private promotion in Latin America.

High-rise condos (HC) that have certain gated community characteristics could be set in context of the Common Interest Housing Communities (CIHC's) proposed by Evan McKenzie (2003). According to this author, to this category would belong developments ranging from gated communities to condominiums, including townhouses. These developments share certain characteristics, namely: 1) the owners own exclusively certain units (e.g. apartments) and at the same time share indivisible common service areas (e.g. swimming pools); 2) land use controlled by the owners association, the acquisition involves the acceptance of a set of rules ranging from uniform architectural treatment (including the private units) to lifestyle aspects (e.g. around playing golf), behavior, ethnicity, religion, and even the age of residents (Bellet, 2007); 3) private management, homeowners associations are formed (known as communities, condominiums or simply homeowners associations) which are managed independently by the owners and sometimes with the support of legal professionals, management, accounting or architecture, and 4) safety measures such as access control, surveillance and internal walls.

Unlike the townhouses and gated communities, high-rise condos are usually located in both kinds of urban land: green and brownfields that are redeveloped; while private management is limited to the administration as opposed to what happens in large suburban developments where they often assume the role of local authorities.

While this type of development has in the U.S., the "fortified nation" (Blakely & Snyder, 1997), its higher expression (it is estimated that in 1998 14.6% of housing in this country was in a CRIC - McKenzie, 2003), this "lifestyle" (or mode of real estate production) has spread throughout the globe. Latin America has not escaped to this process and it has exacerbated due to increased inequality in the income distribution (Coy & Pöhler, 2002), increased public insecurity, inefficiency of local government in providing services and the historical process of privatization of public spaces from the colonial cities to nowadays (Sheinbaum, 2008). The Latin American urban model is characterized by three features: (i) an apparent gradual decline of the State, not only by the dismantling of the social system and its ability to redistribute the wealth, but also to its loss of leadership in the urban planning processes (Janoschka, 2002) and worthy housing production, (ii) the gradual replacement, in this sense, has become real estate capital in the construction and reconstruction of urban areas (De Mattos, 2002), often speculative (iii) lack of private solidarity practice in the construction of collective spaces, probably associated with the European Latin tradition, based on the prioritization of the individual construction of the city and the empowerment of home ownership as a mean for the historic proposed to strengthening family interests over the commons (Arbaci, 2008). These structural processes, coupled with the term associated mainly with the economic crisis that the region has experienced in the past two decades have led to a specific evolution model of territorial occupation. Ribeiro and Lago (1995) the sum of (i) a decrease of large cities in favor of the intermediate, (ii) the emergence of a new form of socio-spatial segregation, and (iii) the occurrence of upper classes where previously was only low ones.

The above processes are embodied in certain forms of the city that reproduce the social division of space:

- In one hand are the CIHC's private ventures type, with a considerable dimension, targeting the elite and with a horizontal format (e.g.: countries clubs), that have gained in diversity, location, social profile, size and format (e.g.: high-rise condos), at the same time that have adopted features of gated communities which recreate specialized "models" of community life, giving a sense of security, showing a thematic lifestyle or simulating natural areas (Bellet, 2007).
- Following are the private enterprises sponsored by the government who delegate on the first ones its responsibility for housing provision. These "precariopolis" (Hidalgo, 2008), would be characterized by mono-functional spaces, segregated, fragmented and with limitations in the provision of basic urban services. So, Rodriguez (2006) has called them the landscape of exclusion: massive production of cheap housing, with closed roads and houses without corridors, where social housing, poor in size, design and quality, suggests a new socio-spatial configuration of the territory, those are the landscapes and architectures of the exclusion.
- In addition to the two previous relatively recent forms, coexist two more historically related, first with the informal production of housing (on illegally taken land), persistent despite (and sometimes because of) by the legalization-improvement programs, basically aimed at low income groups without regular incomes or (Botelho, 2007), where the big business goes to the informal developer (Smolka, 2003).

Chile is not immune to these major processes, and as the development of condominiums regards, they have adopted, when they are located in central districts, the facet of high-rise buildings. "In contrast to what happens in the U.S., the Chilean CIHC's are not only often located in remote suburbs with low population densities, but they do in relative well urban areas where their inhabitants are only separated by a wall and a street coexisting with the poorest neighborhoods of the city "(Salcedo & Torres, 2004, p. 27). This spatial "coexistence" between low and high income groups generates a very interwoven mosaic that is rarely seen in most developed occidental cities and that, at a certain scale, might to seem a low spatial segregation, masking in the background a social exclusion processes (Sabatini, Cáceres & Cerda, 2001). So, as these authors have found for Santiago, the higher average income of the neighborhood the higher the socioeconomic diversity of the people, just as occurs in Maceió, Brazil (Marmolejo & Batista, 2008). This geographical proximity between rich and poor has been deeply appreciated by Caceres & Sabatini (2004) as a potential to reduce social isolation; since it might generate job opportunities for the poorest inhabitants (e.g. domestic services), retail trade and other types of personal services employment. On the other hand it generates a dynamization of the neighborhood, because although most of the benefits (in equipment and infrastructure) are beyond the enjoyment of neighbors, new services and facilities appears in the vicinity as a result of the increased localized demand. Also, Salcedo & Torres (Op. cit) argue that the dignity of neighborhoods is enhanced when they lost their stigma signs (e.g. in terms of drugs, crime and poverty) who once owned. The most cited advantages of gated communities, found on surveys of these authors, can be classified into 4 domains: improving quality of life in the area, better job opportunities, reducing the stigma of living in a poor district, and increased value of their land"(p. 33). "Despite their low educational level residents

show a great understanding on the revalorization of the land in the neighborhood. Many people understand how speculative land market works, and expect potential benefits from the sale of their land "(p. 34). While this good acceptance is not always extended to the entire original population (see Figure 1).

Fig. 1 High-Race condos under contruction and local protests in Ñuñoa

Source: Aguirre & Marchant, 2007

So when the CIHC's are scattered around the city (outside the districts traditionally occupied by affluent households), their walls, act as semi-open borders between different social groups (Sabatini *et al*., 2001; Sabatini & Salcedo, 2007).

While there is a general consensus among academics (Caldeira, 2000; Judd, 1995, Low, 2001 and 2003) about the negative impact resulting from the CIHC's to the integral construction of a virtuous civil society, it seems that are private benefits that are reflected in the real estate value of buildings that fall into this class of developments as well as in the neighboring buildings as discussed in the next section, although it persist the question on whether these benefits are distributed uniformly in space.

3. Impact of new residential developments on real estate values

Several studies have shown that the characteristics that define CIHC's generate a market premium on property values. Bible & Hsieh (2001) found, using a hedonic pricing model (HP), that houses inside a gated community (GC) in Shreveport Louisiana worth, all else equal, a 6.07% more. LaCour-Little & Malpezzi (2001) decomposed a value increase of 26% of houses in a St. Louis GC by 17% produced by the existence (and good management) of a neighborhood association and by 9% by the existence of walls and access control, thus concluding that

empowerment should not be solely or primarily to the closing of the developments, but the efficiency in the provision of internal services and the ability of homeowners to decide on them. Shelter (2007) found, using a HP model, for a set of GC in Mazatlan (Mexico) a revaluation between 9.24% and 9.89%. Pompe (2008) using the same methodology of HP analyzed the prices of a sample of houses near Charleston, South Carolina, concluding that the premium of these was from 18.6%. With a different methodology, based on interviews with experts (realtors) from Los Angeles, Le Goix (2005) has suggested that the increase in value is somewhat 10%.

