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The Spanish mortgage crisis: Evidence of the concentration of foreclosures in the most deprived neighbourhoods

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Abstract

The Spanish mortgage crisis has resulted in a massive process of home dispossession through foreclosures. This process forms part of the logics of accumulation by dispossession supported by the Spanish financial and real estate model. The article uses the city of Lleida as a case study to show that the effects of this phenomenon has tended not to be spatially homogenous, but rather to be more concentrated in the most deprived urban areas. The analysis has been focused on two approaches: (1) identifying the characteristics of housing affected by foreclosure processes that have resulted in evictions, and; defining the spatial distribution patterns of this housing. This work demonstrates how evictions due to mortgage foreclosures have followed very clear patterns. Firstly, they have predominantly been focused on lower quality housing (identified in this study as the cheapest and smallest properties). Secondly, Getis-Ord G_i^ spatial statistic has been used to show that they have been concentrated in the most deprived areas of the city. Both issues confirm the central hypothesis of our study: the Spanish mortgage crisis has exacerbated existing urban disparities.*

Zusammenfassung

Die spanische Immobilienkrise führte zu massiver Wohnraumenteignung in Folge von Zwangsräumungen. Dieser Prozess ist Teil einer Logik der Akkumulation durch Enteignung, die durch das spanische Finanz- und Wohnungsmarktsystem begünstigt wird. Der vorliegende Beitrag zeigt anhand der Fallstudie der Stadt Lleida, dass sich die Effekte dieses Phänomens tendenziell nicht als räumlich homogen erweisen, sondern vielmehr in den am stärksten benachteiligten städtischen Räumen konzentriert auftreten. Die Analyse legt ihren Fokus auf zwei Ansätze: (1) die Identifikation von Charakteristika des Wohnraumes, der von Kündigungsprozessen und infolge dessen von Zwangsräumungen betroffen ist, und (2) die Bestimmung der räumlichen Verteilungsmuster dieser Wohngebiete. Die Arbeit zeigt, dass Räumungen durch Zwangsvollstreckungen sehr klaren Mustern folgen. Erstens fokussieren sie vorwiegend auf Wohnraum geringer Qualität (der in der vorliegenden Studie als preisgünstigster und kleinster Wohnraum definiert wird). Zweitens wurde Getis-Ord G_i^* als Tool für räumliche Statistik verwendet, um zu zeigen, dass sie sich in den am stärksten benachteiligten Bereichen der Stadt konzentrieren. Beide Aspekte bestätigen die zentrale Hypothese der Studie: Die spanische Immobilienkrise hat existierende städtische Disparitäten verschärft.

Keywords: mortgage crisis, foreclosures, evictions, housing, deprived neighbourhoods, Spain

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1. Introduction

The history of capitalism is the history of its crises. Every time that it has been confronted by its own contradictions, this form of production has found no other answer than to reinvent itself, pushing back its limits and thereby acquiring renewed vigour, although always at a certain cost (*Lapavistas* 2012: 17). Within this approach, the proliferation of mortgage foreclosures has become one of the main manifestations of the global financial crisis that began in 2007. Previously, the global financialization of housing markets (*Aalbers* 2008; *Gotham* 2009; *Rolnik* 2013) and speculative real estate practices (*Foster* and *Magdoff* 2009; *Stephens* 2007) had led to a massive increase in the overexposure of household economies to credit, with this being especially true during the years of the property boom (from the 1990s to 2007). The bursting of the property bubble and the accelerated growth in unemployment from the onset of the crisis resulted in a wave of evictions associated with mortgage foreclosures caused by the inability of an increasing number of families to meet the cost of their mortgage payments. In the USA, the mortgage crisis has resulted in more than 7 million foreclosures since 2007. In Europe, Spain has been the state most affected (with 600,000 mortgage foreclosures which derived in more than 380,000 evictions) (*Beswick* et al. 2016; *Gutiérrez* and *Delclòs* 2016 and 2017). Ireland, the United Kingdom, Italy and Greece have also seen high rates of foreclosures, but at lower rates than in Spain (*European Mortgage Federation* 2011; *Cano* et al. 2013).

The most extensive literature on the mortgage crisis and foreclosures has been developed in the US context. Different case studies have highlighted their contribution to what are known as neighbourhood effects. These have made a direct contribution to urban deprivation and forced displacement (*Schuetz* et al. 2008; *Leonard* and *Murdoch* 2009). Within this context, it has been possible to demonstrate the relationship between foreclosure concentration and falling property values within given neighbourhoods (*Immergluck* and *Smith* 2006a; *Lin* et al. 2009; *Rogers* and *Winter* 2009; *Rogers* 2010; *Frame* 2010) and also their relation to increasing crime rates (*Immergluck* and *Smith* 2006b; *Arnio* et al. 2012; *Baumer* et al. 2012; *Katz* et al. 2013) and contribution to racial segregation (*Rugh* et al. 2010; *Hall* et al. 2015). The second important approach to research in this area has been the analysis of the various negative impacts of the proliferation of foreclosures on public health (*Bennett* et al. 2009; *Saegert* et al. 2011; *Libman* et al. 2012).

In the Spanish context, the growing literature on mortgage crisis and foreclosures combined different points of view, such as its economic and financial dimensions (*Hoekstra* and *Vakili-Zad* 2011; *Coq-Huelva* 2013), the diagnosis of the derived social impacts (*Colau* and *Aleman* 2012), the emergence of social movements, activism and political participation that provides necessary responses to this problem (*Romanos* 2014; *Álvarez de Andrés* et al. 2015; *Barbero* 2015; *Lois-González* and *Piñeria-Mantiñán* 2015), as well as their impact on public health (*Gili* et al. 2013; *Valiño* 2015). However, at present there is a small but growing corpus of academic literature that has analysed the Spanish mortgage crisis from a geographic perspective. *Méndez* et al. (2014), *Méndez* and *Plaza* (2016) and *Obeso* (2014) have made a geographic study for the whole of Spain based on data from its 431 judicial districts; however, the territorial scale adopted in this study does not allow an analysis of the uneven distribution of foreclosures within Spanish cities. *Vives-Miró* et al. (2015) and *Gutiérrez* and *Delclòs* (2016) have used different sources that have permitted an urban scale approach to the study of this phenomenon based on case studies. The work of *Vives-Miró* et al. (2015), which was based on a compilation of data from the *Common Service of Notices and Foreclosures of the Palma courts* (Majorca), made it possible to show the spatial patterns of foreclosures and evictions carried out within the judicial district of Palma. *Gutiérrez* and *Delclòs* (2016), on the other hand, used data collected from the real estate advertisements published on the web portals of the real estate subsidiaries of the 17 main financial institutions in Catalonia to georeference the housing stock held by these financial entities that had been acquired through mortgage foreclosure processes in the Catalan cities of Tarragona and Terrassa. Until now, however, no study had analysed this phenomenon from the perspective of the characteristics of housing units that were foreclosed and evicted. For this reason, our work seeks to contribute to the field by adding new evidences based on the results obtained from applying a methodology designed specifically for this purpose and applied in the city of Lleida. The objective of this article has therefore been to identify the characteristics of housing units that were evicted due to a mortgage foreclosure (their surface area and market price) and to undertake a spatial analysis of the relationship between these characteristics and their distribution pattern within the different neighbourhoods of the city. This constitutes a novel contribution to the study of the territorial logic of evictions in Spain, as it allows us to identify both

the type of housing affected and the neighbourhoods in which this phenomenon has mainly been concentrated.

This research is based on, and seeks to validate, the following hypotheses:

1. Previous studies showed that evictions due to mortgage foreclosures have mainly affected the most precarious sectors of society (*Gutiérrez and Delclòs 2016; Valiño 2013; Vives-Miró et al. 2015*). These sectors include families with lowest income and least capacity to access the property market; consequently they have tended to acquire the lowest quality housing. As a result, the type of housing most affected by mortgage foreclosures has tended to be that of the lowest quality (understood as that of the smallest surface area and market price).

