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**“An analysis of the recent evolution of  
house price to rent ratios in Spanish  
provinces”**

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## Abstract

In this work, we analyze the analysis of the recent evolution of house price to rent ratios in Spanish provinces. First, we review recent literature about the house price to rent ratio. Second, we make a brief analysis of the current situation of the Spanish rental market and describe possible government interventions. Finally, we carry out an empirical analysis to determine the influence on the Spanish provinces' house price to rent ratio of some factors previously shown to be linked to this variable. The factors we used to explain the price to rent ratio are the average net income per household, median age, property taxes, and year. We achieve consistent estimates with a fixed effect panel-data model. We find that the house price to rent ratio is higher in those provinces with higher income per household, but is not significantly affected by the IBI rate. Surprisingly, age seems to affect negatively the house price to rent ratio, but the estimated coefficient is only weakly significant. Moreover, the house price to rent ratio in the Spanish provincial capitals has been increasing, on average, in the last six years.

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# 1. Introduction

One of the most latent problems facing Spanish society is the difficulty in accessing housing, whether owned or rented. So much so that this problem is the one on which a large part of the political activity experienced in recent months in Spain is focused.

The objective of this paper is to analyze empirically the rental market and the determinants of the house price to rent ratio in Spanish provinces. To do this, first of all, we analyze the percentage of the population that lives in rent in our country and we have compared it with other European countries. Secondly, to see how the people who live in rent are distributed, we describe the evolution of the percentage of people living in rental housing by age groups.

Therefore, once we have seen the current situation of the rental market, we will see what may be the possible interventions that the government can do. We will see that you can apply direct or indirect policies on price control of residential rentals. Specifically, in the case of Spain, we analyze the recent law on the right to housing.

Next, we focus on the most important factors that we believe that motivate people to rent or own homes. These factors are the rental price, home prices, family income, and property taxes. We analyze all these factors by province capitals, since we think that analyzing the rental market by major cities in each province would give us a vision that is as close to reality as possible.

To carry out this analysis, we use as a basis the house price to rent ratio. This ratio consists of dividing the sale price by the annual rental price and is used to see if a house is overvalued or undervalued. This ratio is used in a similar way to the price to earning ratio (PER), which is one of the most widely used tools by which investors and analysts determine a stock's relative valuation. The PER helps one determine whether a stock is overvalued or undervalued.

Finally, we carry out an empirical analysis on the evolution of the house price to rent ratios of the provincial capitals of Spain, following the analysis performed by Pancak (2017) in the paper *Variation in Local House Price–Rent Ratios*. We do our analysis from two points of view, firstly, using cross-sectional data and secondly another using panel data.

For the analysis using panel data, we estimate the econometric model by three methods: Pooled OLS, Fixed Effects and Random Effects. Finally, we specify the

selection by Hausman Test, Breusch Pagan test and F test of significance of fixed effects.

## 2. Literature Review

There is a large academic literature looking at the relation between residential prices and rents. The equilibrium of the housing and rental market can be approached from different perspectives. Throughout history it has been observed that the rental market and the real estate market are related.

From the point of view of determining the price of housing, the causal relationship between housing prices and rents, as well as the relationship between the Price to Rent ratio and other economic fundamentals are included in the DiPasquale and Wheaton's Four-quadrant Model (1992). The Four-quadrant Model relates the concepts of Rent, Price, Stock and Construction. Here it is concluded that the house price is determined by expected future rents since the former could be viewed as the summation of all future discounted rental incomes. The total amount of housing stock and the demand for real estate jointly affect the level of rent, which subsequently results in a change in the price level through the process of capitalization.

On the other hand, as Gallin recounts in *The Long-Run Relationship Between House Prices and Rents* (2008), house prices in the United States doubled in the period from 1994 to 2005, that is, in 10 years the price face value of homes in the United States doubled their price. But the curious thing about this is that during that same period of time, the indexes for tenants and owners equivalent rent in the consumer price index increased less than half as much. Because rents are a fundamental determinant of the value of housing, one might think that they should not move too far out of line with prices. Therefore, looking at this, Gallin (2008) remembers the stock market analogy that Leamer makes in *Bubble Trouble?* (2002), where he compares the price-rent ratio with the dividend-price ratio in the stock market; when stock prices have been high relative to dividends, future price growth for stocks has been subdued. One might reasonably expect the analogous statement to be true for the housing market. Furthermore Gallin (2008) tries to investigate the predictive power of the price-rent relation. In this analysis, he concludes that the price-rent ratio is not a good indicator of precision, and it does not help us to know when and how prices are going to change.

Another point of view from which we can consider the housing market is offered by Bram in *To buy or not to buy? The changing relationship between Manhattan and rents and home price* (2012). This study examines the price-rent ratio in New York City and states that while rents are driven by supply and demand forces, house prices are driven in part by speculative factors, and they sometimes rise or fall to levels incommensurate

with prevailing rents. Therefore, it illustrates that a low ratio indicates house prices are undervalued and a high ratio indicates that prices are overvalued. Also, the level of mortgage interest rates and other homeownership costs affect the price–rent relation.

Himmelberg, Mayer, and Sinai in *Assessing High House Prices: Bubbles, Fundamentals, and Misperceptions* (2005) concluded that the housing market cannot be studied at the state level since the different dynamics that occur in cities are not appreciated, thus asserting that house price dynamics are a local phenomenon. They also emphasize that the heterogeneity of the territory means that they cannot draw conclusions about house prices by comparing cities: price-to-income and price-to-rent ratios that would be considered “high” for one city may be typical for another. On the other hand, they find that in cities where the supply of housing is inelastic, prices will be higher in relation to rents and housing prices will normally be more sensitive to changes in interest rates.

André, Gil-Alana and Gupta in *Testing for persistence in housing price-to-income and price-to-rent ratios in 16 OECD countries* (2014) affirm that depending on the nature of the problems associated with high price-income and price-rent ratios, different policy instruments must be applied. They also argue that high housing prices are due to two factors: rigid housing supply linked to tight supply of land for development and unsustainable demand. Finally, they conclude that if high ratios have adverse social and economic consequences, policy action, guided by a careful analysis of underlying factors, may be warranted.

Now we will analyze the paper on which we have focused our empirical analysis. This paper is *Variation in Local House Price-Rent Ratios* (Pancak,2017). In this article Pancak analyzes price-rent ratios at the local level generated by aggregating individual property estimates of price and rent, rather than metropolitan-level ratios based on price and rent indexes developed from properties of differing quality and value.

Pancak (2017), when carrying out his empirical analysis, encountered certain limitations, which have also arisen for us, as we will see later. Price to rent ratios can be an effective tool, but as researchers have recognized, ratios are typically derived from two separate sets of housing data (data on purchase prices and data on rental prices) that differ in quality. This limits the ability to say something about the financial value of owner-occupied houses based on the rental income of tenant-occupied houses. Therefore, the best way to avoid the comparability issue would be to look at purchase price and rent for the same set of houses as Bram (2012) did for Manhattan.



Pancak (2017) carries out this empirical analysis through the data provided by Zillow. This website is an American tech real-estate marketplace company that was founded in 2006 and is the reference company in the sector in the United States. From the data obtained from this website, Pancak (2017) constructed the price to rent ratio for the 48 U.S. states and DC (missing Kansas and Maine) monthly from October 2010 to December 2013. Furthermore, she also separately analyzed the select Connecticut Town price to rent ratios, monthly, in the same time period.

In this study, Pancak looked at three potential local influences on town price rent ratios: property tax rate, median household income, and median age. She concluded that income and age will have a positive effect on the relation between price and rent, although property tax rates have a negative effect on price rent ratios. Then, taking into account these town-level variables, she made an ordinary least squares regression with price rent ratio as the dependent variable and the above mentioned independent variables. This empirical analysis shows that seventy percent of the variation in local house price-rent ratios is explained by town property tax rates, income, and age. To conclude, in this paper she highlights that on average the price rent ratio of a town with a property tax mill rate of 20 will be 1% less than a town with a property tax mill rate of 16.

