

**SUBSIDIZED HOUSING DEVELOPERS IN MADRID
COOPERATION OR COMPETITION?**

by

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ABSTRACT

Subsidized housing construction is one of the main policy instruments used in Spain to facilitate the access to affordable housing. Public companies, private developers and cooperative associations coexist as providers of these subsidized units. Due to the financial crisis, some of the public companies have decided to stop their role as developers and to focus on the management of their rental stock.

This study describes the Spanish subsidized housing system and analyzes the interaction among the three types of developers to understand whether public companies should continue with their construction activity or become a different kind of player. Focusing on the Region of Madrid, we worked with data on the subsidized housing projects built from 2005 to 2014 and tested for the existence of a crowd-out effect at the district level. We analyzed the effect for the 10-year period, and afterwards we analyzed it separately for the housing market boom (2005-08) and bust (2009-14) periods. Our results suggest that a crowd-out effect exists between public and private developers in the three periods of analysis. However, cooperatives show a tactical alternation with public companies when analyzed at the boom and bust periods, but a strategic complementarity when analyzed as a single 10-year period. In the short term, a crowd-out effect exists between cooperatives and public companies, but in the long term there is a crowd-in effect.

Although an analysis of the type and quality of the housing provided by each developer would be needed to complement this study, results suggest that the decision of public companies to change their role from active developers to service providers could benefit the whole subsidized housing sector. If the right incentives persist, private companies and cooperatives will continue to construct new subsidized housing units, whereas public companies can follow a complementary housing policy, focused on promoting rental units and refurbishment of existing buildings in city centers.

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TABLE OF CONTENTS

SUBSIDIZED HOUSING POLICY IN SPAIN	9
HOUSING POLICY CONTINUITY FOR HALF A CENTURY	9
OWNERSHIP AND NEW CONSTRUCTION AS KEY CHARACTERISTICS OF ALL POLICIES	11
PUBLIC INSTITUTIONS IN CHARGE OF THE SUBSIDIZED HOUSING POLICIES	14
IMPLEMENTATION THROUGH LAND CESSIONS, ZONING AND DIRECT DEVELOPMENT	16
SUBSIDIZED HOUSING CATEGORIES BY MAXIMUM HOUSEHOLD INCOME	18
BENEFITS AND OBLIGATIONS OF ACQUIRING A SUBSIDIZED HOUSING UNIT	19
OVERVIEW OF THE SUBSIDIZED HOUSING PRODUCTION IN SPAIN	20
SUBSIDIZED HOUSING POLICY IN THE REGION OF MADRID, 2005-2015	23
HOUSING OVERVIEW IN THE REGION OF MADRID	23
HOUSING POLICIES IN THE MADRID REGION	25
SUBSIDIZED HOUSING CATEGORIES	26
SUBSIDIZED HOUSING DEVELOPERS	30
SUBSIDIZED HOUSING PROJECTS IN THE MADRID REGION, 2005-2015	33
ACTIVITY OF EACH TYPE OF DEVELOPER	33
SUBSIDIZED HOUSING PROJECTS BY TYPE OF TENURE	37
SPATIAL DISTRIBUTION OF THE FINISHED UNITS	39
CROWD-OUT EFFECT ANALYSIS	46
DATA DESCRIPTION	48
UNIT OF OBSERVATION	48
SUBSIDIZED HOUSING UNITS	48
DEMOGRAPHIC VARIABLES	52
ECONOMIC VARIABLES	53
BUILT ENVIRONMENT VARIABLES	53
POLICY GOALS VARIABLES	54
EMPIRICAL SPECIFICATION	56

RESULTS	57
2005-2014 ANALYSIS	57
BOOM AND BUST PERIODS ANALYSIS	62
LIMITATIONS AND FURTHER RESEARCH	70
DATA AVAILABILITY	70
HOUSING QUALITY, INNOVATION & SATISFACTION.....	70
CONCLUSIONS	72
GLOSSARY	74
REFERENCES	75

SUBSIDIZED HOUSING¹ POLICY IN SPAIN



Figure 1: Subsidize housing building developed by a public company in Vallecas, Madrid. Source: Imagen Subliminal



Figure 2: Subsidize housing building developed by a cooperative in Vallecas, Madrid. Source: Grupo Ibosa

HOUSING POLICY CONTINUITY FOR HALF A CENTURY

Housing policies that aim to facilitate access to decent accommodation have been part of the Welfare system of European countries since World War II (Castaño, 2012). The different methods of public intervention in housing applied by each country depend upon their understanding of the Welfare system (Leal, 2005). The definition of the Welfare system varies as each society assumes different government obligations concerning the fulfillment of the basic needs of citizens, which the market is not capable of providing. In the case of Spain, the right to decent housing is part of the 1975 Constitution, so today it is considered a

¹ As the Spanish term “housing with public protection”, which is the translation of “Vivienda con protección pública” can be misleading, in this study we will be using the term subsidized housing to refer to the developments that are the outcome of the housing policies in Spain. Within the subsidized housing label we can find projects developed either by public institutions or private developers, which in turn can be professional real estate companies or individual citizens grouped in cooperative associations. At the same time, these housing projects can be directed towards low or middle income populations or groups with special needs. Each of these housing types receives a specific denomination and has its own requirements regarding maximum size and maximum income of its residents. The term “subsidized housing” refers to the fact that all projects receive some kind of public subsidy either in the form of land reserves, direct subsidies, or some combination of any of the above.

government obligation to provide affordable housing if the available housing at the free market price does not satisfy the population's needs.

Nevertheless, Spanish housing policy began long before 1975. We find the first subsidized housing policy in Spain in 1911, with the law for “affordable and hygienic rooms”². It first defined most of the instruments that have fostered affordable housing development to the present. These instruments include land reserves, tax exemptions and direct construction by public authorities. The 1911 law also defined the term “qualified dwelling” – still in use today - and the type of housing unit it implied (Cruz, 2005). Many other laws followed, such as the affordable housing law of 1921³, the “Salmon law” of 1935, the affordable housing law of 1939, and the consequent ones in 1954, 1976, 1978, and 1980. In 1980, it was established that the housing policy would be written in the form 3 to 4 years plans. Since then, Spain has had multiannual housing policy plans, the current one corresponding to 2013-2016⁴.

Although there have been a considerable number of laws, they all share a similar underlying structure (Leal, 2005), such that we can trace many of the instruments used today back to the original 1911 law. Of course, there have been modifications that adapted policies to their respective times, but none of them were very deep. If we look at how much society has changed during these years, the underlying continuity of the core goals does not seem effective. Leal (2005) explains that if we consider the provision of subsidized housing to be a response to the inabilities of the market, and, at the same time, a response focused on the needs of society, the different policies should have evolved more profoundly to accommodate changes in both society and housing market prices, such as new household compositions or periods of boom and bust.

² Some footnotes will give the Spanish name of the laws which are being discussed, as the reader will have to look for this term in case they want to read the original document. In this case, the 1911 law is called “Ley de habitaciones higiénicas y baratas”

³ “Ley de casas baratas”

⁴ “Plan Estatal de fomento del alquiler de viviendas, la rehabilitación edificatoria y la regeneración y renovación urbanas, 2013-2016”

OWNERSHIP AND NEW CONSTRUCTION AS KEY CHARACTERISTICS OF ALL POLICIES

All Spanish housing policies since the beginning of the 20th century - and even more since the end of the Spanish civil war⁵ - have had two main differentiating characteristics with respect to other European countries (Leal, 2005) (Castaño, 2012) (Trilla, 2001):

- **Promoting ownership as the main tenure type.** While in most European countries, social or public housing is mainly conceived for rentals, in Spain, the majority of subsidized housing residents are owners of their units. The strong presence of ownership as the preferred tenure system is not only a characteristic of subsidized housing but also of the general housing market. This distinguishing feature of the Spanish housing market is a direct consequence of the housing policies and tax benefits that have been continuously applied for the last fifty years.

As an example that tenure preference has changed over time due to the applied policies, we can see that in 1950, 50% of the Spanish households were owners (Leal, 2005), whereas in 2014, this number had increased up to 79% (Eurostat, 2014). As Figure 3 shows, Spain has the 12th highest ownership rate in the EU-28, only surpassed by eastern-European countries, which joined the EU in 2004.

Part of the reasons for housing policies encouraging ownership after the Spanish civil war were due to the political situation of the country, which was under a dictatorship. A higher presence of owners offered less social mobility and more social control of the population. The rationale behind this idea is that the obligation to pay your mortgage encourages citizens to behave according to the established rules in order to not lose their jobs and the investment on their house.

⁵ Spanish civil war: 1936-1939

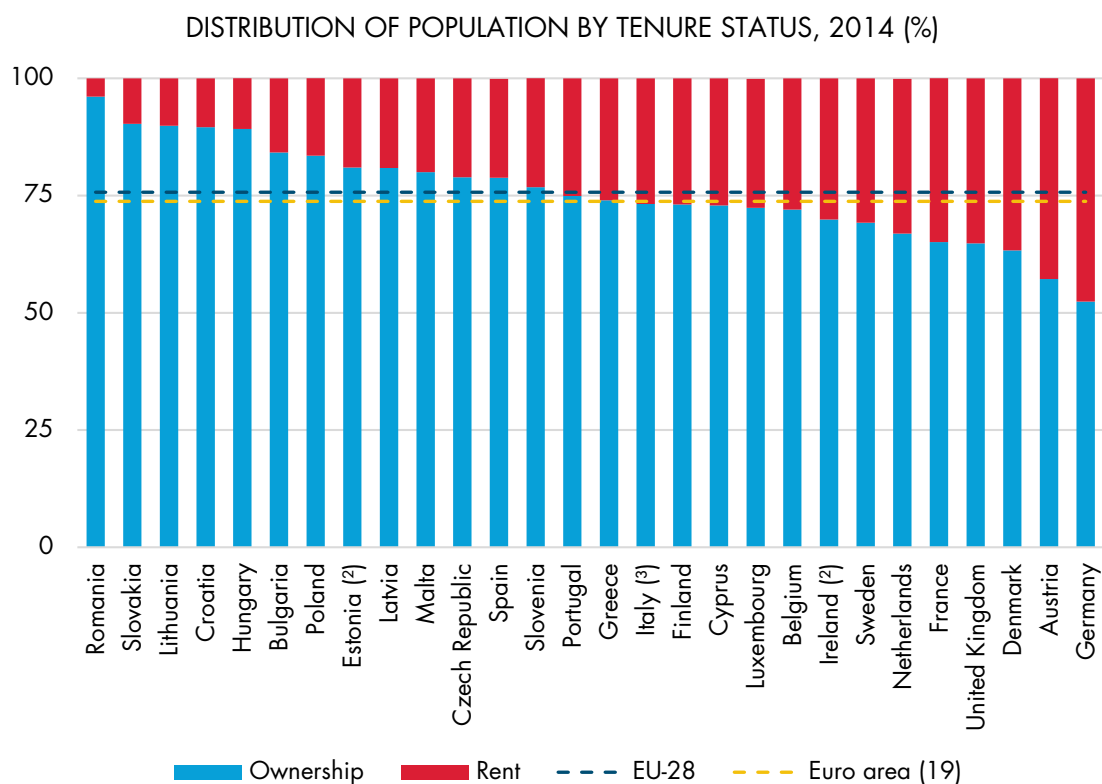


Figure 3: Distribution of population by tenure status, 2014 (% of population). Data source: Eurostat

The ownership tenure was promoted through tax exemptions on the annual amounts invested on new primary residences. They were calculated as a percentage over total acquisition expenses, including both the principal and interest on mortgages. These fiscal benefits were the main housing policy instrument until their elimination in 2013. Leal (2005) remarks that the virtual expenditure on tax exemptions grew from representing 50% of the total housing policy expenditure at the beginning of the 1990's, to becoming 80% of it in 2003, leaving the other 20% to direct funding on the construction of new housing units. Ownership was additionally fostered by facilitating access to mortgages at lower interest rates compared to those in the regular market, and also by reducing the housing annual property tax for subsidized units.

In addition, renting was discouraged via maximum rent controls. Caps on rents were partially eliminated in 1985, but it was not until 1994 that Spain achieved a total free market in the rental sector. Since 2005 we have seen some encouragement of the rental sector with the creation of a

public company to enhance the transparency and security of the market. Moreover, in 2007 direct subsidies were established for renters under 30, and in 2008, tax exemptions on the annual housing rent were included as additional incentives to rent. Although these policies were not reflected in significant changes on the Spanish housing trends, it is not possible to fully evaluate them as a long-term effort because both the public rental company and direct subsidies to young people were eliminated in 2012.

- **Promoting the construction of new units.** The other common characteristic of Spanish housing policies up to today is the constant development of new units to the detriment of refurbishing the existing stock. During the 1950's, as the Spanish cities received a large amount of internal migration from rural areas, the development of new housing units was a clear priority for solving housing needs. Later on, in the 1960's and 1970's – a period of high economic growth – the construction sector became one of the main economic drivers of the country, mostly through the proliferation of new developments. Ever since, the Spanish economy has relied too much on the construction sector (Castaño, 2012). Therefore, when defining a housing policy, choosing to promote the construction of new units had broader economic goals than merely the direct provision of affordable housing. This lack of attention might be why the term “refurbishment” has only been included in the title and goals of the national housing plans since 2009⁶.

Spain has one of the largest housing stocks in Europe, partly as a consequence of the excess of development during the past boom cycle. However, housing policies have paid little attention to this existing stock. As Leal (2005) remarks, the evaluation of housing policies has been focused on the total number of new units built, without much care about their use or location. As a consequence of subsidized housing being part of new development areas, its location has been pushed to the outer rings of cities, with few projects taking place in city centers. Nevertheless, with the existence of an aging stock in the core of cities and an increasing demand for housing in the city centers, in 2009, policies started combining the efforts on new developments with incentives to refurbish the existing buildings.

⁶ Plan Estatal de Vivienda y Rehabilitación 2009-2012

PUBLIC INSTITUTIONS IN CHARGE OF THE SUBSIDIZED HOUSING POLICIES

Three levels of government are involved in the elaboration and implementation of subsidized housing policies. The result is a sometimes too complex system where a certain degree of discoordination among the different authorities limits the effectiveness of the policies.

- **National authority.** Subsidized housing policies are a responsibility of the Ministry of Housing⁷ or of the Ministry of Public Works and Transportation. The national authority is in charge of the national laws and multiannual plans, which set the basic rules with which all regional authorities have to comply. At this level, the two most important laws are the land regulation law⁸ and the national housing plans⁹. Regarding housing, the land regulation law defines the different zoning categories land can have, the percentage of land ceded for public ownership upon up-zoning, and, since 2008, the percentage of residential land which would be reserved for subsidized housing in new developments. As of 2014, the land ceded for public ownership was established at a maximum of 10%, and the percentage of residential land reserved for subsidized housing was set at a minimum of 30%, only on land that is up-zoned from rural to urban use.
- **Regional authority.** Spain is administratively divided into 17 regions and 2 autonomous cities. Although the national government sets the general laws, ultimately, each region establishes its own regional laws. These regional laws have the capacity to modify the national ones, provided that they do not contradict them. The result is that each region has its own land law and housing plan, with their own specificities. As an example of the disparities that can exist among regions, we can compare the different residential land reserves for subsidized housing at the same point in time. In 2006, the national law did not include any minimum reserve. The Basque country's regional law, however, established that 75% of new residential land had to be zoned exclusively for subsidized housing, upon zoning reclassification from rural to urban. On the opposite side we find the Valencia region which had no reserve requirement, and in the middle ground there was the Madrid

⁷ Spain had a Ministry of Housing from 1957 to 1975, and from 2004 to 2010. If the Ministry of Housing does not exist in a government period, its competencies become part of the Ministry of Public Works and Transportation.

⁸ "Ley de suelo"

⁹ "Planes estatales de vivienda"

regional law, which had established a 50% reserve. All these situations were complying with the national law but offered a different context for the development of subsidized housing.

- **City authority.** The implementation of housing policies is mainly done at the city level, although some regional agencies also implement parts of them. On the one hand, cities are responsible for defining the land zoning and permitting the construction projects within their territory. The amount of land dedicated to subsidized housing is defined through these two urbanism processes, and the city has to ensure that the devoted resources comply with the law. On the other hand, some cities have created their own housing development companies, which are in charge of the direct development of subsidized housing projects. These companies ensure the correct development and management of public housing projects and are a key component in the success of the policies. In the case of the Madrid region, most of the largest cities have their own housing development companies. In addition, the regional government also has its own housing company, which complements the local companies and services the cities which don't have their own.

IMPLEMENTATION THROUGH LAND CESSIONS, ZONING AND DIRECT DEVELOPMENT

Three main instruments are used for the implementation of the housing policies.

- **Land cessions.** Since 1975, national land laws have established that part of each new development area has to be ceded to the city or regional government upon rezoning to urban use. National laws set the maximum percentage - which has usually been around 10% - and regional authorities can decide to decrease it. The purpose of this cession is to provide land for the development of public facilities, such as schools, medical centers or subsidized housing. This land can be developed by the public authorities or, just in the case of housing, sold to private agents which would develop the final product. The transaction of public land is always controversial, as corruption practices existed in the past and were a common practice during the real estate boom period in Spain.
- **Land zoning for subsidized housing development.** Zoning is one of the most important instruments for the promotion of affordable housing. In this regard, land can be specifically zoned for subsidized residential projects. As mentioned above, even before the national law did, certain regions established that a minimum percentage of residential land in new developments had to be specifically dedicated to subsidized housing. This land can be developed by either public companies or private agents, who receive subsidies and/or favorable credit conditions in exchange.
- **Direct development by public entities.** Both instruments above are land-based mechanisms that assure land availability for the development of subsidized housing. On the topic of the actual physical asset, regional and city authorities have created public companies in charge of managing this land, developing the projects and operating the rental buildings.

Public companies have five revenue sources: the sale of land of public ownership, the sale of the subsidized units the companies develop, the rents from the units under their management, the fees they charge for providing urban consulting services to the City Hall, and the subsidies they receive from the City Hall to cover part of their expenses.

In the case of the Madrid city public housing company (EMVS), its 2014 breakdown of revenue sources was the following:

- 60.7% of the total revenue. Sale of land of public ownership (€84M)
- 24.6% of the total revenue. Subsidies received from the City Hall (€34M)
- 10.9% of the total revenue. Sale of subsidized housing units, garages and premises (€15M)
- 3.6% of the total revenue. Rents received from the rental units managed by the EMVS (€5M)
- 0.2% of the total revenue. Fees charged to the City Hall for urban consulting services (€0.3M)

Some of these companies have also had a key role in the innovation in housing typologies through the design competitions they organized for deciding the configuration of each of the projects. Through these competitions and the exhibitions of the subsequent buildings, the public companies have contributed to draw interest from the architecture community towards the subsidized housing field. They have also avoided the creation of negative connotations towards low-income housing and have attracted the best professionals to think about housing and community living.



