JUST ONE HOUSING BUBBLE? AN ANALYSYS OF SPATIAL SEGMENTATION OF THE RESIDENCIAL VALUES OVER TIME IN BARCELONA

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Abstract

During the last real estate cycle most of the countries have experienced a housing bubble linked to the expansion of credit, increasing residential values dramatically. Despite the globalization of financial markets, this increase has not had the same impact on all the countries concerned. For this reason, this research analyzes the spatial variation in property values during this period in the case of the city of Barcelona. From the hypothesis that the areas where the population lives with lower qualifications and general education, and in particular financial education, these areas have had more variation in residential values in relation to those areas inhabited by well-off population. Additionally, these historically disadvantaged areas have been the culmination of the extra-EU immigration, which has incentive the dynamics of the real estate market. To test this hypothesis, it is carried out a descriptive analysis of the evolution of scale multifamily values districts and neighborhoods, as well as an econometric analysis to explain this variation. The results confirm the initial hypothesis and suggest the existence of a spatial segmentation of the housing market during both inflation and deflation of the housing bubble. Namely, the poorest

neighborhoods have experienced sharped bubbles and busts compared to wealthy areas of the city.

Introduction

The sharp increase in residential values lived in the last real estate cycle in different countries has been a recurring theme and discussed by experts from different disciplines[1] because of the complex character that has affected the global financial system. This process has resulted in the current economic crisis, which has been ranked as the worst crisis since the Great Depression. Unlike the latter, it was characterized by a strong expansion of loans linked to the property market.

Roubini & Mihm (2010) point out that the increase in house prices in the last real estate cycle, besides affecting the United States, has affected countries like Australia or Dubai, and in most of Europe as Spain, UK or Ireland. These authors argue that the affected countries have had their own housing bubbles linked by the financial system. In all cases the causes were similar: lax monetary policies, less regulation of mortgage markets with a cut in interest rates, excess global savings and increased spending on the acquisition of property rising prices (Daher, 2013). Interestingly, the increase in property values and overvaluation has not had the same behavior in all countries concerned, although they all had in common a housing bubble linked to an expansion of mortgage credit. In this sense, there is no theoretical reason to assume that within the same country, and even the same city that inflation / deflation of the housing bubble is uniform. This research has as main objective to analyze whether during inflation in the housing market and subsequent deflation, changes in residential values has been uneven throughout the territory, and therefore have been a number of sub-housing bubbles in the specific case of the city of Barcelona.

It starts from the assumption that the areas inhabited by people of lower income, professional qualification and a low level of education, have suffered higher inflation and deflation of residential values in relation to those inhabited by the moneyed population. The rest of the article is structured as follows: the first section provides a literature review on the work they have studied housing market segmentation or existence of local bubbles in other geographies. In the second section the methodology generally consisted of a descriptive analysis of the change in residential values and the development of different models of multiple linear regression in order to explain this variation is detailed. The following section presents the results and finally, in the conclusions, the main findings are put into perspective the implications of the existence of local bubbles for real estate valuation, financial market and public policies.

The residential market is a segmented market

From a spatial perspective it is well known that the residential market is not unitary, but rather consists of submarkets, so that borders are established, generally arbitrated by prices, hindering traffic demand of each other. Josep Roca (1982) considers necessary the existence

[1] See for example Mendez, R. (2012) geographer and historian; Glaeser, E. (2012) economist; García, A (2013) Sociologist and PhD in Urban Management and Valuation; or Daher, A. (2013) architect, among others.

of a plurality of structures that determine the differentiation of prices for these submarkets arise. He describes three conditions that favor the formation of submarkets: an imbalance between the quantities and qualities of urban space products offered by users and actually offered on the market; qualitatively different demands on the market; and finally, the inability to have certain users to access the housing market will determine areas. Regarding this last point, previous evidence has been found on the relationship between housing prices and racial differentiation and income of the population, research conducted in San Francisco (Stratszheim 1975) and New Haven (Goodman 1978). Subsequently, it would confirm this differentiation with the study in the metropolitan area of Dallas, where higher-income households were willing to pay more for housing to maintain homogeneity of the neighborhood (Goodman & Thibodeau 1998). More recently, Glaeser (2012) observed in the United States, the increase in real estate prices was more pronounced in central locations, especially in metropolitan areas where poverty was disproportionately centralized. Meanwhile, Roca (1983), emphasizes that in the case of the city of Barcelona this differentiation of land values based on social prejudices which tend to prioritize the housing market repercussions in housing prices.