To sum up, we have seen that Gallin (2008), and Bram (2012) argue that the rental price can be used as a mechanism to analyze whether house prices are supported by fundamentals. Leamer (2002) relates the concept of housing prices with rental prices and defends that in the long term it is impossible for both variables to be uncorrelated. Himmelberg, Mayer, and Sinai (2005) affirm that the price-rent ratio is a good measure to see if house prices are economically sound. They conclude that when the price-rent ratio remains high for an extended period of time, it is possible that prices are being supported by buyers speculating on future price appreciation rather than fundamental value based on rent and, as a result, they create a bubble. Pancak (2017) affirms that a large proportion of the variation in local house price-rent ratios is caused by town property tax rates, income, and age.

### 3. Rental Market in Spain

In Spain, the amount of population residing in rental housing has always been relatively small compared to the main countries of the European Union (2017). Recently, however, the Bank of Spain (2019) reports that in recent years, in our country, there has been a change in trend. This new trend is growing and indicates that the relative weight of rentals in the Spanish residential market has increased notably. This report affirms that the greatest relevance and dynamism is concentrated in certain communities, such as young households, temporary workers, and immigrants, and in specific geographical areas, like big cities (Madrid and Barcelona) and cities in which tourism is of immense importance (Mallorca, Málaga, Ibiza and Gran Canaria).

One of the causes to which this change in trend is attributed is the strong increase in the demand for residential rentals by certain groups of individuals, characterized by lower income due to higher unemployment, lower duration of employment contracts and the fact that many of these are part-time. Other factors that have led to the increase in rental demand in Spain are the reduction in the average loan-price ratios of new mortgages, the concentration of economic activity in geographical areas with a rigid supply of residential housing or the associated taxation to the house [Banco de España (2019)].

The dynamics of rental supply prices could be explained by the increase in demand concentrated in certain markets, in the face of a relatively rigid residential rental supply in the short term. This strength of demand in certain markets would have been only partially offset by the increase in private supply after the entry of new professional agents into the rental market, which would have been encouraged by the increase in the gross profitability of residential rentals in the period 2014-2017. It should be noted that the lower dynamism of the supply occurs in a context of weak public rental supply due to the 2008 and 2020 crisis, and in which alternative purposes for residential housing appear, such as vacation rentals.

To contextualize the relevance of the rental market in our country, we are going to focus on the data and compare them with the countries of the European Union based on the European Survey of Income and Living Conditions (EU-SILC) [Eurostat (2018)].

This survey gives us information on the proportion of the population that lives in a dwelling that is not owned by them. In 2021, in Spain 24.2% of the population lived in rental housing. This value, if we compare it with the European average, is very low. In

the year 2021, in the countries of the European Union, 30.8% of the population lived in rental housing. We can highlight the high ratios of countries such as Germany (50.9%), Switzerland (57.8%), Austria (45.8%) and Denmark (40.8%) (See figure 1). On the other hand, countries such as Portugal (21.7%) and Greece (26.7%) have low ratios that are very similar to those of Spain.

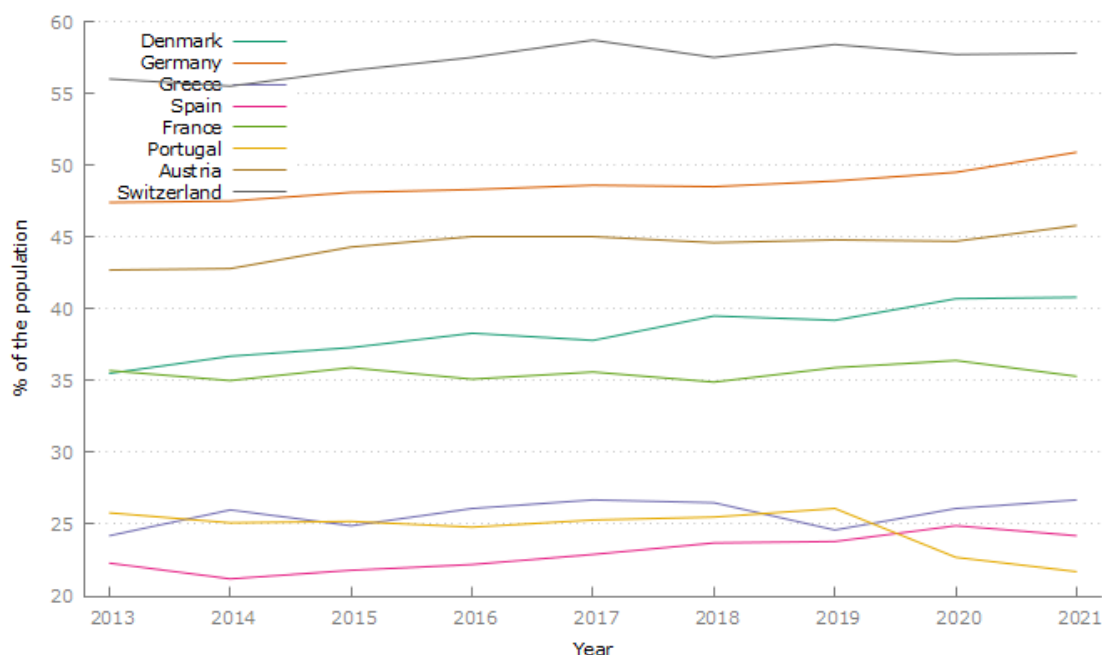


Figure 1. Evolution of the percentage of population that lives in rental housing in the main countries of the EU. Own elaboration from Eurostat data.

As we can see in figure 1, in Spain the trend is increasing: from 21.2% of the population living in rent in 2014, in 2021 this fraction increased to 24.2%. On the other hand, in countries like Portugal, the trend is constant until 2019, when it suffers a sharp decline and goes from 25.8% to 21.7%.

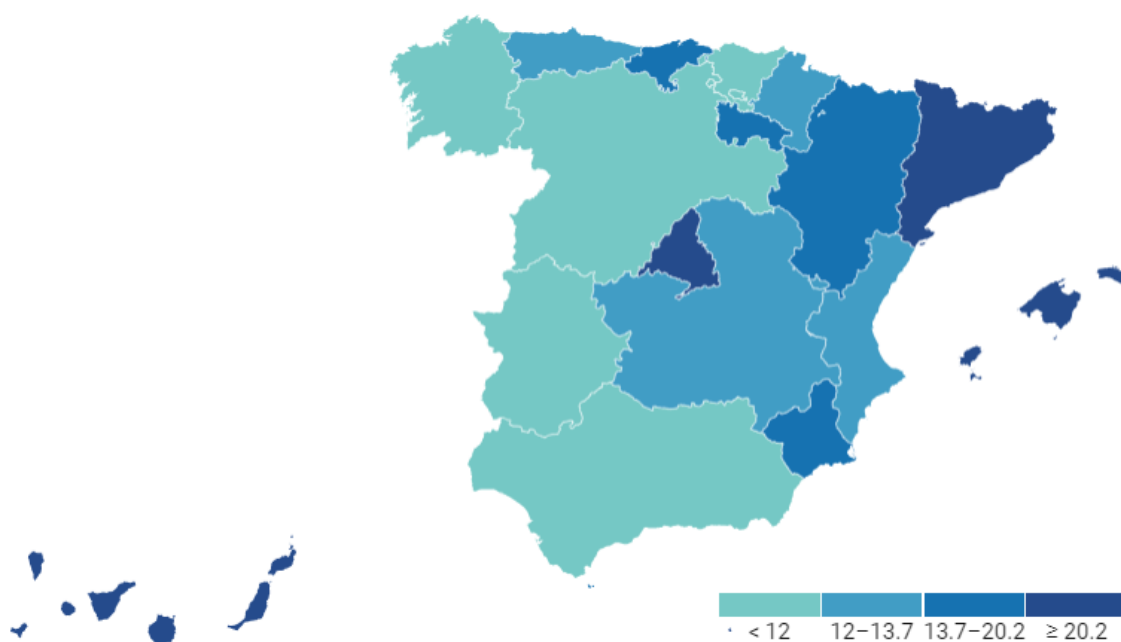
On the other hand, this European survey also indicates that the relative weight of rent at reduced price or free in the EU stands at 8.6% in 2019 (latest data available). We highlight the high ratios for the year 2021 of the Netherlands (25.9%), France (20.1%), Ireland (18.5%).<sup>1</sup>

In the case of Spain in 2021, 15.7% of the population lived in rental housing at market price and 8.5% in rent at reduced price or free.

