ARCHITEKTURA
CZASOPISMO TECHNICZNE
TECHNICAL TRANSACTIONS
ARCHITECTURE
WYDAWNICTWO POLITECHNIKI KRAKOWSKIEJ
3-A/2010
ZESZYT 6
ROK 107
ISSUE 6
YEAR 107

CARLOS MARMOLEJO DUARTE, ESTEBAN SKARMETA CORNEJO,
CARLOS AGUIRRE NÚÑEZ

DO HIGH-RISE APARTMENT CONDOS EQUALLY REVALUE THE NEIGHBORING HOUSING?

CZY WYSOKOŚCIOWCE WYWIERAJĄ NEGATYWNY WPŁYW NA SĄSIEDNIE ŚRODOWISKA MIESZKANIOWE?

Abstract

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. 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.

Keywords: real estate values, hedonic prices, GWR, gated communities, high-rise condos

Streszczenie

Wiele prac naukowych analizuje negatywny wpływ wywierany przez wysokościowce na środowiska mieszkaniowe w postaci cienia, szumu, wiatru itp. Skoro jednak budynki takie wznoszone są z myślą o wysokodochodowych mieszkaniach, nie jest jasne, czy proces podnoszenia statusu oraz wzrost szacowanej wartości gruntu wytwarza pozytywny wpływ na sąsiednie środowisko mieszkaniowe, jak twierdzą Salcedo i Torres (2004) oraz Cacares & Sabatini [3]. W niniejszym artykule, wykorzystując hedonistyczny model cen oparty na informacjach na temat domów jednorodzinnych sprzedawanych w Ñuñoa (Santiago de Chile) w latach 2002–2004, spróbujemy zmierzyć wpływ niedawno wybudowanych budynków z mieszkaniami własnościowymi na cenę takich domów. Wyniki sugerują, że budynek średniej wielkości daje rewaloryzację 4.7% w otaczających go domach, mimo że wpływ ten ma dość ograniczony zasięg. Przestrzenna analiza danych poprzez geograficzny model regresji (GMR) ukazuje, że rewaloryzacja wyższa jest na obszarach zamieszkanych przez zamożniejsze rodziny. W ten sposób najbardziej wiarygodni kredytowo mieszkańcy nadal zwiększają wartość swego majątku. Dlatego właśnie budynki z mieszkaniami własnościowymi wznoszone w Ñuñoa mogą zwiększyć dochody miasta uzyskane z podatków gruntowych. Rewaloryzacja zasobów mieszkaniowych daleka jest jednak od uniformizacji. Wzmacnia ona wartość najdroższych posiadłości.

Słowa kluczowe: wartość nieruchomości, ceny hedonistyczne, GMR, społeczności zamknięte, wysokościowce z mieszkaniami własnościowymi

* Carlos Marmolejo Duarte, Esteban Skarmeta Cornejo, Carlos Aguirre Núñez, Centrum Polityki Gruntowej i Wycen oraz Wydział Konstrukcji Architektonicznych, Politechnika Katalońska.

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 Wheaton & DiPasquale [17], 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 [14] plus the value of the existing building (including the cost of demolition). So, the "historic" density is replaced by a "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.

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 are presented;
4) then the results are discussed;
5) the paper ends summarizing the work done.

2. The condominium buildings, in a private real estate market

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 [9]. 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 [1];
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;
4) safety measures such as access control, surveillance and internal walls.

Several studies have shown that the characteristics that define CIHC's generate a market premium on property values. [2] 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. [6] 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. [13] found, using a HP model, for a set of GC in Mazatlan (Mexico) a revaluation between 9.24% and 9.89%. Pompe [7] 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 [7] has suggested that the increase in value is somewhat 10%.

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[1].

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.

This research assumes the hypothesis that described issues, generate a revalorization of neighboring properties surrounding high-rise[2]. This hypothesis is part of Segal [15] 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. [16]. Thus, by analyzing sales prices of duplexes[3] 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 confirmed that this impact Can (1990) 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 [5] 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. [4] 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 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. [11], 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.

3. Nuñoa, an municipalities in transformation.

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 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%)[4].

Since the early 90's, pericentral communes of Santiago de Chile[5], 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[6].