Instead, less known is the existence of real differentiation processes temporal aspect. In this sense, the results of several recent research suggest that developments in macroeconomics has influenced unevenly throughout the territory. In this context, Nuñez & Roca (2007) found a correlation between variables related to changes in the macroeconomy and the change in value of urban land in the conurbation of Greater Concepcion in Chile, between 1992 and 2002. The impact has had the evolution of macroeconomics in variation and segmentation of residential values has intensified during the last housing bubble linked to an expansion of mortgage credit. Most countries saw dramatically increased residential values, then experiencing a sharp decline due to the housing crisis that originated in the United States. In that country Montañes & Olmos (2013) found that the bursting of the housing bubble had affected unequally the 19 provincial sub-markets identified by themselves, reducing the spatial segmentation of the housing market with falling prices. Coinciding with previous authors, Miles (2013) obtained in its investigation that the trend in the United States was responding to a market segmentation, and the beginning of the housing bubble that had increased segmentation. He emphasizes the fact that the west coast and the east coast are the areas most likely to differentiate the evolution of domestic prices in general, which is consistent with the findings by Glaeser (2012), who observed a higher growth real estate prices in the warmest cities in the United States. The data obtained showed a higher growth not only in the warmer cities, but also in those with lower initial density, with high residential preliminarily values and whose population had a lower level of education.

In the same way, Lyons (2013), in Ireland, asserts that there was a difference in the relative importance the population to the intrinsic characteristics of housing during this period (inflation and deflation of the housing bubble). The author noted that during the period of inflation the properties associated with more space had a higher relative price increase, a trend that continued in the deflationary period. In the particular case of Spain, the effect it has had the housing bubble and its subsequent burst is also uneven across the territory. In 2004, Rodriguez (2004) and described a disparate increase in property values between some areas and others. The author referring to data from the Ministry of Public Works, impinged on the annual increase

in 2003 was more intense in cities of over 500,000 inhabitants, and in turn, in the coastal towns facing the interior. With the onset of the economic crisis and devaluation in house prices, Mendez (2012) conducted a similar reading. He argued that the crisis was relatively moderate in inland provinces because of not being so involved in the real estate expansion and to a less related economy with the construction sector, in return for the coastal cities of the Mediterranean. The latter claims were identified by Altuzarra & Esteban (2010), who from statistics on real estate transactions at the level of provinces prepared by the Ministry of Housing during the period 2006-07, found that provinces with specialized economic dynamism in the provision of second home residents and non-residents were the most affected before the withdrawal of housing market activity. The same authors pointed that the housing market in Spain was heterogeneous and that there were distinct regional dynamics. In this sense Arends & García-Almirall (2013), obtained from the analysis of sales transactions of multi-family housing prices in the center of Barcelona, with a strong presence of immigrant, had risen above the rest of the city.

Methodology

This research has benefited from an extensive database[2] for sale securities appraisals of multifamily housing in the metropolitan area of Barcelona between 2004 and 2010. In the said database there are 17,149 housing valuations once discarded those outside the city from Barcelona. Subsequently obtained demographic, labor and economic pages of official statistical data[3] and information on urban changes made during the period studied in Barcelona[4]. On the other hand, to take into account the quality of the neighborhoods that make up the city, it has been incorporated the three quantitative indicators made by Jimenez (2011) [5] for the degree of sustainability that they present in Barcelona: environmental sustainability, economic sustainability and social sustainability.