2. The urban areas in which these evictions have been most concentrated are, precisely, the most precarious neighbourhoods. The neighbourhoods with the greatest percentages of working class population, and with the greatest relative presence of lower quality housing, are the ones that have seen the greatest number of evictions due to mortgage foreclosures.

The confirmation of both hypotheses would allow us to demonstrate that the mortgage crisis has contributed to the exacerbation of existing urban inequality: processes of home dispossession have clearly tended to predominantly affect the poorest families and most precarious neighbourhoods. Moreover, this study contributes to better understand the spatial logics of the uneven geographical development of mortgage crisis.

After this introduction, we present the framework within which this research was carried out: the Spanish financial and property model in the global context of financialization of the built environment and how it has led to the mortgage crisis (section 2). We then introduce the study area (the city of Lleida) and justify the data source for our research and the methodology used to exploit it (section 3). In section 4 we present and discuss the results obtained. Finally, section 5 ends with some concluding remarks that can be drawn from these results.

2. Background: the mortgage crisis, foreclosures and urban inequality in Spain

Although the current crisis had its origins in the global model of accumulation, it manifested itself in different forms in each region and according to its position

within this model. The different types of financialization, the role played by the state in the construction and maintenance of the model of accumulation, and the roles played by the different financial and property agents have been specific to each country. As a result, the specialization of the countries of Southern Europe in tourism and construction has led to them currently suffering a much deeper crisis than elsewhere. The South of Europe has consequently suffered massive capital devaluation, the closure of production facilities, a rapid growth in unemployment, the spread of social exclusion and poverty and a sharp fall in living standards (*Charnock et al. 2014*).

The fact that Spain has been one of the countries most hard hit by the current global financial crisis is not the result of chance or bad luck. It is a consequence of a model built on property-based debt (*López and Rodríguez 2010; Naredo 2010*). This dynamic has its origins in economic policies that were first promoted during the Francoist regime and which became consolidated as part of a hegemonic model from the 1980s onwards, following Spain's entry into the European Union. What best characterizes this model is massive capital investment – especially European, but also Spanish – in the secondary circuit (*Harvey 1982*), consolidated as a spatial fix (*Gotham 2009; Harvey 2003; Lois et al. 2016*), which triggers what has been called “tsunami urbanisation” (*Fernández Durán 2009*) or “property market hypertrophy” (*Gutiérrez and Delclòs 2015*).

Within this context, the massive proliferation of evictions following the bursting of the property bubble and the global financial crisis has been one of the most evident products of the Spanish financial and property development model (*Coq-Huelva 2013; Burriel 2014; Colau and Alemany 2012; Méndez and Plaza 2016; Valiño 2013; Vives-Miró et al. 2015*). The financialization of the built environment, the housing price bubble and public policy clearly aimed at promoting owner-occupied housing all contributed to the overexposure of Spanish household economies to credit during the years of the property boom (1997-2007). The rapid growth in the unemployment rate since the onset of the economic crisis has subsequently made it impossible for an increasing number of families to meet the cost of their mortgage payments. Since 2010, the unemployment rate has constantly remained above 20%. Moreover, according to Eurostat data for 2014, 29.2% of the Spanish population face the risk of poverty or social exclusion and 42.7% of Spanish families

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are unable to meet unexpected financial expenses. Aided by mortgage legislation which is particularly permissive for landlords, this situation has led to a process of large-scale home dispossession and to the impoverishment of large sectors of Spanish society.

The mortgage crisis has taken place within the framework of Spain's financial and property model, which has political and economic roots that date back over several decades (Fernandez Durán 2006; Naredo 2010; Romero et al. 2012). In other words, the evictions have not been an isolated phenomenon, but rather constitute just one of the consequences of a series of public policies that, again, date back to the time when the Francoist regime promoted the homeownership as a way to social control. The democratic governments did not introduce significant public policies to reinforce their orientation in the promotion of rental housing (López and Rodríguez 2010). This has led to the current situation in which Spain is the Western European state with the highest percentage of homeownership (over 80% according to Eurostat data); this compares with only 50%, just five decades ago. A mixture of demographic, economic, cultural and political factors produced this increase in demand for homeownership in Spain (Fernández and Cruz 2013; Romero et al. 2012; Rullan 2012; Vinuesa 2013). Even so, it is essential to underline the role of the financial sector as a key driving force behind this phenomenon. Moreover, this all took place under the umbrella of the public policies that allowed and encouraged the progressive financialization of housing (Aalbers 2008; Coq-Huelva 2013; Herce 2013; Sevilla-Buitrago 2015). This model was based on the conception of housing as a spatial fix for capital investment and as an effective way for creating and appropriating urban rents (Vives-Miró and Rullan 2014). Although the subjacent logic of this model was not new, the property boom and pricing bubble during the decade 1997-2007 exacerbated its implications (Burriel 2014; Romero 2010; Rullan 2012). Global financial capital, fed by the increasing deregulation and the search for investment opportunities in products offering high short-term benefits, found very attractive speculative possibilities in the Spanish property market (Stephens 2007). Thus, within a global context dominated by the financialization of the economy, capital found in housing production (and more generally in the production of the city) a way to speculate, generate and appropriate rents (Aalbers 2008), thereby contributing to the secondary circuit of accumulation (Gotham 2009; Lefebvre 1974).

Within this context the indebtedness of families grew exponentially. The increase in the number of years over which mortgages were taken out helped to reduce the level of interest rates. This also meant that despite continuous increases in prices and the stagnation of salaries, the number of families with mortgages continued to grow, year after year (Donat 2014). Thus, according to data from the Bank of Spain, analysed by the Metropolitan Observatory of Madrid, during the period 1994-2007, Spain's total volume of mortgage debt had been multiplied by twelve, passing from € 24,000 million to € 300,000 million (López and Rodríguez 2010: 190).

Since the bursting of the real estate bubble, the fall in housing prices and the beginning of the financial and economic crisis, there has been an enormous increase in the number of foreclosures and evictions in Spain (Méndez et al. 2014; Méndez and Plaza 2016). The rapid increase in unemployment, in addition to the overexposure to credit risk, has led to a growing number of families to the impossibility of paying their credit loan and, with this, the explosion of the eviction crisis (Gutiérrez and Delclòs 2016). The overexposure to credit risk and then the rapid extension of mortgage foreclosures have been two steps that have formed part of the same process: the financialization of the built environment and the appropriation of urban rents through home dispossession. The global mobility of financial capital, the conversion of land and housing into capital assets and the mercantilization of urban development and the production of the city, helped to maintain the model of neoliberal urbanisation during the expansive phase of the cycle (Harvey 2006). Now, from the onset of the mortgage crisis, evictions have allowed to feed processes of accumulation by home dispossession (Harvey 2003). These processes have completed the cycle of generating and appropriating urban rents.

From all of this, it can be seen that home dispossession processes fuelled thanks to the mortgage crisis have not affected the whole of society in the same way, but have tended to hit hardest the lower-income classes (Colau and Alemany 2012; Valiño 2013). In fact, as in all of the crises of capitalism, processes of dispossession have been focused on the most precarious areas and social groups (Harvey 2003). This mechanism has implied the exacerbation of their precariousness and has fuelled social inequalities and urban polarisation and fragmentation.

3. Data and methods

3.1 Study area

The city of Lleida has been selected as a case study. This is a medium-sized city (137,000 inhabitants in the 2011 census) and provincial capital which is located in inland Catalonia in a predominantly rural area quite distant (150 km) from the metropolitan area of Barcelona. This allowed us an individualised analysis of the urban dynamics of the city (its segregation and the inequalities between its different neighbourhoods) without the need to incorporate any explanatory factors relating to the metropolitan scale.

Lleida is a classical Mediterranean compact city. However, the urban growth experienced during the second half of the 20th century consolidated some peripheral neighbourhoods with social and built environment characteristics that are clearly differentiated from those of the traditional city centre and upper-middle class areas of the city. Thus, the peripheral neighbourhoods of Pardinyes, Balafia, La Mariola, Magraners and La Bordeta (see *Fig. 1*) were constructed in the last decades of the period of the Francoist regime (in the 1960s and 1970s) and concentrate the greatest volume of low quality and social housing in the city.