<sup>1</sup> The category of rent at reduced price or free in Eurostat (2018) includes both rent subsidized by the public sector and free transfers of housing. In Spain, this category basically includes free transfers, which, according to the Living Conditions Survey (ECV), represent 6% of the main residence of households, compared to a proportion of rentals below the market price, which has been around 3% since 2012 ([INE, (2019a)].

We now turn to analyze the Living Conditions Survey (INE, 2022), to see how the different variables evolve in relation to rents in Spain and each Autonomous Community.

As we have just seen, in Spain in 2021, 15.7% of the population lived in rental housing at market price, but if we disaggregate this data at the level of Autonomous Communities, we can see that there is a great difference between “Madrid”, “Catalunya”, “Illes Balears” and “Islas Canarias” with the rest of Spain. In these four Autonomous Communities, more than 20% of the population lives in rental housing at market price (figure 2).



Source: INE • Created with Datawrapper

Figure 2. Percentage of population that lives in rental housing at market price by Autonomous Communities in 2021.

Although at the aggregate level both the starting ratios and the increases in residential rents are relatively moderate, a notable heterogeneity is detected between groups of households and geographical areas. More specifically, young households and those of foreign origin stand out both for their higher starting levels and for their strong upward trend in recent years. As we can see in figure 3, the weight of the proportion of rental housing among young households has increased significantly, more specifically in those whose reference person in the dwelling is between 16 and 29 years of age. In this age group, it can be seen that the percentage of people renting a house has increased by 22.2 percentage points, from 25.5% in 2006 to 47.7% in 2021. We can also highlight the very strong increase that has experienced the age group from 30 to

44 years old, we can see that in 2014 it was 19.8% and it became 28.5% in 2021. This is mainly due to the generation that increased the ratio in the period 2006-2011 has moved to the next age group and with this the ratio has increased and has stabilized in the 16 to 29 age group.

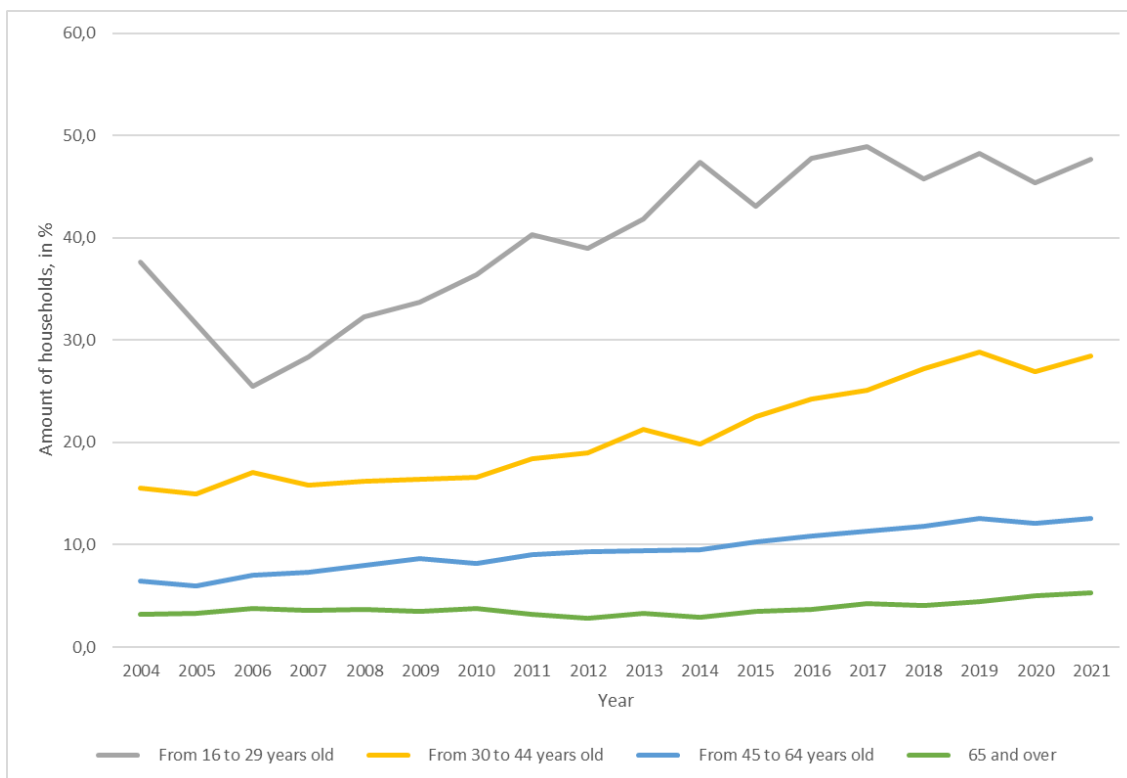


Figure 3. Evolution of the percentage of people living in rental housing, by age groups.  
Own elaboration from Living Conditions Survey (INE, 2022)

Additionally, in relation to the proportion of rent in the home of people without Spanish nationality, in 2021 was 57.7% for foreign people from the European Union and that same year, for foreign people from the rest of the world it was 66.1%. This last value is very significant because just before the pandemic we found that this value was 75% in 2019 and 72% in 2018. The pandemic suffered in 2020 has caused a very high trend change, and this is because many foreigners from outside the European Union decided to return to their country of origin and with it, this drop in the ratio [Living Conditions Survey, residential rent by nationality (INE, 2022)].

Once we have seen the percentage of people who rent, mainly in Spain, we will see the most important factors that motivate people to rent or own homes. We believe that this is mainly due to four factors and they are, firstly, the rental price, secondly, the price of houses, then family income and finally property taxes.

First of all, we are going to see what is the state of rental prices in our country. For this we have the information offered on the website of the Ministerio de Transportes, Movilidad y Agenda Urbana (2023), where there is a section whose objective is to guarantee transparency in the housing rental market and the result of the exploitation of tax sources of the data on habitual residence leases is offered, within the framework of the development of the State System of reference of the housing rental price. You can access five different maps depending on the territorial level that is the object of your consultation: census section, district, municipality, province and autonomous community. Here we have downloaded the average rental data in the Spanish provincial capitals.

If we graph the evolution of the rental price in Spain from 2015 to 2021 in real terms, we can see that it has followed a growing and constant trend. Going from being close to €460 per month in 2015 to more than €520 per month in 2021 (figure 4).

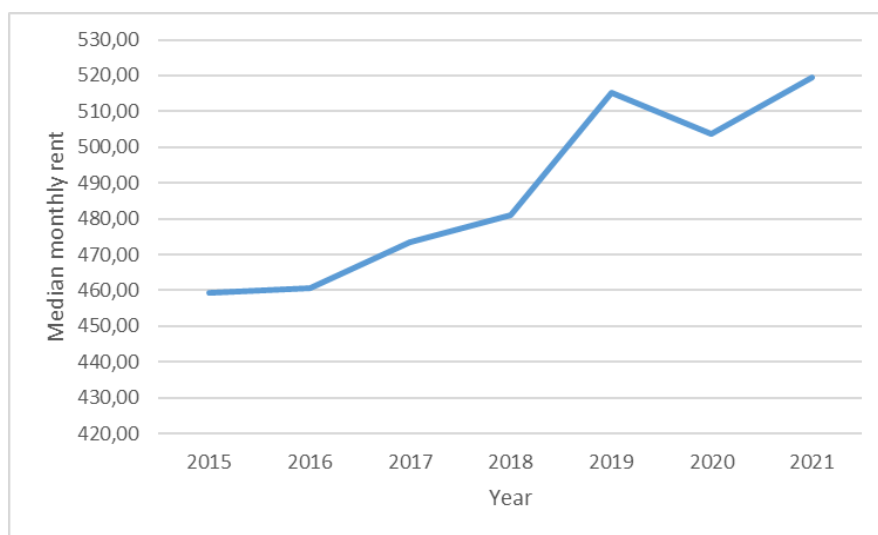


Figure 4. Evolution of the average rental price in Spain. Own elaboration from MITMA data.

As we have mentioned, we have the data by province capitals, therefore we can observe that there is a great difference between provinces. In Madrid, specifically we can see that the average rental price is over a thousand euros. Over the last few years in Madrid the rental price has risen little by little until it exceeds 1.200€ per month, this is the highest average price that we observe in all our data, there is no other city in Spain that exceeds an average of one thousand euros of rental price. We find other cities such as Malaga or Barcelona where the rental price is higher than the country's average. In these two cities we can see that the average rental price in 2021 was around €800 in Barcelona and more than €700 in Malaga.