So, dwellings inside the CIHC's, especially in the GC, worth more than, all else equal, those located outside, although paradoxically the maintenance and management costs are higher since are privately founded. Thus, exclusivity or exclusion (and thus reduced congestion, pollution and *free riders*[2]), social prestige, the feeling of security and other efficient Self-provided services under private management, seem to be behind the higher WTP of buyers. Pompe (*Op. Cit*.) and LaCour-Little & Malpezzi (*Op. Cit*.) have added further that the higher regulation on architectural typology, land use and even the rules of behavior within the CIHC's, increases the certainty about the future value (acting as a sort of insurance) and therefore reduces the risk of depreciation of real estate assets.

However, in literature little or no attention has been given to analyze the impact that these developments generate in their neighborhoods. This impact is important when is produced in the context of redevelopment processes of atomized parcels in the consolidated urban fabric (e.g. by means of high-rise condominiums), and therefore most likely to generate important changes in large areas. In any case, the quantification of this impact is important for the correct evaluation of urban projects from a public perspective, since revalorization might affect taxes revenue linked to property, and taken to the social extreme, could democratize the property values spatial formation with the revalue of the assets of lower income groups. [3]

From a theoretical perspective we can define that the impact is associated with four distinct issues:

1. The improvement of the urban landscape created by the new buildings of a better quality and the provision of small infrastructures (located outside of the development but paid by the developer) produces an effect of externality that is internalized in the value of neighboring properties.
2. The arrival of new settlers, usually with a higher purchasing power than the original population, produces a social restructuring that may involve a process of gentrification.
3. The increase of settlers generates an increase in demand for services that might incite the arrival of new service providers in the vicinity.
4. The property dynamics of the areas to be redeveloped affects the perception of the landowners whose revalorization expectations are increased.

[2] Refers to those who enjoy a service of a public good (e.g. a park) at the expense of others who pay for their maintenance.

[3] McKenzie, 1994 has also raised concerns that, from the perspective of supply, the many restrictions imposed on households, contribute to better control the future value of the parcels through the control of potential negative externalities.

This research assumes the hypothesis that described issues, generate a revalorization of neighboring properties surrounding high-rise[4]. This hypothesis is part of Segal (1977) who suggested that concentrations of *new* housing units had a high impact probability on neighboring property values. An early work which quantified this impact is that of Simons *et al*. (1998). Thus, by analyzing sales prices of duplexes[5] and single family houses in Cleveland and by using a HP models the authors found a positive impact. Specifically for each new home built, within a radius of two residential blocks, the value was increased about 670 U.S. dollars (1.9% of average household). Also, following the work of Can (1990) confirmed that this impact is not stationary across space. However, this first job left open some questions of great importance: a) is the impact independent of the size of new developments?; B) how fast the effect decreases in space?; C) affects more poor neighborhoods?; d) depends on the typologies of the new construction? In a following paper Ding, Simons & Baku (2000) attempted to answer some of these challenges. Using the same HP method (although with spatial lagged variables) and also with data from Cleveland but only of houses, the authors found that: a) small developments had little or no influence on the value of neighboring properties, b) the influence barely extends beyond the 91.44 m (300 ft), c) the revaluation is greater in neighborhoods with low-income population as well as those dominated by Caucasians.

The impact might be greater when the new building is constructed in replacement of degraded areas. In this line De Sousa *et al.* (2009) have measured the impact of the regeneration of industrial sites (usually polluted) promoted and, in part, funded by public entities on the value of neighboring houses in Milwaukee and Minneapolis. Analyzing two hedonic pricing models (one before and one after regeneration) have found that residential values were increased in 11.4% and 2.7% respectively. Although the impact was greater when the regeneration project was targeted to build housing or parks instead of new industry or commerce. Not surprisingly the impact is bigger when the sites were radically changed substituting negative externalities by positive ones. A similar conclusion was reached by Noonan *et al*. (2007), who have stressed that this positive impact is intermingled with a change in the socio-professional composition and quality of residential park produced by people attracted by the environmental improvement.

4. Case study, data and model

4.1 Transformation Ñuñoa and condominiums in urban vertical

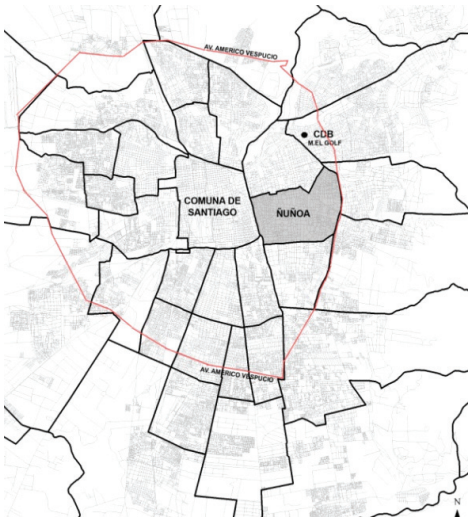
Ñuñoa is one of the 52 municipalities of the Metropolitan Region of Santiago (32 in the "Great Santiago"). Has an area of Sq. Km 16.9 and according to the 2002 Census has a population of 163,511 inhabitants in 52,884 households, resulting in an average of 3.09 persons per household. The Socioeconomic status of its residents is rather medium to medium-high, so we can say that this is a district with an unusually diversity in the socioeconomic structure for Greater Santiago, where there is a predominance of groups of middle and upper middle income, but also there are poorer areas within. According to

[4] Although the effects of the high-raise buildings can be negative the when there are not accompanied by improvements in infrastructure, causing congestion, while shadows and loss of visual privacy of surrounding houses.
[5] Duplex homes in America are those that accommodate two homes in the same building structure.

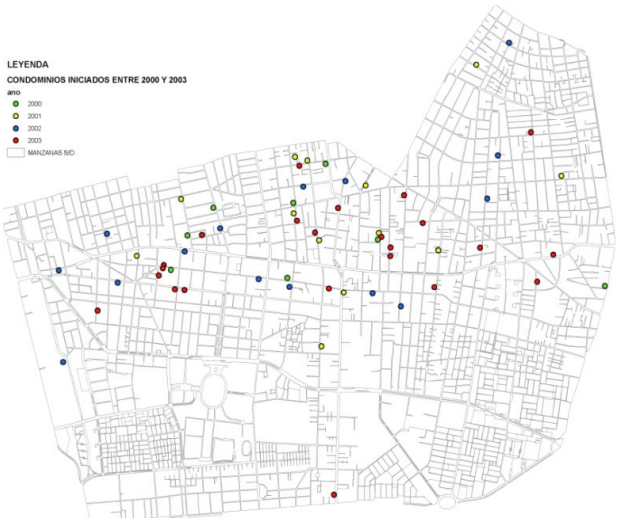
Census 2002 data, the socioeconomic structure of households in Ñuñoa, following the conventional classification of Adimark (1999) is: "ABC1" High-income (32%), C2 middle-high income (35%), C3 middle income (17%), D lower-middle income (14%), and E low-income (2%)[6].