Once obtained all the data descriptive analyzes are performed: one at district level and a second more detailed analysis. Initially the option to perform a descriptive analysis at the neighborhood level is considered to observe the spatial differences in the evolution of residential values from a socioeconomic perspective. However, this analysis has had to be discarded due to lack of samples per neighborhood, as had been obtained within twenty observations in most cases. For that reason, it was decided to perform a cluster of neighborhoods from the criteria obtained by Alabart *et al.* (2008). Despite this first group, some

[2]The authors are grateful Arends, L.N. and Garcia-Almirall, P., have facilitated the database used in his article Concentration of Immigrants and property market of the city of Barcelona available *http://upcommons.upc.edu/bitstream/handle/2099/16458/1333_1350%20MIGRAR%20INMIGRAR.pdf?sequence=1&isAllowed=y*. This database consists of information provided by companies appraisers as CATSA, Ibertasa or EUROTASA

[3] www.barcelona.cat and www.ine.es

[4] Data obtained from the official website of the Generalitat de Catalunya (www.territori.gencat.cat) and the website www.territori.scot.cat

[5] Thanks to the author Laura Jimenez Barrero facilitating qualitative indicators made in his final dissertation *"Alternativas a la dispersión urbana. Análisis de indicadores basados en nuevas estrategias para el desarrollo sostenible".*

neighborhoods show insufficient samples. So we decided to perform a factor+cluster[6] analysis to cluster those neighborhoods with few values. Table 1 shows the resulting 31 neighborhoods, of which only 29 neighborhoods were used throughout the investigation[7], as *La Font de la Guatlla* and *Vallvidrera* had insufficient samples.

Table 1. Correspondence Cantred-Neighborhoods of the city of Barcelona.

Cantred's name	Neighborhood's name	Cantred's name	Neighborhood's name
01. El Raval	1. el Raval	20. Vall Hebrón	38. la Teixonera
02. Ciutat Vella	2. el Barri Gòtic		39. Sant Genís dels Agudells
	4. Sant Pere, Santa Caterina i la Ribera		40. Montbau
03. Barceloneta	3. la Barceloneta		41. la Vall d'Hebron
04. St Antoni	10. Sant Antoni	21. El Guinardó	33. el Baix Guinardó
05. Esq Eixample	8. l'Antiga Esquerra de l'Eixample		34. Can Baró
	9. la Nova Esquerra de l'Eixample		35. el Guinardó
06. Dreta Eixample	7. la Dreta de l'Eixample	22. El Carmel	37. el Carmel
07. El Fort Pius	5. el Fort Pienc	23. Vilapiscina	44. Vilapicina i la Torre Llobeta
08. Sagrada Familia	6. la Sagrada Família		45. Porta
09. Poble Sec	11. el Poble Sec - Parc Montjuïc		46. el Turó de la Peira
10. Zona Franca-Port	12. la Marina del Prat Vermell - Zona Franca		47. Can Peguera
	13. la Marina de Port	24. Nou Barris	48. la Guineueta
11. La Font de la Guatlla	14. la Font de la Guatlla		49. Canyelles
12. Sants	15. Hostafrancs		50. les Roquetes
	16. la Bordeta		51. Verdun
	17. Sants - Badal		52. la Prosperitat
	18. Sants		53. la Trinitat Nova
13. Les Corts	19. les Corts		54. Torre Baró
	20. la Maternitat i Sant Ramon		55. Ciutat Meridiana
14. St Gervasi Gran	21. Pedralbes		56. Vallbona
	23. Sarrià	25. St. Andreu	60. Sant Andreu
	24. les Tres Torres	26. Bon Pastor-Trinitat	57. la Trinitat Vella
	25. Sant Gervasi - la Bonanova		58. Baró de Viver
	26. Sant Gervasi - Galvany		59. el Bon Pastor
	27. el Putxet i el Farró	27. La Sagrera-Congrés	61. la Sagrera
15. Vallvidrera	22. Vallvidrera, el Tibidabo i les Planes		62. el Congrés i els Indians
16. Gracia	31. la Vila de Gràcia		63. Navas
17. Coll-Vallcarca	28. Vallcarca i els Penitents	28. Poblenou	66. el Parc i la Llacuna del Poblenou
	29. el Coll		67. la Vila Olímpica del Poblenou
	30. la Salut		68. el Poblenou
18. El Camp d'en Grassot	32. el Camp d'en Grassot i Gràcia Nova		69. Diagonal Mar i el Front Marítim del Poblenou
19. Horta	36. la Font d'en Fargues		71. Provençals del Poblenou
	42. la Clota	29. La Verneda - St Martí	72. Sant Martí de Provençals
	43. Horta		73. la Verneda i la Pau
		30. Barri Besos	70. el Besòs i el Maresme
		31. El Clot-Camp de l'Arpa	64. el Camp de l'Arpa del Clot
			65. el Clot

Source: Own development.