On the other hand, we observe that there are cities where the rental price is lower, such as Zamora, Lugo, Pontevedra or Cuenca, where in 2021 it does not reach €400 per month on average. But we have to highlight that in these four cities the rental price has also followed a growing trend. For all this we can conclude that in Spain over the last seven years the rental price has risen and continues to do so constantly and continuously in all the provincial capitals and consequently in the country.

Now we will see another fundamental factor when it comes to explaining why there are more and more people living for rent in our country. If we look at the data provided by the Consejo General del Notariado (2023) we can see that the average price of a home in Spain, in real terms, has increased significantly in recent years (figure 5).

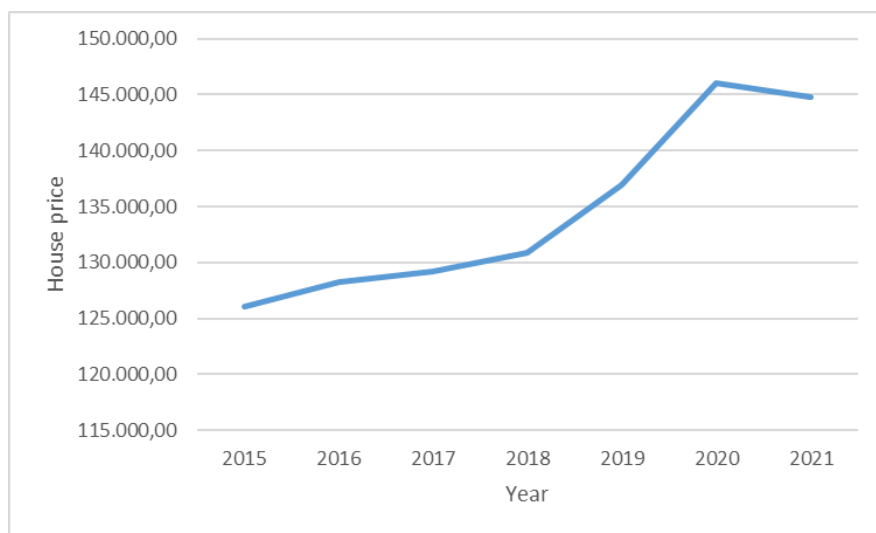


Figure 5. Evolution of the average house price in Spain. Own elaboration from Consejo General del Notariado data.

In this figure we can see that in the last seven years in Spain the real price of housing has increased at a strong and constant rate. We observe that in 2015 the price was close to 125.000€ and in 2021 it went to more than 145.000€. If we look at this data by province capital we can see that there is a big difference in prices depending on the city. The most expensive homes are in Madrid and Barcelona, where they exceed 200.000€ on average. We can highlight the case of Malaga, where in just seven years the price of housing has increased by almost €80,000 (figure 6).

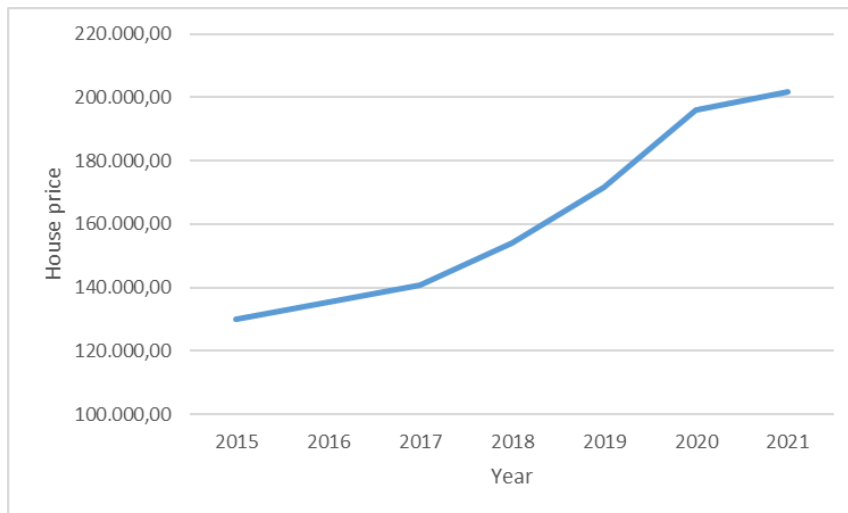


Figure 6. Evolution of the average house price in Málaga. Own elaboration from Consejo General del Notariado data.

On the other hand, we find cities such as Castelló, Zamora or Huelva, where the price of housing in recent years has barely reached 100.000€, well below the country's average.

Now we are going to see another factor that is fundamental when we are analyzing the price of rent and housing, and that is the average net income per household in real terms. Based on the data available on the website of the national statistics institute about Household income distribution atlas [INE (2022)], we can see that the average net income per household in Spain is 34.198€ in 2021 (figure 7).

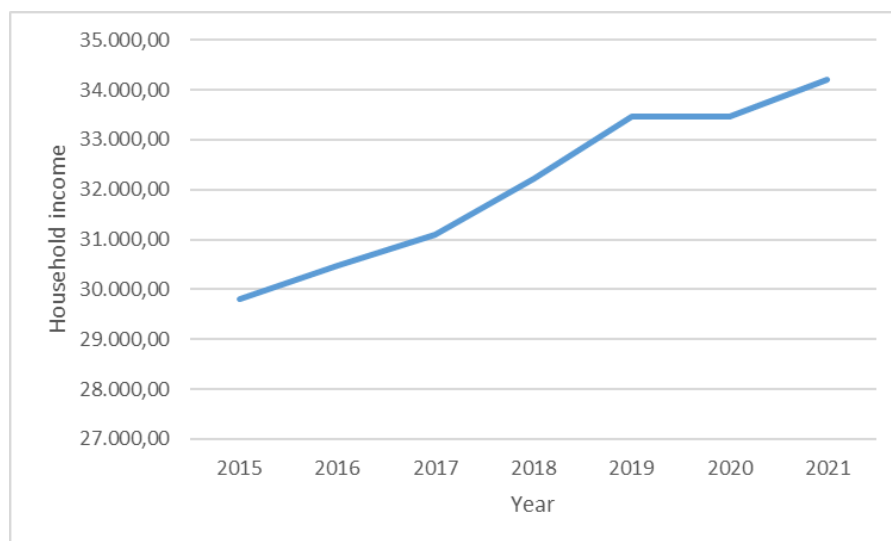


Figure 7. Evolution of the net household income in Spain. Own elaboration from INE data.



As we can see in recent years in Spain the net household income has increased by around 4.500€, that is to say an increase of 14,76%. The increase has been constant and progressive except for the year 2020, very possibly due to the pandemic. If we analyze the data by province capitals, we can see that there is a big difference between average salaries depending on the city. In Madrid and Barcelona they are the only cities where in the year 2021 it will exceed 40.000€. On the other hand, we find cities like Huelva, Orense and Salamanca where in 2021 the household income barely exceeds 30.000€.

Finally, we turn to the property tax. In Spain we find the “IBI” (“Impuesto sobre Bienes Inmuebles” property tax), this is established by each town hall and it can be between 0.4% and 1.3% of the cadastral value of the home. The average in Spain in 2015 was 0.68% and in 2021 it went to 0.62%. As we have mentioned before, each city council decides which tax rate to apply, therefore we find that it is very varied depending on each city. Cities such as Santander, Teruel and Zaragoza in recent years have had values very close to the minimum of 0.4%. In contrast, cities such as Ciudad Real, Girona, Lleida and Tarragona have a value of more than 0.8% in 2021.

On the other hand, now we will see one of the most relevant indicators that a consumer faces when deciding between buying or renting a house. This indicator is the price rent ratio and it is used as a benchmark for estimating whether it is cheaper to rent or own property. This ratio can also be used as an indicator for whether housing markets are fairly valued, or in a bubble.

Many real estate agencies and many papers such as Pancak (2017) established thresholds for the ratios as follows: a price-to-rent ratio of 1 to 15 indicates it is much better to buy than rent; a price-to-rent ratio of 16 to 20 indicates it is more expensive to own a home in this city. The total costs of ownership of a home in this city are greater than the costs of renting, but it might still make financial sense depending on the situation. Finally, a price-to-rent ratio of 21 or more indicates that the total costs of owning a home in this city are much greater than the costs of renting. Another way to analyze this ratio is how much buyers are willing to pay for a home in terms of numbers of years of rent. That is to say, that a price to rent ratio of 15 means that buyers are willing to pay the equivalent of 15 years of rent to buy the house.