Fig. 1 Study area: the city of Lleida. Source: Own elaboration

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These common patterns observed in the peripheral neighbourhoods have allowed the present work to relate the spatial distribution of mortgage foreclosures to the characteristics of the neighbourhoods in which they tend to be concentrated, using an approach that could be replicated in other Spanish cities.

The research work presented in this paper seeks to validate a new source of data for the characterisation and analysis of the spatial distribution of housing affected by evictions due to mortgage foreclosures in Spain. This required a case study that was not an excessively large city. The fact that Lleida is a medium-sized city allowed us to validate the data obtained from the proposed source using qualitative information in fine detail. This research involved meeting and interviewing representatives of associations of neighbours from the parts of the city that have been most affected by foreclosures, of property development companies associated with the six main financial entities operating in the city, and of the local assembly of the *Plataforma de Afectados por la Hipoteca* (Platform of Mortgage Victims - PAH).

There are no official data on the number of foreclosures and evictions that have taken place in the city of Lleida (see the next section for more details concern-

ing the lack of disaggregated official data available at the municipal level in Spain). However, data relating to the whole judicial district of Lleida (which included 65 municipalities with a total of 243,000 inhabitants in the 2011 census) show that this is one of the judicial districts with the highest rates of foreclosures in Spain. *Figure 2* shows the total number of judicial processes associated with mortgage foreclosures initiated by year in both the judicial district of Lleida and the whole of Spain since 2001. It can be appreciated that both cases have experienced a similar evolution. There was a rapid growth in the number of foreclosures in 2008 and 2009, a second upturn in 2012, and then a relative reduction in newly initiated judicial processes in recent years. In contrast, *Figure 3* illustrates how the relative concentration of foreclosures (judicial processes of mortgage foreclosure initiated per 1,000 inhabitants and year) in Lleida has been clearly greater than the average for Spain. Indeed, according to *Méndez and Plaza (2016)*, Lleida was the Spanish province with the 8th highest foreclosure rate during this period. It was also the only province with in the twenty with the higher foreclosure rates which is not located on the Mediterranean coast or within the metropolitan region of Madrid.

Fig. 2
Number of judicial processes of mortgage foreclosures initiated by year (2001-2015) in the judicial district of Lleida (left axis) and Spain (right axis). Source: Own elaboration based on data from the General Council of Judicial Power

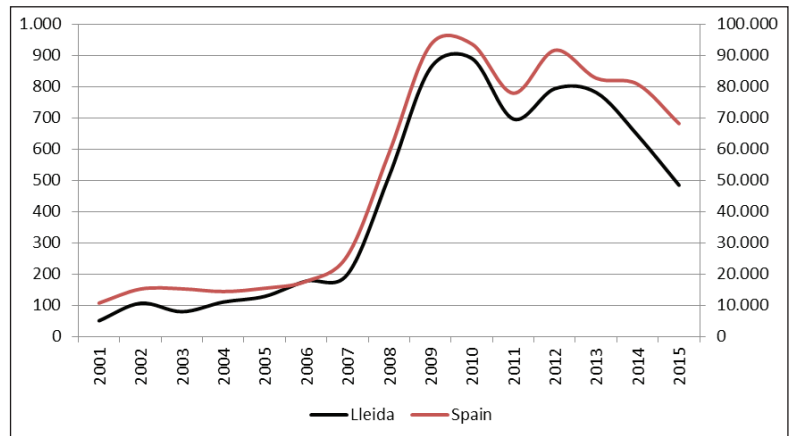
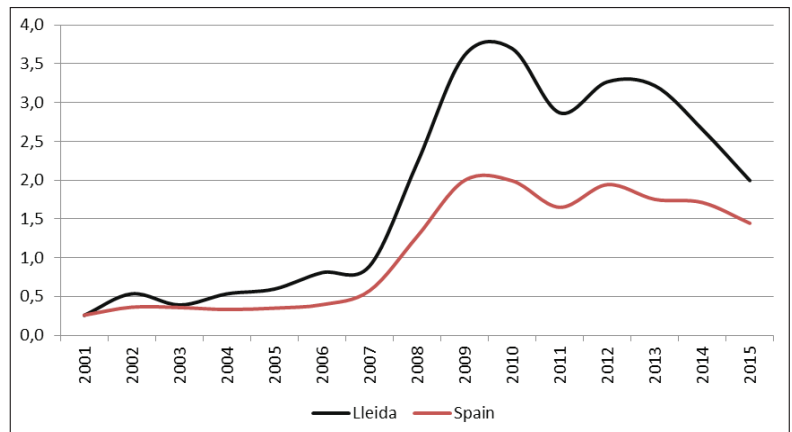


Fig. 3
Judicial processes of mortgage foreclosures initiated by year (2001-2015) per 1,000 inhabitants in the judicial district of Lleida and Spain. Source: Own elaboration based on data from the General Council of Judicial Power



3.2 Data

The *Consejo General del Poder Judicial* – General Council of the Judiciary (CGPJ) and the *Instituto Nacional de Estadística* – National Institute of Statistics (INE) are the only organisations that provide official data on the territorial distribution of mortgage foreclosures and evictions in Spain. In the case of the CGPJ, data are available to the general public from 2009 onwards and aggregated by judicial district. Spain has 431 judicial districts, almost all of which are supra-municipal scale organisations. As a result, they do not permit a disaggregation of data at the city or neighbourhood scale. In the 12 largest cities, the judicial districts correspond to the whole municipality. However, it cannot be used to obtain data at the infra-municipal scale (neighbourhood, district or census tract). On the other hand, the INE has published aggregated data on the number of evictions per province since 2014. This, however, does not serve the purposes of the present research either. This is a very relevant deficit because evictions, like any other socioeconomic phenomenon, should also be analysed on the basis of their territorial patterns. In order to overcome the limited scale of analyses permitted by the official data, we used secondary alternative (non-official) data sources. We used the housing units in hands of financial entities (HOB - Housing units Owned by Banks) as a *proxy* for evictions due to mortgage foreclosures. All this stock is composed by housing that has been acquired by banks through mortgage foreclosures that have implied the eviction of former residents.

The fast growth of foreclosures in Spain resulting from the mortgage crisis has supposed that banks have emerged as the new large-scale property owners. As a result, Spain's main banks have created property subsidiaries encharged with managing and selling their property assets. This strategy is also a consequence of their objective to transfer toxic assets to other companies. This forms part of the wider financial strategy of sanitising the Spanish banking sector within the framework of the Spanish bank sector rescue and the agreement that involved the Memorandum of Understanding signed with the European Commission in 2012. These property subsidiaries use their web pages to promote and sell all the housing stock accumulated through mortgage foreclosures. The webpages of each property company contain a list of the housing available, and each housing unit's advertisement contains detailed information about the characteristic of the property. The data used in this study have been obtained from a systematic exploitation of the websites of the property subsidiaries of the ten most important financial entities in Catalonia¹. This operation was carried out between the months of August and September 2015 and it was

possible to identify 614 HOB in the city of Lleida (see *Fig. 4*). By following this procedure, it was possible to create a database in which each item (each HOB) includes information about its location (full postal address) and other main characteristics (its year of construction, surface area, number of rooms, market price and current owner bank). These data were obtained from each advertisement that was used to offer these properties for sale on these webpages. All the advertisements found during the collection date were included in the database (614 HOB). There was not applied a criteria of discrimination. The resulting database did not only provide information about the distribution patterns of the evictions due to foreclosures (see *Figure 4* to appreciate spatial distribution of HOB and their bank owners), but also provided details of the characteristic of the foreclosed homes. This is information that was not available from any other direct or indirect source and illustrates why the exploitation of this source of data could provide new evidences for the study of mortgage crisis in Spain.