Finally, in order to explain the change in value per m^2 of buildings in the studied period there have been four multiple linear regression models. For the first time there has been a model in which only takes into account the variables corresponding to the intrinsic characteristics of the property, and a second model where you have incorporated all of the above statistics, that qualitatively differentiate the different neighborhoods (see table 2). For the second period is made the same process.

[6] To perform the factorial analysis the following corresponding to the 35 neighborhoods variables are used: quantitative indicators of social, environmental and economic aforementioned sustainability, the unemployment rate (2012), academic training (2009), and disposable income (2008).

[7] They have only considered the appraisals of the years 2004, 2007 and 2009 and corresponding to the ends of the periods selected.

Table 2. Summary of the variables used in the regression models

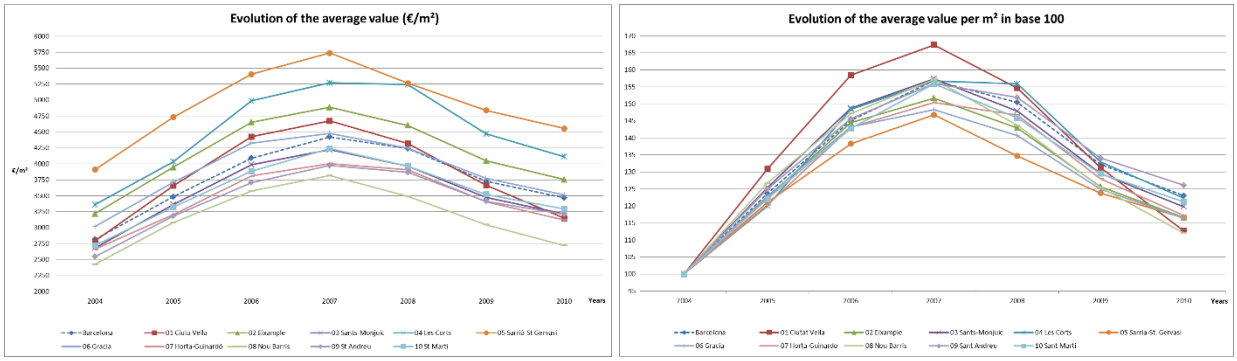
Variables	Period 2004-2007	Min.	Max.	Mean	Periodo 2007-2009	Min.	Max.	Mean
Intrinsic characteristics of housing	Var. % No. Bethrooms	-25,00	15,09	1,87	Var. % No. Bethrooms	-38,86	21,80	-1,88
	Var. % No. Bathrooms	-12,78	49,25	8,64	Var. % No. Bathrooms	-13,43	22,38	2,66
	Var. % Elevators	-20,90	135,71	16,99	Var. % Elevators	-68,97	83,33	3,03
	Var. % Year of construction	-0,67	1,86	0,15	Var. % Year of construction	-1,21	0,97	-0,05
	Var. % Quality carpinteria	-12,87	19,07	-0,21	Var. % Quality carpinteria	-10,30	19,55	4,43
	Var. % Quality bathroom	-14,60	9,64	-1,56	Var. % Quality bathroom	-7,09	19,54	3,95
	Var. % Quality kitchen	-12,74	17,58	-1,16	Var. % Quality kitchen	-8,70	21,97	4,17
	Var. & heating	-27,14	150,00	22,37	Var. & heating	-30,95	60,42	2,86
Quantitative indicators	DP2_IND Social	10,69	20,94	15,13	DP2_IND Social	10,69	20,94	15,13
	DP2_IND Economic	7,59	12,85	10,64	DP2_IND Economic	7,59	12,85	10,64
	DP2_IND Environmental	9,27	14,94	13,38	DP2_IND Environmental	9,27	14,94	13,38
Urbanistic operations	2004-07_Proyects announced	0	1	0,24	2007-09_Proyects announced	0	1,00	0,10
	2004-07_Proyectos delivered	0	1	0,31	2007-09_Proyectos delivered	0	1,00	0,38
Unemployment rate	2006_Unemployment rate	8,03	15,90	11,42	2012_Unemployment rate	5,92	15,88	11,13
level of income	2005_RFD pc (€/year)	10188	30926	15286,52	2008_RFD pc (€/year)	11841	35362,67	17869,22
Density	2005_Density (citizens/ha)	18,63	533,97	265,66	2008_Density (citizens/ha)	19,84	538,37	271,68
Nacionality of population	2005_% Spanish	55,35	94,16	85,47	2008_% Spanish	52,00	91,33	80,90
	2005_% Total foreign	5,84	44,65	14,53	2008_% Total foreign	8,67	48,00	19,10
	2005_% Western European	0,28	4,86	1,46	2008_% Western European	0,40	6,94	2,02
	2005_% Eastern European	0,50	5,07	1,01	2008_% Eastern European	1,05	5,34	2,15