According to the analysis we have carried out in Spain, we find that the price to rent ratio stands at 24 years. According to what we have just explained, this ratio is a high ratio, but compared to other neighboring countries it is within the average (Global

Property Guide (2020)). So this ratio means that in Spain buyers are willing to pay the equivalent of 24 years of rent to buy the house. In countries such as Germany, Switzerland and Luxembourg the ratio is between 32 and 35 years in 2020. On the contrary, in countries like Lithuania, Ukraine and Ireland the price to rent ratio is 13 years. If we focus on the countries that surround us, Portugal and France the ratio in 2020 was 19 and 25 respectively.

Country	Price Rent Ratio
Monaco	40 yrs
Luxembourg	35 yrs
Switzerland	34 yrs
Germany	32 yrs
France	25 yrs
Belgium	24 yrs
Spain	24 yrs
Netherlands	20 yrs
Portugal	19 yrs
Greece	18 yrs
United States	18 yrs
UK	16 yrs
Italy	16 yrs
Ireland	13 yrs
Ukraine	13 yrs
Lithuania	13 yrs

Figure 8. Price to rent ratio in Europe and USA.

Own elaboration from Global Property Guide (2020)

On the other hand, if we analyze the price rent ratio of the United States (Smartasset (2020)), we observe that the highest ratios are located in San Francisco and Oakland, whose ratios are 53 and 39,93 years. The fifth city in the United States with a price rent ratio higher is New York and is 37,25 years. On the other hand, the two cities with the lowest ratio are Detroit and Memphis with ratios of 5,14 and 10,01 years respectively. Finally, the average price to rent ratio in the United States is 18,09 years.

If we focus on the Spanish provincial capitals, we find that this ratio differs depending on the city. We find very high ratios such as those of Santa Cruz de Tenerife, Barcelona and Palma de Mallorca, around 32 years (in 2021), and on the other hand we find very low ratios such as those of Ávila, Guadalajara and Jaén, around 16 years (in 2021).

## 4. Government Intervention

Over the past few years, we can see that rental prices for residential housing have risen sharply in many of the metropolitan areas of advanced economies. Specifically, as we have just seen in the previous section, in Spain in the last seven years the rental price has increased at a constant rate and does not seem to have a ceiling. This is due to a relative scarcity in the supply of rental housing, in addition we must add a strong increase in demand among certain groups, such as households with a lower income level and those headed by young adults, and it has been located fundamentally in the geographical areas where economic activity tends to be concentrated, that is, in large cities and their central districts [López-Rodríguez, D., de los Llanos, M. (2020)].

Nowadays in society a broad debate has arisen on the possibility of reinforcing the role of public policies in the residential rental market, whose objective is to improve the conditions of access to housing by the most vulnerable groups. On occasions, the demand for greater intervention in the residential rental market has also been justified for reasons of macro-financial stability of the economy. In other words, this problem extends to the labor market, since it hinders the mobility of workers, particularly young people. Thus, a greater relative weight of rented housing, in relation to owned housing, among active households would facilitate the mobility of the unemployed.

Another of the problems associated with the problem of renting a home is macroeconomic stability, due to the increase in rental spending for certain households, more specifically due to its concentration in groups with little saving capacity and a greater propensity to consume. The increase in rental prices entails a reduction for these households in the demand for other goods and may increase the proportion of households whose consumption is restricted by their current income level. This change in the composition of household spending causes an increase in the sensitivity of aggregate consumption and economic activity to possible abrupt changes in the cyclical position of the economy, as we see in the article by Paciorek and Sinai (2012).

Now we will see the main intervention instruments that the government can apply to intervene in the rental market. We can divide the policies into three large groups that we will explain below based on the article by Andrews et al. (2011). Finally, we will see the bill that has just been approved in Spain on this matter.

## 4.1. Intervention Instruments

One possible policy instrument is the price control of residential rentals. Contemporary historical evidence shows the introduction of rental income control policies in exceptional periods, such as the two World Wars, or in the face of very strong increases in housing rental prices in large cities with strong demographic dynamism (Malpezzi (2017)).

These price controls were maintained in Europe until the 1980s, due to the fact that during the Second World War, much of the residential stock was destroyed and its reconstruction was very slow. On the other hand, in the United States, these controls were extended over time before the return of soldiers to large cities; these policies were eliminated in the 1940s, with the exception of New York City. If we focus on the case of Spain, the freezing of rental income, together with the indefinite nature of the contracts, was incorporated into the Urban Leasing Law of 1946. Previously, there was a freezing of rental income in 1920, which had a notable effect on urban centers (Artola (2012)).

In the 1980s, the process of liberalization and economic deregulation led to the disappearance of a large part of the controls on the levels of rental prices and the simplification of some complex rent updating systems. In practically all of the OECD economies, regulations on rental income disappeared or were replaced by interventions of a lesser scope and greater administrative simplification. An example of this was income stabilization policies, in which regulation was limited to set the maximum growth of the lease during the duration of the housing rental contract (Salvi del Pero et al. (2016)).

Today, we find that the strong growth in rental prices in practically all of the main global metropolies has led to the resurgence of social demands that demand the establishment of limits on the price of housing rentals (The Economist, 2019). In some regions, local authorities, regional or federal governments with powers in the housing market have listened to these demands from society and have applied new regulations that limit the maximum growth allowed in the housing rental price, and even, in some cases, maximum limits are established on price levels.

We now go into the case of Germany, since it is the most relevant country regarding limitations to the growth of rental prices in Europe. The importance of the case of Germany is given by two points: on the one hand, the relative importance of its housing rental market (close to 50.9% of households (Eurostat (2018))) and, on the other hand, the wide scope of the regulatory experience in this country, to try to contain the rental

price. In June 2015, the Mietpreisbremse law was approved, which allows the governments of the federated states or Länder, to establish price controls in those municipalities where housing rental markets are stressed, for a maximum period of five years<sup>2</sup>.

In order to keep rental prices low, a ceiling is established on rental income for new contracts, which is conditioned by past rental growth in the local market. The maximum rental price is set at the average rental income for comparable homes rented in the municipality, during the last four years, plus 10%. Average annual rents in a municipality of comparable homes are obtained from a rental mirror system (Mietspiegel) that estimates the average prices of homes with comparable characteristics in a given local market. The main objective of this mechanism, in a context of rising prices, is to slow down the growing dynamics of rental prices.

Even with this mechanism, the problems of access to rental housing continue in some of the most dynamic cities in Germany. These problems are particularly relevant in Berlin, a city where a large part of the migratory flows is concentrated and where housing production is unable to absorb the growth in demand (Mense et al. (2017)).

We now move on to see the second intervention tool that the state can apply, which are direct supply policies.

Direct supply policies focus on the provision of public rental housing at regulated prices. These regulations are justified by the greater efficiency of focusing on the causes that explain the abrupt increase in rental income. More specifically, given the relative insufficiency of housing available for rental in local markets where rental demand is increasing, an increase in the public provision of rental housing would be justified to contain the upward trend in prices.

This provision of public housing can be carried out by public institutions in various ways and at various levels. More specifically, they may involve the creation of a publicly owned housing stock in which the amount and type of housing for lease are periodically set. They can manage and maintain this public rental housing stock. They can also introduce tax incentives and subsidies for the private sector to build and maintain a certain amount of rental housing for a certain period of time and allocate it among

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<sup>2</sup> Stressed areas are considered when they meet one of these four criteria: 1) Average rental income on a local scale grows more than the national average. 2) The average ratio of rental income divided by income at the local level is significantly higher than the average of this ratio at the national level. 3) The local population grows at a rate greater than the capacity to build new housing that absorbs the growth in housing demand. 4) In the municipality there is a low rate of housing vacancies and a high demand for housing

tenants. In particular, direct subsidies or tax credits can be provided to real estate developers so that they allocate a proportion of newly built homes or rehabilitated homes to housing rentals. This regulation could also be aimed at considering the transfer of public land to the private sector at a reduced price, conditioned to the development of rental housing, or to require the private sector to transfer urban land or a percentage of housing in its promotions, with the objective of expanding the regulated residential rental park.