Figure 4: (Left) Exhibition of the subsidized housing projects built by the Madrid public housing company. Source: EMVS. (Right) Image of the winner proposal in one of the housing design competitions. Sources: Untercio arquitectos.

SUBSIDIZED HOUSING CATEGORIES BY MAXIMUM HOUSEHOLD INCOME

Subsidized housing projects are classified based on the income level of their future inhabitants. Subsidized housing recipients must not own any other kind of housing unit. Once this condition is met, the main classification is done in three groups by comparing the household income level with a state-defined indicator called Indicador Público de Renta de Efectos Múltiples (IPREM). For 2014, the IPREM was 7,455.14 € and the three categories established in the 2009-2012 national plan were:

- **Special regime.** Targeted towards low-income households whose annual income is not higher than 2.5 times the IPREM. In 2014, it implied a maximum household income¹⁰ of 18,368 €.
- **General regime.** Targeted towards middle-income households whose annual income is not higher than 4.5 times the IPREM. In 2014, it implied a maximum household income of 33,548 €.
- **Charter regime.** Targeted towards higher middle-income households whose annual income is not higher than 6.5 times the IPREM. In 2014, it implied a maximum household income of 48,458 €.

The multipliers of the IPREM can be slightly modified by each regional government to adapt them to the purchasing power of their citizens. As an example, the Madrid region, for the same 2009-2012 period used a multiplier of 5.5 for the general regime, and 7.5 for the charter regime. In addition to the income level filter, there are subsidized housing projects which target vulnerable groups by age, such as the elderly and the young. In these cases, both age and income level criteria have to be met by the applicants.

¹⁰ In 2014, the Spanish annual average gross household income was 26,154 €. Source: Spanish National Institute of Statistics (INE)

BENEFITS AND OBLIGATIONS OF ACQUIRING A SUBSIDIZED HOUSING UNIT

Until the 1980's, the main benefit presented by subsidized housing was the possibility to have access to mortgages at lower interest rates than the commercial banks offered. Over time, as rates decreased and mortgage accessibility increased, subsidized housing benefits shifted to having access to units similar to the free market ones but at lower prices.

Because of the public regulations, subsidized housing prices did not suffer the boom and bust cycle that market price housing did, as Figure 5 shows. Nevertheless, we can observe that the difference in prices between the two housing types has decreased during the crisis period (2008 - present). In 2004, subsidized housing was 42% cheaper than market price housing. This difference increased to 50% in the peak of the market in 2007, and since 2013, it has been stable at a price around 25% lower than the free market.

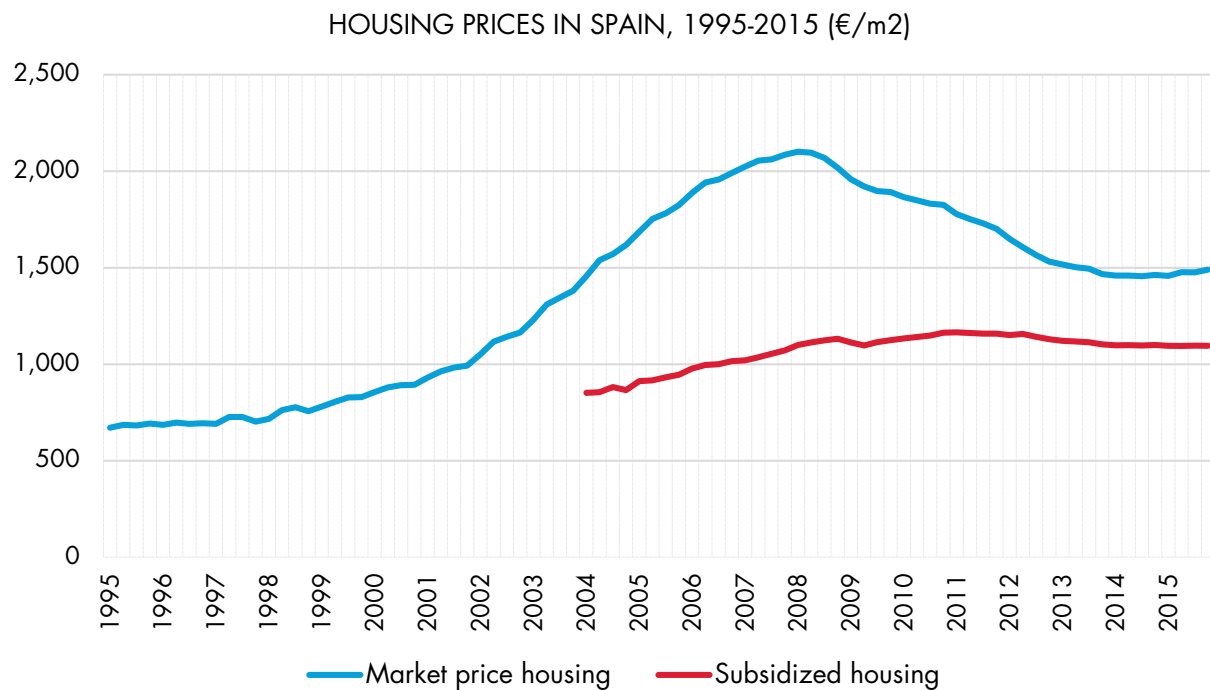


Figure 5: Evolution of housing prices in Spain, 1995-2015 (€/m²). Data source: Spanish National Institute of Statistics

In exchange for the lower prices and special circumstances under which they have been developed, the units acquire the category of subsidized housing for 15 to 30 years after their completion, depending on the region. This categorization implies that if the first owner wants to sell the unit, they can't do it on the free

market, as if it were a regular unit. The reselling of subsidized housing units has to be mediated through the public housing agencies, so that the selling price is consistent with the publicly regulated price, and that the future owner meets the conditions to be a subsidized housing inhabitant. After those 15-30 years, a unit is de-categorized, becoming a regular one which can be freely traded on the market. The length of the categorization period and the process of de-categorization are controversial points in all housing policies. In the past, there were unlawful practices in order to benefit from the de-categorization of a unit and make a profit by selling it on the market. To avoid these practices, some regions, such as the Basque country, have decided that the categorization cannot change, so that a unit will never be traded in the free market.

This permanent categorization, together with the Registry of Subsidized Housing Applicants- in which people willing to live in one of the units must be enrolled - have been part of the latest policy instruments to avoid illegal practices with the housing units. Moreover, as Leal (2005) remarks, when the two instruments are effectively used, they open the path to create a parallel subsidized housing market.

OVERVIEW OF THE SUBSIDIZED HOUSING PRODUCTION IN SPAIN

Looking at the number of subsidized housing units built in comparison with the free market units, we can differentiate three periods since 1960. As seen in Figure 6, until 1975 subsidized housing had a strong presence in the overall housing market, representing an average of half of the units licensed, sometimes even more. From 1975 to 1985, the subsidized housing presence decreased to around 20% of the total units built. This change can be explained by the end of the dictatorship regime in 1975 and the consequent regulatory changes that happened, such as the housing law of 1976, which decreased the obligations imposed by the state regarding the construction of subsidized housing. The third period started in 1985 when, as J. Rodriguez (2009) points out, the development of a more accessible mortgage market in Spain enhanced the accessibility to free market housing for all. From 1985 onwards, the percentage of subsidized housing in the market has been constantly lower than in previous periods. Subsidized housing production has since stabilized at around 50,000 units licensed per year, while free market units went through boom period peaks of around 350,000 units in 1990, or 850,000 in 2007.

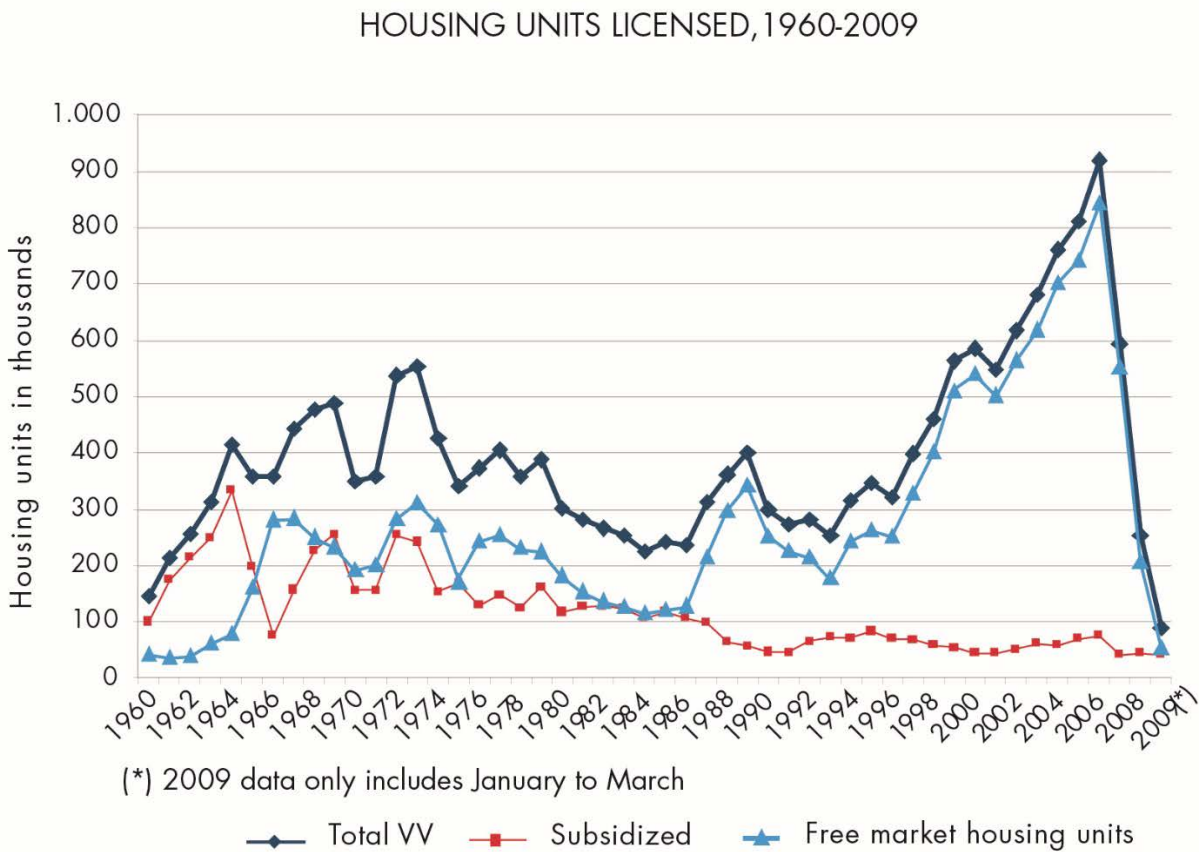


Figure 6: Housing units licensed in Spain, 1960-2009 (number of units). Source: Rodriguez J. (2009) CSCAE

Figure 7 shows the housing production of the different regions¹¹ in which Spain is subdivided, after normalizing by the number of inhabitants. For the 2005-2014 period, three regions – Castilla la Mancha, Murcia and La Rioja – stand out for having the highest number of total units built by 1,000 inhabitants. The presence of subsidized housing in these three regions, however, is not really high, being between 5% of the total in Murcia and 14% in La Rioja.

¹¹ Ceuta and Melilla are autonomous cities, not regions. Their special government system responds to political strategies, their isolated location in the African continent, and their small land extension.

There were other regions in which subsidized housing was a big component of their new stock, although they did not have such a large number of total built units per 1,000 inhabitants. These are the cases of Navarra, with almost 40% of the units being subsidized, País Vasco (36%), and Madrid (35%).

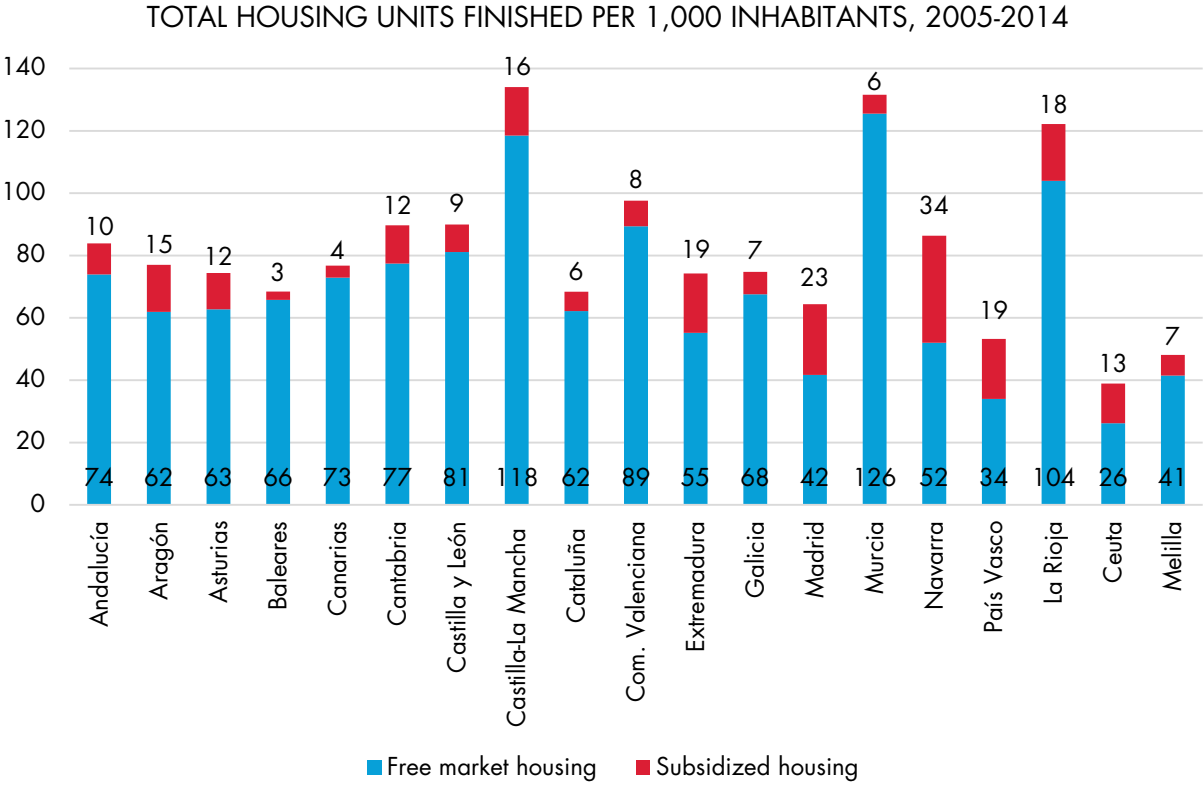


Figure 7: Total number of housing units finished per 1,000 inhabitants in each of the Spanish regions, 2005-2014. Data source: Spanish Ministry of Public Works

It might be significant that all these regions had the zoning requirement that a minimum percentage of residential land had to be dedicated to subsidized housing, even before the 2008 national law obliged all regions to do so.

SUBSIDIZED HOUSING POLICY IN THE REGION OF MADRID, 2005-2015

HOUSING OVERVIEW IN THE REGION OF MADRID

Located in the center of Spain, the Region of Madrid¹² is the most densely populated region in the country, with around 800 inhabitants per km². Its territory¹³ represents 1.6% of Spain and it accommodates 13.8% of the country's population. The city of Madrid – capital of the region - is one of the main economic hubs of Spain, attracting national and international migration which, together with the decrease in household size, creates a constant demand for housing in the city and its surrounding municipal areas.

The Region of Madrid is going through the last years of a boom and bust housing cycle. The number of free market housing units finished in the Region grew at an average of 13% per year from 2000 to 2007, and have been declining since then. The range of years included in this study, 2005-2014, comprises the last two years of this boom period, when the housing units finished each year were growing at 5% in the free market. The bust period started in 2008 and it continues until the last years of the study. During these years, the number of finished units in the free market decreased at an average of 30% per year. To fully understand how dramatic the housing crisis has been in the Region of Madrid - and in Spain - it is worth mentioning that in the peak of the boom, 61,621 units were finished in the free market, whereas at the trough, in 2014, only 2,691 units were finished.

Figure 8 shows how the number of subsidized housing units was considerable lower than the free market ones until 2010, when the exceptional circumstances of the crisis led to more subsidized housing units being finished. Overall, for the 1991-2015 period, subsidized housing represented 26% of the total number of units finished. However, the tendency changed significantly from 2003 to 2004, when subsidized housing went from its lower presence in the market (3%) up to 17%. The 1,137 subsidized housing units finished in 2003 increased in 2004 by 10 to 11,628 units. This change of tendency could be explained by the 2001 land law, which mandated that 50% of the designated residential land of new developments had to be zoned for

¹² The Region of Madrid can also be found in literature as the Community of Madrid or the Madrid Region.

¹³ The Madrid region has 8,022 km² of land. Its population for the period of study went from 5,866,186 inhabitants in 2005 to 6,378,297 in 2014, growing at an average of 1% per year.

subsidized housing.¹⁴ The two years delay between the law and its effects on the increase of units finished would just be a reflection of the length of the development process.

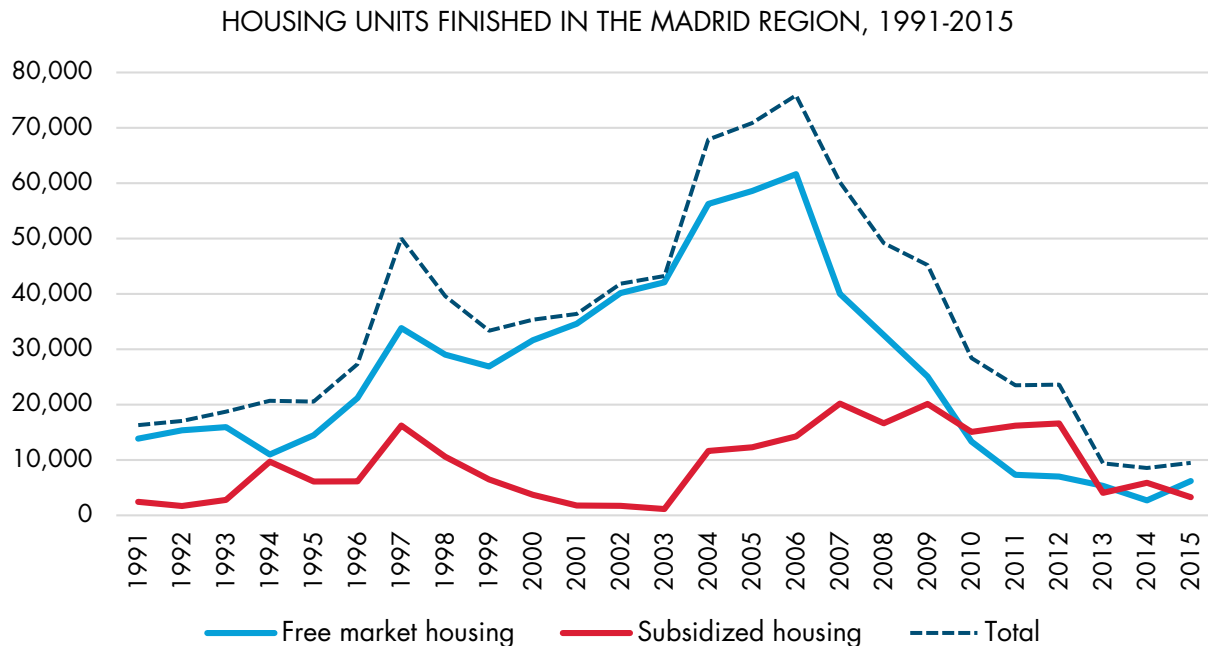


Figure 8: Housing units finished in the Madrid region, 1991-2015. Data source: Spanish Ministry of Public Works

Figure 9 shows how the boom and bust cycle affected free market prices while subsidized prices grew constantly at 1% per year until mid-2012, when they stabilized. During the boom period, subsidized housing was around 63% cheaper than free market housing, offering attractive prices for the low- and middle-income population, who saw housing prices increasing rapidly every year on the free market. Since 2012, with the decrease of free market prices, subsidized housing has constantly been 33% cheaper than free market units. Indeed, in some municipalities with low demand, there have been cases in which free market housing prices have plummeted below that of subsidized housing. In these cases, municipalities can apply for a temporal suspension of the reserve obligation, if there are empty subsidized units and their price is higher than the free market ones. However, these cases are exceptions and access to affordable housing is still a challenge for a large part of the population.

