



EXTENDED ABSTRACT

Title: Housing prices and productivity. Evidence from Spanish cities

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Abstract: *(minimum 300 words)*

This paper undertakes the case Spanish cities. It gathers the available data at city level from several sources in order to approach how their characteristics would identify the relationships between economic productivity and housing prices. Following the principles explaining the role of productivity in the city competitiveness as well as the fundamentals to explain housing prices, the paper shows the economic links relating the variables and empirically analyses the three cases following two-steps. Firstly, an exploratory analysis where data are consistently related to those drivers making the city to evolve into a ‘super-city’. Secondly, conducting an empirical test finding evidence about the relationship between housing prices and city productivity, based on a panel with 99 Spanish cities. Results show early evidence of the effect of city productivity on housing prices in Bilbao and Valencia but not in Madrid and suggest that Madrid and Bilbao could approach the ‘super-city’ pattern.

Keywords: *(maximum 6 words)* productivity, cities, Spain, housing prices, commuting
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I.- Introduction

City competitiveness and the channels through which cities growth faster than others is a key issue in the developed countries. The role that the cities are playing on the global economy networks allows them to compete in better conditions generating economic benefits for the citizens in terms of skills, knowledge and better wages (Glaeser and Maré, 2001) promoting relocation of household into cities and enlarging the potential of the city as a large and complete production system.

Several studies demonstrate how urban areas provide larger productivity in economic activities as they expand, what is known as the ‘Urban Productivity Premium’ (Maré, 2016). It is far known that labour market shows those benefit with larger human capital associated to jobs and higher salaries which are product of the larger productivity as the



cities concentrate more specialised activities, well explained by the agglomeration theories (Fujita). The empirical evidence support the idea of the existence of a relationship between city size and productivity, as in Sveikaukas (1975) who established that a doubling of city size is associated with a 6% increase in labour productivity.

The role of real estate is key to support economic activities and efficient labour markets as well as to offer a good environment to the citizens. In fact, real estate market is the city as such: a set of buildings whose space is used for economic, social or household purposes.

The efficiency of real estate markets and how flexible their mechanisms are, are also a key to understand the city dynamics. The economic activities require that real estate markets (both residential and non-residential sectors) respond quickly to their demands avoiding to create constrains or barriers for inputs and resources to move.

One of the more common examples of these barriers is the housing market responding to labour mobility. When a city exhibits housing supply constraints, any increase on industrial or services activities (which has the effect of rise the number of jobs) results on both limiting its expansion due to the lack of decent houses available for rent or sell, or with available houses at expensive prices. There is a great paradox well reported by Gyourko et al (2006) when define the 'superstar cities': the city success competing with others creates a very wealthy city for business which attracts wealthy people at large creating competition for the existing housing and increasing housing prices.

Large housing prices force workers in less-productivity sectors to move outside looking for affordable houses to live and increasing travels to work. Commuting is the result, as an increasing phenomenon associated to the city competition since three decades ago and rising as the city size does. But when commuting takes longer than a reasonable time or cost due to the spatial diffusion of the housing market and prices, the excessive housing costs in the city could act as a barrier for firms or movers and would prevent the economic activity of growth because the lack of workers.

Housing provision (new supply) or supply mechanism is the transmission channel in which most of literature relates productivity and housing market. Blumenthal et al (2016) suggest that a lack of housing (or a fail in the housing market mechanism) reduces productivity in cities as '*competition for limited housing units pushes job-seekers away from centers of economic activity*' (ibid. pp.2). The result is that the richest households gain in such competition, creating cities with large accumulation of rich and middle-rich citizens (Gyourko et al, 2006) affecting the income distribution and making other households to move towards more affordable areas (Furman, 2015).

Some evidence of this phenomena has appeared recently in several researches. For instance, Glaeser (2006) demonstrates that housing costs has been associated with declines in employment and income, and a loss of population in metropolitan areas. There are insufficient supply of housing in high-cost cities in the US (Hsieh and Moretti, 2015) and Ganong and Shoag (2017) empirically show that a flow of less-skilled workers to high-paying-job cities have declined as a result of expensive housing. Glaeser et al (2005) also sets that regulation that reduce housing supply have substantial impact on housing and labour market dynamics.