Lastly, we note that these public provision policies for residential rentals during the second half of the 20th century have been an effective instrument to increase the supply of housing rentals at moderate prices for lower-income households, based on what affirm Salvi del Pero et al. (2016). However, international experience also shows the complexities that these policies present, both in their design and in their implementation.

Finally, we will see the third tool that the state can apply, indirect policies on the rental market. The difficulties and limitations presented by direct regulations on the supply or prices of rental housing explain the importance given to indirect interventions on the rental market in advanced economies in recent decades. The purpose of these policies is to modify the incentives of the agents that operate in the housing rental market, with the purpose of increasing the private rental supply, as well as containing the growth of household spending on housing rentals.

According to what they say in López-Rodríguez, D., de los Llanos, M. (2020) these types of policies are carried out in three different ways. First, by modifying the design and effectiveness of the legal framework that regulates contracts. Secondly, by introducing tax benefits and subsidies, both to stimulate private supply and to support demand segments particularly affected by the rise in rental income for housing. Third, by modifying the regulations at the local level that condition the supply of residential housing.

Now we will see the rentals for tourist use. Over the last few years, in much of Europe, and in Spain specifically, there has been a boom in a new housing rental market for tourist use. The development of this new activity has coincided with the increase in residential rental prices in the central areas of large cities with great tourist attractions. This has led to the creation of new regulations in recent years to control this new activity, specifically, these new regulations have the objective of limiting the possible reduction of the residential rental offer, in certain areas of a city, due to the change of

houses of residential use towards the tourist activity. Therefore, it is sought that tourist activity does not put pressure on residential rental prices, nor does it have negative effects on the quality of life of residents.

These measures are promoted by the local authorities of those municipalities where this is a serious problem. These types of measures have been carried out in Spain in cities such as Barcelona, Bilbao, Madrid, San Sebastián or Palma de Mallorca. These measures are mainly the obligation to have a license to carry out the tourist activity in a residential home, it can also be the establishment of a tax on the development of this activity or the setting of strict limitations on the maximum number of days that a Housing can be used for vacation rental. Compliance with these measures can only be carried out by reinforcing inspections and, in the event of non-compliance, with high sanctions on the owners and platforms that operate outside the regulations.

## 4.2. Draft bill on housing rights (April 24, 2023)

With everything we have just seen about the rental market in Spain and given the great social demand that there was in Spain to take measures to control this market, the Spanish government has just approved a law in this regard.

On April 27, 2023, the new "Proyecto de Ley por el derecho a la vivienda" was approved in the "Congreso de los Diputados", it should be noted that it is still pending approval by the "Senado" for its complete processing. In this section we will see what are the main novelties that are included in this new law.

Regarding the key points about this new law, we highlight the following measures:

- Expansion of stressed areas in the rental market. The law affirms that the conditions for the declaration of a stressed zone are improved and facilitated, covering more areas for the application of control measures. It should be noted that the declaration of a neighborhood or a municipality as a stressed area will depend on each Autonomous Community.
- New definition for large holders. These will be the natural or legal person who owns more than ten urban properties for residential use or a constructed area of more than 1,500 m<sup>2</sup> for residential use, excluding garages and storage rooms in any case.
- Limit of annual rent update. As of January 2024, rent updates will be limited to a maximum of 3% and will be decoupled from the CPI. It is expected that by

January 2025 a new reference index will be created by which all rents will be updated, and that will be more stable and lower than the CPI.

- Regularization of rental prices in stressed areas. The rental prices of the new contracts, regardless of whether they are from large or small owners, will be regulated and limited. The objective of this measure is to contain and reduce the price of rental housing and will not be applied in areas that have not been declared stressed. This means that for small owners, the new contracts may not exceed the rental price of the previous contract plus the increase corresponding to the current index.
- Transfer to the landlord to pay the real estate fees. The real estate management expenses and the formalization of the contract will be borne by the lessor.
- Prohibition of agreements between the parties against this new law. The clauses that allowed the non-application of the measures contained in the Law if there was an agreement between the parties are eliminated. The Urban Leasing Law allows, as in any contract, the parties to reach agreements even if they are contrary to part of the Law.
- Protection against evictions. New regulations are established to protect tenants, such as putting an end to evictions without a predetermined date, mandatory access to out-of-court settlement procedures for vulnerable people, the autonomous communities may articulate their own mediation mechanisms and housing alternatives that they deem appropriate. Finally, we highlight that the ability to use funds from state housing plans to offer housing alternatives for people at risk of eviction through subsidized social rents, rehousing people in vulnerable situations or any other policy is recognized.
- Tax benefits for owners. Small owners who have a home in an area declared stressed will apply tax incentives in personal income tax (IRPF).
- IBI (property tax) surcharge for empty homes. This is aimed at incentivizing the rental of those homes that have been empty for more than two years, for owners with more than four homes in the same municipality.

All the information about the draft bill on housing rights (April 24, 2023), has been retrieved from “Boletín Oficial de las Cortes Generales [BOE(2023)]”.



## 5. Empirical analysis

To carry out the empirical analysis we carry out an analysis similar to the one in Pancak (2017), but with different data. As we have seen, Pancak (2017) used data of the 48 states and DC of the United States and then, she used more specifically data from Connecticut town. In contrast, we are going to utilize data from the 50 provincial capitals of Spain and the two autonomous cities of Ceuta and Melilla.

The cities that we are going to use are: Albacete, Alicante, Almería, Badajoz, Barcelona, Bilbao, Burgos, Castellón de la Plana Ciudad Real, Cuenca, Cáceres, Cádiz, Córdoba, Girona, Granada, Guadalajara, Huelva, Huesca, Jaén, La Coruña, Las Palmas de Gran Canaria, León, Logroño, Lugo, Lleida, Madrid, Murcia, Málaga, Orense, Oviedo, Palencia, Palma de Mallorca, Pamplona, Pontevedra, Salamanca, San Sebastián, Santa Cruz de Tenerife, Santander, Segovia, Sevilla, Soria, Tarragona, Teruel, Toledo, Valencia, Valladolid, Vitoria, Zamora, Zaragoza, Ávila, Ceuta, Melilla.

The next step in performing the analysis is to collect the data. This section first explains the limitations of the data collection. Secondly, we are going to explain the data that we used.

### 5.1. Limitations

In the first place, when collecting the data, we have faced different problems. One of the most important has appeared when searching for a historical series of housing prices by cities. There was no data available on official state websites, and the few data available were for the price per square meter, not the total price.

Secondly, for the rental price series, we have used the portal of the "Ministry of Transport, Mobility and Urban Agenda" whose objective is to guarantee transparency in the housing rental market. It offers the result of the exploitation of tax sources of the data on leases of habitual residence, within the framework of the development of the State System of reference of the price of the rental of housing. Since this is an exploitation of tax sources based on the cadastral reference, the second problem encountered has been that it is made up of the entire common tax territory, that is, the entire national territory except the Basque Country and the Foral Community of Navarra. Therefore, we do not have data available for the cities of Pamplona, Bilbao, Vitoria and San Sebastián. We found this same problem when downloading the IBI data, we did not have the data for these cities for the same reason.

To solve it, we have gone to the websites of each of the nine city councils to look for information on the IBI history of each of these cities. To obtain data on the average age, average income and the consumer price index, we have not come across any problems.

## 5.2. Data

**Price:** Average price for buying and selling real estate expressed in euros. The series takes values from the first quarter of 2015 to the first quarter of 2021, data frequency is annual. This data is available in “Centro de información estadística del Notariado” within the website of the “Consejo General Del Notariado”. More specifically, the price is that of Transfer Contracts on all types of goods and rights, real estate in urban properties- Housing.

**Rent:** Price of real estate leased for habitual residence declared per year. Separated between Collective Home (CH) and Single Family Home (SH) expressed in euros/month. The series takes values from the first month of 2015 to the first month of 2021, data frequency is annual. In some cases, we multiply these data by 12 to obtain the price paid for renting a house per year. These data are available in “Ministerio de Transportes, Movilidad y Agenda Urbana”.

**PR (Price-Rent ratio):** The price to rent ratio is calculated by dividing the median home price by the median yearly rent. To obtain the median yearly rent, we multiply the variable “Rent” by 12. Therefore to obtain this new variable, we have divided the variable “Price” by the median yearly rent (“Rent” per 12).

**Age:** Average age of the population broken down by provinces. The series takes values from the first month of 2015 to the first month of 2021, data frequency is annual. These data are available in INE (Instituto Nacional de Estadística).