	2005_% African	0,28	6,83	1,44	2008_% African	5,30	20,74	9,56
	2005_% Latin American	4,04	20,16	8,16	2008_% Latin American	0,37	4,64	1,55
	2005_% Asian	0,35	21,03	2,43	2008_% Asian	0,67	23,77	3,63
Professional category	2001_PC Armed forces	0,05	0,15	0,10	2011_PC Armed forces	0,00	0,22	0,07
	2001_PC Management & públic adm.	3,99	19,69	8,87	2011_PC Management & públic adm.	0,40	17,61	4,64
	2001_PC Technical and intellectual	4,73	36,41	17,28	2011_PC Technical and intellectual	4,67	39,83	21,84
	2001_PC Technical support	9,91	19,62	16,23	2011_PC Technical support	8,27	19,32	15,27
	2001_PC Administration & office	8,98	16,43	13,16	2011_PC Administration & office	9,76	20,86	17,44
	2001_PC Service & sellers	7,66	24,29	15,79	2011_PC Service & sellers	10,09	40,37	21,26
	2001_PC Farming & fishing	0,17	2,15	0,38	2011_PC Farming & fishing	0,00	0,65	0,29
	2001_PC Artisans, industry & const. workers	3,57	19,05	11,03	2011_PC Artisans, industry & const. workers	1,89	15,00	6,60
	2001_PC Operators	2,40	14,75	7,56	2011_PC Operators	0,94	7,56	3,38
	2001_PC low-skilled jobs	4,60	20,73	9,60	2011_PC low-skilled jobs	2,49	22,34	9,20
Level of education	2001_%Without studies	3,31	23,06	12,72	2009_%Without studies	7,43	20,43	12,65
	2001_%Basic studies	0,25	26,73	19,69	2009_%Basic studies	10,65	36,22	24,54
	2001_% ESO/Batx elem/FPI	14,12	26,78	22,15	2009_% ESO/Batx elem/FPI	11,87	23,67	18,99
	2001_% Batx/COU/FPII/CFGM	13,95	23,92	19,79	2009_% Batx/COU/FPII/CFGM	15,26	27,60	22,81
	2001_% Degree/CGFS	9,18	46,18	23,79	2009_% Degree/CGFS	6,90	41,94	20,91
	2001_%PhD	0,14	3,53	0,99	2009_%PhD	0,05	0,17	0,11
Type of tenure	2001_%Own paid	22,89	63,63	45,26	2011_%Own paid	15,56	51,51	36,94
	2001_%Own mortgage	11,96	34,83	20,26	2011_%Own mortgage	13,31	42,88	23,22
	2001_% Own inheritance or donation	1,40	4,37	2,54	2011_% Own inheritance or donation	0,00	5,66	3,47
	2001_% Rent	9,01	59,76	28,68	2011_% Rent	11,86	62,25	30,31
	2001_% Yielded/slow price	0,60	2,56	1,27	2011_% Yielded/slow price	0,00	3,16	1,54
	2001_% Another forms	1,32	2,74	2,00	2011_% Another forms	1,96	5,58	3,71

Source: Database appraisals of residential values provided by Arends & García-Almirall (2013), quantitative indicators made by Jimenez (2011) and official statistics pages. Own development.

Results

From descriptive analysis at different scales has been observed an evolution of unequal residential values in the city of Barcelona. From a more general point of view at the district level, it is observed that the inflationary period of residential values and subsequent decrease is consistent in all districts. The district with a higher value per m2 property, as expected, has been Sarrià-St. Gervasi, followed by Les Corts district, two districts with population greater purchasing power. In return the Nou Barris district is located on the outskirts of the city and inhabited by a population with few resources.