¹⁴ The 2001 land law also established that only 25% of the amount of land designated for subsidized housing could be used for the housing categories targeted to the higher middle-income population.

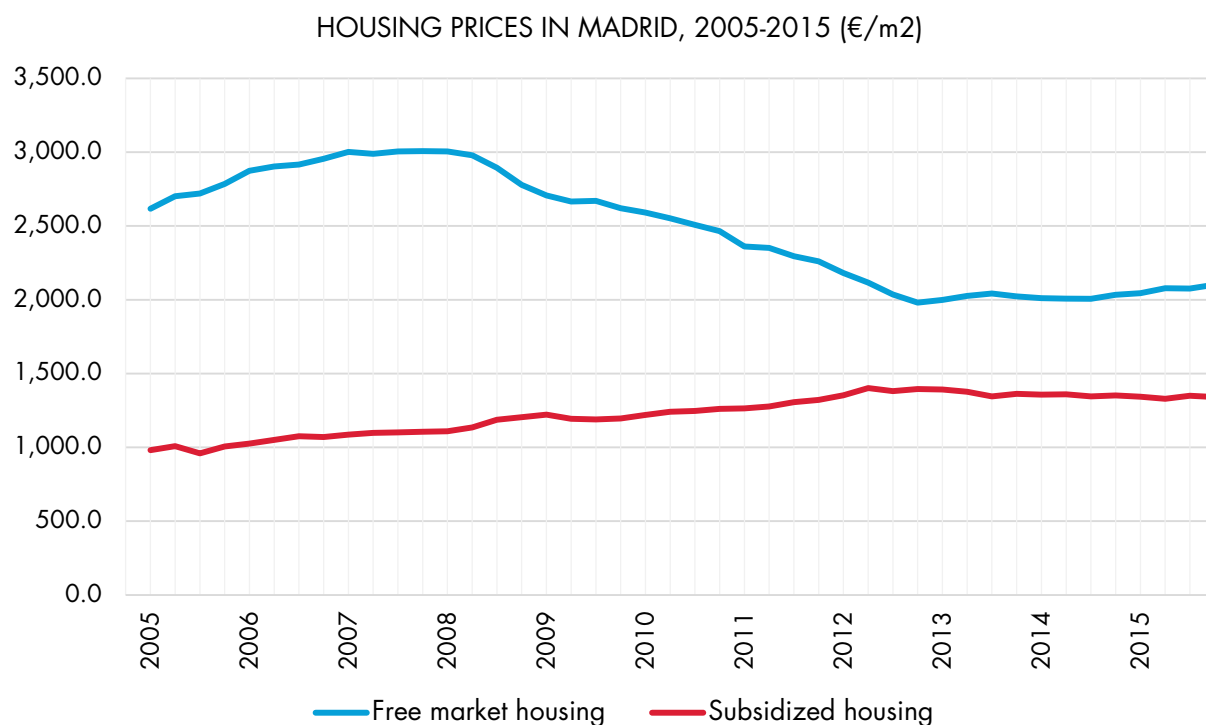


Figure 9: Housing prices in the Madrid region, 2005-2015 (€/m²). Data source: Spanish Ministry of Public Works

HOUSING POLICIES IN THE MADRID REGION

During the 2005-2014 period, three main policy documents have affected the subsidized housing construction:

- **The 2001 regional land law - modified in 2011.** As mentioned before, the regional law established a 50% reserve of residential land in new developments for the construction of subsidized housing. In December 2011, however, the law was modified and the percentage decreased to 30%, which was the minimum dictated by the national law at that time.
- **The 2005-2008 regional housing plan.** The regional housing plans are responsible for defining the subsidized housing categories, maximum floor areas, maximum household income levels, and duration of the subsidized categorization. The 2005-2008 plan also defined the direct subsidies for which future inhabitants could apply. These direct subsidies provided a further discount – between

5-10% - on the price of the units, but they ended in 2012 due to the decrease in public expenditures during the economic crisis.

- **The 2009-2012 regional housing plan.** The plan was a continuation of the 2005-2008 plan, with some changes regarding the denomination of the categories and their characteristics. Overall, the 2009-2012 plan increased the units' size, expanded the household income ranges and decreased the number of years that the units would be in the subsidized category (and could not be sold on the free market).

SUBSIDIZED HOUSING CATEGORIES

Since 1997, the existing categories of subsidized housing in the region of Madrid have been based on the type of tenure and maximum floor area of the units, the maximum household income of their future inhabitants, and whether the inhabitants had to be part of targeted population groups, such as the young or the elderly.

As noted, during the 2005-2014 period, there were two subsidized housing regional plans in Madrid, one from 2005 to 2008 and another from 2009 to 2012. For strategic and financial reasons, the Region of Madrid did not publish a 2013-2016 subsidized housing plan; however, they continued applying the 2009-2012 one. In these plans, the different housing categories were classified by their tenure types. Categories remained almost the same from one plan to the next, with only a few changes in their parameters.

Two types of subsidized housing exist for owner occupancy, as seen in Table 1:

- **Vivienda de Protección Pública de precio Básico (VPPB)** or subsidized housing with a basic price. These units are targeted to the middle-income population. Their maximum floor area was limited to 110 m² in the 2005-2008 plan, and it increased to 150 m² in the 2009-2012 plan. Another major change between plans was the reduction from 20 to 15 years of the period in which the unit is

categorized as subsidized housing. VPPB units can be built in any land designated for residential purposes, if they comply with the size restrictions specified in the land zoning¹⁵.

- **Vivienda de Protección Pública de precio Limitado (VPPL)** or subsidized housing with a limited price. These units are targeted towards people with a higher salary but still considered middle-income. The units are restricted to be built either on land designated for free market residential development or on land designated for large¹⁶ subsidized units. The percentage of land for VPPL units in new developments is restricted by law, so that developers who buy land designated for subsidized housing do not build an excessive number of them, escaping the requirement to build lower-income units.

Table 1: Comparison of the characteristics of the ownership categories in the 2005-2008 and 2009-2012 plans.

	VPPB		VPPL	
	2005-2008 plan	2009-2012 plan	2005-2008 plan	2009-2012 plan
Maximum floor area	110 m ²	150 m ²	150 m ²	150 m ²
Subsidized housing category	20 years	15 years	20 years	15 years
Maximum household income above IPREM	5.5x	5.5x	7.5x	7.5x
Possibility of early decategorization as subsidized unit	After 15 years	No	After 15 years	No
Type of land on which it can be built	No restrictions	If land designated for units < 110 m ² , that will be the maximum area	Designated for free market housing or subsidized housing >110 m ²	Designated for free market housing or subsidized housing >110 m ²

¹⁵ Land zoning can specify maximum floor areas for the housing units that will be built on it.

¹⁶ Large subsidized units are defined as the ones having a gross floor area between 110 m² and 150 m².

As Table 2 shows, in the subsidized housing for rent, there have been changes in the categories established in each plan. The 2005-2008 distinguished two categories based on their size and the maximum household income of their inhabitants:

- **Vivienda de Protección Pública de Alquiler en Régimen Especial (VPPA RE).** The units are directed towards the low-income population. They are smaller, with a maximum size of 90 m², which can be increased to 120 m² in case of accredited large families (3 children or more).
- **Vivienda de Protección Pública de Alquiler (VPPA).** The units have a larger size, 110 m², and they are targeted towards the middle-income population. In both of the rent categories, the maximum annual rent was defined as 4% of the selling price of the unit in the subsidized housing market.

The 2009-2012 plan reorganized the rent categories to parallel the ownership ones. The plan defines two VPPA categories with identical characteristics regarding size and prize, which are distinguished only by the maximum household income of their inhabitants. The actual result is that one rental category embraces two household income levels.

Table 2: Comparison of the characteristics of the rental categories in the 2005-2008 and 2009-2012 plans.

	VPPA RE	VPPA	VPPA
	2005-2008 plan	2005-2008 plan	2009-2012 plan
Maximum floor area	90 m ²	110 m ²	150 m ²
Subsidized housing category	25 years	25 years	15 years
Maximum household income above IPREM	2.5x	5.5x	5.5x and 7.5x
Annual rent (% of subsidized selling price)	4%	4%	5.5%
Possibility of early decategorization as subsidized unit	Exceptionally, if manager is a public institution	Exceptionally, if manager is a public institution	Exceptionally, if manager is a public institution
Type of land on which it can be built	No restrictions	No restrictions	No restrictions

A third mixed-tenure option combines rental and ownership, as Table 3 shows. These units are rented during their first years at a higher price than the rent-only, and part of the rent accumulates towards the future buying of the unit. After the first 5 years, inhabitants can choose to buy the unit at its subsidized price. The units can be targeted to the whole population or specifically towards the young. It was indeed required in the 2005-2008 regional plan that any subsidized housing project with rental units had to have 50% of them as mixed-tenure for the young.

- **Vivienda de Protección Pública de Alquiler con Opción a Compra (VPPAOC).** The units are targeted towards middle-income population without any age restrictions. The 2009-2012 plan increased the household income ranges that fit this category, decreased the rent and increased the years in which the unit remains under the subsidized category.
- **Vivienda de Protección Pública de Alquiler con Opción a Compra para Jóvenes (VPPAOCJ).** The units for young people (under 35 years old) are the smallest of all categories, with only 70 m², and they target the middle-income population. The 2009-2012 plan increased the size of the units, decreased the rent and increased the number of years in which the units are considered subsidized.

Table 3: Comparison of the characteristics of the mixed-tenure categories in the 2005-2008 and 2009-2012 plans.

	VPPAOC		VPPAOCJ	
	2005-2008 plan	2009-2012 plan	2005-2008 plan	2009-2012 plan
Maximum floor area	150 m ²	150 m ²	70 m ²	80 m ²
Subsidized housing category	7 years	10 years	7 years	10 years
Maximum household income above IPREM	5.5x	5.5x and 7.5x	5.5x	5.5x
Annual rent (% of subsidized selling price)	7%	5.5%	7%	5.5%
Possibility of early decategorization	No	No	No	No
Type of land on which it can be built	No restrictions	No restrictions	No restrictions	No restrictions
Age requirement	No	No	Under 35 years	Under 35 years

In the 2005-2008 plan there was a special category: **Vivienda de Integración Social (VIS)** or housing for social integration. This category was directed towards population with special needs, like elderly who could not live alone, population with mental health problems or in risk of social exclusion. The units could never be sold on the regular market and were always built for rent tenure. Inhabitants pay a small rent - or sometimes even nothing - and the buildings were managed by either a public or a non-profit institution. The VIS category was not included in the 2009-2012 plan.

All these different categories can be combined in one development project but each tenure type needs to be physically isolated in one building or served by a different entrance, stairs and elevator core.

SUBSIDIZED HOUSING DEVELOPERS

Subsidized housing can be developed by public or private agents, which receive favorable credit conditions and direct subsidies to compensate for the lower price at which the units must be sold.

- **Public companies.** In the Region of Madrid, most of the largest cities – and the regional government - have public housing companies which develop and manage the stock of subsidized housing following the goals of the regional plans. These companies and all their activities are publicly funded. They are in charge of the whole development process, from the design competition, to hiring the construction company, to delivering the units. In the case of the rental units, the public companies also manage the buildings and services to the tenants. All the hiring processes of these companies have to be done through bidding or design competitions.

Their projects are located on publicly owned plots and the areas that the companies prioritize for development are usually aligned with the city goals. To have access to a subsidized housing unit developed by public companies, citizens have to enroll in the Registry of Subsidized Housing Applicants. When enrolling in the Registry, each household is assigned a number of points based on their income and household composition. This system of scoring is used to prioritize the needs of certain households over others. Considering this score, the inhabitants of future buildings are chosen by raffle from the Registry and assigned to a specific unit in a project. If the result of the

raffle does not satisfy the household, they can renounce that unit and return to the Registry. Of course, declining the assigned unit is a risky decision as it reduces their score in future raffles. Consequently, too often, the raffle process results in many subsidized housing inhabitants not feeling attached to their house, and reducing their engagement with the neighborhood.

- **Professional private developers.** Subsidized housing can also be built by private developers. Indeed, many professional real estate developers are involved in the construction of both free market and subsidized housing. The development process is the same in both type of projects, with the exception that the selling price is publicly regulated for the subsidized units. Private developers are compensated by the difference in price through direct subsidies which can account for up to 30% of the total costs, and access to favorable credit conditions on construction loans for a maximum of 80% of the development costs.

To access subsidized housing developed by private agents, households have to comply with all the established requirements, such as maximum income and not owning another house. However, they do not have to enroll in the Registry of Subsidized Housing Applicants and go through the raffle process. Buying subsidized housing from private developers offers the benefit of choosing your future unit and location.

- **Cooperative associations.** In Spain, housing cooperatives are a type of private developer formed by a group of people who self-develop their future units. In short, cooperative members gather to be the developers of a building. Once it is finished, each unit is assigned to its correspondent member and the cooperative is dissolved. Therefore, it is a temporary collective that only exists during the development process. There is no obligation of communal living, as it happens in other European countries. Indeed, the Spanish cooperative model is more similar to a private developer – the cooperative manager – who crowdfunds the capital from its future inhabitants, than to the shared-living communities of northern Europe.

In the past, cooperative developments were usually started by labor unions and offered to their members. Yet, this situation has changed during the last decade, with private cooperative management companies proliferating in the Region of Madrid. These companies have no affiliation

with any union, and offer cooperative developments to anyone interested in participating. They operate as a private developer would do in searching for the land and hiring architects to design a project for the site. The difference stays in the search for capital. Instead of asking for a construction loan, as a private developer would do, cooperative management companies advertise the future developments and look for cooperative members. When future inhabitants join as cooperative members, they pick a particular unit in the project which has an estimated price. From that moment on, members will pay a monthly fee which is directed to fund the construction of the project. When the management company has achieved a minimum number of members, it can ask for a construction loan that is backed by its cooperative members. Once the construction is finished, members will pay the remaining amount to complete the cost of their unit, so that the loan is completely repaid.

In the case of cooperatives for subsidized housing, the members have to comply with the requirements established by the national and regional laws, such as having certain maximum household income and not owning another house. Like all private developers, subsidized housing cooperatives benefit from the land reserves zoned only for subsidized housing development, and are also able to reduce the cost of the units through the public subsidies that they receive, which can compensate for up to 30% of the total development costs. Another advantage of developing subsidized housing is accessing construction loans at better credit conditions for a maximum of 80% of the total costs.

For the members, the benefits of buying subsidized housing through cooperatives are that they don't have to be part of the Registry of Subsidized Housing Applicants, and they can choose – sometimes even customize - their future house.

SUBSIDIZED HOUSING PROJECTS IN THE MADRID REGION, 2005-2015

We had access to the database of the subsidized housing developments in the Region of Madrid from 2005 to 2015. From the 179 municipalities in which the Region is subdivided, only 77 of them had any subsidized housing project developed, or at least started, during these years. The database reveals that 2,217 subsidized housing projects were built during the 11 year period. As reflected in the type of license the projects have, 1,913 of the developments were finished and 304 were started but were not finished.

ACTIVITY OF EACH TYPE OF DEVELOPER

Table 4 shows that private developers built 48% of the subsidized housing projects which were finished, cooperatives developed another 30% and public companies the remaining 22%. Regarding the size of the projects, public developments are more constant in the number of units they have, with 68% of the projects having between 29 to 151 units. Cooperatives follow in second place and private projects are the most diverse, being the smallest ones on average but with the largest dispersion on their size.

Table 4: Characteristics of the subsidized housing projects by type of developer, 2005-2015. Data source: Subsidized housing website of the Region of Madrid.

Subsidized housing projects finished, 2005-2015					
	Number of projects	Average project size *	Standard deviation of project size *	Largest project size *	Smallest project size *
Cooperatives	574	79	55	402	1
Private	918	68	66	487	1
Public	421	90	61	332	2

* Measured in housing units

If we look at the distribution of the finished projects along the years, Figure 10 shows that private developments were more volatile, and public developments more constant during the whole period. Private developments dominated the subsidized housing market until 2006 and more clearly from 2007 to 2013. From 2006 to 2007 and from 2013 onwards, cooperative developments led the construction of subsidized housing. Until 2012, cooperative and public developments seemed to follow slightly opposite trends - with

one or two years lag - whereas cooperative and private developments share similar movements. After the 2013 decreased of all agents, cooperatives led the recovery in 2014, although their later decline left them in the same position as private developers in 2015.