As this is an approximation based on indirect sources, it is necessary to outline the limitations of the source used. Firstly, it is important to underline the fact that the database includes both housing that the financial organisations offer for rental and that which is offered for sale. It also includes different types of housing, including flats, apartments and single-family detached houses. Secondly, it should be noted that the new housing units offered by these companies have not been included in the study. These are not associated with eviction processes as they have never been occupied by any resident. This is housing that has not been sold and that has ended up in the hands of the bank as a result of the inability of the builder or promoter to return its credits. In contrast, all of the not new housing in the hands of the banks has been acquired through mortgage foreclosures that have resulted in evictions.

Finally, it is needed to underline two of the particularities of the database generated. Firstly, this source provides data focused on evictions due to mortgage foreclosures, but it does not provide any data about evictions resulting from the non-payment of rent. For this reason the research objectives of this work have been centred on evictions related to the mortgage crisis. Secondly, these data do not represent the total number of evictions due to mortgage foreclosures carried out in the city, nor do they include all of the ones carried out in a specific period. Instead, they reflect the total accumulated stock into the hands of the banks, in September 2015. All in all, and taking into consideration the previously mentioned conditioning factors, this source does not allow us to de-

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termine the total number of mortgage foreclosures and evictions in Lleida. However, it allows us to identify the main characteristics of housing affected and their territorial distribution pattern, all of this using a sample that is highly representative. According to the official data facilitated by the CGPJ for the whole judicial district of Lleida by the period of 2008-2015, we were able to estimate that our HOB's sample corresponds to between 25 and 30% of the total mortgage foreclosures undertaken in the city. In other words, it provided a highly representative sample.

As well as this source, data from the Lleida's Municipal Register of Inhabitants and Real Estate Cadastre were also used. The extractions of both databases were made on October 2015 and were exploited at the urban block and census tract levels (one or the other aggregation level has been used in response of the different require-

ments of the statistical and spatial analysis applied). The Municipal Register of Inhabitants provides information about residents at the postal address level. We used these data to construct the dataset for the rate of HOB per 1,000 inhabitants per urban block and census tract. Data from the Municipal Register of Inhabitants were also used to calculate the weight of the immigrant population by neighbourhood. The Property Register provides detailed information about all of the properties in the municipality. However, for this study, we only used data corresponding to housing units. The information used included the location of the postal addresses of all the housing stock in the city, the cadastral value of each of these housing units, and their surface areas and level of conservation. The dataset generated allowed us to calculate the rate of HOB per 1,000 housing units per urban block and census tract and to characterise the housing units included in each territorial unit.

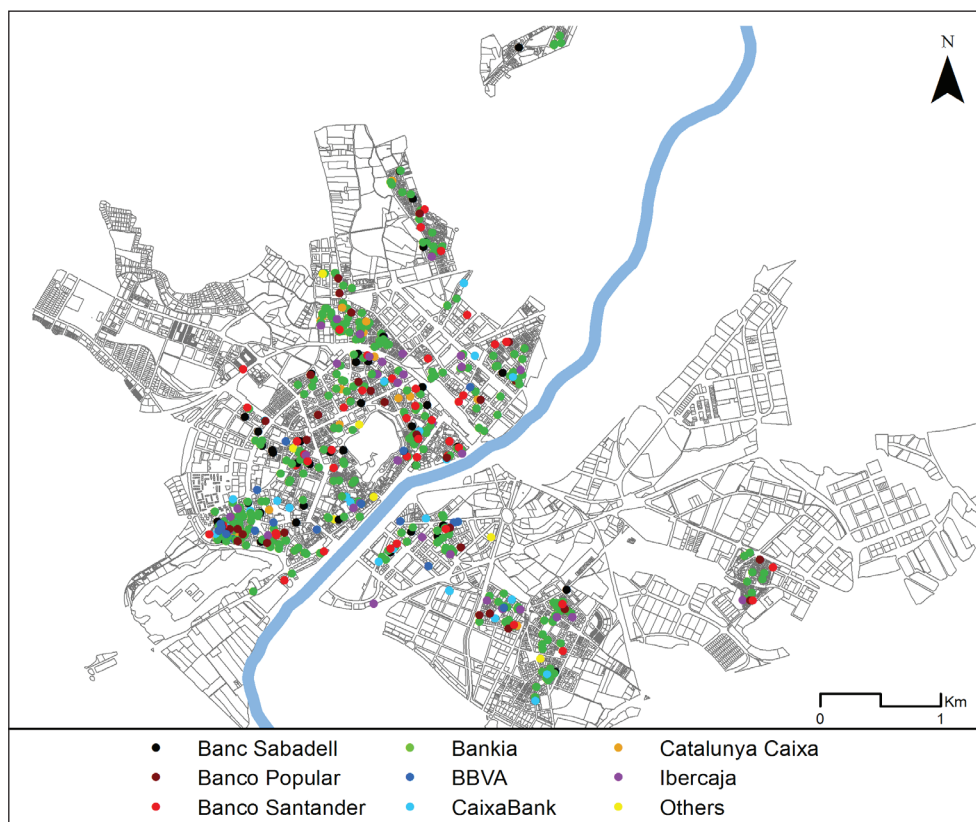


Fig. 4 Spatial distribution of foreclosures in Lleida and the banks responsible. Source: Own elaboration

3.3 Methods

The disaggregation detail of the database generated allowed us to carry out spatial analysis at different scales within the infra-municipal level. A Getis-Ord General G spatial statistics analysis was applied to identify the degree of clustering of the HOB within the city. To work with this, we used ESRI ArcGIS 10.3 ©. This high/low clustering tool (Getis-Ord general G) produces deductive statistics. This means that the results of the analysis are interpreted with respect to null hypothesis². The results provided were: the statistical significance level (p value), the expected General G index, the observed General G index, and the Z score. The Getis-Ord General G spatial statistic is defined as:

$$G = \frac{\sum_{i=1}^n \sum_{j=1}^n w_{i,j} x_i x_j}{\sum_{i=1}^n \sum_{j=1}^n x_i x_j}, \forall j \neq i$$

Where x_i and x_j are attribute values for features i and j , and $w_{i,j}$ is the spatial weight between feature i and j . n is the number of features in the dataset and indicates that features i and j cannot be the same feature.

The z_G -score for the statistic is computed as:

$$Z_G = \frac{G - E[G]}{\sqrt{V[G]}}$$

Where:

$$E[G] = \frac{\sum_{i=1}^n \sum_{j=1}^n w_{i,j}}{n(n-1)}, \forall j \neq i$$

$$V[G] = E[G^2] - E[G]^2$$

The high/low clustering tool was applied using the volume of HOB by urban blocks as a spatial database. When the p value showed that the results were statistically significant, it was possible to reject the null hypothesis. If rejected, the z score sign then became important. If the value of the z score was positive (observed General G > expected General G), this indicated that the high HOB values by urban blocks were spatially clustered. If the value of the z score was negative, (observed general G < expected General G), this indicated that the low HOB values by urban blocks values were clustered. A fixed distance of 300 metres was used as a unit of calculation to identify spatial relationships of concentration or dispersion based on values given by zone.

On the other hand, the local Getis-Ord G_i^* (Hot Spot Analysis) uses a calculation that takes into account the values of each of the features considered and also those of its neighbouring ones; this makes it possible to calculate the level of spatial clustering of a given feature. The cluster analysis was carried out using urban blocks as the basic unit of calculation and aggregating the total number of HOB contained in each block. The analysis also used 300 metres as a fixed distance for clustering calculations. The Hot Spot Analysis tool gives a z score for each feature in the dataset (for each block), which can be significantly positive or negative with a minimum confidence level of 90%. The local Getis-Ord statistic is given as:

$$G_i^* = \frac{\sum_{j=1}^n x_{i,j} x_j - \bar{X} \sum_{j=1}^n w_{i,j}}{\sqrt{\frac{[n \sum_{j=1}^n w_{i,j}^2 - (\sum_{j=1}^n w_{i,j})^2]}{n-1}}}$$

Where x_j is the attribute value for feature j ; $w_{i,j}$ is the spatial weight between feature i and j ; n is equal to the total number of features and:

$$\bar{X} = \frac{\sum_{j=1}^n x_j}{n} \quad S = \sqrt{\sum_{j=1}^n x_j^2 - (\bar{X})^2}$$

The areas with the greatest concentrations of HOB were identified based on the concentration of blocks with statistically significant positive z scores; the higher the z score, the more intense was the clustering of high values.