Fig. 2 Localization of Ñuñoa and the High-raise condos in study

Location of Ñuñoa in the Great Santiago



Location of the High-rise condos studies in Ñuñoa



Source: self elaboration

Nevertheless this social structure is in transformation. Since the early 90's, pericentral communes of Santiago de Chile[7], have developed a significant change in their building typologies, and socioeconomic groups to which they are leaded. This change is seen mainly in Ñuñoa, where has started a densification since 1990, with the construction of residential high-rise condos in areas that were formely dominated by single family homes (up to 3 levels), the original floor area ratio materialized was 0.46 floor sq m/land sq m at 2001.

This transformation has been promoted basically by changes in local regulations (e.g. master plan), which progressively have allowed the densification of such a kind of neighbours. The legislation also allows for a increment of floor area ratio when formely separated plots are joined in order to get a bigger one whith expanded posibilities, this fact results enourmously attractive to investors[8]. The typology of these condo projects is high-rise buildings, with various internal services and access control. These projects are inserted in areas of low density

[6] Indicator of socioeconomic group: ABC1 = High; C2 = medium high, C3 = Medium, D = Medium-low, E = low; This indicator is made by combining the level of "the boss" training of the household and tenure a set of tangible property. These goods, collected from the Census, are 10: shower, color TV, refrigerator, washer, heater, microwave, automotive, cable TV or satellite TV, computer and Internet connection.

[7] It is called "pericentral" to 11 communities that share their administrative boundary with the municipality of Santiago, which is the functional core of the historic city. Furthermore, the expression and those enrolled between the first ring, Vicuña Mackenna planned for mid-nineteenth century and the second ring in the 60 planned in the first metropolitan plan (Aguirre & Marchant, 2007).

[8] Article 63, Ley General de Urbanismo y Construcciones.

types, establishing a major impact on the lives of concurrent residents[9], although the impact might be greater in the case of peripheral municipalities with a significant amount of poor population.

Fig. 3 Residential high-rise condo in Ñuñoa

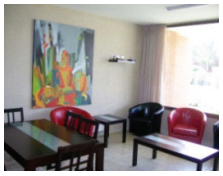
Street view

"It highlights the opaque perimeter closure (up to 30% by law), as well as the presence of low-rise houses in the neighborhood"

Parking

Gym

Piscina



Sala de estudio

Private greenareas

Games room

Source: www.portalinmobiliario.com

These projects are presented as real estate products that incorporate within their attributes: private greenery, swimming pools, laundry, meeting room, barbecue areas, mini-cinemas, and private parking lots (See Figure 2). It can be said that much of the activities that once took place in the public spaces of the city (even private) are now concentrated inside these condominium spaces with ownership and excusive use, this is the main feature by which the Condominiums can be categorized as CIHC's.

This research explore the impact on the price of houses in the vicinity of 59 of those HC whose construction began between 2000 and 2003. These condominiums, as shown in Table 1 have an average area of 7,651 sq m, ranging from 1,700 sq m approx. up to 42,000 sq m, with heights ranging from 5 to 19 levels, and a number of apartments ranging from 20 to 393 units. Table 1 also details that the vast majority of dwellings (78%) and condominiums (81%) are aimed for high income households (ABC1), while the rest for upper-middle income households.

[9] We recommend the documentary film Ignacio Aguero, "This is when" 2003 which chronicles the lives of people in the Dr. Johows Street, during the years 2001 and 2002, Ñuñoa.

Table 1 Characteristics of the High-Condos in study

VARIABLE	N	Min	Max	Media	St. Desv.
Build area (m2)	59	1.739	42.560	7.651	5.984
number of levels	59	5	19	10	3,9
number of apartments	59	20	393	74	64
initial year of construction	59	2.000	2.003	2.002	1,1

	Housing	Housing (%)	HC Buildings	HC Buildings (%)
Offer to high incomes groups (ABC1)	2.695	78%	38	81%
Offer to med-high incomes groups (C2)	752	22%	9	19%
	3.447	100%	47	100%

Note: the segmentation of the offer by socioeconomic groups is owers and is based on the new apartments offered price (when it was available) and the purchasing power of groups.

Source: New build works permits (Ñuñoa district) and www.portalinmobiliario.com

4.2 Model

As seen in paragraph 3 above, with few exceptions, the method used in the literature to assess the impact of the new construction and of the CRIC is the HP. This method, belonging to the family of revealed preference, assumes that in the value of assets are implicitly contained the marginal value of their attributes (Bøjner, 2003). In practice, it is used the value of the buildings to, econometrically, infer the marginal value of externalities, once the rest of locational attributes and housing attributes have been controlled (Lancaster, 1966). Thus in a model like (1), where the dependent variable *P* is price and covariates *k* are *n* built and locational attributes, (including the presence of vertical condominiums in the neighborhood), it would be expectable a positive sign of the coefficient k_R affecting the presence of high-rise condos in the vicinity, if the revaluation hypothesis were confirmed.

$$P_i = f(k_1, k_2, ..., k_n) \quad (1)$$

As shown the main strength of the method is that infers the implicit price of environmental attributes from the actual behavior of individuals in the market. However it has some limitations:

1. *In relation to the specific property market*. In theory, if individuals might to see unmet his expectations, they would have to sell the house immediately and seek another one, thus adjusting the price (Feitelson, *et al*., 1996), which does not happen because the significant transaction costs (e.g. changes, taxes, commissions, legal services, etc.). The main assumption of the method is that one person, in order to maximize her/his utility, would have to choose those goods whose attributes have a marginal value coincident with its marginal WTP for each one (Rosen, 1974). This assumptions is

difficult to meet, since it is difficult to evaluate all the attributes deeply enough in a limited supply and time context.

2. *Regarding the econometric analysis*. There are also problems relating to: (i) the origin of information (e.g. using real estate databases built for other purposes), (ii) absence of socio-demographic characteristics of buyers, and (iii) costs of the econometric problems in the specification and / or omission of covariates (as shown by Bateman, *et al*., 2001)
3. R*egarding the meaning of the evaluated externalities*. This method, use cross-sectional data, does not allow to distinguish which part of the impact is produced by the increased speculative expectations of landowners activated by the apparition of new developments on the vicinity, and which part or the revalorization is produced by other externalities produced by such developments related to improvements on landscaping, infrastructure or services.