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 types, establishing a major impact on the lives of concurrent residents[7], although the impact might be greater in the case of peripheral municipalities with a significant amount of poor population. 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. 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.

4. Results

These researches 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.

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

The 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 1 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 300 m around it by 4.7% (i.e. 7,651 × 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 1

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.

4.2. 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).

Illustration 2 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.

The above analysis suggest that high rise condos (HC) exert a highly local impact on real estate prices of sourounding 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[8].

4.3. 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 an 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. [16] and Ding, Simons & Baku [5] 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. [12] 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 [10] and in the real estate market analysis [8]. 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).

Table 2 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 that provides an average robust to out layers (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 6.131×10^{-06}, in geographically weighted version of the same model is reduced to 3.367×10^{-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).

Table 2

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

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. The results (Table 2 right) confirm the non stationary nature of coefficients at 99% of confidence.

Table 2 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. After clustering the UH in 4 areas, the coefficient B-GWR that internalizes the impact of the size of HC on surrounding UH has been summarized in terms of its descriptive statistics. The results are detailed on Figure-Table 3. 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.

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.*

5. 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.

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. 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 300 m. 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 100 m 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.

Endnotes

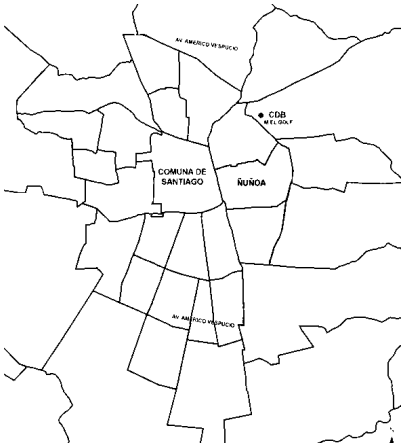
1 McKenzie, in 1994 has also raised concerns that, from the perspective of supply, the many restrictions imposed on households, contribute to better control the future value of the parcels through the control of potential negative externalities.
2 Although the effects of the high-raise buildings can be negative the when there are not accompanied by improvements in infrastructure, causing congestion, while shadows and loss of visual privacy of surrounding houses.
3 Duplex homes in America are those that accommodate two homes in the same building structure.
4 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.
5 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).
6 Article 63, Ley General de Urbanismo y Construcciones.
7 We recommend the documentary film Ignacio Aguero, "Aquí se construye" of 2003 which chronicles the lives of people in the Dr. Johows street, during the years 2001 and 2002, Ñuñoa.
8 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.

Literatura/References

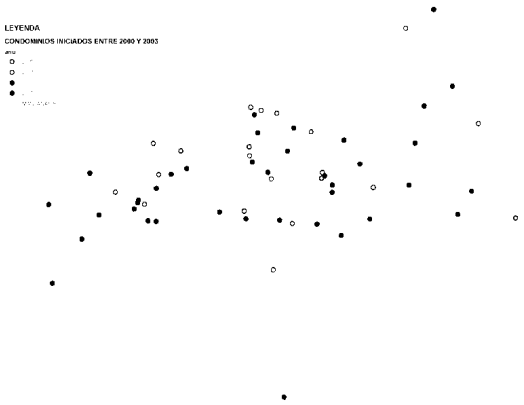
[1] Bellet C.S., *Los espacios residenciales de tipo privativo y la construcción de la nueva ciudad: visiones de privatopía*, Scripta Nova. Revista electrónica de geografía y ciencias sociales, agosto 2007, Barcelona, Universidad de Barcelona, vol. XI, No. 245, Recuperado el 31 de mayo de 2008, de http://www.ub.es/geocrit/sn/sn-169.htm.
[2] Bible D.S., Hsieh C., *Gated communities and residential property values*, Appraisal Journal, 200169, 2, 2007, 140.
[3] Cáceres G., Sabatini F. (ed), *Barrios cerrados en Santiago de Chile: entre la exclusión y la integración residencial*, Santiago: Lincoln Institute of Land Policy/Instituto de Geografía, P. Universidad Católica de Chile (2004), Revista EURE (Santiago), dic. vol. 30, No. 91, 2004, 114-117.
[4] De Sousa C.A., Wu C., Westphal L.M., *Assessing the Effect of Publicly Assisted Brownfield Redevelopment on Surrounding Property Values*, Economic Development Quarterly, vol. 23, No. 2, 2009, 95-110.
[5] Ding C., Simons R.A., Baku E., *The Effect of Residential Investment on Nearby Property Values: Evidence from Cleveland, Ohio*, Journal of Real Estate Research, vol. 19, No. 1/2, 2000.