Moreover, the Getis-Ord G_i^* statistic was applied to all of the HOB (individual values, not aggregated by urban blocks), taking into account the surface area and market price of each HOB. In other words, it was associated their spatial distribution and clustering patterns with their market prices and surface areas. This calculation allowed us to validate the research hypotheses as it would show whether the HOB with lower market price and smaller surface area tended to cluster and, if they did, where this occurred.

In addition to confirming the spatial clustering, we also calculated the Pearson's correlation coefficient between the concentration of HOB and the characteristic of the housing stock in each census tract of the city, based on data from the Municipal Property Register. The variables used were the following: HOB per 1,000 inhabitants; HOB per 1,000 housing units;

the percentage of poorly conserved housing units; the percentage of housing units smaller than 90m²; the percentage of housing units larger than 120m²; and the average property value. This allowed us to confirm whether the clustering patterns were related to the characteristics of the urban fabric of each neighbourhood. The statistic also allowed us to measure the correlation or association between two random quantitative variables. This was defined using the cross products of the standardized scores of the variables X and Y, as set forth in the following formula:

$$r_{xy} = \frac{\sum Z_x Z_y}{N}$$

The results of the Pearson statistic produce values ranging from + 1 to - 1. Values near to zero show the absence of any statistical correlation between the variables studied. The nearer the result is to 1, the stronger the direct, or positive, correlation (an increase in one implies an increase in the other), while the nearer it is to -1, the more intense the inverse, or negative, correlation (an increase in one implies a reduction in the other, or vice versa).

4. Results

4.1 Foreclosure clustering

Figure 5 shows the distribution of HOB by census tracts expressed in relative terms: HOB per 1,000 housing units (left) and HOB per 1,000 inhabitants (right). Both maps show the concentration of HOB in certain urban areas. From them, it is possible to note how evictions due to mortgage foreclosures have not had a homogenous or random distribution, but have tended to be concentrated in certain neighbourhoods. In fact, they have had a particularly high presence in the most peripheral neighbourhoods of the city: La Mariola, Balafia, Secà de Sant Pere, Pardinyes, La Bordeta and Mangraners. As previously mentioned, these are all predominantly working class neighbourhoods that developed in the 1960s and 1970s to accommodate immigrants from the rest of Spain who arrived as a result of development plans corresponding to the latter years of the Franco dictatorship. These are all neighbourhoods with an important presence of social housing and urban planning problems that derive from the poor quality of their built environment. Table 1 shows key socioeconomic and housing indicators of all the mentioned neighbourhoods, all of them could be compared with the city average. As priority areas for public intervention, they have been beneficiaries of a series of urban regeneration programmes over

the last few decades. Along these lines, it is relevant to highlight the fact that La Mariola and Balafia, the neighbourhoods with the greatest presence of HOB, are the urban areas which successive local governments have recognised as being the most vulnerable of the city. These have therefore been the two districts that have received the greatest amount of public investment in the last few decades. This investment has largely been aimed at providing amenities and services, improving the quality of public spaces, renovating housing and, above all, improving habitability (Gutiérrez and Paül 2011; Bellet and Mòdol 2007; Roquer et al. 2013). Both neighbourhoods, among and others, are defined as the most vulnerable areas of the city in the 2001 and 2006 edition of the "Atlas of Urban Vulnerability" (Ministerio de Fomento 2011).

One exception to this general dynamics has been the city's Historic Centre, which is also one of its most deprived areas (identified as one of the most vulnerable areas in the "Atlas of Urban Vulnerability", too). It has suffered an important degree of both physical and functional degradation and concentrated low-income residents. The city's drug trafficking has been concentrated in this area and, as a result, it has suffered a serious problem of stigmatisation. Over the last three decades, it has also received an important amount of public investment for urban renewal and socioeconomic revitalisation programmes. It still suffers serious socioeconomic problems, but from the point of view of our study, the Historic Centre does not have a presence of HOB comparable to the neighbourhoods of La Mariola and Balafia (see Historic Centre's indicators in Table 1). This is explained by the presence in the Historic Centre of an important volume of housing in the hands of a single landlord and the fact that individual flats are offered for rental. This has made the Historic Centre the neighbourhood with the greatest volume of rented housing in the city. According to census data (2011) 53.2% of the households in the Historic Centre correspond to rental tenants (as opposed to 20.9% for the whole city), while only 19.1% of the households are home owners paying a mortgage (compared to 35.6% for the city of Lleida as a whole). As a result, evictions due to mortgage foreclosures have had a smaller presence here (Bellet and Gutiérrez 2014). On the other hand, Figure 5 also allows us to observe how the upper-middle class neighbourhoods of Ciutat Jardí, Joc of Bola and Humbert Torres (in the northeast of the city) are the areas that have been least affected by mortgage foreclosures.

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The results of applying the Getis-Ord General G confirmed that the distribution of HOB in the city was neither random nor lowly clustered. *Figure 6* shows that the z-score was 6.845 and that the p-value was

less than 0.01. The combination of the two variables implied the existence of high clusters with a level of statistical significance of more than 99%.

Table 1 Key socioeconomic and housing indicators of the neighbourhoods with the highest concentration of HOB. Source: Own elaboration based on data from Municipal Register of Inhabitants and Real Estate Cadastre

	Mariola	Secà de St. Pere	Mangraners	Bordeta	Balàfia	Historic Centre	Lleida
HOB per 1,000 inhabitants	17.9	17.6	14.0	14.0	13.4	7.9	7.7
HOB per 1,000 housing units	7.8	6.9	5.6	6.1	5.8	4.5	3.6
% Poorly conserved housing units	39.6	28.8	37.3	19.2	22.7	36.8	22.6
% Housing units < 90 m ²	66.6	54.5	60.0	42.6	49.9	58.5	42.9
% Housing units >120 m ²	9.1	14.2	12.2	15.0	7.3	17.6	25.8
Average property value (Lleida average = 100)	41.7	54.5	38.7	80.1	70.2	114.1	100.0
% Foreign-born population	20.6	15.9	9.9	12.9	19.6	42.5	16.7
% Population without education	11.8	12.5	13.0	5.3	5.1	8.6	7.3
% Population with university education	8.1	8.8	2.5	11.3	17.7	22.3	25.4