The model used in this article is as follows:

$$Ln(P) = B_0 + \sum_{v=1}^{n} B_v V_v + \sum_{s=1}^{n} B_s S_s + \sum_{e=1}^{n} B_e E_e + \sum_{a=1}^{n} B_a A_a \qquad (2)$$

In (2) *P* is the price of homes surrounding HC, *V* is the structural attributes of such housing (e.g. area), *S* are the socioeconomic characteristics of the neighborhood, *E* are the environmental externalities (e.g. proximity to a vertical condominium) and *A* is the dimension on which are inscribed the measurable covariates the accessibility level of housing. Note that (2) attempts to explain the value of existing homes, although it would be preferable to analyze the value of empty plots. Finally it is worth to note that the semi logarithmic form of (2) allows direct measurement of the semi-elasticity, *i.e.* the percentage change in housing prices with a change of one unit of the explanatory covariates.

4.3 Data and spatial processing

The variable to be explained is the price of used houses (UH) that were sold in Ñuñoa between 2002 and 2004. Note that this type of houses surround HC. Information from 1,185 UH has been used, with an average sale price of 3,872 financial units (UF)[10], equivalent to 101,911 Euro. The information of these UH comes from of Property Registry Office (PRO), although the plot area has been directly calculated from digital cartography.

Each one of the 1.185 houses was geopositioned in the Grand Santiago plan conducted by the aero-photometric service of the Chilean Air-Force (SAF) in 1998. This same digital map allowed the geopositioning of the rest of the available information: demographics, socioeconomics, characteristics of existing buildings, use and size of premises for economical activity, and other facilities, this information was obtained from 2002 Census and was available at block level. Finally, data about land use and floor area ration was obtained from the master plan (Plan Regulador Comunal de Ñuñoa effective since 1989).

[10] UF or Unidad de fomento= Chilean financial unit daily actualized according to the IPC. 1UF = 26,32EUR = 37,04USD. Source: Banco Central de Chile at 20/06/2009.

On the other hand the 59 high-rise condos, which permit was granted between 2000 and 2003[11], were geopositionated (see Figure 1). This information comes directly from the website of the Ñuñoa Municipality. For each condominium the following information was available: floor area, stories, number of apartments, income target population, and market price.

Since in the model the unit of analysis is each one of the used detached houses (UH) it has been necessary to transfer to them the information of the characteristics of their neighborhood. To perform this transfer it has been used, by means of a GIS, a buffer of irregular geometry (adapted from the shape of the plot where each housed is contained in). While all environmental variables were transferred using a buffer of 300 meters from the edge of the plot as suggested by Acharya and Bennett (2001), to transfer the presence of High-rise condos several buffers of 200, 300, 400 and 500m[12] were tested, as well 100 meters concentric rings (not reported in this paper).

It should be noted that those households located in bordering areas of Ñuñoa receive contextual information from the bordering municipalities in order to considerer possible externalities coming from beyond the municipal borders of Ñuñoa.

Moreover, the level of metropolitan accessibility of UH was evaluated in Transcad, a GIS specialized in transportation, using the road-network of SAF, considering standard service velocities[13]. In this analysis the subway was not considered because at the time of the study only Line 5 was operative (with 2 stations on the western edge of the commune). In particular we have calculated the minimum distance and time for each UH to: community primary and secondary schools[14], parks and open space squares of the municipality, universities, to the "Julio Martinez" National Stadium and to the CBD[15]. In addition, there were several indicators of proximity to major routes, calculating the linear meters of main streets (avenues) entered in the buffer of 300m from each UH. To complement the accessibility information from Origin-Destination Mobility Survey 2005 of the Inter-Ministerial Secretariat for Transport Planning (SPECTRA) was analyzed, specifically travel-to-work time for each household has been computed.

[11] Because the high-rise condo projects studied, are not only deployed in areas where the plan determined more buildable, we infer that is the whole community that is provided by the buildable potential, and that each house has the potential for being redevelop.

[12] For each buffer, the presence of new development of high-rise condos is taken two years cumulatively prior to the date of the transaction of UH (i.e. the UH sold in 2002, capture the buildings whose license was granted in 2000 and 2001).

[13] Used weight: 17kms / h on avenues; 10kms/h on roads; 3kms/h on passages.

[14] The schools were divided into three sub-categories: private schools, subsidized and municipal, the private being generally, in Chile, have better educational quality.

[15] We considered three points of reference to establish the CBD (Metro station "El Golf"; "Plaza Italia" or Metro station Baquedano and Metro station "Universidad de Chile"), since according to some authors, it has been moving from the center of the capital to the east, currently located in the municipality of Las Condes, in the current "Barrio El Golf," which won this being the best correlation with respect to Ln of the sale price of the CU.

Finally in order to control seasonality of data (*i.e.* the increase in WTP of people produce by many factors long the year like the weather) and the temporal variation in prices (*i.e*. the price increase after the crisis 97-01) fictitious variables or dummy were constructed for each of the *n-1* year seasons and *n-1* years studied. The descriptive statistics for the variables are in Table 2 below.