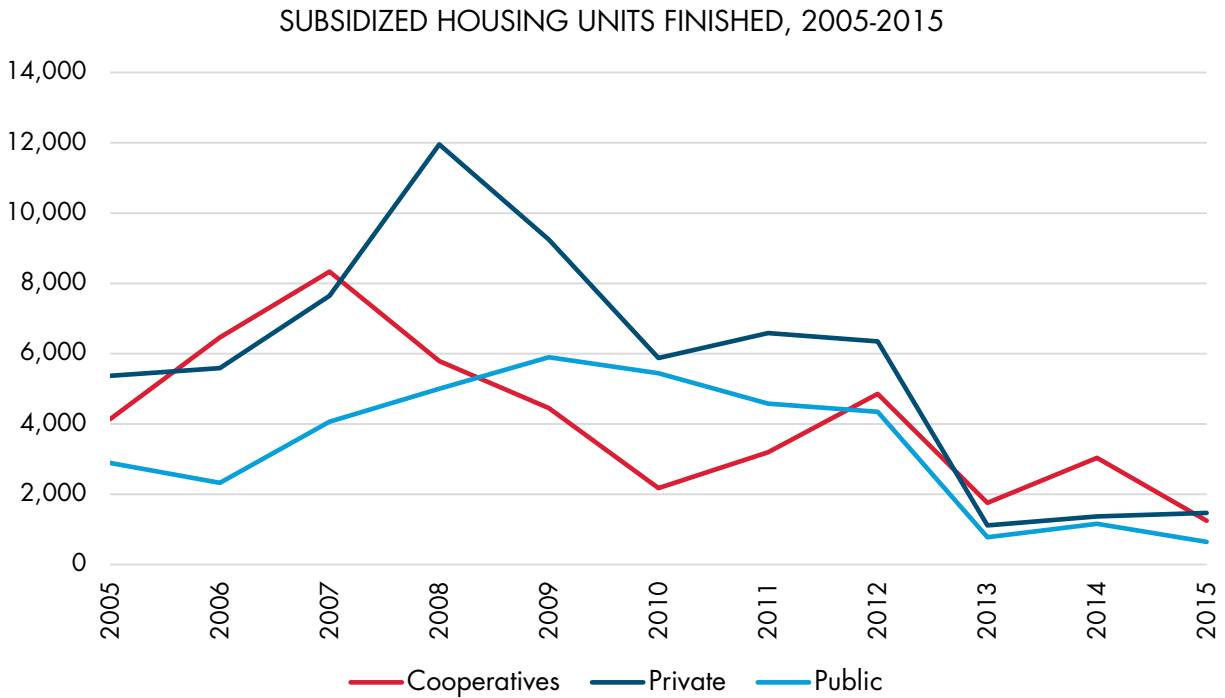


Figure 10: Subsidized housing units finished by type of developer, 2005-2015. Data source: Subsidized housing website of the Region of Madrid.

Figure 11 shows the districts of the region of Madrid and the total number of units finished between 2005 and 2015 by each type of developer. As expected, the majority of the projects were located in the metropolitan area of Madrid, where the population of the Region is concentrated. Private developments are in 62 municipal areas, located in the north-east and the south-east metropolitan ring of the capital. Cooperative developments are similarly located, but they are only present in 43 municipal regions. Likewise, 42 municipal regions had subsidized housing projects built by public developers. Public housing buildings were more concentrated in the south and south-east of the metropolitan region and some in the north-east areas.

SUBSIDIZED HOUSING UNITS FINISHED BY DISTRICT AND TYPE OF DEVELOPER IN THE MADRID REGION, 2005-2015

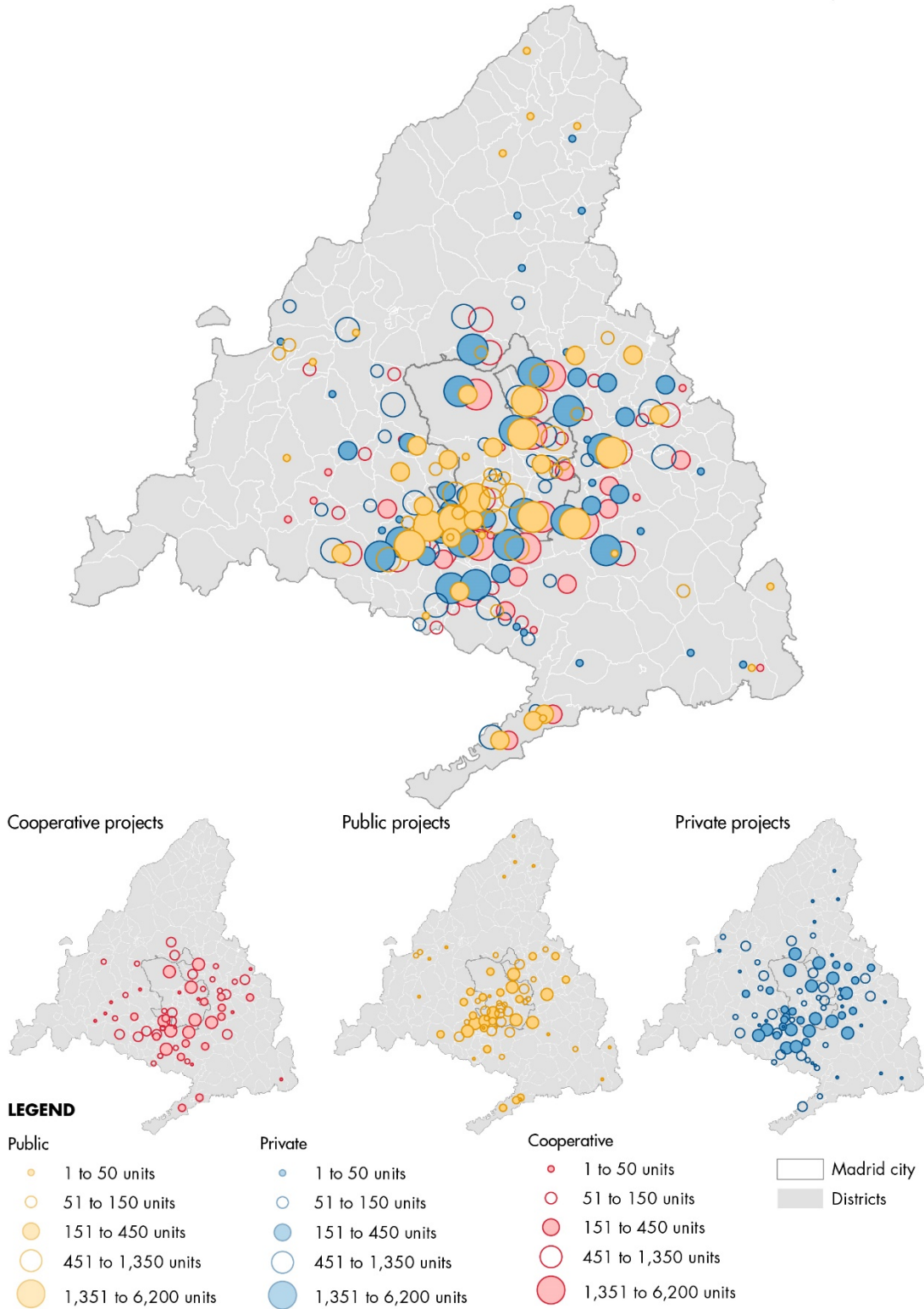


Figure 11: Subsidized housing units finished by district in the Madrid region, 2005-2015. Data: Madrid region web.

The provisional licensing data in Figure 12 provides information about projects that were started but have not been finished yet. Within these projects we can find some that were started and abandoned, or projects that are currently being constructed. Assuming that it would take 3 years for a project to be finished since it acquired the provisional license, the data in Figure 12 shows two different pieces of information. On the one hand, the data regarding the number of units started from 2005 to 2012 shows the projects that were started and abandoned afterwards. On the other hand, the data from 2012 to 2015 shows the subsidized housing developments that are currently being developed, and therefore, it shows the expected number of units that will be finished in the next 3 years.

Similarly to what Figure 10 illustrated, Figure 12 shows that in the peak of the boom, 2008, private developers dominated the subsidized housing market in the number of expected units. However, as the financial crisis arrived, private developers steeply decreased their forecast of future developments. Overall, from 2005 to 2011, private developers started 4,395 units which, probably, were stopped. Public companies had a different behavior, with a lower but more constant number of units started each year. A large decrease occurred in 2013, which coincides with the announcement of the subsidized housing company of the city of Madrid (EMVS) to stop all its projects that were in the design phase. From 2005 to 2011, Figure 12 shows that public companies started but did not finish 2,826 units.

Cooperative associations seem to have been more effective in finishing the projects that they started. This might be due to the nature of their capital and the involvement of their members. At the end, it is their personal investment in their future homes which would be lost if the project were not finished. Therefore, we might consider that cooperatives speculate less than the other agents and, once started, they make a higher effort on finishing the project, even if the circumstances become adverse. Consistent with the data in Figure 10, cooperatives led the construction of subsidized housing since 2012, starting 2,947 units between 2012 and 2015, which would be finished in the near future. This data agrees with articles^{17,18} published in different newspapers, which remark on the role of cooperatives in keeping active the subsidized housing sector.

¹⁷ “Las cooperativas exhiben su fuerza” in *El Mundo*, 11/2014

¹⁸ “La hora de las buenas cooperativas” in *El País*, 10/2014

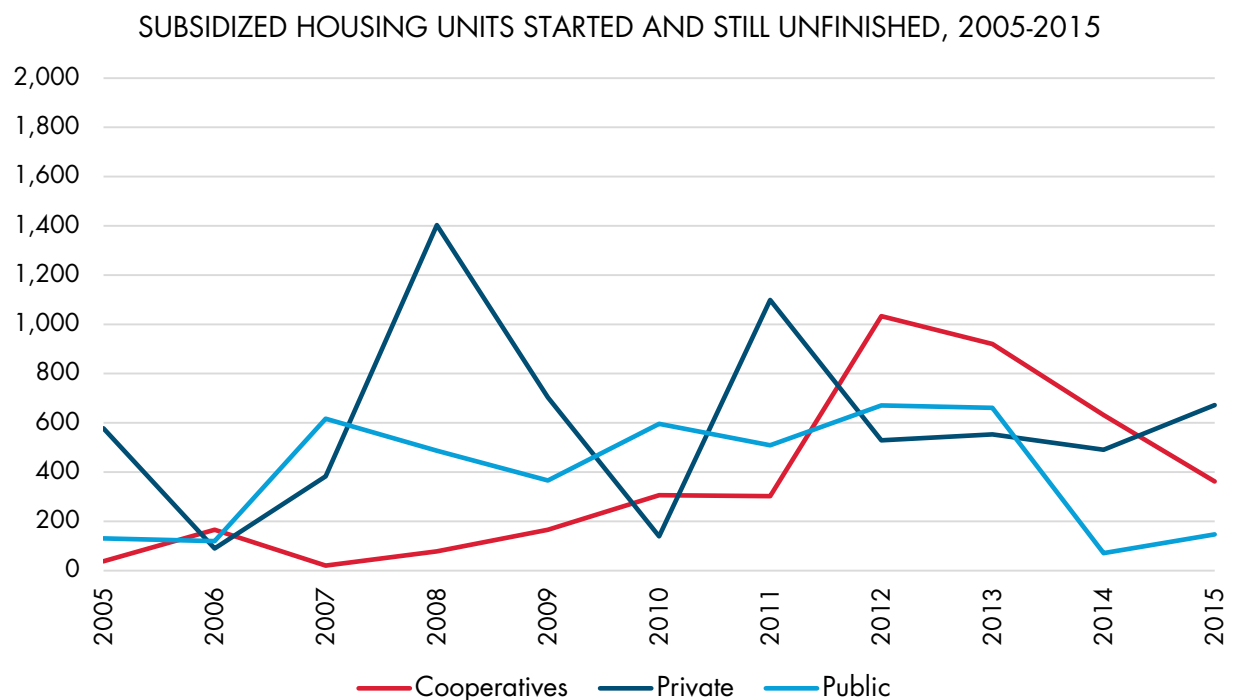


Figure 12: Subsidized housing units started by type of developer, 2005-2015. Data source: Subsidized housing website of the Region of Madrid.

SUBSIDIZED HOUSING PROJECTS BY TYPE OF TENURE

Figure 13 shows that 84% of the units finished between 2005 and 2015 were for ownership tenure, with the four remaining categories having a residual presence. Rent represented 2% of the total units, and rent with future ownership option – excluding the ones for the youth – was only 1%. In both cases, there were years in which no unit was finished in these categories. Housing for population with special needs represented 3% of the total, but no unit was finished after 2013. Rent with future ownership option for young population had the second highest presence, representing 10% of the total. This category took off in 2007 - when the financial crisis started - and from 2008 to 2012 around 2,500 units were finished each year. However, as it happened with all the other categories, the decline in production in 2013 decreased the construction to just 200 units each year.

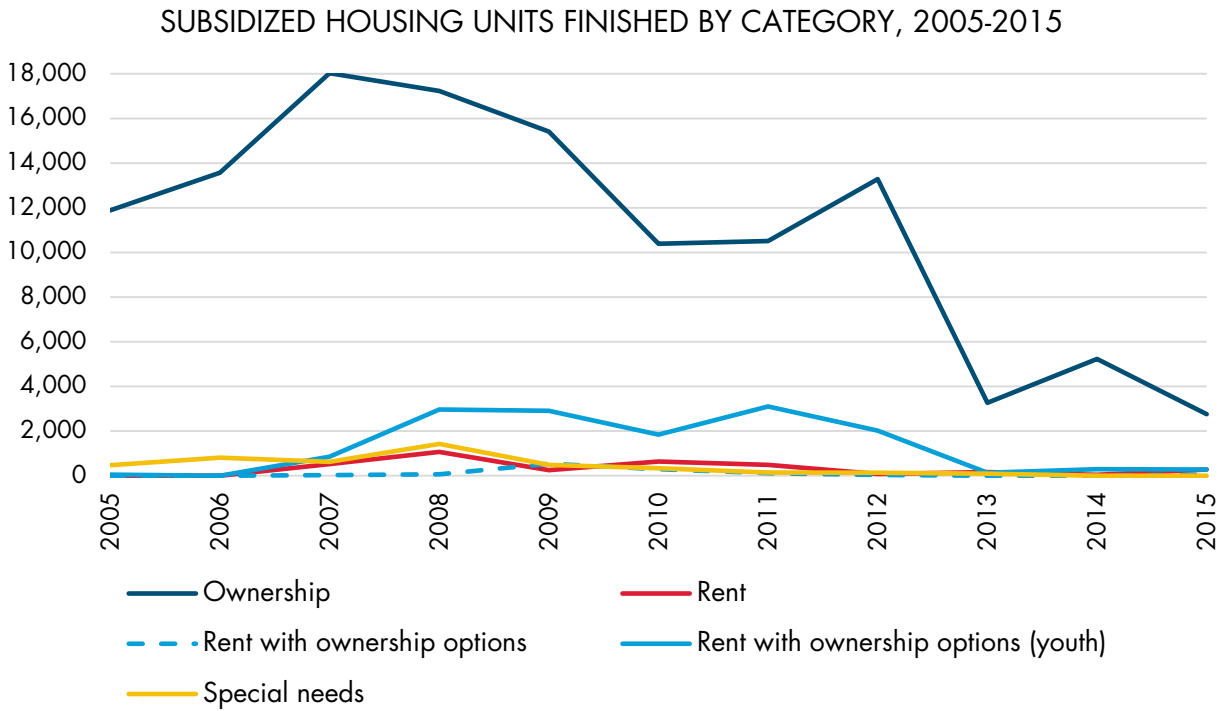


Figure 13: Subsidized housing units finished by type of tenure, 2005-2015. Data source: Subsidized housing website of the Region of Madrid.

As seen in Figure 14, almost all the units built by cooperatives were directed towards the ownership tenure category. This is consistent with the nature of cooperatives in Spain, which are started by members who want to develop and buy their future house. Although private developers built more total units than public companies for ownership tenure, they also built more units overall, as shown in Figure 10. Looking at the percentage over the total number built, 74% of the units by private developers were directed towards ownership whereas public companies developed 80% of their units for this category. For young rentals with future ownership option, private developers dedicated 17% of their units, and public companies 10% of theirs. Both developers dedicated around 4.5% of their production to units for population with special needs, and around 4% of the units for rent, leaving the rental with option to buy as a residual tenure type.

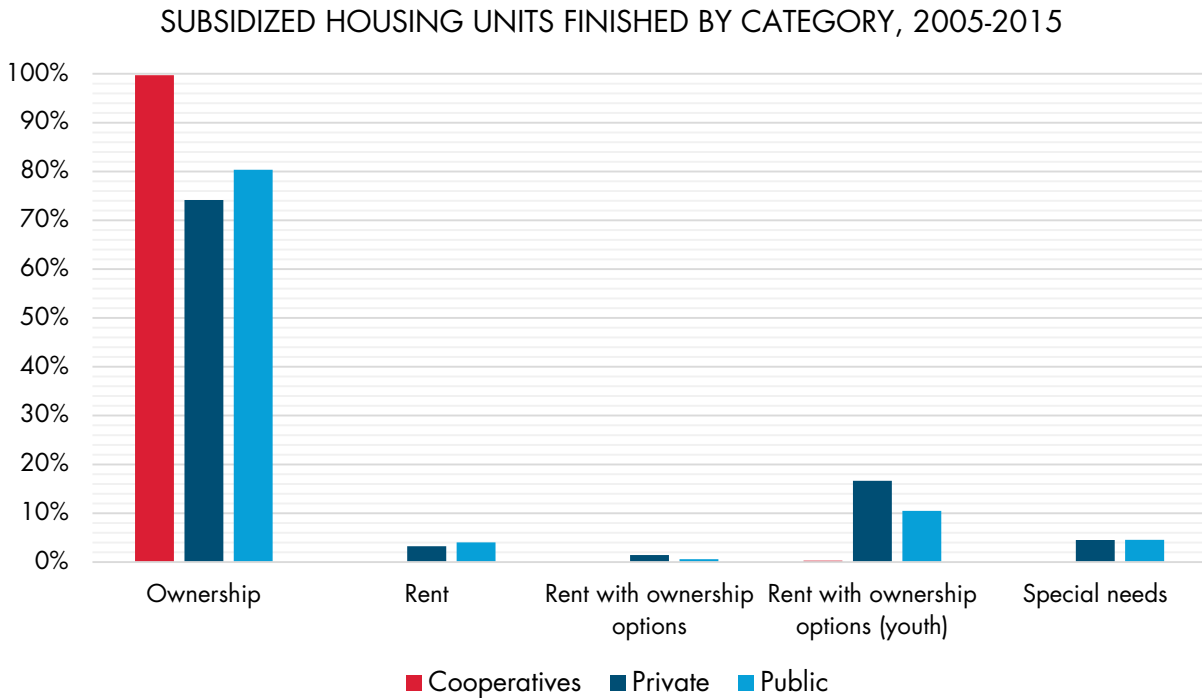
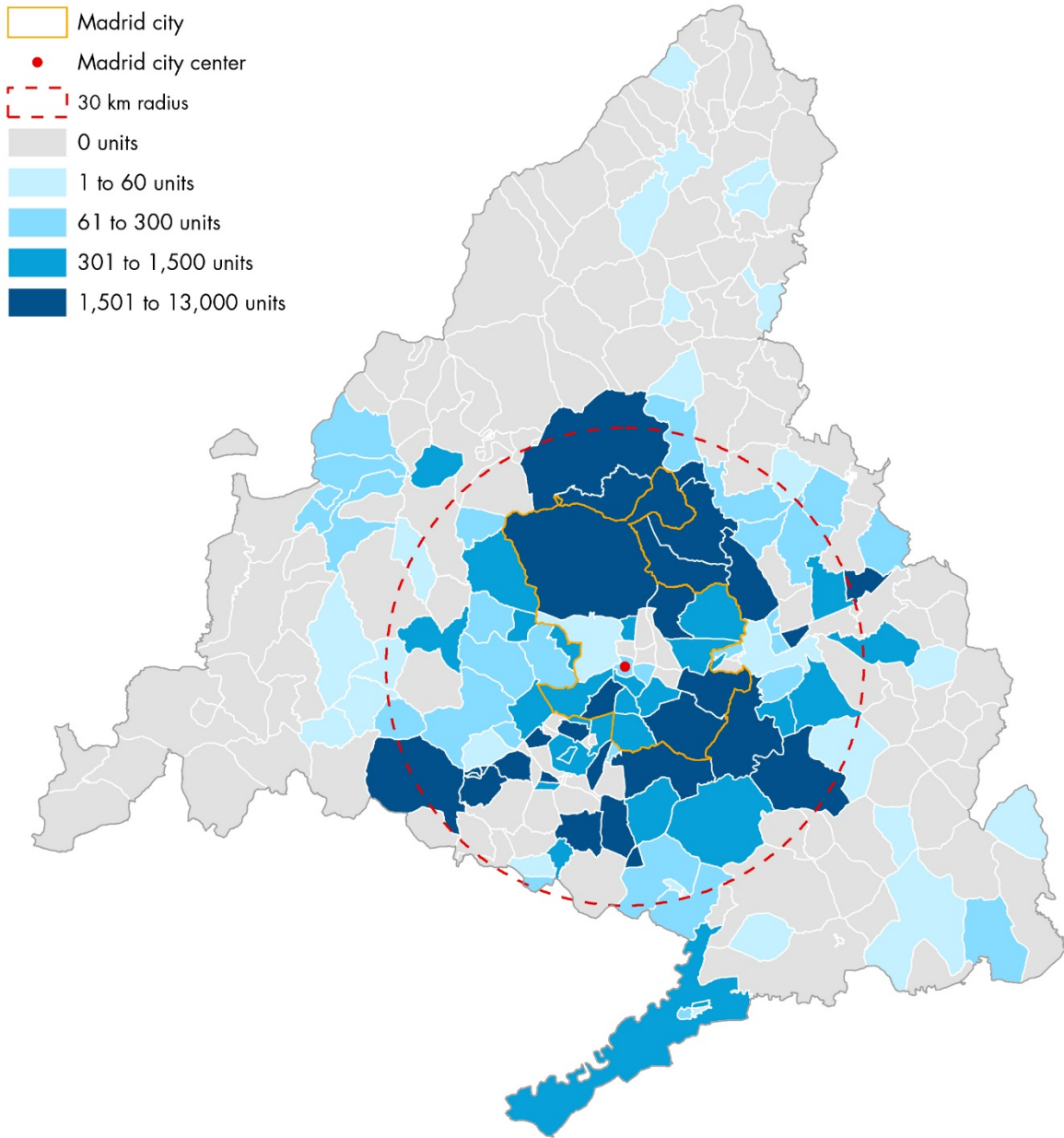


