**Does Affordable Housing Affect Real Free-Market Housing prices?**

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**Abstract:**

Affordable housing advocates have argued that construction of affordable housing does not affect the level of real free-housing market prices. However, construction interests have claimed that affordable housing has contributed to the increase in free-market housing prices since lower benefits in the affordable housing sector must be compensated by higher prices in the free housing market.

This paper tries to investigate the case of the Spanish housing market and determine whether the construction of affordable housing (subsidized owner-occupied housing) had any effect on free-market housing price increases.

In order to achieve this aim we use a panel dataset for 50 Spanish provinces over the period 1995-2010. Our dependent variable is the real free-market housing prices per square meter. Our main explanatory is the ratio of affordable housing completions to free market housing completions (*ratio*, hereafter). We include in our estimation the square of this ratio to identify a potential non-monotonic relationship with the dependent variable and a set of control variables.

We run different estimation methods including a difference General Method of Moments (GMM) approach estimator which we consider that gives the most credible results as it accounts for different sources of endogeneity biases.

Our main result is that the *ratio* does affect the level of the Spanish real free-market housing prices. We also find a threshold effect in the relationship between the real free-market housing prices and the *ratio*. This results means that the *ratio* negatively affects the free-market housing real prices to certain extend, from which the effect of the *ratio* on the prices becomes positive.

We have tried to approximate the point from which this relationship becomes positive. This occurs, in all estimations, once the number of affordable housing completions exceeds the number of free-market ones.

The lagged dependent variable (included also as regressor) has a large positive effect on the real free-market housing prices which indicates high persistence.

**Keywords:** *affordable housing, free-market housing, free-market housing prices, Spain*

**JEL codes:** R20, R28, R31

**Introduction**

The provision of affordable housing through different land use regulations has opened a wide debate over the “incidence” controversy, in terms of Calavita & Mallach (2009). That is, “how the costs of providing affordable, and by definition below-market, housing are addressed, and which of the parties in the real estate transaction actually bears those costs” (p. 15). A major concern is that costs are actually being borne by developers and/or market-rate homebuyers. In the US, for instance, many municipalities enacting inclusionary housing ordinances have introduced incentives to reduce these “costs” in terms of higher densities, lower design requirements or financial incentives (e.g., lower parking requirements, relaxation of design standards, deferral, reduction, or waver of applicable permits and impact fees…). The evidence suggests that these incentives may promote affordable housing but the financial burden or the loss of city service levels, may be finally paid by the taxpayer / public in general (Litman, 2009; Nelson *et al*. 2002; Mulliner, Smallbone & Maliene, 2013; Tiesdell, 2004).

A further issue has been the effect of affordable housing on neighborhood´s property values. Nguyen (2005) made a review of the literature on this issue and found that “the extent to which property values are lowered depends on a variety of factors: design and management of affordable housing, compatibility between affordable housing and host neighborhood, and concentration of affordable housing” (p. 15). Public opinion appears to be very sensitive, especially at local level, to this type of initiatives and many of them may fail before it even begins (Tighe, 2010). That is why some authors have suggested the need to introduce in the US some mandatory regulations at the national level to overcome this opposition (Lerman, 2006; Calavita & Mallach, 2009; Brunick, 2004). Other authors have also analyzed the connections between housing affordability and planning policies in other countries; for instance, Sweden and Germany (Hansson, 2017) and Gaza (Asfour, 2017).

In Spain, the social and political debate so far has been limited to the incidence of the provision of new affordable housing on the prices of market housing units being put simultaneously into the market. Developing and construction interests have claimed that affordable housing has contributed to the increase in housing prices of market units since lower benefits in the affordable housing sector must be compensated by higher prices in the market-rate housing sector[[1]](#footnote-1). This view has been supported also by academics: “What underlies [in the new Act] is the attempt to replace public funding of protected housing policies with an additional burden to be borne by landowners or promoters at first, but if the market is to grow again as it did in the past, this cost will be transferred to open market housing purchasers” (García-Álvarez García, 2010, p. 396).