Table 2 Descriptive statistics of the variables used

ITEM	VARIABLE	UNITS	N	Min.	Max	Av	St. Desv.	Font
STRUCTURAL	Sold Price (UH)	UF (Foment Unit)	1.185	236	56.019	3.872	4.744	a
	Ln Sold Price (UH)	Ln UF	1.185	5,46	10,93	7,93	0,76	a
	Price per m2 (UH)	UF/m2	1.185	0,88	55,35	10,72	6,14	a
	Site area square (UH)	m4	1.185	2.152	17.017.357	303.428	1.139.979	b
	Site area (UH)	m2	1.185	46	4125	394,6	384,5	b
	Max. potential constructability (UH)	m2 useful/m2s	1.185	1,2	3	1,78	0,39	c
NEIGHBORHOOD CHARACTERISTICS	Average sales value previous year	UF	1.185	0	18,72	10,31	2,39	a
	Factor low-income grups (+) vs low-income grups (-) 74,8% [1]	factor	1.185	-2,25	2,77	-0,02	0,98	d
	Internal community area indicator(ac)	m2 ac/m2 built area	1.185	0	0,28	0,11	0,06	d
	Quality average	1 high - 5 low	1.185	2,99	4,01	3,44	0,17	d
	Max. height buildt	levels	1.185	4	12	8,86	2,94	d
	Year of construction average	year	1.185	1937	1974	1957	7,86	d
	Tax appraisals construction m2 (rateable value)	chilean pesos /m2	1.185	2,36	7,9	5,5	1,02	d
	Gross density average	hab./ha	1.185	18,18	283,27	110,1	27,43	d
	Density built in apple	m2 t/m2s apple	1.185	0,14	0,92	0,46	0,15	d
	Factor Premises.: equipment(+) vs residential(-) 29,3%[2]	factor	1.185	-1,93	6,46	0,041	1,067	d
	Factor Premises: metropolitan activities(+) vs neighbor activities(-	factor	1.185	-1,43	9,57	0,016	1,014	d
	Factor Premises.: trade(+) vs residence(-) 9,5%	factor	1.185	-1,67	2,84	0,005	1,001	d
	Factor Premises.: cult and entertainment(+) 8%	factor	1.185	-3,09	5,43	0,014	0,982	d
	Factor Premises.: local sports equipment (+) 6,4%	factor	1.185	-3,41	7,40	-0,001	0,982	d
	Factor Premises.: national stadium (+) 5,7%	factor	1.185	-1,62	15,53	-0,011	0,988	d
	Factor use per m2: economic activities (+) vs housing (-) 11,9%	factor	1.185	-1,51	5,09	0,029	1,016	d
	Factor use per m2: activ use (-) vs leisure (+) 8,5	factor	1.185	-2,10	16,01	-0,017	1,006	d
	Factor use per m2: public facilities (+) 7,6%	factor	1.185	-5,67	5,20	0,001	1,021	d
	Factor sup uso: educational (+) 6,4%	factor	1.185	-4,55	4,28	-0,029	0,966	d
ACCESIBILITY	Time to CDB metro station El Golf	min	1.185	10,50	33,51	21,14	4,30	b
	Distance to private schools	m	1.185	5,23	2.413	661	430,5	b
	Average time to workplace	min	1.185	12,82	40,88	23,26	6,97	f
	Linear meters of avenues (main roads)	m	1.185	0	3.876	1.528	833	b
SEASONALITY	Dummy UH sold on summer	dummy	1.185	0	1	22%	0,41	e
	Dummy UH sold on autumn	dummy	1.185	0	1	23%	0,42	e
	Dummy UH sold on winter	dummy	1.185	0	1	25%	0,43	e
	Dummy UH sold 2003	dummy	1.185	0	1	46%	0,49	e
	Dummy UH sold 2004	dummy	1.185	0	1	10%	0,3	e
HIGH-RISE CONDOS CHARACTERISTIC BUILD ON THE NEIGHBORHOOD	Dummy presence of new building (HC) buffer 300m	dummy	1.185	0	1	42%	0,493	e
	Number of new building housing (HC) buffer 100m	number of housing	1.185	0	324	10	37,2	e
	new building area (HC) buffer 100m	m2	1.185	0	19.719	955	3.103	e
	Average levels of new building (HC) buffer 100m	number of levels	1.185	0	16	1,12	3,31	e
	Number of new projects (HC) buffer 100m	number of buildings	1.185	0	3	0,129	0,387	e
	Number of new building housing (HC) buffer 200m	number of housing	1.185	0	393	23,65	54,81	e
	new building area (HC) buffer 200m	m2	1.185	0	42.560	2.325	5.075	e
	Average levels of new building (HC) buffer 200m	number of levels	1.185	0	19	2,52	4,58	e
	Number of new projects (HC) buffer 200m	number of buildings	1.185	0	5	0,32	0,63	e
	Number of new building housing (HC) buffer 300m	number of housing	1.185	0	481	44,9	76,89	e
	new building area (HC) buffer 300m	m2	1.185	0	42.560	4.468	7.295	e
	Average levels of new building (HC) buffer 300m	number of levels	1.185	0	19	3,95	5,17	e
	Number of new projects (HC) buffer 300m	number of buildings	1.185	0	6	0,64	0,94	e
	Number of new building housing (HC) buffer 400m	number of housing	1.185	0	517	69,69	102,68	e
	new building area (HC) buffer 400m	m2	1.185	0	48.205	6.936	9.787	e
	Average levels of new building (HC) buffer 400m	number of levels	1.185	0	19	4,82	5,16	e
	Number of new projects (HC) buffer 400m	number of buildings	1.185	0	7	1,01	1,28	e
	Number of new building housing (HC) buffer 500m	number of housing	1.185	0	775	111	146	e
	new building area (HC) buffer 500m	m2	1.185	0	60.928	11.008	13.798	e
	Average levels of new building (HC) buffer 500m	number of levels	1.185	0	19	5,66	5,09	e
	Number of new projects (HC) buffer 500m	number of buildings	1.185	0	8	1,57	1,73	e

Notes:

HC= High-rise Condos, **UH**= Used Houses, **CBD**=Central Business District, Metropolitan activities (industry, supermarkets, offices), Neighbor activities (minor commerce).

Fuentes:

a) Santiago's Real Estate keeper , **b)** Chartography from the Aerophotometric Service (SAF), **c)** Ñuñoa's District Plan, **d)** Census 2001, e)New building permits, f) Origin-Destination Survey Department of Transportation (SECTRA)

Clarification:

[1] Factorial reduction performed with variables of socioeconomic and educational status of the population, obtaining a factor explaining 74.8% of total variance, and negative values indicating the presence of groups of higher incomes- education, and its positive values to lower- income- education

[2] The percentage at the end of the variables indicates the variance explained by each of these in a factor analysis that attempts to summarize the structure of activities that are intended for the local housing environment studied.

[3] In factorial reductions is expected a mean = 0 and standard deviation = 1, however, during the model development process were eliminated UH traded in 2001, so there are differences in these estimates, however, for purposes of this analysis we consider as negligible the error.

5. Results

5.1. The impact depends on the size of the condominium?

The best model obtained (Table 3) is detailed in terms of adjustment and conventional assumptions of Ordinary Least Squares calibration (i.e. no multicollinearity, normality and homocedasticity of the residuals). This model has two variants that match on all explanatory covariates, except one: the way in how the presence of high-rise condos in the existing house environment (UH) was introduced. Thus, the Model 1A only introduces a single dummy variable indicating the presence in a 300 m buffer around the UH of a high rise condo. As shown (Table 3 left), this dummy variable does not enter in the model when it is calibrated by a stepwise procedure (using a confidence level of 95%). This first analysis suggests that the mere presence (or absence) of condos in the neighborhood is not sufficient to modify the residential prices function in Ñuñoa. Model 1b tries to demonstrate that the impact on prices of HC in the neighborhood depends on its critical mass, and therefore such an impact is subject of economies of scale. This latter model introduces a variable that measure the amount of square feet of High-rise condos built in the neighborhood of each UH property in a buffer of 300m -new building area (HC) buffer 300-. As shown (Table 3 right) the sign of this variable is, as our hypothesis suggested, positive and significant at 95% confidence. The coefficient B (not standardized) suggests that a medium sized HC, approximately 7,651 sq m of floor space, increases the market value of homes located in a buffer of 300m around it by 4.7% (i.e. 7,651 x 6.131 E^{-06}).

The beta coefficient (standardized) allows to compares the importance of different covariates in the explanation of the price of the UH. First, as expected, enters the floor area of dwellings (with positive sign) and its square (negative). The introduction of the square area attempts to model the principle of diminishing returns, whereby one would expect that from a certain area, the value per sq m of the UH became progressively less, at the same time as it reduces its usefulness for a conventional household. Secondly, in order of importance, is the social structure of the neighborhood. Specifically, the model introduces, principal component 1 of a factor analysis that summarizes the socioeconomic structure of households in Ñuñoa. Such an analysis synthesizes the income level of a household and at the same time the academic level of its householder. According to the sign of the coefficient that affects this variable, the higher income level and academic level of the neighboring homes UH, the higher is the their price. In third place comes, with positive sign, the dummy that controls the higher price of the UH in 2004 considering that 2002 is the base year in the model. Fourthly there are two interlinked variables, first the existent building density (derived from the Census of 2002) and the floor area of new development of HC which has already been explained. Also enters the proximity of private schools, such a proximity exerts a positive influence on residential prices, the bigger is the distance, the lower is the price. Therefore the proximity to elitist private education centers is in Ñuñoa a market premium paid for residential real estates, although it is not clear the causality relation: i.e. whether are such schools who decide to locate in the proximity of high priced dwellings. In any case, it seems that there is a mutual externality effect that, in the local real estate market, is translated into a premium.