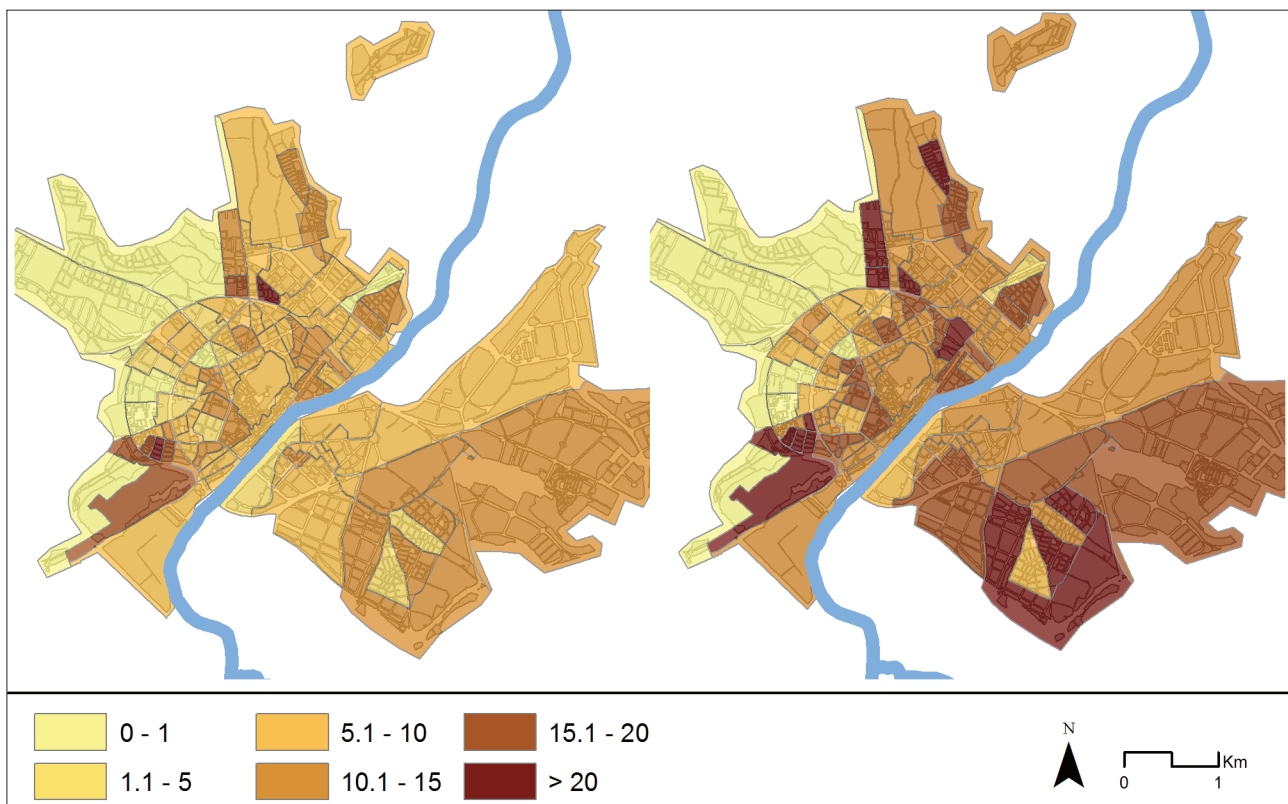


Fig. 5 HOB per 1,000 inhabitants (left) and per 1,000 housing units (right) by census tracts. Source: Own elaboration

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In order to make a deeper spatial analysis of mortgage foreclosures in Lleida, *Figure 7* shows the results of applying the Local Getis-Ord G_i^* statistical analysis based on the aggregation of HOB by urban blocks. The blocks identified with z values (standard deviation) of between -1.65 and +1.65 were those that did not present a statistically significant concentration. The blocks with values of between +1.65 and +1.95 constituted a highly concentrated cluster of HOB with a level of statistical significance of 90% ($p < 0.1$). Those with values of between 1.95 and 2.58 were 95% significant ($p < 0.05$). While those that had z values of greater than 2.58 were evidently clusters, with a level of statistical significance of 99% ($p < 0.01$). The results show that there has indeed been a concentration of HOB in certain neighbourhoods of the city, with them forming clusters or hot spots of high concentration. The neighbourhoods identified as hot spots by Getis-Ord G_i^* spatial statistical analysis were La Mariola and Balafia. In contrast, the neighbourhoods of La Bordeta, some concrete areas of Cappont, and those in the centre of the city presented smaller and less statistically significant clusters, although ones that were still relevant.

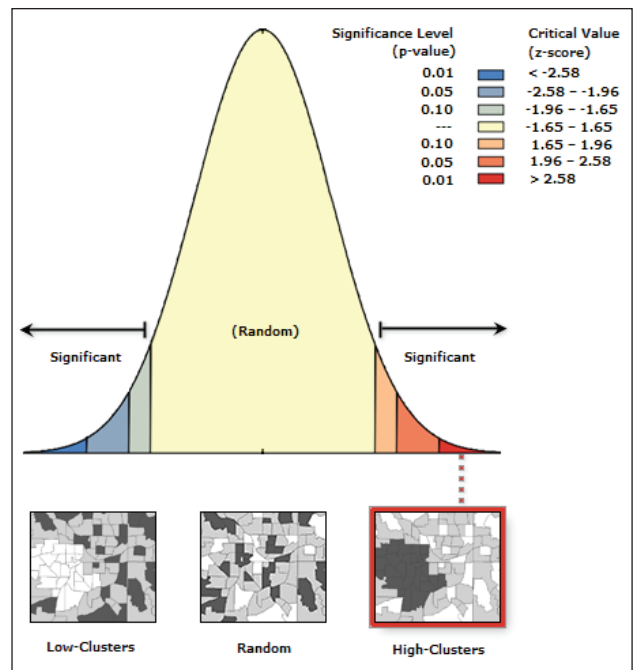


Fig. 6 High-Low Clustering (General G statistic) report

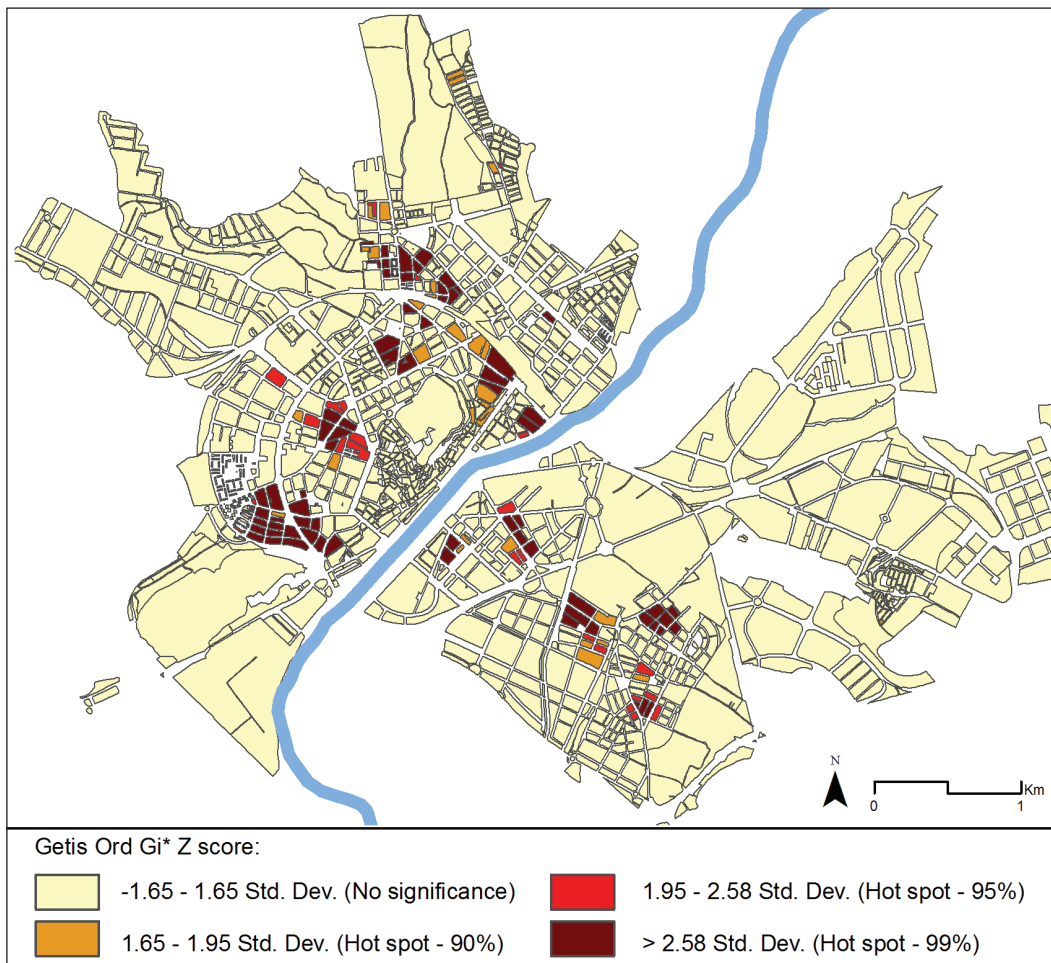


Fig. 7 Clustering of foreclosures in Lleida. Source: Own elaboration

4.2 The concentration of foreclosures in the most run-down housing areas

Tables 2 and 3 show the market prices of the 614 HOB expressed in absolute values (Euros) and in Euros per square metre, respectively. The average price of each HOB was € 64,905. This was 40.7% less than the price of resale (not new) housing on sale in the city and 60.5% less than the selling price of newly constructed housing³. Based on surface area, the average market price of the HOB was € 724/m². This was 30.5% less than the average price of resale housing (€ 1,014/m²) in the city and 49.9% less than the market price of new housing (€ 1,444/m²). These data illustrate how the HOB have a significantly lower value than the rest of the housing in Lleida. In fact, almost 71.3% of them have market prices of less than € 75,000.