Figure 14: Subsidized housing units finished by type of tenure and type of developer, 2005-2015. Data source: Subsidized housing website of the Region of Madrid.

SPATIAL DISTRIBUTION OF THE FINISHED UNITS

Looking at the 249 districts of the Region of Madrid, 115 of them had subsidized housing projects started during the 2005-2015 period, but only in 110 districts were there subsidized housing units finished. Figure 15 shows the total number of subsidized units finished in each district. As expected, the construction of subsidized housing is focused in the metropolitan area of the city of Madrid and its surrounding municipalities, where the highest concentration of population is also located. Indeed, 97% of the units are found within a 30 km radius from the center of the city of Madrid. Northern and south-eastern districts show a much higher degree of subsidized housing construction than the western ones. Likewise, a few districts in the south-west area of the Region - Alcorcon, Arroyomolinos, Fuenlabrada, Navalcarnero, and Mostoles- show a high number of finished units.

SUBSIDIZED HOUSING UNITS BUILT ON EACH DISTRICT, 2005-2015



Districts with 1,501 to 13,000 units built ■

Alcala de Henares (District 04)
 Alcobendas (District 01)
 Alcorcon (District 04)
 Arganda del rey
 Arroyomolinos
 Colmenar Viejo
 Fuenlabrada (District 07)
 Getafe (District 03 and 04)

Leganes (District 03)
 Madrid (Districts of Fuencarral-El Pardo,
 Carabanchel, Hortaleza,
 Villa de Vallecas and Vicalvaro)
 Mostoles (District 04)
 Navalcarnero
 Paracuellos de Jarama
 Parla

Pinto (District 01)
 Rivas-Vaciamadrid
 San Sebastian de los Reyes
 Torrejon de Ardoz (District 02)
 Tres Cantos

Figure 15: Subsidized housing units built on each district between 2005 and 2015. Data source: Subsidized housing website of the Region of Madrid.

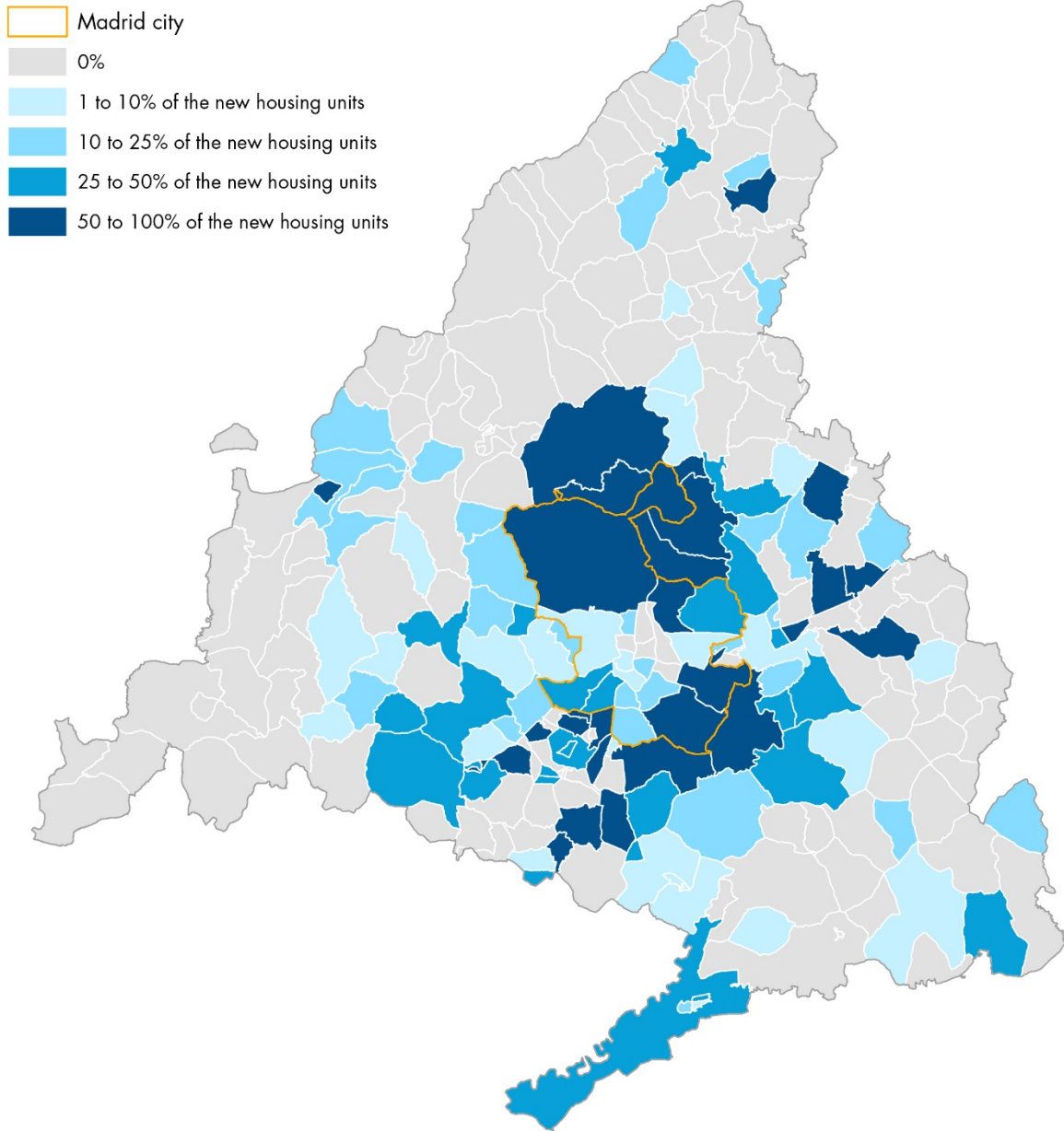
Looking at the city of Madrid, Figure 15 illustrates that subsidized housing was not built in the city center districts. As noted, this is consequence of the housing policies, which foster the construction of new units in the new development areas – typically in peripheral locations – in detriment of the refurbishment of the older stock in the city center.

If we look at the presence of subsidized housing in the new residential stock built from 2005 to 2015, the scenario is slightly different. As presented in Figure 16, the districts in the north and south-east of the city of Madrid are still the ones where subsidized housing had a higher presence in the new residential projects. However, some of the districts that had the highest number of subsidized units built, are not part of the category which represents the highest presence in the new stock. Likewise, the western districts have a lower percentage of subsidized units. In contrast, in some peripheral districts in which the number of total units built was low, these units represent a high percentage of the new residential stock. These are the cases of San Lorenzo del Escorial in the west, Robledillo de la Jara in the north, or Fresno de Torote, district 03 in Alcala de Henares, and Villalbilla in the east part of the Region.

Considering that the regional land law established, from 2005 to 2012, that 50% of the new residential land had to be dedicated to subsidized housing, and this same law decreased this requirement to 30% from 2013 to 2015, a weighted average of 45% should be expected in all districts that had new residential developments. That would be the case if all land had already been developed in 2015 and if all districts had complied with the law. Nevertheless, until 2015, only 31 districts achieved 45% of subsidized housing or more on the new residential projects. As noted, assuming all districts complied with the law, a possible explanation for this fact is that land could be zoned for subsidized units but still not developed at the moment of this study.

When considering the quantity of built units regarding the number of inhabitants in 2015, the districts with the higher concentration are located slightly further out from the city of Madrid. As seen in Figure 17, the districts with more subsidized units built per inhabitant are not as focused in the surrounding of the city of Madrid as they were in Figure 15. Some of the Madrid districts have decreased their relevance and, in exchange, districts located in the periphery of the Region show a high proportion of subsidized units built for the number of inhabitants they have.

SUBSIDIZED HOUSING UNITS BUILT AS A PERCENTAGE OF THE NEW RESIDENTIAL STOCK, 2005-2015

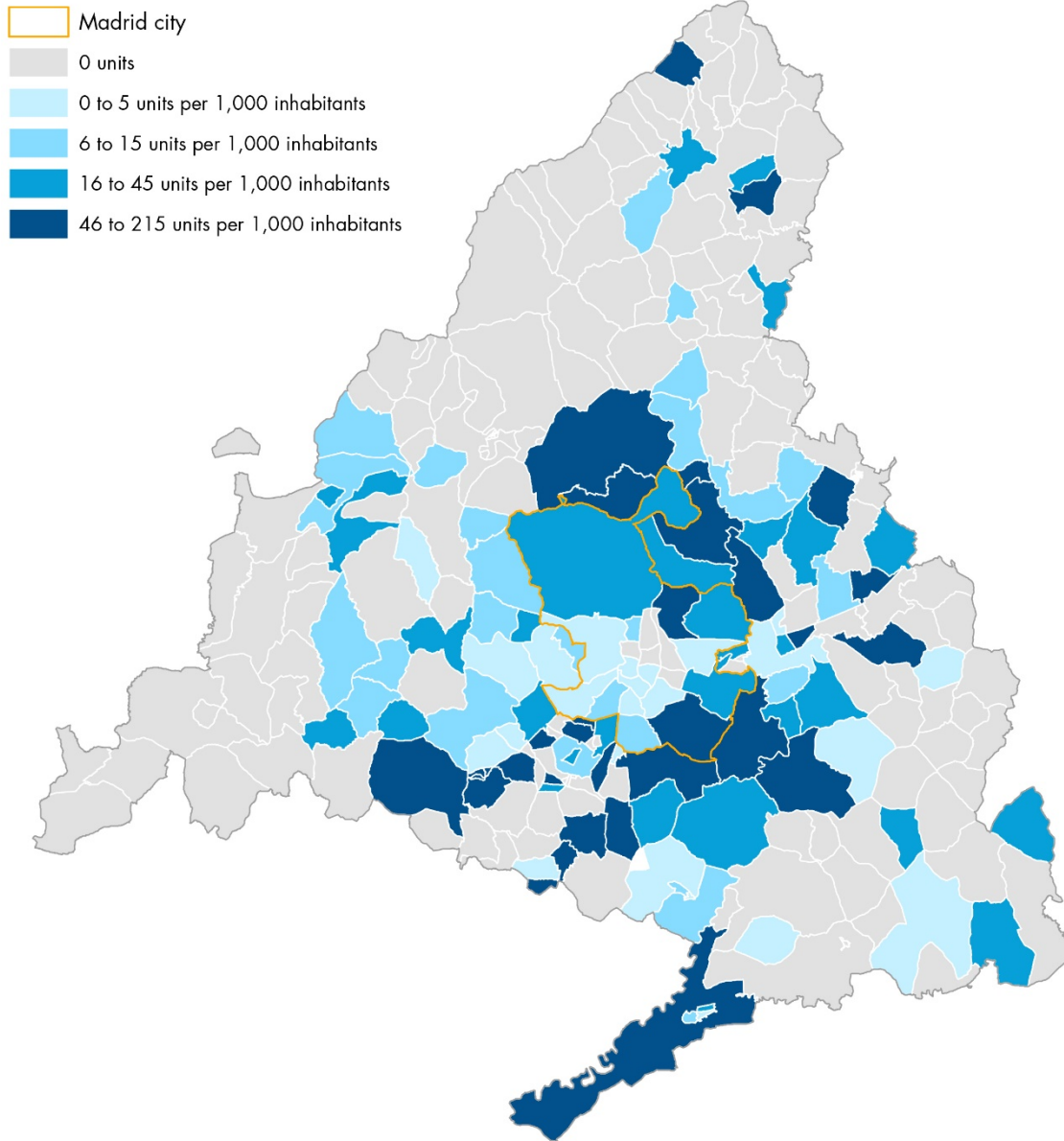


Districts where subsidized housing represents 50 to 100% of the new residential stock built ■

- | | | |
|--|---|--|
| Alcala de Henares (District 03 and 04) | Madrid (Districts of Fuencarral-El Pardo, Hortaleza, Villa de Vallecas and Vicalvaro) | San Lorenzo del Escorial (District 02) |
| Alcobendas (District 01) | Mostoles (District 04) | San Sebastian de los Reyes |
| Alcorcon (District 04) | Parla | Torrejon de Ardoz (District 02) |
| Colmenar Viejo | Pinto (District 01) | Torrejon de la Calzada |
| Coslada (District 01) | Rivas-Vaciamadrid | Villalbilla |
| Fresno de Torote | Robledillo de la Jara | Tres Cantos |
| Getafe (District 03 and 04) | | |
| Leganes (District 03, 05 and 06) | | |

Figure 16: Subsidized housing units built as a percentage of the new residential stock, 2005-2015. Data source: Subsidized housing website of the Region of Madrid.

SUBSIDIZED HOUSING UNITS BUILT PER 1,000 INHABITANTS, 2005-2015



Districts with 46 to 215 units per 1,000 inhabitants ■

- | | | |
|---------------------------------|--|---------------------------------|
| La Acebeda | Fuenlabrada (District 07) | Rivas-Vaciamadrid |
| Alcala de Henares (District 04) | Getafe (District 03 and 04) | Robledilla de la Jara |
| Alcorcon (District 04) | Leganes (District 03 and 06) | San Sebastian de los Reyes |
| Aranjuez (District 04) | Madrid (Hortaleza and Villa de Vallecas) | Torrejon de Ardoz (District 02) |
| Arganda del Rey | Mostoles (District 04) | Torrejon de la Calzada |
| Arroyomolinos | Navalcarnero | Valdemoro (District 02) |
| Casarrubuelos | Paracuellos de Jarama | Villalbilla |
| Colmenar Viejo | Parla | Tres Cantos |
| Fresno de Torote | Pinto (District 01) | |

Figure 17: Subsidized housing units built per 1,000 inhabitants, 2005-2015. Data source: Subsidized housing website of the Region of Madrid.

Regarding the location within each city, Figures 18 and 19 illustrate how subsidized housing units tend to locate on the peripheries of the urban areas, with just few of them in central plots. As noted, this is consequence of the housing policies, which fostered their construction in new developments. It is also a consequence of the trend of the last real estate boom, which was concentrated on the development of new land.