On the contrary, affordable housing advocates in Spain have argued that construction of affordable housing does not affect the general level of housing market prices; quite the opposite, it may even push down general housing prices by increasing housing supply (Burón Cuadrado, 2006, 2008; García Montalvo, 1999, 2004; Roca, 2008, 2010; Roger 2010).

The argument to support this position is that, as most studies on the Spanish housing market have shown, prices are driven primarily by demand factors (Esteban & Altuzarra, 2008). If that´s so, a rational developer will charge the maximum price demand can pay, and thus will be unable to pass along any other costs imposed by the requirement to produce below-market housing units. In fact, the “costs” of affordable housing result in lower land prices and/or lower benefits of developers, but as Burón Cuadrado (2006) points out developers still find it profitable to produce housing in these conditions.

The same controversy can also been found between different political parties. The conservative party (Partido Popular) defended that the new Land Act (approved in 2008 by a socialist majority) that increased the share of affordable housing in new and in-fill developments would eventually led to an increase of 20-30% in the price of free market housing[[2]](#footnote-2). However, it should be noted that in 2013, the conservative government, with absolute majority in Parliament at the time, approved an optional four-year derogation of this obligation in those regions with a high level of unsold new affordable housing units but maintained the regulation for future developments.

The aim of this paper is to empirically determine the influence of land use policies promoting affordable housing on the price of market housing units[[3]](#footnote-3) in Spain. More precisely, we attempt to estimate the effect of the ratio of new affordable dwellings-to-total new dwellings on housing market prices. To the best of our knowledge this is the first time that this issue is investigated in the Spanish housing market. In sum, this paper provides empirical evidence by tackling several questions: does affordable housing have an influence on housing market prices? If so, what is the direction of this effect? Does affordable housing boosts housing market prices or on the contrary, reduces them? What policy recommendations can be drawn from the empirical results?

The rest of the paper is organized as follows. In the next section we discuss land use and housing policies for the provision of affordable housing in Spain in the last decades. Section 3 presents the data used in the empirical analysis. Section 4 explains the econometric strategy. Section 5 shows and discusses the results and in section 6 we draw the main conclusion of our work.

**Affordable housing provision in Spain**

In Spain the right to housing is a constitutional mandate. Article 47 of the 1978 Constitution establishes that “All Spanish citizens have the right to enjoy a decent and adequate housing. Public authorities shall promote the necessary conditions and establish appropriate rules to uphold this right, regulating the use of land in accordance with the general interest to prevent speculation”. Yet, housing affordability continues to be a major problem for many Spanish citizens (Leal Maldonado, 2010; Alguacil et al. 2013).

Spanish housing policy has its roots in the Francoist period and its main characteristics have remained relatively stable since that time. In fact, Spain has never had a genuine social housing policy of the type developed by Northern European countries. Until recently housing policies have been shaped more by a desire to stimulate the economy than by a social policy concern (Trilla, 2001; Hoekstra, Heras Saizarbitoria & Etxezarreta, 2010; Esteban & Altuzarra, 2014).

Spanish housing policies have mainly delivered subsidized owner-occupied housing, even for low and medium income families. Only in the last decade some regional governments have started to develop a strategy towards the provision of affordable rented housing for the lowest income groups (Leal Maldonado, 2010). The last National Housing Plan 2013-2016[[4]](#footnote-4) seems to have given at last the political priority to affordable housing for rent, together with the rehabilitation of the existing housing stock (Esteban & Altuzarra, 2014). Yet, the scope of this initiative has been rather limited so far due to budgetary restrictions.

Spain has a long tradition of providing subsidized owner-occupied housing, referred to as VPO (Viviendas de Protección Oficial – Officially Protected Housing) (thereafter affordable housing). The concept of affordable housing has undergone changes over time and different types of affordable housing have been created targeted at different income groups. Some of these dwellings have been produced directly by public institutions or non-profit organizations, but the vast majority of affordable housing has been produced by profit-oriented private developers. Affordable dwellings are sold in the market at regulated prices below market levels to households that qualify for them (maximum income levels, social conditions…). In compensation, private developers can apply for loans with interest rates below the market rate (subsidized from public finance), but, as the Ombudsman of the Basque region has noted, they have to limit their profits (Ararteko, 2007).