Fig.1. Temporal evolution of the average value per m^2 by districts.



Source: Base residential appraisals provided by Arends & García-Almirall (2013). Own development.

However, when such changes in the various districts of the city in base 100 compared a dramatically opposite behavior is observed. Overall, the inflationary period was more pronounced than the subsequent fall, which has had a smoother slowdown in residential prices. One can see that the district of Ciutat Vella has had an increase in residential values not only above the city average but much more pronounced than any other district (see Figure 1), and a more drastic drop. On the other hand, it is the Sarrià-St. Gervasi, which has been which has had lower inflation and much lower than the city average fall.

In a subsequent descriptive analysis from a more detailed view from the slums, it has compared the percentage change in value m^2 property between different neighborhoods in each selected period (2004-07 and 2007-09). It has been observed that Barceloneta (71.69%), followed by Barris Besòs (63.32%), have a greater variation of residential values during the inflation period. These neighborhoods are located in the old town and the outskirts of the city respectively, where a population resides with limited resources. On the other hand, are the neighborhoods where the population resides bienestante as Coll-Vallcarca or St. Gervasi Gran. These data suggest that the difference in variation of residential values responds to the socioeconomic characteristics of the different areas of the city. During the period of deflation (2007-09), the trend has remained like. Slums indwelt a population with low socioeconomic status, such as the old town, are again above average, unlike the slums located northwest of the city whose population has increased purchasing power. It can intuit that there is a direct relationship between the percentage change in the average value per m^2 of different neighborhoods obtained between inflationary and deflationary period. Specifically, the Pearson correlation is statistically significant at the 99% confidence level and has a value of 0.498.

Once done the descriptive analysis, we have developed different regression models to explain the change in value per m^2 of buildings in different neighborhoods. In the period of inflation (2004-2007) two regression models were conducted, one by entering only the intrinsic variables housing and a second, which also have been incorporated concerning statistical data variables that differ qualitatively different neighborhoods of the city. Thus, in the first model (MOD1) has been obtained 0.373 R^2. One can say that the change in value per m^2 in the slums was due only in part to the homes appraised in 2004 and 2007 have not been the same, since the adjustment in the model has been very high.

Fig.4. Summary and coefficients of the model (MOD1) in the period of inflation (2004-07)

Model	R	R²	R² corrected	Stand. error of the estimate	Durbin-Watson
1	0,646[b]	0,417	0,373	5,42297	1,935

a. Predictors: (Constant), Charact_No. Var. bathrooms, Charact_Var. Elevator

b. Dependent variablese: Price variation % 2004-07

Model		Non-standardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
		B	Stand. Error	Beta			Tolerance	FIV
1	(Constant)	50,255	1,329		37,802	0,000		
	Charact_No. Var. bathrooms	0,278	0,076	0,545	3,641	0,001	1,000	1,000
	Charact_Var. Elevator	0,077	0,033	0,346	2,313	0,029	1,000	1,000

a. Dependent variables: Price variation % 2004-07

Source: Base appraisal of residential values provided by Arends & García-Almirall (2013), quantitative indicators made by Jimenez (2011) and official statistics pages. Own development.

The constant, in this case, represents the relevance of macroeconomics at varying prices. Given that the average increase in value m^2 in the city in this period was 56.56%, that explains virtually constant this variation, being the equivalent of a 50.25% ratio.

Surprisingly, when it is introduced in the second model (MOD2) the other variables, the R^2 obtained was of 0.698, nearly double the previous result. This result clearly indicates a spatial component that explains the difference in the uneven growth of value per m^2 between different neighborhoods. In addition, the constant distance of the average change in prices of the aforementioned city, showing that macroeconomics has not influenced in the same way depending on the spatial characteristics of each area analyzed. Therefore, it can be said that inflation of the housing bubble has affected unevenly to the entire city of Barcelona.