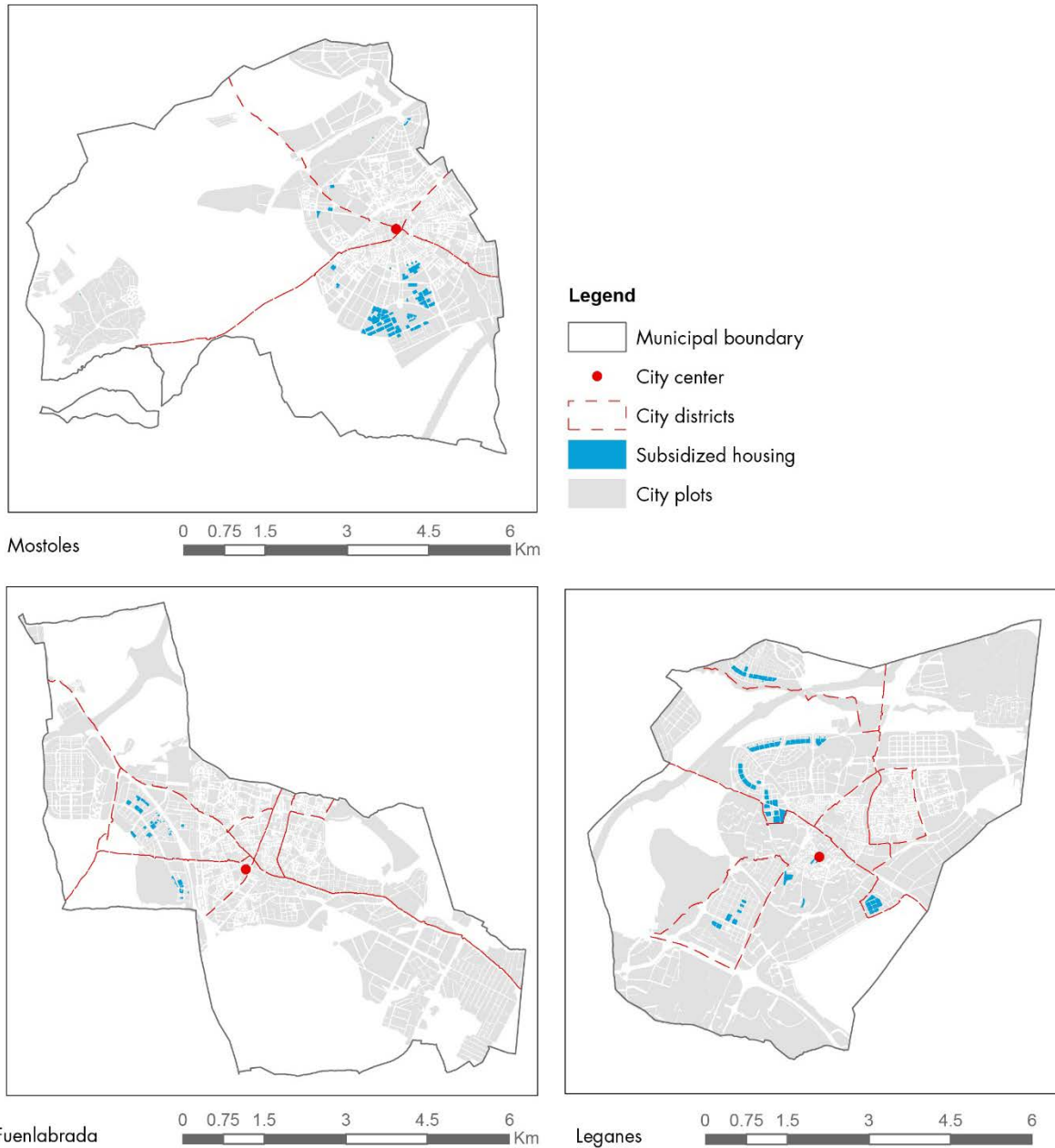


Figure 18: Location of the subsidized housing projects built in some of the largest cities in the Region, 2005-2015. Data source: Subsidized housing website of the Region of Madrid.

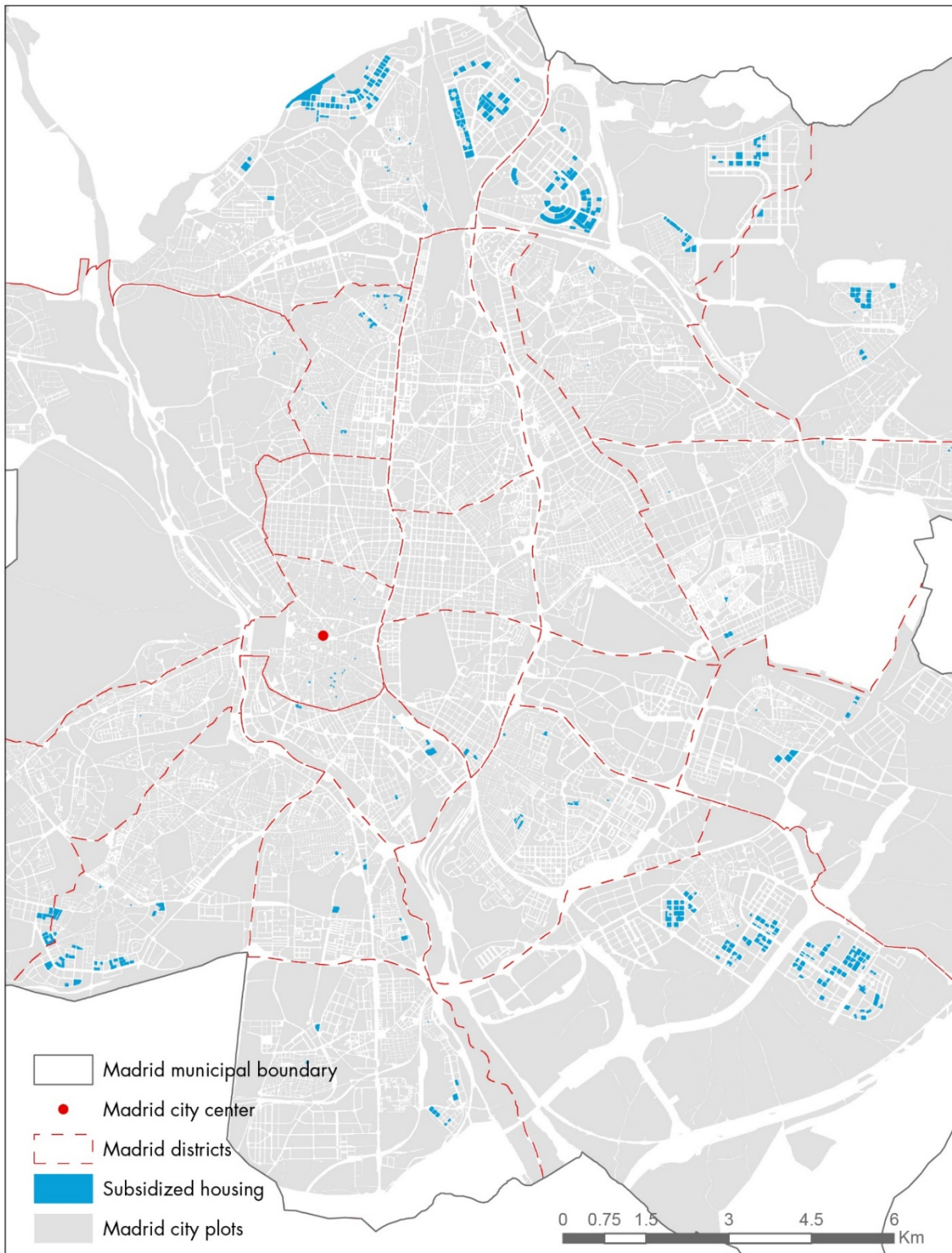


Figure 19: Location of the subsidized housing projects built in the city of Madrid, 2005-2015. Data source: Subsidized housing website of the Region of Madrid.

CROWD-OUT EFFECT ANALYSIS

In the Region of Madrid, as noted, there are three types of developers involved in the construction of subsidized housing: private developers, cooperative associations and public companies. This study aims to empirically analyze the effects of this coexistence. The study purpose is to understand the effect on the number of units built by one agent if the number of units built by another developer increases. Does the construction of more units by one type of developer reduce the construction of units by the others?

Through the description of the subsidized housing data, we saw how private developers led the construction of subsidized units during the boom period of the study (2005-2008), and during the later decline of the market (2008-2012). Later on cooperatives led the recovery of the sector during the recent years of economic crisis (2012-2015). At no moment during this period, did public companies have a leading role in the construction of subsidized housing. On top of that, mismanagement problems led several public housing companies to declare bankruptcy in 2013. Since then, some of them - such as the subsidized housing company of the city of Madrid (EMVS) - redefined their strategy and decided to stop the direct construction of units (EMVS, 2014). Instead, the EMVS decided to focus on the rental of its current stock.

Despite these facts, public developers might have had an important role in triggering the construction of subsidized units, and therefore attracting the other developers to build in the same areas. Measuring this interaction among the different developers will help to understand whether public companies should continue with their construction activity, or whether they can become a different player focused only on renting, as the other developers will continue with the construction of the subsidized units.

In the economic literature, measuring whether there is a positive or negative interaction among subsidized housing suppliers has been done through empirical analysis of the crowd-out effect among them (Sinai & Waldfoegel, 2005) (Eriksen & Rosenthal, 2005) (Chapelle, 2014). A crowd-out effect is argued to happen when increasing the government expenditure in a sector reduces the expenditure of the other agents operating in that same sector.

Chapelle (2014) remarks that in the field of housing there is a debate about which type of policies are more effective: supply side policies focused on the direct provision of units or demand side policies, which provide

vouchers and the like to the future inhabitants. Both types of policy have their benefits and drawbacks, making it necessary to study the housing market characteristics of a country before choosing. As noted, Spain's housing policies are supply side, focused on the provision of units at lower price than the ones on the regular market. Some scholars (Eriksen & Rosenthal, 2010) suggests that one of the drawbacks of these types of policies is that the competition between the providers of subsidized housing and regular housing may lead the private sector to reduce its supply of regular units if there is a large number of subsidized ones in an area.

This study, however, tests the existence of a crowd-out effect not between subsidized and regular housing developers but within the subsidized housing sector itself. In the subsidized housing sector, it could be argued that the three types of developers compete for land, financial facilities and demand for the units. Because of this competition and the scarcity of available resources, it could be expected that an increase in the number of units built by one type of developer would prevent the construction of more units by the other ones. On the other hand, as subsidized housing might be perceived as a less profitable product for private developers, it could also be argued that the construction of subsidized units by public companies is necessary to attract the subsequent construction of units by the other developers. In this case, the presence of subsidized units built by public companies would generate a crowd-in effect.

Understanding the nature of these interactions among the developers of the Region of Madrid would help define more effective housing policies regarding the provision of subsidized housing. If the construction of units by public companies generates a crowd-out effect on the other developers, the decision of companies such as the EMVS of not building more units would be adequate. In that case, the provision of subsidized units would continue - or even increase - through the other developers, if the right incentives existed. In this regard, it would also be necessary to analyze if the resources allocated for these incentives are more or less effective as the same resources under the management of the public companies. In addition, public companies could be focused on offering services which are currently not covered by other agents. Nevertheless, if there is a crowd-in effect, public companies would need to continue with the direct construction of subsidized units, as their role is necessary to attract other developers to build more subsidized units.

DATA DESCRIPTION

UNIT OF OBSERVATION

For the analysis of crowd-out effects on a housing market, a unit of observation that can be defined as a market area is needed. The smallest geographic unit available for most data, a census tract, would be inappropriate because the adjustments to changes within the census tract might happen outside its borders, as remarked by Sinai & Waldfogel (2005). Moving one step up in the size ladder, this thesis employs the 249 districts of the Madrid region as the geographic unit of observation. A district is a geopolitical subdivision of the municipal land controlled by a city. These subdivisions are made in order to facilitate the provision of municipal services.

In the Madrid region there are 179 municipal regions and 20 of them are subdivided. Within the subdivided regions, the median number of districts is 3.5, and the city with the highest number of districts is Madrid (21), followed by Fuenlabrada (9), Alcala de Henares (8) and Leganes (7). The districts have a mean size of 32.49 km² (3,249 hectares) which represents 0.4% of the Madrid region, and the standard deviation is 31.68 km².

SUBSIDIZED HOUSING UNITS

The most important data used in this study comes from the “Search of subsidized developments¹⁹” section of the subsidized housing website²⁰ of the Region of Madrid. This website allows users to browse all the subsidized housing developments which have taken place since 2005. For each project, it shows the following information:

- The phase (definitive or provisional) of the the project with respect to the process of achieving subsidized housing status. The data shows that 145,166 units were finished and achieved a definitive license, whereas 15,039 have a provisional license and were abandoned or are still unfinished. The

¹⁹ Consulta de promociones

²⁰ Portal de Vivienda

study is done using the projects with definitive license, which means they were finished and incorporated into the new residential stock.

- The date in which the phase status was granted by the regional authority.
- The municipal region where the project is located.
- The location of the project. In 80% of the projects the location is specified through the plot number of the development plan. In the remaining cases, it is a regular address.
- The name of the developer in the form of its legal entity name.
- The type of subsidized housing units which are being developed (VPPB, VPPL, VPPA, VPPAOCJ, VIS, VPO, E). As explained before, these categories indicate whether the units are being developed for rent or to sell, and which demographic group they are targeting regarding income and age.
- The number of subsidized housing units of each type.
- The number of garages and storage rooms which are also being developed in the project.
- The number of accessible housing units. It is a legal requirement included in the subsidized housing normative to have a minimum of 3% of the units adapted for physically disabled people in new projects. These units will be assigned to physically disabled people if there are any on the list of future inhabitants of the project. Otherwise, the units will be assigned to non-disabled solicitants.

Although the website does not allow the downloading of the data, it can be copied by making multiple queries to the website. Once we had the original data, we added two new fields which were fundamental for the study:

- The type of developer (public, private or cooperative). Based on the name of the developer field we distinguished the cooperatives as the ones which included the term “coop” on it. Likewise, we also identified public developers. There were two types of public developers: the regional developer (Housing Institute of the Madrid region²¹) and each of the municipal developers, whose names

²¹ Instituto de la vivienda de Madrid

started with “Municipal company”. Both types were included in the Public category. The remaining developers, which were not public or cooperative, were classified as private.

- The geolocation of the project through its cadastral reference number. In order to aggregate the projects by districts, we used GIS software and cadastral data to first geolocate each project, then we intersected them with the district shapefiles and afterwards we extracted each district with the data of the subsidized housing projects located in it.

Because the locations of 80% of the projects were specified through their lot number in the development plan, we could not use automatic geolocation based on their address. Instead, we used the original development plans, such as Figure 20, and satellite images to eyeball the location of each project; we then looked for the plot on the cadastral data shapefiles we had downloaded from the Spanish cadaster²² and assigned the cadastral reference in the shapefile to the project. Cadastral references are unique identifying numbers for built property. This process allowed us to match the database from the subsidized housing website with the cadastral data. It also allowed us to visualize the subsidized housing projects at the aggregation level of city plots, as shown in Figure 21.

We also used the Madrid region district shapefiles published in the Nomecalles website of the Statistics Institute of the Madrid region²³. We intersected the district files with the cadastral data which included the subsidized housing information and extracted the data by district. The result is the aggregation of the whole subsidized housing database at the district level.

In the empirical specification, the subsidized units were used as a percentage of the new stock built. Therefore, for each district, we created the variables PDEF PUB, PDEF PRI, PDEF COOP, which are the sum of the units finished by each type of developer between 2005 and 2014 in a district (j), divided by the total number of new residential units built in that period in the district.

$$PDEF PUB_j = \frac{\sum_{2005}^{2014} \text{Subsidized housing units built by public developer}_j}{\sum_{2005}^{2014} \text{New residential units built}_j}$$

²² Portal de la Dirección General del Catastro

²³ Nomecalles. Instituto de Estadística de la Comunidad de Madrid

P.A.U. DE VALLECAS



Figure 20: Development plan of the neighborhood of Vallecas in Madrid. The plot numbers allowed the location of the subsidized housing projects, which had that plot specification instead of a regular address.

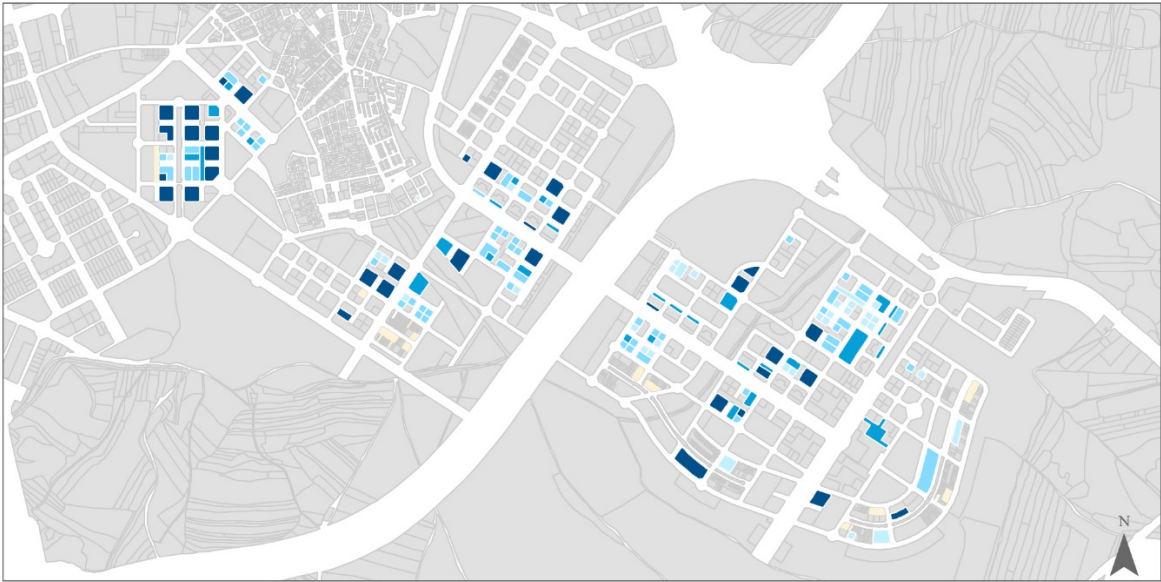


Figure 21: Map of the Vallecas neighborhood in Madrid with the plots that contain subsidized housing projects, in blue. The color intensity refers to the amount of subsidized units built on them.

DEMOGRAPHIC VARIABLES

In addition, we used data published on the Madrid regional database website – BDT²⁴ for its Spanish initials– regarding total population, population by age, and population by nationality. In the case of population, data was available for the 2005-2014 period for the 249 districts. Population by age, however, was only available for 199 districts, which included 178 municipal regions (excluding Madrid city) plus the 21 districts of Madrid city.

We calculated the percentage of population under 40 years old (40 excluded), as a measure of young population living in each district, creating the UND40 variable. Likewise, we calculated the percentage of foreign population living in each district as a control variable (FOREIGN). In both cases, for the districts where we did not have specific data, we used their municipal region data. As the largest differences among districts are within Madrid city and these are already captured, we assume the remaining municipal data is accurate enough for the study.

The three variables - total population, percentage of population under 40 years old, and percentage of foreign population - were transformed into logarithmic form to improve their normal distribution and linear relationship with the dependent variables.

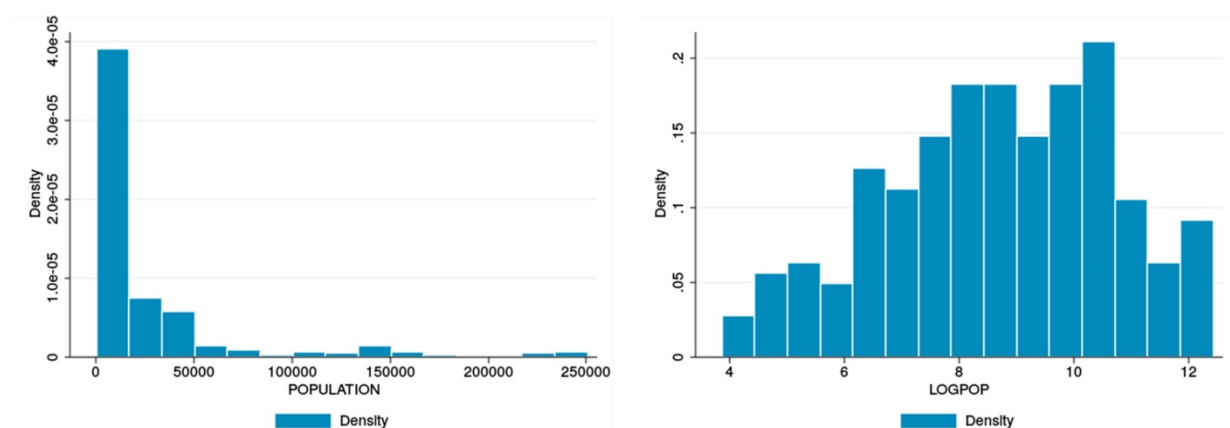


Figure 22: Histogram of the population variable before and after the logarithmic transformation.