**IBI:** Tax on goods and real estate, by municipalities. We take the value of the provincial capitals. The series takes values from the year 2015 to the year 2021, the data frequency is annual. These data are available in “Agencia Tributaria”.

**Household Income:** Average net income per household, broken down by municipality. We use the value of the provincial capitals. The series takes values from the year 2015 to the year 2021, the data frequency is annual. This data is available in INE (Instituto Nacional de Estadística).

**CPI:** Consumer price index, with base year 2021. It is disaggregated by municipalities and is the annual averages. The series takes values from the year 2015 to the year 2021, the data frequency is annual. This data is available in INE (Instituto Nacional de Estadística).

First, we have used the CPI to convert home prices into real prices. To do this, we have divided the price of housing between the CPI of each provincial capital, and we have multiplied it by 100.

Now we will examine a small representation of our data. In the following table, we will look at the main statistics of the aforementioned variables.

To carry out this study we have decided to carry out two analyses, firstly one using cross-sectional data and secondly another one using panel data.

For the cross-sectional data, we have used the data from the 48 provincial capitals (we do not include Pamplona, Bilbao, Vitoria and San Sebastián due to lack of data), in the year 2021. Now we will see the main statistics of these data.

<b>Variable</b>	<b>Observations</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<b>PR</b>	48	23,42	4,86	14,66	36,46
<b>Age</b>	48	44,21	2,52	36,15	48,63
<b>IBI</b>	48	0,62	0,15	0,41	0,97
<b>Income</b>	48	34.197,00	3.147,13	29.508	43.896,80

Table 1: Main statistics of cross-sectional data

As we can see each variable has 48 observations, one per province capital, we have presented the mean, standard deviation, minimum and maximum. We can highlight the great difference between the incomes of the different provincial capitals, since the minimum income is 29,508€ in Zamora and the maximum is 43,896€ in Madrid. We also highlight the difference between the IBI between the different provincial capitals, whose standard deviation is 0.15.

We now turn to the main statistics of the panel data. Here we find data from the 48 provincial capitals (we do not include Pamplona, Bilbao, Vitoria and San Sebastián due to lack of data) in the years 2015-2021.

Variable	Observations	Mean	Std. Dev.	Min	Max
PR	336	23,35	4,85	13,4	41,56
Age	336	43,43	2,56	34,92	48,63
IBI	336	0,63	0,14	0,41	1,01
Income	336	32.098,92	3.389,61	25.672	43.895,80
Year	336	2018	2,01	2015	2021

Table 2: Main statistics of panel data

As we can see, we found 336 observations for each of the variables and we have represented the mean, the standard deviation, the maximum and the minimum. We can highlight the big difference between the maximum income and the minimum, which is around 20,000€. Also to highlight the difference between the maximum price-rent ratio which is 13.4 and the maximum of 41.56.

We now turn to see how the average price-rent ratio has evolved in Spain over the last seven years.

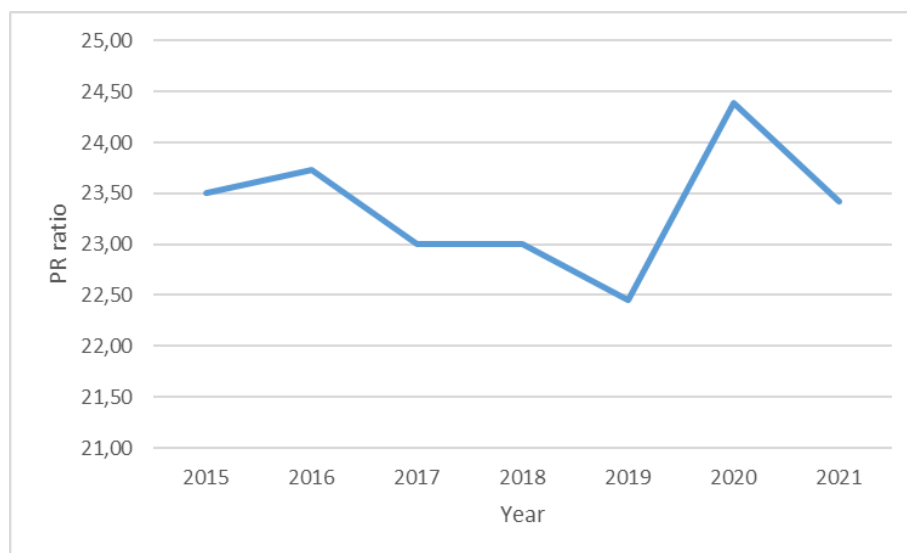


Figure 9: Evolution of price rent ratio in Spain (2015-2021).

In this figure we can see how this ratio has fluctuated in Spain. From 2015 to 2019 it follows a downward and constant trend, but it changes significantly in 2020. This change in trend does not last even for a period, we can see that in 2021 the ratio drops again until it is close to that of 2015.

### 5.3. Econometric Model

In this section we are going to present the specification that we have given to our model. To carry out this study we have decided to carry out two analyses, firstly one using cross-sectional data and secondly another using panel data.

### 5.3.1. Cross section data

This econometric study using cross-sectional data is the same one carried out by Pancak and is the one we have used as a model to carry out our study.

First of all, we will present the specification that we have given to our model:

$$PR_i = \beta_0 + \beta_1 Age_i + \beta_2 IBI_i + \beta_3 Income_i + u_i \quad i=1, \dots, 48 \quad (6.1)$$

Next, we find in table 3, the signs that we expect to obtain for the coefficients that accompany the variables:

<i>Dependent Variable</i>	<i>Independent Variable</i>	<i>Economic Intuition</i>
<i>Price Rent Ratio (PR)</i>	<i>Median Age (Age)</i>	$\beta_1 > 0$ <b>Positive expected relationship</b> The older they are, we expect them to have a greater desire to buy a home.
	<i>Property tax rate (IBI)</i>	$\beta_2 < 0$ <b>Negative expected relationship</b> At higher property taxes, we expect that to decrease demand for homeownership.
	<i>Median household income (Income)</i>	$\beta_3 > 0$ <b>Positive expected relationship.</b> At higher income levels, we expect them to have a greater ability to buy a home.

Table 3: Expected signs of the coefficients cross-sectional data

To obtain the estimated values of the parameters  $\beta_0, \beta_1, \beta_2, \beta_3$  we have used the Ordinary Least Squares (OLS) method and have obtained the following values shown in Table 4. For this we have used the Gretl statistical software.

<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-ratio</b>	<b>p-value</b>
<b>const</b>	-18,968	20,260	-0,936	0,354
<b>Age</b>	0,580	0,320	1,813	0,077
<b>IBI</b>	0,040	4,965	0,008	0,994
<b>Income</b>	0,000	0,00025	1,975	0,055

R-squared 0,103

Adjusted R-squared 0,042

F(3,44) 1,699

Table 4: OLS estimate



		<b>Negative expected relationship</b> At higher property taxes, we expect that to decrease demand for homeownership.
	<i>Median household income (Income)</i>	$\beta_3 > 0$ <b>Positive expected relationship.</b> At higher income levels, we expect them to have a greater ability to buy a home.
	<i>Year (Year)</i>	$\beta_4 > 0$ <b>Positive expected relationship.</b> We expect house prices to continue a positive trend over the years.

Table 5: Expected signs of the panel data coefficients

### a) Pooled OLS

First of all we are going to estimate our model by the simplest method, pooled ordinary least squares, to have a first vision of our model.

Therefore, by Stata, using standard deviations robust to heteroscedasticity, we have obtained the following coefficients that we can see in the following table.

$$PR_{it} = \beta_0 + \beta_1 Age_{it} + \beta_2 IBI_{it} + \beta_3 Income_{it} + u_{it} \quad (6.3)$$

Variable	Coefficient	Robust Std. Error	t-ratio	p-value	(95% Conf. Interval)	
Age	0,312	0,095	3,26	0,001	0,123	0,501
IBI	1,557	1,824	0,85	0,394	-2,031	5,147
Income	0,000	0,000	3,30	0,001	0,000	0,000
const	-0,732	5,878	-0,12	0,901	-12,295	10,830

Table 6: Pooled OLS Estimation

The coefficients that are statistically significant are those whose p\_value is less than 0.05. Then we find that the coefficients corresponding to the age and income are highly significant, at a 1% significance level. On the other hand, the coefficient corresponding to the IBI rate is not significantly different from zero.