Fig.5. Summary and model coefficients (MOD 2) in the period of deflation (2004-07)

Model	R	R²	R² corrected	Stand. error of the estimate	Durbin-Watson
1	,855[c]	0,73	0,698	3,76361	2,244

a. Predictors: (Constant), Tenure_% Own inheritance/donation, Charact_No. Var. bathrooms, Level studies_% Batx/COU/FPII/CFGM

b. Dependent variablese: Price variation % 2004-07

Model		Non-standardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
		B	Stand. Error	Beta			Tolerance	FIV
1	(Constant)	78,300	5,19		15,086	0,000		
	Tenure_% Own inheritance/donation	-4,466	1,205	-0,445	-3,707	0,001	0,747	1,338
	Charact_No. Var. bathrooms	0,253	0,053	0,497	4,765	0,000	0,993	1,007
	Level studies_% Batx/COU/FPII/CFGM	-0,768	0,297	-0,312	-2,589	0,016	0,745	1,343

a. Dependent variablese: Price variation % 2004-07

Source: Base appraisal of residential values provided by Arends & García-Almirall (2013), quantitative indicators made by Jimenez (2011) and official statistics pages. Own development.

The explanatory variables of the second, plus the change in the number of bathrooms in positive value model are the percentage of the population with a medium level education and the percentage of population who have obtained their home ownership by inheritance or

donation, they last two with a negative coefficient. These results show that there is a relationship between socioeconomic characteristics of the population and the spatial variation of values per m^2 during the period of inflation. Specifically, the Pearson correlation between the level of income and level of education that is significant at 99% and has a value of 0.837. Regarding the resulting tenure regime is also significant at 99% and has a slightly lower value of 0,667. The spatial distribution of the variables obtained shows that in both cases the population with a higher percentage of these features residing in the northwest of the city. Instead, with a smaller percentage they correspond mainly to the periphery of the city. This spatial distribution of the variables suggests that neighborhoods where the population has a medium-high or high socioeconomic profile, the value per m^2 property has suffered slower growth during the housing bubble relative to the total slum.

To analyze the deflationary period (2007-2009), it has followed the same procedure. The first model (MOD3), in which only the variables have been introduced concerning the characteristics of the property, has obtained an R^2 of 0,177. This result brings us back to indicate that the change in value per m^2 in the slums has been partly because homes priced in 2007 and 2009 have not been the same. As has happened in the period of inflation, the constant representing the relevance of macroeconomics in the price variation is similar to the average of the declining value per m^2 in the shantytowns in that period, which was 17,28%, and the coefficient of the constant explains 16,26% of the variation of values.

Fig.6. Summary and model coefficients (MOD 3) in the period of inflation (2007-09)

Model	R	R^2	R^2 corrected	Stand. error of the estimate	Durbin-Watson
1	,454[a]	0,206	0,177	2,42612	1,564

a. Predictors: (Constant), Charact_Var. Quality kitchen

b. Dependent variablese: Price variation % (ABS) 2007-09

Model		Non-standardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
		B	Stand. Error	Beta			Tolerance	FIV
1	(Constant)	16,268	0,536		30,346	0,000		
	Charact_Var. Quality kitchen	0,185	0,07	0,454	2,649	0,013	1,000	1,000

a. Dependent variablese: Price variation % (ABS) 2007-09

Source: Base appraisal of residential values provided by Arends & García-Almirall (2013), quantitative indicators made by Jimenez (2011) and official statistics pages. Own development.

It is very striking that by introducing the second model (MOD4) all other variables concerning statistical data qualitatively differentiate the different neighborhoods where the city is divided, the R^2 obtained has tripled the result of the previous model reaching the value of 0,629. This result confirms the existence of a spatial component that explains the difference of unequal decrease in value m^2 between different neighborhoods. Just as in the period of inflation, the constant distance of the average change in prices of the aforementioned city confirming that macroeconomics has influenced unevenly depending on the socioeconomic characteristics of each neighborhood. Therefore, it can be confirmed that both inflation and deflation subsequent

housing bubble, has not affected in the same way in the city of Barcelona due to differences over the territory.