²⁴ Banco de datos territorial de la Comunidad de Madrid

ECONOMIC VARIABLES

We also used data reflecting the price per square meter of housing and the gross income per person. The latter one was published at the BDT website for the 179 municipal regions. However, as we have said before, the districts of Madrid city have large differences among them which are not captured in the municipal level data. We adjusted for this by using 2002-2010 data from the Madrid city hall website which specified the income per capita by district. We calculated the ratio each district represents above or below the average of the city and applied that ratio to the municipal data we had from the BDT. For the years we did not have Madrid city district data (2011-2014) we applied the same ratios as in 2010. As it happened with some demographic variables, for the remaining districts for which we did not have specific data, we used their municipal region data, assuming the differences were not substantial.

Official public data for housing prices was only available for 27 municipal regions in the BDT, so we used data available at the real estate listing website Idealista.com which has data for 50 municipal regions and the 21 Madrid city districts for the 2005-2014 period, expressed as €/m². For calculating the remaining 129 municipal regions, we regressed price as a function of income and its yearly difference, using the regression specification:

$$\text{Price}_j = \alpha + \beta_1 \text{Income}_j + \beta_2 \text{Income}_j^2 + \beta_3 \text{Year}_{ij} + \varepsilon_j$$

This regression had an R² of 0.65 and was used to predict the price for the 129 municipal regions for which we did not have the data. As we did for some demographic variables, the municipal data was assimilated as district data except in the case of Madrid, for which we actually had data. Both the income and price data were transformed into their logarithmic forms to improve their normal distribution and linear relationship with the dependent variables.

BUILT-ENVIRONMENT VARIABLES

For the built stock data, only the Census 2001 and Census 2011 at the municipal level were available. However, the cadastral data registers the construction year of each building and its use, so we deployed this data to calculate both the stock of residential units by year and the new residential stock variables.

We used both the shapefiles and the alphanumeric data available at the Spanish cadaster. The cadaster offers a large amount of data about each plot, building and individual unit built in Spain. On it we can find the construction year, type of use, floor area, address, district, municipality, postal code and other interesting information useful to characterize the built environment. We filtered the residential data and joined it with the shapefiles through GIS software. Afterwards, we extracted the number of residential units at each district and calculated the new residential stock added each year. By adding all the stock up to a date, we also had the total residential stock at each district at a specific year.

The new residential stock built each year was used in the NEWBUILT variable, transformed into its logarithmic form to improve its normal distribution and linear relationship with the dependent variables. The total stock was used in early specifications but it was highly correlated with the population variable and it was finally dropped out of the specification. However, it was later used for the creation of the dummy variable that indicated if the district had a high construction rate.

POLICY-GOAL VARIABLES

Three dummy variables were created to control for the facts of being a district of the city of Madrid, being in a district where the construction of subsidized housing was below the requirements of the housing plan, and being in a district where the real estate market was booming and below the requirements of the housing plan.

We created a dummy variable which indicated whether a district had a construction of subsidized housing which was in compliance with the housing policies or not. As we mentioned before, according to the regional housing plans, 50% of the new residential stock had to be subsidized from 2005 to 2012. This percentage decreased to 30% from 2012 to 2014. Overall, we would expect a weighted average of 46% of the new residential stock to be subsidized if a district was in compliance with the plans. Therefore, we calculated the percentage that the total number of finished units represented over the total new residential stock. Later on, we created the OUTPOLICY dummy variable which was positive if the previous percentage was below 46%, meaning the subsidized housing requirement is not achieved yet. This dummy variable is accounting

for the built stock, not the land zoning. It is necessary to remind that the land could be zoned for subsidized housing but it might not have been developed.

Using the new residential stock and total stock variables, we calculated the percentage of new construction on the stock. Afterwards, we calculated which such percentage delimited the top quartile of districts with the highest rate. Using this threshold, a dummy variable was created to indicate the districts where new residential construction was very high, which was a proxy for being a booming real estate market. Later on, we created the HIGHCONSTOUTPOLICY variable which controlled for the interaction of one district being a booming market and also having the percentage of subsidized housing units representing less than 46% of the new residential stock.

Table 5: Summary statistics of the variables used in the crowd-out analysis.

Summary statistics					
	Observations	Mean	Standard deviation	Minimum	Maximum
PDEF PUB	249	0.042	0.120	0	1
PDEF PRI	249	0.065	0.152	0	1
PDEF COOP	249	0.041	0.115	0	1
LOG POPULATION	249	8.683	1.990	3.871	12.433
LOG INCOME	249	9.604	0.213	9.159	10.338
LOG PRICE	249	7.773	0.153	7.468	8.439
LOG FOREIGN	249	-2.023	0.419	-4.118	-0.971
LOG UND40	249	-0.650	0.170	-1.730	-0.384
LOG NEW BUILT	249	5.944	1.951	0	10.143
OUT POLICY	249	0.884	0.321	0	1
HIGH CONST OUT POLICY	249	0.193	0.395	0	1
MADRID	249	0.084	0.278	0	1

EMPIRICAL SPECIFICATION

This study's empirical approach tries to identify whether markets with more subsidized units built by one type of developer have more (or less) units built by the other developers. We studied the activity of each developer in the subsidized housing market as their contribution to the new residential stock built during that period, expressed as percentage, as noted when defining PDEF PUB, PDEF PRI, PDEF COOP.

To measure the impact of the construction of each subsidized housing developer on the others, we worked with three equivalent specifications. We used each developer as our dependent variable in each specification, and the other two were part of the independent variables. We first regressed the production of each developer as a function of the other two. Later on, we accounted for the economic and built environment variables. Lastly, we included the dummy variables that controlled for the compliance with the housing plans and the existence of a booming housing market in the district. The final specifications are shown below, where j indicates each of the districts:

$$\begin{aligned} \text{PDEF PUB}_j = & \alpha + \beta_1 \text{PDEF PRI}_j + \beta_2 \text{PDEF COOP}_j + \beta_3 \text{LOG POPULATION}_j + \beta_4 \text{LOG PRICE}_j + \\ & \beta_5 \text{LOG INCOME}_j + \beta_6 \text{LOG FOREIGN}_j + \beta_7 \text{LOG UND40}_j + \beta_8 \text{LOG NEW BUILT}_j + \beta_9 \text{OUT POLICY}_j + \\ & \beta_{10} \text{HIGH CONST OUT POLICY}_j + \beta_{11} \text{MADRID}_j + \varepsilon_j \end{aligned}$$

$$\begin{aligned} \text{PDEF PRI}_j = & \alpha + \beta_1 \text{PDEF PUB}_j + \beta_2 \text{PDEF COOP}_j + \beta_3 \text{LOG POPULATION}_j + \beta_4 \text{LOG PRICE}_j + \\ & \beta_5 \text{LOG INCOME}_j + \beta_6 \text{LOG FOREIGN}_j + \beta_7 \text{LOG UND40}_j + \beta_8 \text{LOG NEW BUILT}_j + \beta_9 \text{OUT POLICY}_j + \\ & \beta_{10} \text{HIGH CONST OUT POLICY}_j + \beta_{11} \text{MADRID}_j + \varepsilon_j \end{aligned}$$

$$\begin{aligned} \text{PDEF COOP}_j = & \alpha + \beta_1 \text{PDEF PUB}_j + \beta_2 \text{PDEF PRI}_j + \beta_3 \text{LOG POPULATION}_j + \beta_4 \text{LOG PRICE}_j + \\ & \beta_5 \text{LOG INCOME}_j + \beta_6 \text{LOG FOREIGN}_j + \beta_7 \text{LOG UND40}_j + \beta_8 \text{LOG NEW BUILT}_j + \beta_9 \text{OUT POLICY}_j + \\ & \beta_{10} \text{HIGH CONST OUT POLICY}_j + \beta_{11} \text{MADRID}_j + \varepsilon_j \end{aligned}$$

As the study embraced two different housing phases, we first run the cross-sectional regressions for the 10 years. Afterwards, we run the same regressions for the boom period (2005-2008) and the bust one (2009-2014), to see if there was any difference in the results in response to the housing market situation.

RESULTS

2005-2014 ANALYSIS

The results of the regressions for the 2005-2014 period are reported in Table 6, 7 and 8. The results in the final specifications (5) show that private and public developers may displace each other. Table 6 shows that a 1% increase in the presence of subsidized housing units built by private developers correlates with a decrease of 0.21% in the presence of subsidized units built by public developers. Likewise, the crowd-out effect also exists in the inverse direction. Table 7 shows that a 1% increase in the presence of subsidized units built by public developers correlates with a decrease of 0.18% in the presence of subsidized units built by private developers.

On the contrary, cooperatives seem to have a behavior aligned with both public and private developers. Table 8 shows that a 1% increase in the presence of subsidized units built by public developers correlates with an increase of 0.14% in the presence of subsidized units built by cooperatives. The crowd-in effect of private developers in cooperatives is stronger than the effect of public companies. It can be seen in Table 8 that a 1% increase in the presence of subsidized units built by private developers correlates with an increase of 0.39% in the presence of subsidized units built by cooperatives.

The results regarding the `OUTPOLICY` and `HIGHCONSTOUTPOLICY` variables are noteworthy. The three types of developers build less units if the residential built stock of the district is not in compliance with the required percentage of the housing law, holding all other variables constant. This indicates that, although these districts might have the land zoned for subsidized housing developments, free market units have been developed before the subsidized ones, maybe because they are more attractive to developers. Therefore, subsidized units in these districts are left to be developed for last. This hypothesis is consistent with the fact that private developers build less subsidized units in these districts, except when these districts are also a hot market area. This combination is expressed by the `HIGHCONSTOUTPOLICY` variable. Table 7 shows that in districts where this situation exists, private developers build more subsidized units. The hypothesis behind this result is that subsidized housing is perceived as less attractive than free market units and its development is held up until free market units are sold. However, even in areas where subsidized housing units have been developed at a slower pace than free market ones, if there is a lot of construction

happening, private developers will build simultaneously free market and subsidized units, as both types will be rapidly sold.

Looking at the other independent variables, Table 7 shows that a decrease in the price of housing is correlated with an increase in the presence of units built by private developers. A possible explanation is that in areas where housing prices are decreasing, developers might find it more attractive to build subsidized housing, which has a regional-fixed price, because the free market units might not be so profitable due to the reduction in their selling price. Results also show that an increase in income per capita correlates with an increase in the presence of subsidized housing built by private developers. It might be expected that the construction of subsidized housing would be higher in districts where income decreases, however, in this case, the result is not as counterintuitive as it seems. During the 2005-2014 period, most of the large developments took place in newly-urbanized areas on the peripheries of the cities. Before these developments happened, the areas did not have high income per capita levels compared with their respective cities. The new housing projects attracted population who had higher income than the previous population living there. The final outcome is that both the income per capita of the district and the stock of housing increased during the study period. Table 6 shows that the same results of private developers regarding income and price hold for public developments of subsidized housing. Although it might be expected that public developments would target areas where income is decreasing as part of a public interest in regeneration of certain urban areas, this goal is actually covered through other broader urban regeneration policies.

Although for the three types of developers an increase in population was correlated with more subsidized housing units, this effect is only statistically significant in the case of the cooperative developers. Also, cooperatives are on the opposite side of public and private developers regarding income, as an increase in income is correlated with a slight decrease in the presence of subsidized housing built by cooperatives.

Table 6: Impact of the private and cooperative developers of subsidized housing on the public developers. 2005-2014 data.

VARIABLES	(1) PUBLIC	(2) PUBLIC	(3) PUBLIC	(4) PUBLIC	(5) PUBLIC
PDEFPRI	-0.00535 (0.0636)				-0.209*** (0.0681)
PDEFLOOP	0.365*** (0.0839)				0.235*** (0.0826)
LOGPOP		0.0159*** (0.00525)	0.00607 (0.00560)	0.00369 (0.00634)	0.00164 (0.00634)
LOGPRICE		-0.103 (0.0802)	-0.0923 (0.0730)	-0.120 (0.0806)	-0.146* (0.0795)
LOGINCOME		0.0518 (0.0634)	0.0643 (0.0583)	0.0757 (0.0601)	0.107* (0.0596)
LOGFOREIGN		-0.00187 (0.0199)	0.0185 (0.0183)	0.0170 (0.0184)	0.0135 (0.0181)
LOGUND40		-0.0934* (0.0558)	-0.0908* (0.0529)	-0.0713 (0.0582)	-0.0602 (0.0572)
LOGNEWBUILT			2.25e-05 (0.00513)	-0.000553 (0.00518)	-0.000326 (0.00510)
OUTPOLICY			-0.163*** (0.0237)	-0.165*** (0.0239)	-0.182*** (0.0311)
HIGHCONSTOUTPOLICY			-0.000339 (0.0195)	-0.000585 (0.0196)	0.00372 (0.0194)
MADRID				0.0290 (0.0361)	0.0348 (0.0356)
Constant	0.0278*** (0.00779)	0.141 (0.428)	0.212 (0.394)	0.349 (0.429)	0.293 (0.422)
Observations	249	249	249	249	249
Adjusted R-squared	0.113	0.0353	0.201	0.200	0.232

Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Impact of the public and cooperative developers of subsidized housing on the private developers. 2005-2014 data.

VARIABLES	(1) PRIVATE	(2) PRIVATE	(3) PRIVATE	(4) PRIVATE	(5) PRIVATE
PDEFPUB	-0.00538 (0.0639)				-0.183*** (0.0596)
PDEFLOOP	0.891*** (0.0663)				0.577*** (0.0691)
LOGPOP		0.0205*** (0.00653)	0.00726 (0.00586)	0.00971 (0.00663)	0.000376 (0.00593)
LOGPRICE		-0.197** (0.0996)	-0.180** (0.0764)	-0.152* (0.0843)	-0.161** (0.0742)
LOGINCOME		0.104 (0.0788)	0.138** (0.0611)	0.126** (0.0629)	0.151*** (0.0553)
LOGFOREIGN		-0.0430* (0.0247)	-0.00404 (0.0192)	-0.00251 (0.0193)	-0.00666 (0.0169)
LOGUND40		0.0339 (0.0693)	0.0166 (0.0553)	-0.00345 (0.0609)	0.0126 (0.0536)
LOGNEWBUILT			-0.00591 (0.00537)	-0.00532 (0.00542)	-0.00214 (0.00477)
OUTPOLICY			-0.318*** (0.0248)	-0.315*** (0.0250)	-0.226*** (0.0274)
HIGHCONSTOUTPOLICY			0.0447** (0.0205)	0.0450** (0.0205)	0.0324* (0.0180)
MADRID				-0.0299 (0.0378)	0.00483 (0.0333)
Constant	0.0294*** (0.00779)	0.349 (0.532)	0.386 (0.412)	0.245 (0.449)	0.0465 (0.395)
Observations	249	249	249	249	249
Adjusted R-squared	0.449	0.0784	0.459	0.458	0.584

Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 8: Impact of the public and private developers of subsidized housing on the cooperative developers. 2005-2014 data.

VARIABLES	(1) COOP	(2) COOP	(3) COOP	(4) COOP	(5) COOP
PDEFPUB	0.196*** (0.0450)				0.141*** (0.0494)
PDEFPRI	0.475*** (0.0354)				0.394*** (0.0472)
LOGPOP		0.0213*** (0.00496)	0.0132*** (0.00485)	0.0174*** (0.00547)	0.0130*** (0.00483)
LOGPRICE		-0.0799 (0.0758)	-0.0692 (0.0632)	-0.0211 (0.0695)	0.0554 (0.0618)
LOGINCOME		-0.0266 (0.0599)	3.76e-05 (0.0505)	-0.0199 (0.0518)	-0.0802* (0.0461)
LOGFOREIGN		-0.0154 (0.0188)	0.00998 (0.0159)	0.0126 (0.0159)	0.0112 (0.0140)
LOGUND40		-0.0167 (0.0527)	-0.0161 (0.0458)	-0.0504 (0.0502)	-0.0390 (0.0442)
LOGNEWBUILT			-0.00670 (0.00444)	-0.00568 (0.00447)	-0.00351 (0.00393)
OUTPOLICY			-0.211*** (0.0205)	-0.207*** (0.0206)	-0.0592** (0.0254)
HIGHCONSTOUTPOLICY			0.0212 (0.0169)	0.0216 (0.0169)	0.00396 (0.0150)
MADRID				-0.0511 (0.0311)	-0.0434 (0.0274)
Constant	0.00130 (0.00585)	0.690* (0.405)	0.696** (0.341)	0.454 (0.370)	0.309 (0.326)
Observations	249	249	249	249	249
Adjusted R-squared	0.488	0.0716	0.354	0.359	0.505

Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

BOOM AND BUST PERIODS ANALYSIS

After the analysis of the whole period (2005-2014), we run the same specifications but this time separating the data in the housing boom period (2005-2008) and the bust one (2009-2014). We wanted to test if there was any change in the results when we isolated the different housing market circumstances occurring at each time. The results in Tables 10, 11, 12 and 13 show that even when separating the housing market cycles, private and public subsidized housing developers crowd-out each other. In both cases, the crowd-out effect is stronger in the bust period. However, it is in the case of private developers where this difference among periods is larger. Table 13 shows that a 1% increase in the presence of subsidized housing units built by public developers correlates with a decrease of 0.32% in the presence of subsidized units built by private developers, whereas for the 2005-2008 period the amount decreases by 0.14 percentage points, as shown in Table 12.

Surprisingly, Tables 14 and 15 show that subsidized housing developments built by cooperative associations are crowd-out in both boom and bust periods by public developments. This result is the opposite of what we found out in the 2005-2014 analysis in Table 8, where an increase in the subsidized units built by public companies was correlated with an increase in the presence of cooperative developments in the new residential stock. Instead, Table 14 shows that a 1% increase in the presence of subsidized housing units built by public developers correlates with a decrease of 0.13% in the presence of subsidized units built by cooperatives, similar to the decrease of 0.12% showed in Table 15. The explanation to this different behavior is that both cooperative and public developers built subsidized housing in the same districts but at alternating periods in time. This situation becomes one of strategic complementarity when looking at the market in the long term, but one of tactical alternation when looking in two differentiated short-term periods. Therefore, cooperatives and public companies are substitutes on the short-term, with one crowding-out the other, but they are compatible on the long-run.

An example of the tactical alternation between cooperatives and public companies can be seen in Table 9. The data shows the number of subsidized units built by each type of developer in two specific districts: district 04 of Alcala de Henares and Arganda del Rey. It can be seen that in the years in which public

companies finished their subsidized units, there was no cooperative development built, and vice versa. Private developments do not show this alternating pattern, though.