However in periods of high and increasing demand, these housing policy initiatives did not ensure the provision of affordable housing in sufficient numbers to meet the demand, since public resources to provide affordable housing have been limited and private developers could choose to operate only in the open housing market, and abandon the affordable sector, if economic and social conditions allowed them to. Thus, several regions began to introduce changes into urban planning regulations to oblige private developers to produce a certain amount of affordable housing.

Thus, since the early 1990´s land use regulations in some regions in Spain have required private developers of market-rate residential developments to set aside a portion of their units for households unable to afford housing in the open market. The share of affordable housing in new and in-fill developments depends on the Region´s regulations and shows wide variations across Autonomous Communities. Yet, the proportion has been increasing over time. Recently, as a response to skyrocketing of housing prices leading to sharp affordability problems, the 2008 Land Act has established that all urban plans must set aside a minimum of 30% of residential land for affordable housing in new residential developments and 10% in in-fill developments. However, several regions have approved higher ratios that reach a maximum of 40 to 75%, for example, in the case of the Basque Country (García-Álvarez García, 2010; Burón Cuadrado, 2006).

Similar planning strategies to provide affordable housing can be found in other countries with different denominations: Inclusionary Housing Programs in the US, Affordable Housing Strategies in the US, UK, Australia, New Zealand, France, Italy or Canada (Calavita & Mallach, 2009; Paris, 2007; Whitehead, 2007; Gurran & Whitehead, 2011; Beer, Kearins, & Pieters, 2007).

**Data**

We use a panel dataset for 50 Spanish provinces (Ceuta and Melilla have been excluded due to insufficient data) made up of a set of variables coming from different sources of information over the period 1995-2010. We consider that this time-span is the most appropriate for the aim of this study since it is in this period when most political decisions regarding the construction of affordable houses were taken. In addition, to achieve our econometric analysis we have to make sure that our series have not structural breaks as that occurred after this period as a result of the financial crisis.

Table 1 shows the variables used in our estimations. Our dependent variable is *real housing market prices per square meter* which is taken from the Ministry of Public Works (Ministerio de Fomento). Our main explanatory variable is the *ratio of affordable dwelling completions to free market dwelling completions* (ratio of affordable dwelling, hereinafter). The completions of affordable houses and of new market units’ data come from the Ministry of Public Works (Ministerio de Fomento). The control variables are those that the literature has traditionally related to housing demand (Esteban & Altuzarra, 2008): *annual growth of population* measured as the annual percentage variation; *level of disposable income*; *mortgage interest rate*. Housing prices and disposable income are used in real terms using the GDP deflator and are expressed in natural logarithms.

Table 1. Variables used in our econometric analysis

|  |  |  |
| --- | --- | --- |
| Variable | Description | Source |
| Real housing market prices per square meter | Real housing market prices per square meter for all type of dwellings (in logs) | Ministry of Public Works |
| Ratio of affordable to free market dwelling completions | Ratio of the number of affordable dwellings completions to the number of market dwellings completions | Ministry of Public Works |
| Squared of the Ratio of affordable to free market dwelling completions | Squared value of the ratio of affordable to free market dwelling completions | Ministry of Public Works |
| Δ Population | Annual percentage variation of the population | Spanish Statistical Institute (INE) |
| Real disposable income | Level of the real disposable income (in logs) | Regional Accountants elaborated by Spanish Statistical Institute (INE) |
| Mortgage interest rate | Mortgage interest rate | Spanish Central Bank. |

Figure 1 presents the evolution of affordable and market dwelling completions and the evolution of real housing market prices for Spain during the period 1995-2010. The pace of market dwellings completions increases during the growth period until 2008 and shows a marked drop beyond that time. The affordable dwelling completions present a shifting trend during the period under study. They decrease until 2002 and start an increasing trend until 2008 to start dropping again since then. In terms of volume of completions, the variation has been much more prominent in the case of market dwellings than in the affordable sector. There have been, however, significant differences across regions in the evolution of both types of dwellings. Real housing prices moves similarly to market housing completions, showing a dramatic drop since 2008.