Table 3 General Model (variant a and b)

OLS Model	MOD. 1a			MOD. 1b		
R Square	0,576			0,579		
Adjusted R Square	0,574			0,576		
Std. error of the estimate	0,495			0,494		
Covariable / factor	Unstandardized Coefficients B	Sig.	Standardized Coefficients Beta	Unstandardized Coefficients B	Sig.	Standardized Coefficients Beta
(Constant)	7,035	-		7,081	-	
Site area	0,002	0,00	0,945	0,002	0,00	0,941
Site area square	- 0,000	0,00	- 0,420	- 0,000	0,00	- 0,418
Factor low-income grups (+) vs low-income grups (-)	- 0,148	0,00	- 0,191	- 0,147	0,00	- 0,190
Density built in apple	0,632	0,00	0,126	0,481	0,00	0,096
Dummy UH sold 2004	0,341	0,00	0,135	0,324	0,00	0,129
Distance to private schools	-1,20E-04	0,00	- 0,068	-1,20E-04	0,00	- 0,068
presence of new building (HC) buffer 300m				nd	nd	nd
new building area (HC) buffer 300m	nd	nd	nd	6,13E-06	0,01	0,059
ANOVA						
Model	Sum of Square	df	Mean Square	Sum of Square	df	Mean Square
Regression	392	6	65,41	394	7	56
Residual	288	1.178	0,24	287	1.177	0
Total	681	1.184		681	1.184	
	F	Sig.		F	Sig.	
	267	0		231	0,00	

Dependent variable: Ln Sold Price (UH)

OLS stepwise

So, these models suggest that the simply presence of a HC do not suffices on the modification of real estate price function, it is also necessary to have some critical mass.

5.2. What is the spatial influence of the revalorization impact?

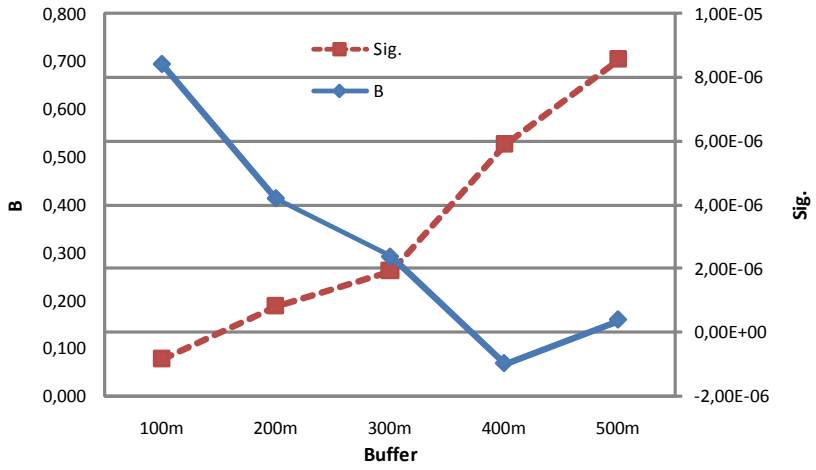
So far, the analysis suggests that the presence of condos is important; what means that it is internalized in the prices of existing homes. However, we need to explore how this impact decreases in the space. For this reason a family of univariate regression models has been designed, where:

1. The dependent variable is the unstandardized residual derived from Model 1a, i.e. the model which does not consider in their covariates the floor area of new HC.

2. The explanatory variable, for each new model family, is the floor area of new HC in the neighborhood, considering influence areas (buffers) of 100, 200, 300, 400 and 500 meters around each UH.

Put simply, this approach consist in analyzing how the importance of high-rise condos (HC) decays in space, after having controlled all the remaining factors that explain the price of used houses (UH). Figure-Table 4 summarizes the results of these models. As it is clearly shown as the distance in which the HC is located from the UH increases, the value of coefficient B decreases, and the sig. coefficient increases, both things indicate a lost in importance and significance in statistical terms. As a matter of fact, in the best model (i.e. that considering only the HC in a 100 m ratio), the B coefficient (affecting the floor area of new HC) is significant only at 90% confidence level.

Fig. 4 Spatial delay of the impact of the high-rise condos



Statial interdependence	B	Sig.
new building area (HC) buffer 100m	8,4E-06	0,08
new building area (HC) buffer 200m	4,2E-06	0,19
new building area (HC) buffer 300m	2,4E-06	0,26
new building area (HC) buffer 400m	-9,7E-07	0,53
new building area (HC) buffer 500m	4,1E-07	0,70

Dependent variable: Unstandardized residuals from model 1b without new building area (HC) buffer

Source: Self elaboration, independent variable forced into the OLS model (enter)

The above analysis suggest that high rise condos (HC) exert a highly local impact on real estate prices of surrounding detached used houses (UH). Since as the distance increase in spatial models the importance of the presence of HC decreases in importance and significance, due that this latter covariate loss variance since the sample gets homogeneity[16].

[16] Which is evident, from the data in Table 2 for descriptive statistics, splits, for the new building area of CV, the standard deviation of the mean, we have for the 100m buffer ratios of 3, 24 for the 200, 2.18, 1.63 for 300, 1.41 for the 400 and finally 1.25 for the 500m.

5.3 Is the impact uniform throughout the space?

The final research question tries to identify the variability of the impact of HC along the space. As mentioned before Ñuñoa, like almost all administrative boundaries, is presented as a heterogeneous municipality in socioeconomic terms. Such heterogeneity is also reflected in the residential typologies: there are zones dominated by vertical housing blocks of poor quality, coexisting with self-promoted detached houses, historic areas dominated by high-quality houses, some of them abandoned other considered part of the architectural heritage of the municipality. This urban and social heterogeneity suggests that the impact (i.e. revalorization) that HC exerts on the real estate market is not homogeneous. The question to address is whether or not HC tends to equally benefit to all the original landowners via the revalorization of their properties.

To address this question, unlike the work of Simons *et al*. (1998) and Ding, Simons & Baku (2000) who proposed a "hard" segmentation of the sample, this research proposes, on the contrary, the use of a “soft segmentation". Segmenting the sample, in a "hard" way in two or more subsamples for parallel econometric models and then compare their results has three drawbacks: 1) decide how many subsamples should be created, 2) decide where the sample should be divided, and 3) prevent to consider the externalities mutually exerted by the dwelling contained in different samples.

Following the work of Paez *et al.* (2008) the geographically or locally weighted regression (GWR and LWR) is used. This method, widely used in geography (Brunsdon *et al*., Fotheringham, *et al*., 2002), has been used also in the urban economy McMillen (1996) and in the real estate market analysis (Marmolejo and Gonzalez, 2009). Its main advantage is that determines how the influence of explanatory factors, in this case the impact of HC on their neighboring houses, changes and blends over the space, while allowing for solving other important shortcoming of econometric models applied to cross-sectional studies: the spatial autocorrelation problem (i.e. the influence mutually exerted by individuals for the simple fact of sharing a spatial neighborhood).