The HOB have not only notably lower market price than the rest of the housing in the city, but they are also clearly smaller in size. Table 4 shows how the average surface area of this housing (91.3 m²) is 12.0% smaller than that of resale housing (103.7 m²) and 20.0% smaller than new housing offered for sale (114.1 m²) in Lleida. Thus, while the housing units with areas between 60 and 90 m² represent 33.4% of the housing in the city, it supposes 45.4% of the HOB. On the other hand, the housing units with surface areas bigger than 120 m² represent 19.3% of the housing in the city, but it only supposes 10.5% of the HOB. The combination of low rates for both of these

variables (market price and surface area) shows how the HOB share common characteristics and that these differentiate them from the rest of the housing in Lleida. This allows us to validate the first hypothesis of the research: evictions due to mortgage foreclosures have tended to be concentrated in lower quality housing (housing with smaller surface area and of lower market price).

Another relevant question for our research was to establish whether this housing presented a specific pattern of spatial distribution. Table 5 shows the statistical correlation (based on the Pearson statistic) between the relative concentration of HOB by census tracts and the characteristics of their housing stock. The data show that the greater presence of bigger housing (> 120 m²) and the greater the average value of the housing in census tracts, the smaller was the presence of HOB. On the other hand, the smaller the average size of the housing units included in the census tract and the worse their state of conservation, the greater was the relative presence of HOB. In other words, the data corroborated the fact that mortgage foreclosures have been concentrated in the deprived neighbourhoods, which can be understood as those that include the housing of the lowest quality (with the smallest surface areas, lowest property values and worst state of conservation).

Table 2 Market prices (€) of foreclosed housing units in comparison with local real estate prices. Source: Own elaboration

Price (€)	Housing units	% of total
< 25,000	36	5.8
25,000 - 50,000	176	28.5
50,001 - 75,000	228	37.0
75,001 - 100,000	96	15.6
100,001 - 125,000	48	7.8
> 125,000	33	5.3
Mean market price - HOB (€) (*)		64,905 €
Mean market price, total city of Lleida - resale housing units (**)		109,500 €
Mean market price, total city of Lleida - new housing units (**)		164,200 €
(*) Mean for the HOB		
(**) Mean of the market prices of all the housing for sale in the city of Lleida (disaggregated in new housing and not new (resale) housing units). Values for the whole of the municipality based on data from market study conducted by the Catalan Agency of Housing (2014).		

Table 3 Market prices (€/m²) of foreclosed housing units in comparison with local real estate prices. Source: Own elaboration

Price (€/m ²)	Housing units	% of total
< 500	138	22.4
500 - 700	190	30.8
701 - 900	151	24.5
901 - 1,100	65	10.5
1,101 - 1,300	30	4.9
> 1,300	43	7.0
Mean market price - HOB (€/m ²) (*)		724 €
Mean market price, total city of Lleida - resale housing units (**)		1,041 €
Mean market price, total city of Lleida - new housing units (**)		1,444 €
(*) Mean for the HOB		
(**) Mean of the price of all the housing for sale in the city of Lleida (disaggregated in new housing and not new (resale) housing units). Values for the whole of the municipality based on data from market study conducted by the Catalan Agency of Housing (2014).		

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Price (€/m ²)	HOB		Total housing (city of Lleida)	
	Housing units	% of total	Housing units	% of total
< 60	54	8.8	7,829	12.1
60 - 90	280	45.4	21,637	33.4
91 - 120	218	35.3	22,854	35.3
121 - 165	57	9.2	9,080	14.0
> 165	8	1.3	3,432	5.3
Mean surface area – HOB (m ²) (*)		91.3 m ²		
Mean surface area, total city of Lleida - resale housing units (**)		103.7 m ²		
Mean surface area, total city of Lleida - new housing units (**)		114.1 m ²		
(*) Mean for the HOB				
(**) Mean of the price of all the housing for sale in the city of Lleida (disaggregated in new housing and not new (resale) housing units). Values for the whole of the municipality based on data from market study conducted by the Catalan Agency of Housing (2014).				

Table 4
Surface area (m²) of foreclosed housing units in comparison with whole city housing.
Source: Own elaboration

Table 5 Pearson correlation between the volume of HOB and the type of housing by census district. Source: Own elaboration. Data obtained from Real Estate Cadastre

	HOB per 1,000 inhabitants	HOB per 1,000 housing units
(%) Poorly conserved housing units	0.621 (**)	0.637 (**)
(%) < 90 m ²	0.609 (**)	0.625 (**)
(%) > 120 m ²	-0.497 (**)	-0.549 (**)
Average property value	-0.516 (*)	-0.531 (**)
(**) Correlation is significant at 99%; p=0.01 level (2-tailed).		
(*) Correlation is significant at 95%; p=0.05 level (2-tailed).		

The maps in *Figures 8* and *9* reflect the results of the Getir-Ord Gi* statistic combined with the surface area and market price of the clustered HOB. In this case, the cold spots (blue points) correspond to zones with a high concentration of HOB and the lowest market prices (*Fig. 8*) or smallest surface areas (*Fig. 9*). In contrast, the hot spots (red points) are zones with relative concentrations of HOB, but which have the

highest prices and largest surface areas (within HOB sample). The yellow points correspond to HOB that are not significantly clustered.

Both maps show similar results. They identify the neighbourhoods of La Mariola and Balafia as those that (1) have the highest concentration of HOB and (2) the greatest weight of HOB with the lowest market price and smallest surface areas. Thus, the greater the concentration of HOB, the greater is the relative weight of the HOB in the worst conditions. In other words, the HOB with the lowest prices and smallest surface areas tend to be concentrated in the most deprived neighbourhoods. Furthermore, the neighbourhoods that had previously been identified as clusters of lower intensity (part of La Bordeta and Cappont and certain areas of the urban centre – see *Fig. 7*) are the ones that have the HOB with the highest prices and greatest surface areas (even though these are, in net terms, below the average for the city as a whole). These results allow us to validate the second hypothesis of the study: the urban areas in which the evictions due to mortgage foreclosures are most concentrated are the most precarious neighbourhoods in the city.

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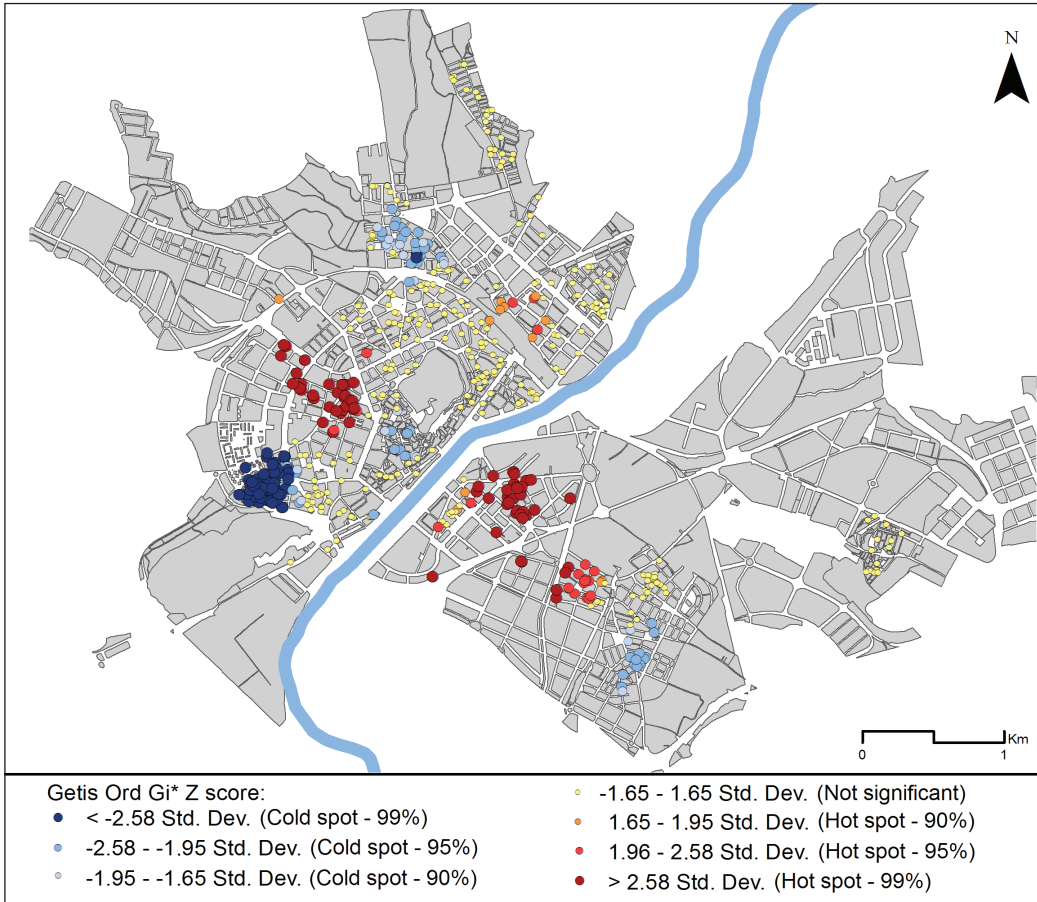