Figure 1. Completions of affordable and market dwellings and real housing market prices per square meter. 1995-2010

Source: Ministry of Public Works and own elaboration

Figure 2 shows the evolution of both the ratio of affordable dwellings and real housing market prices per square meter for Spain during the period 1995-2010. Two different trends in the evolution of the ratio of affordable units are noted: from 1995 to 2002 there is a downwards trend and from 2003 to 2010 an upward tendency. For example, in 2002 only 0.08 affordable dwellings were built for every market unit built (8%). In 2010, 0.25 affordable dwellings were built for every market dwelling built (25%). The path of the ratio of affordable dwellings is almost the opposite to that of real housing prices during the period studied.

Figure 2. Ratio of affordable dwelling and Real housing prices per square meter. 1995-2010

Source: Ministry of Public Works and own elaboration

There are, however, significant differences across regions. Figure 3 shows the ratio of affordable dwellings for four provinces in Spain: Madrid, Barcelona, Malaga and Alava. Madrid, Malaga and particularly Alava show a steady trend of growth while Barcelona exhibits a low pace. For example, in 2010 Alava exhibited the highest ratio of affordable units (4.4) which means that, in that year 4.4 affordable dwellings were built for every market unit. In Madrid, this ratio was 1.1 and 0.7 in Malaga. In Barcelona, however, only 0.4 affordable dwellings were built for every new market unit built.

Figure 3. Ratio of affordable dwellings. 1995-2010. Spain, Madrid, Barcelona, Malaga and Alava

Source: Ministry of Public Works and own elaboration

**Econometric strategy**

***Model Specification***

The empirical strategy builds on the considerations discussed in the previous sections. Our main objective is to determine the influence of the ratio of affordable dwellings to market dwellings on housing market prices. We estimate the following model:

logHPi,t = β0 + β1logHPi,t-1 +β3ratio\_affordablei,t + β4sq\_ratio\_affordablei,t+ β5Xi,t + ηi + εi,t  (1)

with i=1, …,N indicating the province and t = 1, …, T indicating the time periods, respectively. logHPit is the real housing market prices per square meter in province i in year t. Our main variable of interest is the ratio of affordable dwellings completions to market dwellings completions (ratio\_affordablei,t). The sq\_ratio\_affordablei,t is the squared of the variable ratio of affordable dwellings to account for a potential no-monotonic behavior of this variable. The vector Xi,t is the set of control variables defined in the previous section related to the characteristics of the provinces. These variables include mortgage interest rate, real disposable income and growth of population. ηi is a time constant unobservable province effect and εi,t is the time-varying error term.

The variable mortgage interest rate is also used as a proxy for the macroeconomic shocks that affect all Spanish regions. We decided to use this variable instead of including time dummies because the latter ones induce collinearity with variables that do not vary within cross-sectional units, as it is the case of the mortgage interest rate. An alternative would be to replace the time dummies with a linear trend. This is not possible either however, because the mortgage interest rate is highly correlated with the linear time trend. This solution is found in various works (Farrell & Hersch, 2005). It is expected that annual growth of population and real disposable income will push housing prices up while mortgage interest rate will push housing prices down. Table 2 presents some descriptive statistics of the variables.

Table 2. Descriptive statistics. Average values for the period 1995-2010

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | Obs | Mean | Std. Dev. | Min | Max |
| Real housing market prices per square meter | 800 | 7.107 | .373 | 6.34 | 8.058 |
| Ratio affordable dwelling | 800 | .219 | .284 | 0 | 4.405 |
| Squared Ratio affordable dwelling | 800 | .128 | .734 | 0 | 19.405 |
| △population | 750 | .862 | 1.151 | -.9764 | 5.578 |
| Real disposable income | 800 | 15.839 | .857 | 13.975 | 18.590 |
| Mortgage rate | 800 | 5.370 | 2.175 | 2.769 | 11.038 |

From an econometric viewpoint, several problems may arise in estimating the econometric model. One potential problem is the non-stationarity of the variables. If variables are non- stationary the regression results would be spurious.