[6] LaCour-Little M., Malpezzi S., *Gated Communities and Property Values*, CULER working paper, University of Wisconsin–Madison, 2001.
[7] Le Goix R., *The impact of gated communities on property values: evidences of changes in real estate markets, Los Angeles, 1980–2000*, International Symposium TCE: Territory, Control and Enclosure, 28 Feb–3 March 2005, Pretoria, Rep. of South Africa, 2005, 20.
[8] Marmolejo C., González C., *Does Noise Stationarity Matters on Spatial Formation of Real Estate Values?* A GWR Analysis for Barcelona's Residential Market, Paper accepted for publication in the Journal of European Real Estate Research (JERER), Paper number: JERER#2009#007.
[9] McKenzie E., *Common-Interest Housing in the Communities of Tomorrow*, Housing Policy Debate, Fannie Mae Foundation, vol. 14, issues 1–2, 2003.
[10] McMillen D.P., *One hundred fifty years of land values in Chicago: a nonparametric approach*, Journal of Urban Economics, 40, 1996, 100-124.
[11] Noonan D. S., Krupka D.J., Baden B., *Neighborhood dynamics and price effects of superfund site clean-up*, Journal Of Regional Science, vol. 47, No. 4, 2007, 665-692.
[12] Páez A., Long F., Farber S., *Moving window approaches for hedonic price estimation: An empirical comparison of modelling techniques*, Urban Studies, 45 (8), 2008, 1565-1581.
[13] Pompe J., *The Effects of a Gated Community on Property and Beach Amenity Valuation*, Land Economics, 84 (3), august 2008.
[14] Roca J., *La problemática de la valoración urbanística en la ley del suelo*, Revista de derecho urbanístico, No. 98, mayo–junio 1986.
[15] Segal D., *Urban Economics, Homewood*, IL: Richard D. Irwin, Inc., 1977.
[16] Simons R.A., Quercia R.G., Maric I., *The value impact of new residential construction and neighbourhoods disinvestment on residential sales price*, Journal of Real Estate Research, January 15, No. 1–2, 1998, 147-161.
[17] Wheaton W.C., Dipasquale D., *Urban Economics and Real Estate Markets*, Englewood--Cliffs, NJ: Prentice-Hall, 1996.

Location of Ñuñoa in the Great Santiago



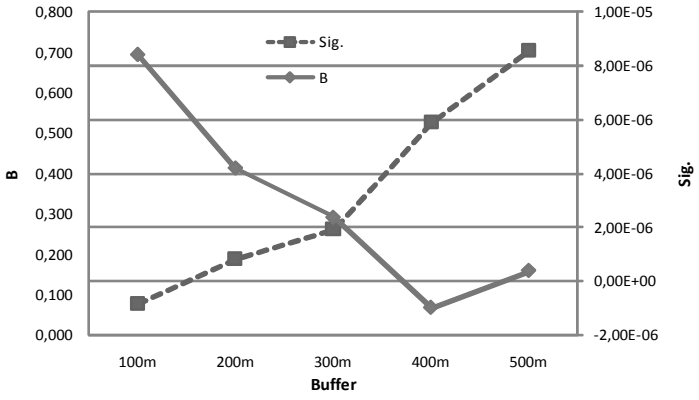
Location of the High-rise condos studies in Ñuñoa



Source: self elaboration

III. 1. Localization of Ñuñoa and the High-raise condos in study

II. 1. Lokalizacja Nunoy oraz opracowanie zespołów wysokościowca



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)

III. 2. Spatial delay of the impact of the high-rise condos

II. 2. Przestrzenne opóźnienie oddziaływania wysokościowca z mieszkaniami własnościowymi

			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

III. 3. High-rise condos impacts over residential values per socio-economic areas

II. 3. Wpływ wysokościowców z mieszkaniami własnościowymi na społeczno-ekonomiczne wartości obszarów zabudowy mieszkaniowej