Table 9: Number of subsidized units built by each type of developer. Source: Subsidized housing website of the Region of Madrid.

Alcala de Henares. District 04				Arganda del Rey			
	Public	Private	Cooperatives		Public	Private	Cooperatives
2005	160	0	0	2005	0	256	212
2006	0	0	0	2006	11	274	0
2007	0	0	0	2007	0	16	0
2008	0	0	0	2008	0	153	40
2009	26	0	0	2009	0	845	82
2010	0	99	0	2010	20	275	0
2011	0	492	538	2011	0	55	71
2012	0	226	157	2012	0	61	287
2013	0	0	0	2013	0	0	0
2014	0	0	0	2014	0	0	0

The correlation between districts having a percentage of subsidized units below the policy goal and the decrease in construction of subsidized units continues being statistically significant for the three types of developers in the two periods. As noted, the hypothesis behind this result is that in districts where building subsidized housing is less attractive – in terms of demand or profitability – than building free market housing, developers will firstly build the free market units. The exception to this hypothesis are the districts with booming construction, as shown by the HIGHCONSTOUTPOLICY variable. Here, developers will build more subsidized units possibly because demand is so high that the units will be rapidly sold and all available land will be quickly developed regardless. However, these results are only statistically significant for public and private developers during the bust period. A possible explanation is that during the bust period there is a higher differentiation between the districts with high demand and low demand, and therefore, developers are more selective choosing the districts where they will develop.

Table 10: Impact of the private and cooperative developers of subsidized housing on the public developers. 2005-2008 data.

VARIABLES	(1) PUBLIC	(2) PUBLIC	(3) PUBLIC	(4) PUBLIC	(5) PUBLIC
PDEFPRI	0.161** (0.0761)				-0.189** (0.0735)
PDEFLOOP	0.0740 (0.100)				-0.312*** (0.0978)
LOGPOP		0.0104* (0.00618)	0.00878 (0.00609)	0.00801 (0.00618)	0.0115* (0.00604)
LOGPRICE		-0.00229 (0.0948)	-0.0838 (0.0837)	-0.104 (0.0883)	-0.0649 (0.0860)
LOGINCOME		-0.00318 (0.0572)	0.0713 (0.0516)	0.0774 (0.0523)	0.0407 (0.0515)
LOGFOREIGN		-0.00240 (0.0159)	-0.000114 (0.0137)	-0.00140 (0.0139)	-0.0103 (0.0136)
LOGUND40		-0.0118 (0.0499)	-0.0185 (0.0438)	-0.00574 (0.0473)	-0.0232 (0.0459)
LOGNEWBUILT			-0.00385 (0.00432)	-0.00429 (0.00437)	0.00138 (0.00443)
OUTPOLICY			-0.262*** (0.0285)	-0.263*** (0.0286)	-0.350*** (0.0344)
HIGHCONSTOUTPOLICY			-0.00273 (0.0155)	-0.00322 (0.0156)	0.00452 (0.0152)
MADRID				0.0206 (0.0286)	-0.000457 (0.0281)
Constant	0.0244*** (0.00697)	-0.0216 (0.435)	0.190 (0.378)	0.303 (0.409)	0.355 (0.396)
Observations	249	249	249	249	249
Adjusted R-squared	0.0228	0.0134	0.268	0.267	0.314

Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 11: Impact of the private and cooperative developers of subsidized housing on the public developers. 2009-2014 data.

VARIABLES	(1) PUBLIC	(2) PUBLIC	(3) PUBLIC	(4) PUBLIC	(5) PUBLIC
PDEFPRI	0.0255 (0.0482)				-0.228*** (0.0528)
PDEFLOOP	0.144** (0.0595)				-0.0993* (0.0597)
LOGPOP		0.0176*** (0.00667)	0.0101 (0.00669)	0.00197 (0.00788)	0.00508 (0.00765)
LOGPRICE		-0.0871 (0.0679)	-0.0187 (0.0636)	-0.0729 (0.0691)	-0.0737 (0.0664)
LOGINCOME		0.0623 (0.0696)	0.00233 (0.0645)	0.0260 (0.0653)	0.0283 (0.0628)
LOGFOREIGN		0.0115 (0.0238)	0.0293 (0.0220)	0.0253 (0.0219)	0.0175 (0.0212)
LOGUND40		-0.141** (0.0627)	-0.169*** (0.0578)	-0.114* (0.0641)	-0.101 (0.0620)
LOGNEWBUILT			0.00508 (0.00574)	0.00382 (0.00574)	0.00209 (0.00556)
OUTPOLICY			-0.149*** (0.0254)	-0.152*** (0.0253)	-0.264*** (0.0351)
HIGHCONSTOUTPOLICY			0.0333 (0.0254)	0.0358 (0.0253)	0.0469* (0.0244)
MADRID				0.0809* (0.0417)	0.0562 (0.0405)
Constant	0.0352*** (0.00988)	-0.108 (0.483)	0.116 (0.454)	0.408 (0.476)	0.484 (0.459)
Observations	249	249	249	249	249
Adjusted R-squared	0.0277	0.0532	0.206	0.215	0.275

Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 12: Impact of the public and cooperative developers of subsidized housing on the private developers. 2005-2008 data.

VARIABLES	(1) PRIVATE	(2) PRIVATE	(3) PRIVATE	(4) PRIVATE	(5) PRIVATE
PDEFPUB	0.111** (0.0525)				-0.144** (0.0559)
PDEFLOOP	0.548*** (0.0759)				0.0708 (0.0870)
LOGPOP		0.0173*** (0.00546)	0.00760 (0.00522)	0.00890* (0.00529)	0.00963* (0.00527)
LOGPRICE		-0.00248 (0.0837)	-0.00287 (0.0718)	0.0309 (0.0755)	0.00844 (0.0751)
LOGINCOME		-0.0385 (0.0505)	-0.0238 (0.0443)	-0.0339 (0.0448)	-0.0159 (0.0450)
LOGFOREIGN		-0.0158 (0.0140)	-0.0138 (0.0118)	-0.0116 (0.0118)	-0.0103 (0.0118)
LOGUND40		0.00777 (0.0441)	-0.0188 (0.0376)	-0.0402 (0.0404)	-0.0388 (0.0400)
LOGNEWBUILT			0.0104*** (0.00370)	0.0111*** (0.00373)	0.00967** (0.00381)
OUTPOLICY			-0.220*** (0.0245)	-0.219*** (0.0244)	-0.246*** (0.0322)
HIGHCONSTOUTPOLICY			0.0164 (0.0133)	0.0172 (0.0133)	0.0157 (0.0132)
MADRID				-0.0347 (0.0244)	-0.0285 (0.0244)
Constant	0.0166*** (0.00584)	0.245 (0.384)	0.327 (0.324)	0.137 (0.350)	0.175 (0.346)
Observations	249	249	249	249	249
Adjusted R-squared	0.192	0.0775	0.355	0.357	0.375

Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 13: Impact of the public and cooperative developers of subsidized housing on the private developers. 2009-2014 data.

VARIABLES	(1) PRIVATE	(2) PRIVATE	(3) PRIVATE	(4) PRIVATE	(5) PRIVATE
PDEFPUB	0.0447 (0.0843)				-0.319*** (0.0741)
PDEFLOOP	0.547*** (0.0716)				0.00317 (0.0711)
LOGPOP		0.0110 (0.00953)	-0.00229 (0.00786)	0.00569 (0.00927)	0.00626 (0.00906)
LOGPRICE		-0.217** (0.0970)	-0.0402 (0.0746)	0.0127 (0.0813)	-0.0105 (0.0789)
LOGINCOME		0.164 (0.0995)	0.0468 (0.0758)	0.0237 (0.0769)	0.0321 (0.0743)
LOGFOREIGN		-0.0807** (0.0340)	-0.0434* (0.0258)	-0.0396 (0.0258)	-0.0315 (0.0251)
LOGUND40		0.188** (0.0897)	0.146** (0.0679)	0.0925 (0.0754)	0.0565 (0.0737)
LOGNEWBUILT			-0.00428 (0.00674)	-0.00306 (0.00676)	-0.00180 (0.00658)
OUTPOLICY			-0.375*** (0.0298)	-0.372*** (0.0297)	-0.420*** (0.0373)
HIGHCONSTOUTPOLICY			0.0423 (0.0298)	0.0399 (0.0297)	0.0513* (0.0289)
MADRID				-0.0788 (0.0491)	-0.0528 (0.0480)
Constant	0.0600*** (0.0128)	0.0629 (0.690)	0.304 (0.533)	0.0190 (0.560)	0.147 (0.545)
Observations	249	249	249	249	249
Adjusted R-squared	0.196	0.0865	0.483	0.486	0.520

Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 14: Impact of the public and private developers of subsidized housing on the cooperative developers. 2005-2008 data.

VARIABLES	(1) COOP	(2) COOP	(3) COOP	(4) COOP	(5) COOP
PDEF PUB	0.0297 (0.0404)				-0.132*** (0.0414)
PDEF PRI	0.319*** (0.0442)				0.0394 (0.0484)
LOGPOP		0.0128*** (0.00409)	0.00412 (0.00396)	0.00585 (0.00397)	0.00656* (0.00393)
LOGPRICE		0.0449 (0.0628)	0.0608 (0.0544)	0.106* (0.0567)	0.0910 (0.0557)
LOGINCOME		-0.0816** (0.0379)	-0.0835** (0.0336)	-0.0971*** (0.0336)	-0.0856** (0.0331)
LOGFOREIGN		-0.0257** (0.0105)	-0.0245*** (0.00892)	-0.0216** (0.00890)	-0.0213** (0.00873)
LOGUND40		0.0189 (0.0330)	-0.00283 (0.0285)	-0.0315 (0.0304)	-0.0307 (0.0298)
LOGNEWBUILT			0.0105*** (0.00281)	0.0115*** (0.00280)	0.0105*** (0.00280)
OUTPOLICY			-0.148*** (0.0185)	-0.146*** (0.0184)	-0.172*** (0.0244)
HIGHCONSTOUTPOLICY			0.0133 (0.0101)	0.0144 (0.0100)	0.0133 (0.00983)
MADRID				-0.0465** (0.0183)	-0.0424** (0.0180)
Constant	0.0127*** (0.00445)	0.301 (0.288)	0.340 (0.246)	0.0857 (0.263)	0.120 (0.258)
Observations	249	249	249	249	249
Adjusted R-squared	0.179	0.0954	0.353	0.368	0.394

Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 15: Impact of the public and private developers of subsidized housing on the cooperative developers. 2009-2014 data.

VARIABLES	(1) COOP	(2) COOP	(3) COOP	(4) COOP	(5) COOP
PDEF PUB	0.161** (0.0667)				-0.116* (0.0699)
PDEF PRI	0.350*** (0.0459)				0.00265 (0.0593)
LOGPOP		0.0181** (0.00778)	0.0113 (0.00695)	0.0182** (0.00821)	0.0184** (0.00820)
LOGPRICE		-0.218*** (0.0791)	-0.0831 (0.0660)	-0.0376 (0.0720)	-0.0461 (0.0720)
LOGINCOME		0.0607 (0.0811)	-0.0112 (0.0670)	-0.0312 (0.0680)	-0.0282 (0.0679)
LOGFOREIGN		-0.0159 (0.0277)	0.00893 (0.0228)	0.0123 (0.0229)	0.0153 (0.0230)
LOGUND40		-0.0142 (0.0731)	-0.0340 (0.0601)	-0.0801 (0.0668)	-0.0935 (0.0671)
LOGNEWBUILT			-0.0115* (0.00596)	-0.0104* (0.00598)	-0.00995* (0.00598)
OUTPOLICY			-0.280*** (0.0263)	-0.277*** (0.0263)	-0.294*** (0.0376)
HIGHCONSTOUTPOLICY			0.0223 (0.0264)	0.0202 (0.0263)	0.0243 (0.0265)
MADRID				-0.0679 (0.0434)	-0.0583 (0.0438)
Constant	0.0149 (0.0107)	0.954* (0.563)	0.976** (0.472)	0.731 (0.496)	0.778 (0.495)
Observations	249	249	249	249	249
Adjusted R-squared	0.213	0.0716	0.381	0.385	0.388

Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

LIMITATIONS AND FURTHER RESEARCH

DATA AVAILABILITY

As noted by Palacios & Vinuesa (2010), housing experts in Spain complain that there is a lack of statistical information regarding the housing field when compared with other European countries. It is true that the inexistence or non-continuity of several housing databases is not the optimal situation to foster a deeper quantitative research, especially in the subsidized housing realm. However, although not user-friendly ready to work with, there are resources that can be helpful. The cadastral database, publicly available since 2011, offers a large amount of information of the Spanish built stock and its potential is still to be exploited (Mora-Garcia et al. 2015). Likewise, with the recent creation of an online compilation²⁵ of the open data available in the country, it should be expected an improvement in the quantity and quality of housing data.

Our study could only access the licensing data of subsidized housing projects from 2005 to 2015 in the Region of Madrid. Expanding this study in its time range or replicating it for other regions, would provide a more complete picture of the effectiveness of the current subsidized housing policies. Furthermore, for many of the independent variables used in this study, district level data was not available. As explained in the data description section, we used municipal data to represent the different districts embraced by that municipality, except in the case of the city of Madrid. If we had had precise data at the district level, we would had better captured the different characteristics of the units of analysis, allowing for more robust results.

HOUSING QUALITY, INNOVATION & SATISFACTION

This study analyzed the coexistence of the three types of developers by measuring their interaction through the number of units they built, their construction output. In this quantitative approach no attention was given to the differences in the types of housing layouts, quality of the building or innovation each type of developer presents in their developments. Likewise, no research was done in the inhabitants' satisfaction with the final units.

²⁵ www.datos.gob.es

As noted, public companies had an important role promoting design competitions, innovation in housing typologies, as well as using new construction techniques which aimed to improve the quality and sustainability of the buildings. The resulting projects received numerous awards and attracted the attention of public housing companies of other countries. However, private developers and cooperatives have assumed less risk when designing and building their subsidized housing projects. More comprehensive research would be needed to assess the long-term externalities of the innovation in the housing buildings, as well as the inhabitants' satisfaction with it. Furthermore, if public companies stop their role as developers of new subsidized units, new policy instruments should be studied to encourage private and cooperative developers to hold open design competitions and invest in new construction technologies. Likewise, public companies should make an effort to continue fostering innovation in the housing field in their new role as service providers.

CONCLUSIONS

Regarding housing policy in Spain, we saw that there is a need to improve the efforts on refurbishing the built stock in the center of cities. These areas are highly attractive due to their proximity to all the existing amenities and are in high demand. We have also noted that the presence of the rental market in Spain is too small when compared to other European countries and that certain groups of the population, such as the young, need alternatives to ownership to improve their access to housing.

The empirical analysis of the subsidized housing licenses data showed that the coexistence of public, private and cooperative developers is not without frictions. Due to the competition for land and demand, there is a correlation between an increase in the units built by public companies and the consequent crowding-out of the units built by private developers. Similarly, in the short term, public companies also generate a crowd-out effect on the construction of subsidized units by cooperative associations. The presence of these crowd-out effects is consistent with the results of the studies on the overall housing market by Sinai & Waldfoegel (2005) in the US, and Chapelle (2014) in France. These studies showed the existence of crowd-out effects between the provision of public housing and the provision of regular housing.

Considering all these circumstances, the decision of some public housing companies to stop their development activity could be a fantastic opportunity to improve several aspects of subsidized housing in Spain. Although their decision was driven by their bankrupt financial situation and not by strategic policy reasons, it opens a door to restructure the way subsidized housing is provided, and for dealing with current under-addressed problems.

On the one hand, through the subsidized housing licenses data, we saw that private and cooperative developers can be active players in the development of subsidized housing projects. Private developers led the market until 2013, and cooperatives followed. Later on, cooperatives led the recovery after 2013. If the current incentives, such as the land reserves and financial facilities, persist we can assume private companies and cooperatives will continue building subsidized housing projects. Therefore, the direct provision of subsidized units will not stop even if public companies stop their development activity. However, the results of the analysis showed that there were a large number of districts where plots reserved for subsidized housing were left to be developed last, as free market units were more attractive for private and

cooperative developers. Improving the two-speed development process occurring in these districts is needed to achieve a fully-functioning subsidized housing system. Addressing this problem might require a revision of the current policy instruments or the design and implementation of new ones. Of course, looking deeper into the system, the topic of whether Spain's system of supply-focused housing policies is the most efficient option, or subsidies should be directed towards future inhabitants, as in demand side policies, need further discussion.

On the other hand, public companies have the opportunity to focus their activity on aspects of the subsidized housing market that are currently under-addressed. We noted that 84% of the subsidized housing units built from 2005 to 2015 were directed towards ownership and that Spain needs to improve its policies in the rental sector. Furthermore, we have seen that the large stock in the center of cities needs refurbishment whereas most of the subsidized housing projects take place in the periphery. Public companies could not only manage their current rental stock but also increase the presence of subsidized rental units. Indeed, when choosing how to grow the subsidized rental stock, public companies could focus on the refurbishment of more centrally-located buildings instead of building new ones as they were doing. This way, the role of public companies would truly complement the one of private and cooperative developers. In this scenario, private companies and cooperatives would continue to construct new subsidized housing units mainly in peripheral locations, where new development occurs and where current housing policies foster these new subsidized developments. Public companies, however, would follow a complementary housing policy, focused on promoting rental units through the refurbishment of buildings in city centers.

GLOSSARY

EMVS	<i>Empresa Municipal de Vivienda y Suelo de Madrid.</i> Public subsidized housing company of the city of Madrid.
IPREM	<i>Indicador Público de Renta de Efectos Múltiples.</i> Nationally-defined indicator used for the assessment of the household income level.
VIS	<i>Vivienda de Integración Social.</i> Subsidized housing built for the population with special needs.
VPPA	<i>Vivienda de Protección Pública de Alquiler.</i> Subsidized housing built for rental tenure for the middle-income population.
VPPAOC	<i>Vivienda de Protección Pública de Alquiler con Opción a Compra.</i> Subsidized housing built for mixed-tenure for the middle-income population, with no age restriction.
VPPAOCJ	<i>Vivienda de Protección Pública de Alquiler con Opción a Compra para Jóvenes.</i> Subsidized housing built for mixed-tenure for the middle-income population under 35 years old.
VPPA RE	<i>Vivienda de Protección Pública de Alquiler en Régimen Especial.</i> Subsidized housing built for rental tenure for the low-income population.
VPPB	<i>Vivienda de Protección Pública de precio Básico.</i> Subsidized housing built for ownership tenure for the middle-income population.
VPPL	<i>Vivienda de Protección Pública de precio Limitado.</i> Subsidized housing built for ownership tenure for the higher middle-income population.

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