To test for potential non-stationarity of our variables, we conduct two panel unit root tests. We apply those by Im *et al.* (2003) and Maddala & Wu (1999) and Levin, Lin & Chu (2002). All unit root tests assume that all series are non-stationary under the null hypothesis against the alternative that some panels are stationary, at least one series in the panel is stationary and panels are stationary, respectively. Table 3 presents the results of the Im-Pesaran-Shin (IPS) the Fisher-type and the Levin, Lin and Chu (LLC) unit root tests for panel data performed. Results from the IPS, Fisher and LLC tests show that at different levels of significance the null hypothesis of unit root can be rejected in all cases. It can be concluded that our time series are stationary. The optimal lag structure has been chosen according to Akaike’s information criterion (AIC) in the IPS and LCC unit root test.

Table 3- Results of the panel unit root test

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | IPS |  | Fisher |  | LLC |  |
| Statistic | W-t-bar . |  | Z |  | Adjusted t |  |
| Real housing market prices per square meter | -2.9658 | \*\*\* | -3.9199 | \*\*\* | -12.6483 | \*\*\* |
| Ratio affordable dwelling | -7.7572 | \*\*\* | -4.8318 | \*\*\* | -11.4369 | \*\*\* |
| Squared Ratio affordable dwelling | -17.0504 | \*\*\* | -12.1283 | \*\*\* | -20.4402 | \*\*\* |
| △population | -1.2447 | \* | -9.0581 | \*\*\* | -3.4536 | \*\*\* |
| Real disposable income | -2.6304 | \* | -1.9484 | \*\* | -7.8853 | \*\*\* |
| Mortgage rate | -10.070 | \*\*\* | -12.1685 | \*\*\* | -137479 | \*\*\* |

\*\*\* indicates the rejection of the null hypothesis of non-stationarity at the level of 1%, \*\* at the level of 5% and \* at the level of 10%p<0.05 and \* p<0.1

A second problem is the potential endogeneity of our independent variable. This is an important issue since failing to control for endogeneity problems would likely lead to biases in the estimation of the impact of the ratio of affordable dwellings on real housing market prices. Endogeneity could have different sources. First, the existence of the time-constant unobserved province characteristics which could be correlated with both variables the real housing market prices and the ratio of affordable dwellings. Second, the ratio of affordable dwellings might depend on the past values of the real housing market prices or that the current real housing market prices could depend on the future ratio of affordable dwelling. We have tested the first of this hypothesis by regressing the ratio of affordable dwellings on the lag of real housing market prices. The second hypothesis has been tested by regressing the real housing market prices on the lead of the ratio of affordable dwellings. In both cases we have used the fixed effect estimator. Only in the first regression the lag of real housing market prices was statistically significant (see results in Appendix 1). Therefore, we can rule out the second hypothesis. Third, the existence of a significant relationship between housing market prices in t and t-1. Fourth, a potential reversed causality from the fact that the actual ratio of affordable dwellings is determined by current real housing market prices. The process of providing new affordable housing involves a relatively long political decision procedure. For this reason, we think that it is reasonable to assume that the ratio of affordable dwellings does not depend on past housing price levels.

In sum, as we have controlled for all potential sources of endogeneity, our results will not be significantly biased by this problem.

***Estimation techniques***

The econometric problems presented above suggest the use of the General Method of Moments (GMM) approach of Arellano & Bond (1991). The GMM technique allows one to deal with the unobserved heterogeneity and the other potential endogeneity problems by implementing a first difference transformation and using instrumental variables (Arellano and& Bond, 1991; Bond, 2002). In order to build the instruments it is especially important with this technique to establish whether the explanatory variables are strictly exogenous, predetermined or endogenous. We believe that the most reasonable assumption is to treat the ratio of affordable dwellings as predetermined, that is, we assume that this variable may be dependent on the level of the past real housing market prices. The variable ratio of affordable dwellings and the lagged dependent variable are instrumented with their levels from 1 to 2 inclusive in the difference equation. All instruments are collapsed in order to limit the number of instruments (Roodman, 2009).

The consistency of the parameters obtained with the GMM estimator depends on the validity of the instruments. In order to test this consistency two specification tests are considered. The first one is the Hansen test of over-identifying restrictions, which tests the null hypothesis of overall validity of the instruments used. Failure to reject this null hypothesis gives support to the choice of the instruments. The test for serial correlation of the error term tests the null hypothesis that the differenced error term is first and second order serially correlated. Failure to reject the null of no second order serial correlation means that original error term is serially uncorrelated and the moment conditions are correctly specified.