Fig.7. Summary and model coefficients (MOD 4) in the period of deflation (2007-09)

Model	R	R^2	R^2 corrected	Stand. error of the estimate	Durbin-Watson
1	,834[e]	0,695	0,629	1,6293	1,61

a. Predicts: (Constant), Asian nationally, Charact_Var. Quality kitchen, Tenure_% own paid, African nationally

b. Dependent variablese: Price variation % (ABS) 2007-09

Model		Non-standardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
		B	Stand. Error	Beta			Tolerance	FIV
1	(Constant)	4,724	2,795		1,690	0,105		
	Asian nationality	0,398	0,084	0,681	4,731	0,000	0,641	1,561
	Charact_Var. Quality kitchen	0,138	0,050	0,339	2,758	0,011	0,878	1,139
	Tenure_% own paid	0,198	0,051	0,659	3,928	0,000	0,472	2,121
	African nationality	0,322	0,139	0,355	2,309	0,030	0,562	1,778
	Caract_Var. Heating	-0,040	0,018	-0,29	-2,246	0,035	0,793	1,260

a. Dependent variablese: Price variation % (ABS) 2007-09

Source: Base appraisal of residential values provided by Arends & García-Almirall (2013), quantitative indicators made by Jimenez (2011) and official statistics pages. Own development.

In this second model, in addition to the variation in the quality of the kitchen and the variation in the existence of heating, variables were the percentage of population of Asian nationality, the percentage of people of African nationality and finally, the percentage of population with home ownership paid. All these values are positive, except the variation in heating existence, since the quality property in this period is indirectly related to the variation of its value in absolute terms. These results confirm the relationship between socioeconomic characteristics of the population and the spatial variation of values per m^2, as had been observed in the stage of inflation. The Pearson correlation, in this period, between the level of income and people of African nationality is significant at 95% and has a value of -0,455, as expected. In the case of the population of Asian nationality and tenure regime resulting in the model, surprisingly they are not statistically significant at the 95% confidence level with the level of income, obtaining a value of -0,365 and 0,016 respectively. However, the sign is expected as the population of Asian nationality, and that the greater proportion of this group exists in a smaller neighborhood is their income level.

The spatial distribution of the variables obtained shows that there is a higher percentage of people of Asian and African nationality in the center and the periphery of the city. These results suggest a tendency of immigrants to settle in areas of the city with low socioeconomic status and highlight the replacement process has been in those neighborhoods where the resident population, strongly associated with the working classes, has gradually been replaced by the immigrant population. Finally, the variable relating to the tenure, despite being slightly positive is not statistically significant. This is due to the spatial distribution of this variable is not as clear as the other variables by the city's own characteristics. The neighborhoods with a lower percentage of the population under ownership paid do not correspond in all cases to areas of greater

purchasing power of the city, but to areas with a higher percentage of the population rent, ie helmet old and the central area.

Conclusions

The analysis offered throughout this article show the relationship between socioeconomic status of the population and spatial distribution of variation in house prices in the city of Barcelona during the studied period (2004-2009). As pointed Josep Roca (1983) social prejudices tend to prioritize the property market differentiation impacting land values, and consequently housing.

The results suggest that once controlled the architectural features of homes, various socioeconomic indicators have an impact on explaining the uneven variation of residential values in the case of Barcelona. So that the areas where the population lives with less resources are most affected by the processes of revaluation and devaluation associated with residential macroeconomic changes. These areas are, on the other hand, the immigrant population given their slim chances of property auction end up living in the most disadvantaged areas concentrated. Our main hypothesis is that both the original population of these areas historically associated with working classes, as the immigrant population not only have lower educational levels than the average of the city, but also a lower financial training. Therefore it is likely, that together, in the time of economic boom has allowed access to the property by way of mortgage without any possible consequences that might flow from the then unlikely change in the economic cycle, and increasing residential values. So that the financial crisis, the increase in the unemployment rate (with defaults consequential and property repossessions), and reducing migration flows (even reversed in some cases) has also produced in these neighborhoods a greater fall property values. Quite the contrary, in well-off neighborhoods both the increase and the reduction in prices has been smoother, and it is likely that behind this greater stability underlies a population with more knowledge about the consequences of over-indebtedness, and a correlative better training and therefore a more robust labor position before the crisis and reduced reliance on financial markets to access a first home.

It is necessary therefore to make a reflection on the implications of the housing market on social equity, not only from a spatial perspective as it has done in the traditional way, but also temporary. It must be controlled in a more comprehensive way the mortgage market protecting citizens against possible abuses of the banking system and encouraging policies of financial education in order to reduce the overvaluation of housing and social exclusion in acquiring it. It remains to see how far the conclusions reached by our analysis are maintained in areas of broader, able to incorporate areas aimed at second home extension study. It is very likely that the inclusion of those territories that have been the focus of speculative real estate processes, reveals the existence of multiple real estate bubbles.

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