The GWR process consists in making as many regressions as observations as are in the sample. In these regressions the importance (i.e. weight) of the observations on the estimation of the parameters B decreases as the distance increases to the pivot point of regression which they are located (a different one for each regression). So the weighting matrix is calculated:

$$w_{ij} = \left\{1 - \left(\frac{d_{ij}}{h_i}\right)^2\right\}^2 \; si \; d_{ij} < h_i \; otherwise = 0 \qquad (3)$$

Where *w* is the spatial weighting matrix, *i* is the pivot point of each local regression, *j* is each of the *N* observations in the local regression and *h* is the distance from point N_{HT} *j* (Charlton *et al*., 2005). When the density of the observations (e.g. existing homes) is not constant throughout the space it is appropriate to use a kernel[17] or adaptive sphere of influence, also this kernel does not constrain the geometry of the analysis area, which not necessarily has to be isotropic from each *i* point.

Table 4: Parameters for the geographically weighted regression model (GWR)

GWR Model				**Akaike information criterion**		
Coefficient of Determination	0,674			OLS	1.699	
Adjusted r-square	0,626			GWR	1.731	
Sigma (St. Error)	0,464					
B coeficients - estatistical distribution				**Significance tests**		
	Lwr Quartile	Huber's M Estimator	Upr Quartile	Local regressions significant at 95% level	Monte Carlo significance tests for B spatial variation (p-value)	
Intercept	6,533	7,057	7,465	100%	0,00	***
Site area	0,001	0,002	0,003	84%	0,00	***
Site area square	-1,00E-06	-4,23E-07	-	49%	0,00	***
Factor low-income grups (+) vs low-income grups (-)	- 0,294	- 0,177	- 0,058	43%	0,00	***
Density built in apple	- 0,425	0,417	1,297	15%	0,00	***
Dummy UH sold 2004	0,038	0,242	0,442	39%	0,00	***
Distance to private schools	-4,39E-04	-2,04E-04	4,90E-05	22%	0,00	***
new building area (HC) buffer 300m	-6,00E-06	3,37E-06	1,20E-05	18%	0,00	***
				*** = significant at 0,1% level		

ANOVA					
	Suma de cuadrados	df	Media cuadrada		
OLS Residuals	287	8			
GWR Improvement	65	144.13	0,4485	Number of nearest neighbours	119
GWR Residuals	222	1032,87	0,215	Number of locations to fit mode	1.185
F	Sig				
2,086	0,00				

HC= High-rise condos

dependent variable: Ln sold price

GWR Adaptative Kernel

Table 4 summarizes the results, as expected, the overall coefficient of determination is substantially higher than the non spatial model MOD 1b (R2 = 0.626 versus R2 = 0.576), since GWR model locally adjust its parameters to each specific location. The summary of the distribution of the coefficients (recall that there is a different B coefficient for each local regression) is expressed in terms of upper and lower quartiles and the Huber's M-estimator

[17] To determine the size of the kernel is followed by two criteria: firstly that the level of adjustment is maximized, and secondly that in no case be less than 10% of the aggregate sample, for this not to reduce the degrees of freedom of the models.

that provides an average robust to outlayers (see Huber, 1981). As it can be seen the coefficient measuring the impact on the price of existing homes (UH) that each sq m of new high-rises condos (HC) is slightly lower than its comparable non-spatial OLS model (MOD 1b); so, if *B* in the OLS model is equal to 6.131 x 10^{-06}, in geographically weighted version of the same model is reduced to to 3.367 x 10^{-06}; this would amount to saying that a mid-size condominium does not add 4.7% the value of the houses that surround it, as was said before, but only 2.6%, when the local specificities have been taken into account. This suggests that the impact of HC prices on residential neighborhood is not homogeneous throughout the space, so that if the lower quartile value is considered, there are areas where the presence of HC does not add value to the neighboring properties, but extract it (e.g. by increasing road congestion or shadows).

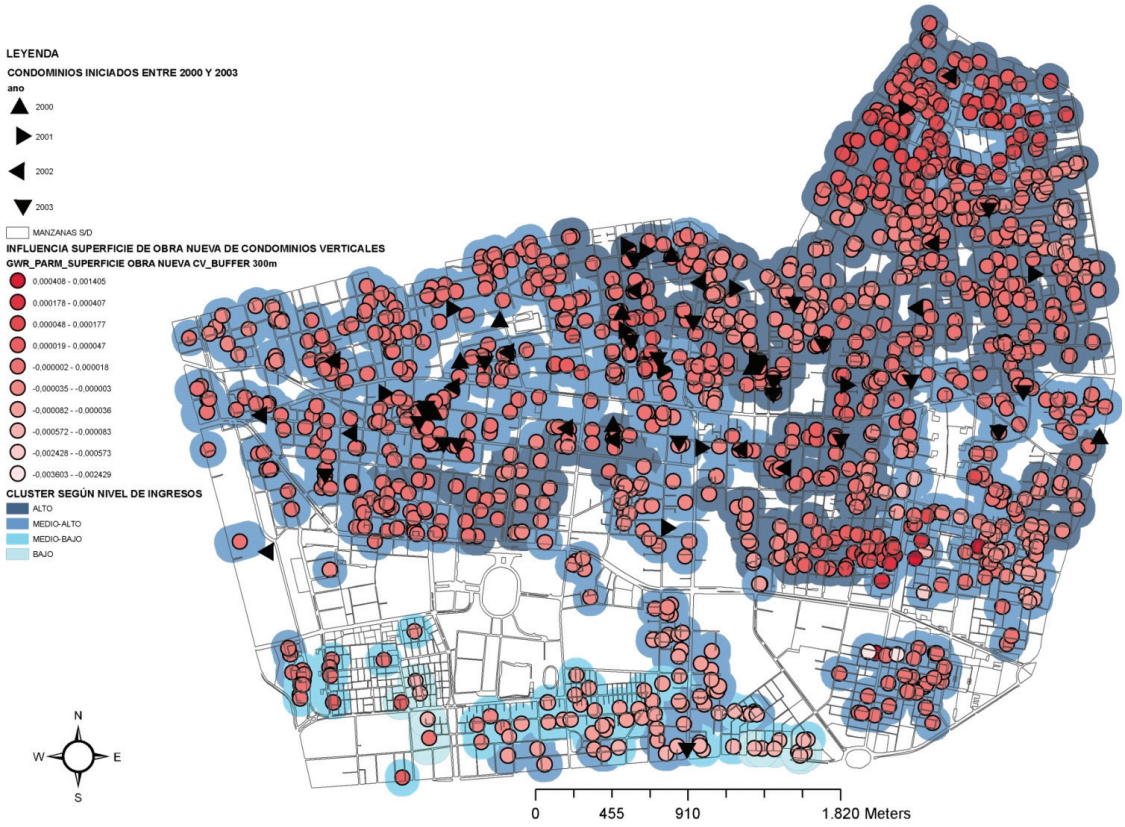
The point is that virtually all variables have non-stationary effects. This means that the marginal value of each unit of each attribute change over space. It is likely that improvement of the explanatory power of the GWR is due precisely to the consideration of these local specificities in the valuation of residential properties. To statistically validate the spatial variation of local factors has been carried out the Monte Carlo test (Fotheringham, *et al*., 2002). The results (Table 4 right) confirm the non stationary nature of coefficients at 99% of confidence.