**Results**

In table 4 we present the results where the dependent variable is the real housing prices for market dwellings. We present the results from different specifications. First, an OLS regression (column 1) without taking into account neither the province unobserved effects and nor the persistence nature of real housing market prices. Second, we run an OLS regression with one lagged dependent variable (column 2) accounting for the persistence of the variable real housing market prices. Third, we estimate a fixed effect model including the lagged dependent variable, in addition to control for unobserved province heterogeneity (column 3). Fourth, a difference-GMM Arellano-Bond estimation is run to control for unobserved heterogeneity and endogeneity problems (column 4). The difference-GMM estimator is more appropriate than a system GMM since the time dimension can be considered as large (T>15) (Labra & Torrecillas, 2014). The test of Hansen and the test for serial correlation of the error term are accepted which support the validity of the instruments used. We believe that the difference-GMM estimator gives the most correct estimates with the smallest bias. OLS estimator does not take into account the data’s panel structure and generally produces an upward-biased coefficient for the lagged dependent variable in the presence of unobserved heterogeneity (Bond, 2002). The Fixed Effects estimator, meanwhile, considers the data's panel structure but ignores the correlation between the lagged dependent variable and the regression error producing a downward-biased coefficient estimate for the lagged dependent variable (Nickell, 1981).

Our main result is that the ratio of affordable dwellings does negatively affect the level of real housing market prices. The estimated coefficient for the ratio of affordable dwellings is (-0.212) in the difference-GMM estimation which means that an increase of 1 unit in the ratio of affordable dwellings will decrease real housing market prices in 21.2 percentage points[[5]](#footnote-5). This means that if we increase the amount of affordable dwellings built from 10% to 30% of the total units built, housing market prices will drop by 4.24%.

In the OLS estimation without the lagged dependent variable, the coefficient of the ratio of affordable dwellings shows a large and negative effect of 32.9 percentage points on real housing market prices (column 1). The estimated effect becomes smaller in the OLS with lagged dependent (5.7 percentage points, in column 2) when we control for the persistence of the real housing prices. This difference between the coefficients in these two models was expected since the OLS without the lagged dependent variable overestimates the effect due to the correlation between past levels of the real housing prices and ratio of affordable dwelling. When we control for the unobserved heterogeneity, the effect (12.4 percentage points, in column 3) is in between those of the previous OLS models[[6]](#footnote-6). The coefficient in the difference-GMM estimator is larger than in the fixed effects estimation. This difference could be explained by changes in the ratio of affordable dwellings produced as a result of previous changes in the level of real housing market prices that lead to a downward bias in the fixed effect estimation.

We also find a threshold effect in the relationship between real housing market prices and the ratio of affordable dwellings. This result means that the ratio of affordable dwellings negatively affects real housing market prices until a threshold is reached, from which the effect of the ratio of affordable dwellings on real housing market prices becomes positive. This result is consistent in all estimations. We have tried to approximate the point from which this relationship becomes positive. This occurs, in all estimations, once the number of affordable dwellings completions exceeds the number of market completions, that is, once the number of affordable dwellings built exceeds 50% of the total units constructed.

The argument to support the existence of this threshold at the level of 50% relates to tensions in the free housing market between supply and demand, once market housing supply drops below the level of 50% of total new housing supply. That is, the demand of the population who do not meet the conditions to be eligible for an affordable unit is high for the existing offer in the free market and thus housing market prices tend to go up. This is a very relevant question for policy makers since our results show that too high levels of affordable housing construction (in this case over 50% of the total) may create unexpected accessibility problems for other social groups, especially lower medium income groups who are not eligible for an affordable unit but see housing prices increase in the market. Obviously, the level of the threshold would depend upon rent and household’s characteristics set up as eligibility criteria by housing policy makers. Therefore, careful attention must be paid when establishing these eligibility conditions for affordable housing to take into account the resulting demand segmentation.