Fig. 8
Clustering of HOB in relation to their market prices. Source: Own elaboration

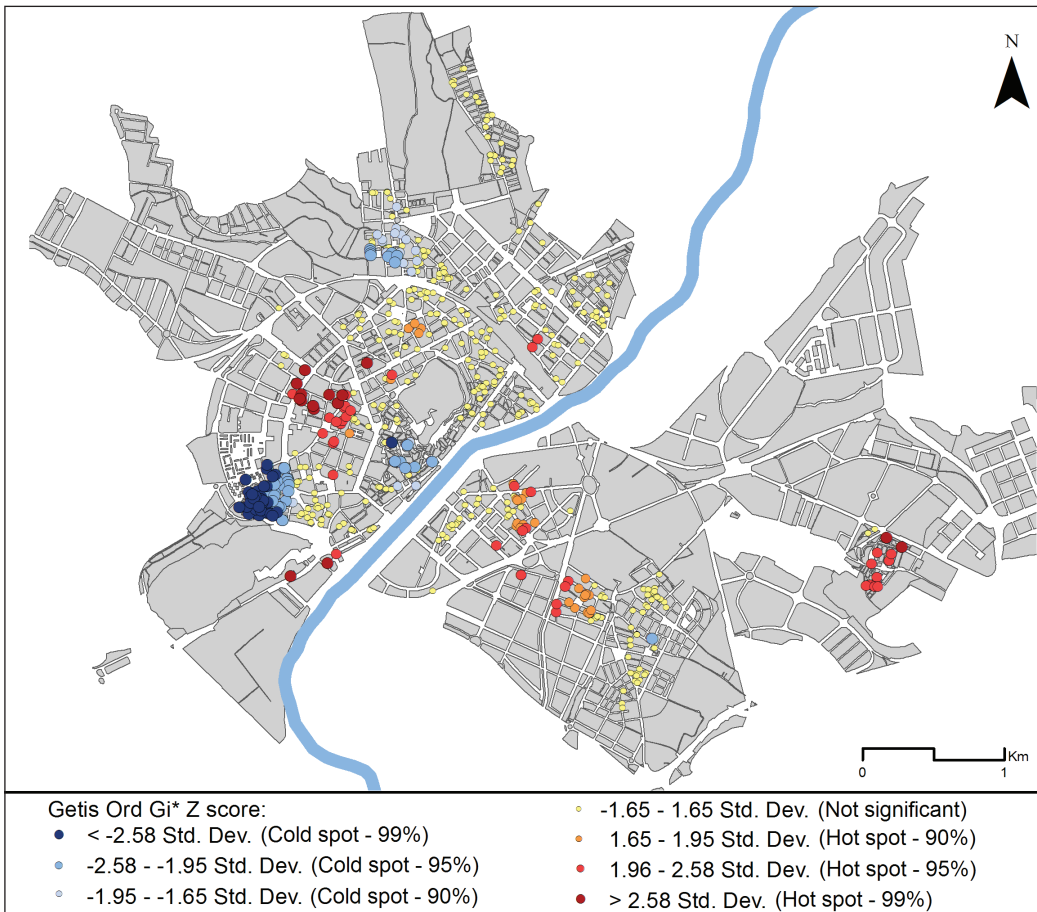


Fig. 9
Clustering of HOB in relation to their surface areas. Source: Own elaboration

5. Conclusions

The study of evictions due to mortgage foreclosures based on the proxy created through housing units in hands of banks allowed us to better understand the uneven geographical development of the mortgage crisis in Spanish urban areas. The spatial analysis applied to the city of Lleida has shown how the HOB have tended to concentrate in certain neighbourhoods. These have been identified as hot spots of HOB through spatial analysis undertaken at the urban block level. First, the results of the paper allowed us to demonstrate the concentration of evictions in the most deprived urban areas. This implies adding a further problem to the neighbourhoods that have traditionally suffered the main socioeconomic challenges and most important urban deficits. Secondly, the results permitted us to characterise the housing subject to foreclosures. A statistical correlation has been demonstrated between the surface area of the housing in the different census tracts, its value and state of conservation according to the Real Estate Cadastre and the relative concentration of HOB. That is to say, the greater the surface area and property value, the smaller the number of HOB. On the contrary, the smaller the surface area and the worse the state of conservation, the greater the concentration of HOB. Furthermore, the two phenomena are spatially linked. In other words, the clusters with high concentrations of HOB are also the zones with the greatest relative amount of housing in poor conditions. The worse the condition of the housing subject to foreclosure, the more intense the HOB hot spot.

As *Brenner and Theodore (2002)*, *Harvey (2006)* and *Hadjimichalis (2011)* note, capitalist crises result in uneven geographical development processes. The mortgage crisis has been no exception to this logic. In the Spanish context, *Méndez and Plaza (2016)* note that the socioeconomically most vulnerable regions have been those that have experienced the greatest growth in foreclosures since the beginning of the crisis. The results of our research demonstrate that these inequalities have been reproduced not only regionally but also, and indeed especially, at the urban scale, with clear contrasts being observed between different neighbourhoods. Within this context, our findings help to deepen our understanding of urban geographies of vulnerability associated with the property crisis by showing the confluence of the geography of poverty and that of home dispossessions.

Finally, the wave of evictions due to mortgage foreclo-

sure cannot be explained without reference to the financialization of the built environment as strategy of capital accumulation. It can be concluded that the proliferation of evictions has been a strategy associated with the production of urban rents and one that has been carried out thanks, in particular, to the financialization of housing. The main burden of the large-scale debt resulting from this financialization and speculation has largely fallen on the working classes, as has the brunt of the associated mortgage foreclosures and evictions. The results of this study also highlight the relevance of incorporating the spatial dimension into the study of the logic of the mortgage crisis. This has allowed us to empirically demonstrate how the evictions caused by mortgage foreclosures have not had either a homogenous or a random distribution within the city, but have mainly been concentrated in the most deprived neighbourhoods, thereby exacerbating their precariousness. This article therefore provides new evidence about how the mortgage crisis has contributed to the exacerbation of inequalities in Spanish cities.

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Notes

¹ The financial organisations included in this study were: CaixaBank, Bankia, Banco Santander, Banc Sabadell, BBVA, CatalunyaCaixa, NovaGalicia, Banco Popular, Banesto and IberCaja.

² The null hypothesis states that there is no spatial clustering of HOB and, therefore, that the spatial distribution of these is random.

³ The market price of housing in the city has been extracted from a study of the real estate market carried out by the *Agència de l'Habitatge de Catalunya* [Catalan Agency of Housing] (2014).

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