Regarding the signs of the coefficients, we expected those coefficients corresponding to age and income to be positive, and in the pooled OLS estimation it gives us these results. On the other hand, in relation to the expected sign of the IBI coefficient, we expected it to be negative and it has turned out to be positive, but these results are not significantly different than zero.

## b) Fixed Effects

In this section we will see how we have estimated our panel data model using the Fixed Effects method, to incorporate possible heterogeneity between individuals. If we assume fixed effects, we impose that the time effects are independent for each entity that is possibly correlated with the regressors.

Using Fixed Effects estimation, we introduce dichotomous variables ( $\alpha_i$ ) into the model. These variables allow us to model the individual characteristics of our individuals (province capitals), which do not change over time. All this leads us to the fact that now our equation will add a different constant for each province capital.

Therefore, using Stata, we proceed to estimate our model using Fixed Effects. First we look at our new equation and then a table with the estimates provided by Stata.

$$PR_{it} = \beta_0 + \beta_1 Age_{it} + \beta_2 IBI_{it} + \beta_3 Income_{it} + \beta_4 Year_{it} + \alpha_i + v_{it} \quad (6.4)$$

Variable	Coefficient	Robust Std. Error	t-ratio	p-value	95% Conf. Interval	
Age	-2,152	1,143	-1,88	0,066	-4,452	0,148
IBI	5,471	4,898	1,12	0,270	-4,383	15,326
Income	0,000	0,000	-2,63	0,011	-0,001	0,000
Year	1,057	0,302	3,50	0,001	0,449	1,665
const	-2.002,378	566,290	-3,54	0,001	-3.141,609	-863,146
sigma_u	7,587					
sigma_e	2,245					
rho	0,919					

Table 7: Fixed Effects Estimation

As we can see, this estimation tells us that the coefficients associated with the variables "Income" and "Year" are significant (at 5% and 1% significance levels, respectively). We also found that the coefficient associated with the variable "Age" is significant at 10% significance, while IBI does not appear to have a significant effect on the price to rent ratio.

## c) Random Effects

Random effects estimation does not consider a fixed value of the individual effects (constant over time for each individual) but instead considers a random variable with a mean value and a variance,  $\text{var}(\alpha_i) \neq 0$ .

In order to consistently estimate this model by RE, the assumption must be fulfilled that the unobservable effect is not correlated with any explanatory variable, that is, it must be fulfilled that  $C(X_{it}, j, \alpha_i) = 0$ .



We now turn to see the estimates robust to heteroscedasticity obtained using the Stata statistical program.

$$PR_{it} = \beta_0 + \beta_1 Age_{it} + \beta_2 IBI_{it} + \beta_3 Income_{it} + \beta_4 Year_{it} + \alpha_{it} + \varepsilon_{it} \quad (6.5)$$

Variable	Coefficient	Robust Std. Error	t-ratio	p-value	(95% Conf. Interval)	
Age	0,099	0,245	0,40	0,687	-0,382	0,581
IBI	2,782	3,617	0,77	0,442	-4,308	9,872
Income	0,000	0,000	0,41	0,685	0,000	0,000
Year	-0,040	0,193	-0,21	0,833	-0,421	0,339
const	97,548	380,023	0,26	0,797	-647,283	842,380
sigma_u	4,251					
sigma_e	2,245					
rho	0,781					

Table 8: Random Effects Estimation

As we can see with this estimation we find that no coefficient is significant at 10%, 5% or 1% significance levels. All the p-values that we have obtained in this estimation are very large.

## 5.4. Specification selection

Once the model has been estimated using different methods, we can select which one provides a better specification. To make this decision, we will look at the result of three different contrasts.

### 5.4.1.F test of significance of fixed effects

First, we will carry out the F test of significance of the fixed effects whose null hypothesis is that the regression constants do not vary between individuals that have been considered. Instead, the alternative hypothesis assumes that the null hypothesis is not true.

The significance test of the fixed effects would be as follows:

$$H_0: \alpha_1 = \alpha_2 = \dots = \alpha_{52}$$

$$H_1: H_0 \text{ is not true}$$

Therefore, if the null hypothesis is rejected, it would be preferable to estimate using fixed effects versus the estimate by pooled OLS. The p\_value obtained is 0 and the value of the F statistic is 76.97.

With the results we have obtained with Stata, we can reject the null hypothesis of equality of the parameters for each individual for any of the coefficients of commonly used significance.

### 5.4.2. Test Breusch-Pagan

In this section we will see the results obtained by performing the Breusch-Pagan test. This test is used to determine if heteroskedasticity is present or not in our model. In this test if the variance is constant, then we will have homoscedasticity; on the other hand, if the variance varies, we will have heteroskedasticity.

We will use the following null and alternative hypotheses:

- $H_0$  Null hypothesis, homoscedasticity is present ( $\text{Var}(v)=0$ )
- $H_1$ : Alternative hypothesis, heteroskedasticity is present ( $\text{Var}(v)\neq 0$ )

	Var	sd=sqrt (var)
<b>PR</b>	23,601	4,858
<b>e</b>	5,042	2,245
<b>u</b>	18,079	4,251

Test: Var(u)= 0  
chibar2(01)= 576,78  
Prob>chibar2= 0

Table 10: Breusch-Pagan test

The results obtained tell us that  $X^2= 576,78$  and that the p-value is 0, therefore we can affirm that we reject the null hypothesis, that is, heteroskedasticity is present in our model.

### 5.4.3. Hausman Test

In order to know if it is preferable to estimate by Fixed Effects or by Random Effects, we can resort to the Hausman Test. In this case, the contrast would be the following:

$$H_0: \text{Cov}(X_{it,j}, \alpha 1) = 0$$

$$H_1: \text{Cov}(X_{it,j}, \alpha 1) \neq 0$$

	(b) fixed	(B) random	(b-B) Difference	sqrt (diag(V_b-V_B)) S.E.
Age	-2,152	0,099	-2,251	0,774
IBI	5,471	2,782	2,689	2,544
Income	0,000	0,000	0,000	0,000
Year	1,057	-0,040	1,098	0,293

$$\text{chi2}(3) = (b-B)'[(V_b-V_B)^{-1}](b-B) = 14,04$$

$$\text{Prob}>\text{chi2} = 0,0028$$

Table 11: Hausman test

This test tells us that the Fixed Effects estimator is preferable to the Random Effects estimator. This estimator provides us with consistent estimates.

## 6. Conclusion

The objective of our analysis was to determine the significance of the factors that determine the house price to rent ratio in Spain. For this, we have used a set of panel and cross-sectional data where we have included as explanatory variables the family income, the median age, the property taxes and the year, and as the dependent variable the house price to rent ratio in the different provincial capitals of Spain between the years 2015 and 2021.

In the first place, we have made an estimation of the regression model using cross-sectional data for 2021 by OLS, but the estimated coefficients are not significantly different from zero (at 1% or 5% significance levels). We also observe that the R-Squared obtained is very low, therefore the model is not able to explain a large part of the variation in the dependent variable.

Second, estimating a panel-data model using pooled OLS, we find that the coefficients associated with the age and income variables are significant at 1%.

Third, we have estimated the model by fixed and random effects. In relation to the estimation by fixed effects, we have found that all the coefficients associated with the variables are significant, at least 10%, with the exception of the IBI, that does not appear to have a significant effect on the price to rent ratio. On the other hand, regarding the random effects we found that no coefficient is significant at 10%, 5% or 1% significance levels.

We used the Hausman Test to determine whether it is preferable to estimate by fixed or random effects. This test has indicated that the fixed effects estimator is preferable and provides us with consistent estimates.

The results that we have obtained regarding income and year are significant at a significance level of 1%, and they are what we had expected. We find that the house price to rent ratio is higher in those provinces with higher income per household, and that the price to rent ratio is higher as the years go by. On the other hand, we observe that age has a negative effect on the price to rent ratio, that is, we find that the house price to rent ratio is lower in those provinces with higher age, but this coefficient is only weakly significant at 10% of significance level. Finally, we highlight that the price to rent ratio is not significantly affected by the IBI.

To conclude, we can add that for future research other variables that could be added further to explain the house price to rent ratio of the capitals of Spanish provinces, such

as if the city is more or less touristic, or if the cities have some kind of regulation on the rental or housing market.

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