Table 4. Results

Dependent variable: Real housing market prices (log)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | OLS | | | OLS with  lagged dependent | | | Fixed Effects with lagged dependent | | Difference-GMM | |
| Real housing market prices (t-1) (log) |  |  | | .912  (.007) | | \*\*\* | .776  (.017) | \*\*\* | .839  (.049) | \*\*\* |
| Ratio affordable dwelling | -.329  (.079) | \*\*\* | | -.057  (.012) | | \*\*\* | -.124  (.015) | \*\*\* | -.212  (.037) | \*\*\* |
| Squared Ratio affordable dwelling | .096  (.017) | \*\*\* | | .012  (.003) | | \*\* | .022  (.003) | \*\*\* | .040  (.008) | \*\*\* |
| Real disposable income (log) | .169  (.011) | \*\*\* | | .018  (.003) | | \*\* | -.011  (.044) |  | -.167  (.097) |  |
| △population | .089  (.007) | \*\*\* | | .007  (.002) | | \*\* | .032  (.002) | \*\*\* | .032  (.006) | \*\*\* |
| Mortgage rate | -.066  (.005) | \*\*\* | | -.012  (.001) | | \*\*\* | -.019  (.001) | \*\*\* | -.019  (.001) | \*\*\* |
| Constant | 4.745  (.175) |  | | .430  (.057) | | \*\*\* | 1.888  (.597) | \*\*\* |  |  |
|  |  |  | |  | |  |  |  |  |  |
| N | 750 |  | | 750 | |  | 750 |  | 700 |  |
| aic | 145.317 |  | | -2098.168 | |  | -2377.530 |  | . |  |
| bic | 173.038 |  | | -2065.828 | |  | -2349.810 |  |  |  |
| R2 | .488 |  | | .974 | |  | .958 |  |  |  |
| Hausman test |  |  | |  | |  | 378.45\*\*\* |  |  |  |
| rho |  |  | |  | |  | .638 |  |  |  |
| Number of collapsed IVs |  | |  | |  |  |  |  | 47 |  |
| 2nd order autocorrelation |  | |  | |  |  |  |  | .295 |  |
| Hansen difference test |  | |  | |  |  |  |  | .167 |  |

Province cluster robust standard errors in parenthesis in OLS and Fixed Effects models

Windmeijer's (2005) robust standard errors in parenthesis in the Difference-GMM estimation.

\*\*\*p<0.01, \*\*p<0.05 and \* p<0.1

The lagged dependent variable has a significant and large positive effect on the real housing market prices which indicates high persistence. This finding is similar in all estimations and as the economic theory predicts, in the GMM model the coefficient of this variable is in between the coefficient of the OLS with lagged dependent and the fixed effect models. This result supports the validity of the GMM model. The rationale behind the relationship between real housing market prices and its lag is that the positive push on fundamentals can induce the rise of prices and expectations, and rising expectations can lead to increases in real housing prices. The housing prices falls would produce the opposite phenomenon.

The real disposable income is positive and statistically significant in the OLS with and without the lagged dependent variable models though non-significant in the Fixed Effect and Difference-GMM estimators.

The growth of the population presents a positive and significant coefficient in all estimations. Demographic growth due to natural population growth or/and migratory flows is a fundamental of the housing demand that positively affects real housing prices.

The mortgage interest rate holds a negative and significant coefficient showing, as expected, a negative effect on market real housing prices. Mortgage rate remained low in Spain since mid 1990s and mortgage costs in real terms fell because of declining nominal rates and because of rising inflation, pushing housing demand and housing prices up.

**Conclusions**

The aim of this paper is to empirically determine the influence of land use policies promoting affordable housing on the price of market housing units in Spain. More precisely, we attempt to estimate the effect of the ratio of new affordable dwellings-to-total new dwellings on housing market prices. A set of hypotheses are tested by using different estimation methods including a simple OLS, an OLS with the lagged dependent variable, a fixed effects and a difference-GMM estimator for 50 Spanish regions for the period 1995 to 2010. We consider that the GMM estimation gives the most credible results as it accounts for different sources of endogeneity biases.

Developing and construction interests have claimed in Spain that affordable housing policy has contributed to the increase in housing market prices since lower benefits in the affordable housing sector must be compensated by higher prices in the market-rate housing sector. On the contrary, affordable housing advocates have argued that new affordable housing does not affect housing market prices; quite the opposite, it may even push prices down by increasing housing supply.