Table 4 also reports the percentage of local regressions in which the covariate on the sq m of new HC has been significant at 95% of confidence. As seen only in 18% of the regressions, this covariate is statistically significant.

So far, the analyses suggests that impact of the size of HC on real estate prices is not uniform across Ñuñoa, it is necessary to explore what is the relation of this variability and the socioeconomic status of the zones. To address this question all detached used houses (UH) have been classified into 4 categories according to the socio-economic area in which they are located. This classification was done using the same factor analysis that previously has been used in the regression models. Such an analysis summarizes in two main components the socioeconomic and educational status of the householders. The factor or principal component one (which in fact is one that has been used in the models) on one hand polarizes higher incomes and educational groups, and on the other hand the least creditworthy and least educated people; principal component 2 synthesizes the middle classes. The classification therefore has been done by classifying the UH according to principal components using a K-media cluster process. In such a cluster it has been specified 4 areas (see clusters in Figure 5).

After clustering the UH in 4 areas, the coefficient B-GWR that internalizes the impact of the size of HC on sourounding UH has been summarized in terms of its descriptive statistics. The results are detailed on Figure-Table 5. As shown there is a clear relation between the socioeconomic level where used detached houses (UH) are located and the relative importance of the presence of condos on the market price thereof. In particular the higher socioeconomic level, the greater the positive impact of the HC on the value of homes. In fact, in that areas inhabited by groups of lower-middle income the impact is slightly negative, which also is relevant given the percentage of regressions in which this factor has been significant at 95% of confidence.

Figure 5 High-rise condos impacts over residential values per socio-economic areas



			Unstandardized Coefficients B in GWR model				
		N	Min.	Max	Huber's M Estimator	St.Desv.	Local regressions significant at 95% level
high income groups	new building area (HC) buffer 300m	545	-6,03E-05	7,00E-05	3,65E-06	2,06E-05	7%
med-high income groups	new building area (HC) buffer 300m	567	-3,60E-03	1,41E-03	4,63E-06	2,03E-04	25%
med-low income groups	new building area (HC) buffer 300m	62	-1,29E-04	3,93E-05	-4,48E-05	4,09E-05	50%
low income groups	new building area (HC) buffer 300m	11	-1,56E-04	2,77E-05	-1,19E-04	5,78E-05	0%
Sum		1.185					18%

HC= High-rise condos

Note: Segmentation of the sample according to an factorial analysis and cluster performed on the percentage of persons by level of education and income

Source: self elaboration

At has been seen, the influence of the condominiums is not homogeneous throughout the space, so the richest areas are precisely the ones which benefit more. For that reason is not surprising the positive, although modest and significant, correlation ($r = 0.07$, $p = 0.008$) between the price of existing homes and the coefficient B-GWR. Put this in another way, the marginal impact of 1 sq m of HC is higher in areas where housing is more expensive.

Therefore, it can be concluded that the construction of condominiums, in the way in how they are being built in Ñuñoa, perpetuates and exacerbates the social division of space, that in the dimension of the housing market, is reflected in a higher differential prices among the most solvents, which are increasingly more rich, and the less affluent increasingly poorest in relative terms. *The impact of condos in* Ñuñoa*, therefore, is far from democratize, at the microscale, the spatial distribution of property values in this particular enclave of Santiago de Chile.*

Conclusions

As a result of the crisis of the state in Latin America on the regulation of land use and housing provision there has been a liberalization process. In this context, and to find solutions to the needs and tastes of groups of middle and upper-middle class, have proliferated various forms of Common-Interest Housing Communities, such as gated communities and high rise condominiums (HC). In some cities, like Santiago de Chile, these developments tend to localize in neighborhoods that have traditionally been populated by groups of low incomes, because developers take advantage of the relatively low land prices. Several authors such as Sabatini, Cáceres & Cerda (2001), Cáceres & Sabatini (2004), Salcedo & Torres (2004) and Sabatini & Salcedo (2007) have analyzed the sociological implications of this new form of coexistence, which among many other findings, suggest a revalorization of the assets of original landowners. This research has attempted to quantify the impact that produce high-rise condos (HC), most notably the interest has focused on whether this impact has a uniform effect throughout the space, in particular, if it have an homogeneous impact on the value of the assets of the original settlers.

With this objective in mind, a database has being built using information of used detached houses (UH) bought in Ñuñoa between 2002 and 2004. Using GIS information, data about the neighborhood of each house, have been added: the level of accessibility, service provision, socio-economic structure, environmental externalities, etc. Just as those derived from the 59 high-rise condo (HC) whose construction begun between 2000 and 2003. On this basis a hedonic price model has been calibrated, where the dependent variable is the price of existing homes (assumed as the value of the assets of the original settlers), and the independent neighborhood variables including the presence of condos.

The results suggest that an average-size HC, i.e. about 7,651 sq m, produces a 4.7% appreciation in houses that are in a radius of 300m. Furthermore, this impact appears to be affected by scale economies, since the mere presence of a condo does not suffices to modify the land rent function of neighboring buildings, is therefore necessary that the condo has a certain critic mass. To analyze the extent of how decreases the impact as the distance between a HC and a house increases, a family of models has been calibrated by the progressive inclusion of those condos that are part of successive buffers of 100m from each house. This analysis suggests that the externality generated by condos is basically local, since as the

distance increases the presence of condos loses importance and significance in the explanation of residential market prices.

However, the main finding of this research is that the revalorization that generates vertical condominiums on the assets of original landowners is not uniform across space. Specifically, using a geographically weighted regression model, and segmenting the sample, using factor analysis followed by k-means cluster analysis, it has been found that the condominiums produce an increased revalorization in areas of higher income. That is, areas that are structurally more expensive, where more wealthy people live, are precisely those where the marginal impact of a new condominium sq m is greater. Therefore a redistribution of the wealth in the microscale doesn't occur in Ñuñoa. Quite the opposite, it creates a greater differentiation in the value of property assets that must be understood as an evidence of socio-economic differentiation of space. This impact could be greater if we explicitly consider in the model the socioeconomic profile of new residents who will be living in those 59 condominiums (78% of households will be of high income and 22% of upper-middle income), given that the socioeconomic structure of neighborhood is the main exogenous explanatory covariate influencing the price of used detached houses.

It must be concluded, therefore, that the private model of housing production, characterized by a concentration of condos in the northern part of Ñuñoa, bordering the prestigious district of Providencia, produces a revaluation of assets that can increase the tax revenue based on property prices, but is far from promoting a democratization of the spatial structure of property values. The spatial self-organization in a liberalized context, again, demonstrates his ineffectiveness in the social redistribution of wealth.

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