The main conclusion of this study is that the ratio of affordable dwellings completions has a negative and significant effect on the level of the real housing market prices; that is, if housing policy increases the amount of affordable dwellings built from 10% to 30% of total units built, housing market prices will actually drop by 4.24%. We also find a threshold effect in the relationship between the ratio of affordable dwellings and real housing market prices. We have tried to approximate the point from which this relationship becomes positive. This threshold occurs once the number of affordable dwellings built exceeds 50% of the total units constructed.

These results are very relevant for housing and land use policy making since they provide an empirical framework to design more efficient affordable housing strategies in Spain. Affordable housing does not increase housing market prices, as suggested by construction interests, as long as the share of affordable housing is properly established. Therefore, this work suggests that the debate should not be so focused on the above dichotomy (obligation by land use policies to built affordable housing or not), but rather on the share of affordable housing at every local housing market.

These results are dependent on specific characteristics of the Spanish housing and land use policy. More studies are needed for other countries in order to get further insights into the relationship between affordable housing and housing market prices.

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**Apendix**

Table A1. Testing if the real housing prices depend on the expected future values of the ratio of affordable dwelling

|  |  |  |
| --- | --- | --- |
| Dependent variable: Real housing prices (log) | | |
| Ratio affordable dwelling | -.339  (.098) | \*\*\* |
| **Ratio affordable dwelling (lead of)** | **-.015**  **(.019)** |  |
|  |  |  |
| Covariates | Yes |  |
| R2 | .3958 |  |
| N | 700 |  |
| Rho | .807 |  |

Province cluster robust standard errors in parenthesis

Table A2. Testing if the ratio of affordable dwellings depend on the past values of the real housing prices

|  |  |  |
| --- | --- | --- |
| Dependent variable: Ratio affordable dwelling | | |
| **Real housing prices(lag of)** | **-.119**  **(0.49)** | **\*\*** |
|  |  |  |
| Covariates | Yes |  |
| R2 | .667 |  |
| N | 750 |  |
| Rho | .201 |  |

Province cluster robust standard errors in parenthesis

We can observe that in the second regression the lag of the real housing prices is statistically significant (Table A2) while in the first regression the lead of the ratio of affordable dwellings is not statistically significant.

1. Many representatives of development and construction interests have made clear this position in many occasions (Azumendi, E. (2004, September 26); Europa Press (2010, October 28); Navarra Confidencial (2012, December 20); Baza, N. (2008, February); El Economista (2007, June 28); El Mundo (2006, July 20); Guardiola (2006, December 10). [↑](#footnote-ref-1)
2. See (La Opinión de Murcia, 2007, October 10) and the debates carried out at the Parliament (<http://www.congreso.es/portal/page/portal/Congreso/PopUpCGI?CMD=VERLST&BASE=puw8&FMT=PUWTXDTS.fmt&DOCS=1-1&DOCORDER=LIFO&QUERY=%28CDA20060908009601.CODI.%29#(Página1))>. [↑](#footnote-ref-2)
3. Since the majority of households in Spain live in dwellings, in this work the following terms are synonyms: dwellings, houses, housing units. [↑](#footnote-ref-3)
4. Plan Estatal de Fomento del Alquiler de Viviendas, la Rehabilitación Edificatoria, y la Regeneración y Renovación Urbanas, 2013-2016 (<https://www.fomento.gob.es/MFOM/LANG_CASTELLANO/DIRECCIONES_GENERALES/ARQ_VIVIENDA/APOYO_EMANCIPACION/PLAN_ESTATAL.htm>). [↑](#footnote-ref-4)
5. It is worth noting that an increase of 1 unit in the ratio means to move for example from a ratio of 0.3 affordable dwelling completions for every market dwelling completion to 1.03 affordable dwellings for every market dwelling, i.e. the number of affordable dwelling completions would exceed the number of market dwelling completion. [↑](#footnote-ref-5)
6. We have implemented the IPS, Fisher and LLC panel unit root test on the residuals of the OLS and Fixed Effect models to confirm the stationarity of the variables. Results show that the residuals are stationary. Results are available from the authors upon request. [↑](#footnote-ref-6)