The solution for less-skilled workers (assuming lower salaries and productivity) is to commute to further areas, suggesting the key role played by transport infrastructures. Hsieh and Moretti (2015) estimated that if workers were able to freely move to more strong-economy metropolitan areas, the US economy would have grown 0.3% more a year from 1964 to 2009.



It can be said that housing prices constitute a ceiling for economic development unless the wealthy and smart city applies measures or establishes flexible systems to allow housing provision. The ability of housing markets in the city to respond by constructing new units to any increase on housing demand coming from both labour or income shocks, is important to its economic well-being (Saks, 2000).

II. Economy and housing prices' links. Theoretical base

“Fast productivity growth in three main American cities (New York, San Francisco and San José) increased local housing prices and local wages, but employment did not expand accordingly” (Hsieh and Moretti, 2015).

The mechanism to which the economy and the housing market are related is well-known in housing economics. DiPasquale and Wheaton (DPW, 1994, 1996) identified the channel to which an increase in economic activity results in a rise in housing prices, the direction and its effect on the real estate cycle. The sense of the effect is not, as believed, through firms' costs which do not directly increase due to housing prices (unless the firm would eventually cover its workers' housing costs). The effect is posterior, directly affecting housing purchase capacity through the increase on wages due to larger productivity or the increase of workers due to expansion on production.

Basically, what DPW model and other studies support is the fact that any increase in the basic housing demand affects the price level in the short run. Rising demand could come from the natural population growth (new household creation) and/or migration (new households appearing in the city). Every market has a stable population growth or migration rate to which the housing market mechanism is adjusted to; that is, the housing market holds a vacancy or unoccupied stock (or build a stable number of new units according to it) which is proportional to market size and results enough to attend the 'stable' demand in the long term. When the housing market absorption is enough to satisfy the amount of new demanders, housing prices are stable or growth at their long term rate.

In the short run, the housing market capacity (increasing the supply) to respond to new housing needs is limited as the stock is fixed (that is, the total units available to be habited cannot be increased rapidly because development needs time to be completed and some regulatory limitations would make the new construction react slowly), and new-enters should meet the amount of houses already supplied (the vacancy units). In the case that the increase in demand is larger than the existing vacancy in the market (or an unexpected shift in the demand happens) then the rent prices go up. This is the only reason, from the basic demand perspective, to justify the increase in prices.

DPW also explains the financial mechanism responsible to transmit the rent increases (resulting from a demand pressure) into housing prices (and in the real estate prices in general). Property prices (that is, the price of the real estate asset – a building or a house) maintain a relationship with rent prices associated with the benefits generated by the property as a capital good. The capitalization rate is the relationship itself and the variable making the developers to react starting construction. The capitalization rate is very stable in the long term so that when rents rise, housing prices also rise at similar rate. Cap-rate can change exogenously depending on whether there are changes in financial system or capital markets affecting the capital asset returns. For instance, when the interest rates rise *caeteris paribus*, the perception of the amount of capital associated with the property asset changes, and it could increase the demand of financial assets and reduce the one for real estate. The real estate value perceived is lower in that case and, then, the housing prices can fall, stop overpricing or reduce growth rate. It is considered that the housing price growth rate is in equilibrium when it is close to the economic

growth (as real estate represents part of fixed capital in the economy and, then, represents part of the wealth).

The Cap-rate can be influenced by the expected return of other investment in the city (or other cities) and compete for attracting capital with them. When cap-rate in real estate is sufficiently larger than in other investment assets, then capitals go to real estate markets, both through purchasing the existing buildings to manage their rents or building new ones. This situation normally happens in growing cities and make cities to expand the size.

Large cap rates are associated with large housing prices and diminishing house price growth rate, and the larger the housing price growth, the stronger the incentives to build. This is the market mechanism affecting new supply.

At a developer level, and focusing on new supply, the literature well supports that developer responds to market incentives, that is, he or she starts building when see housing prices going up and expectations of larger prices exists when the building is finished. That is why during periods of housing price revaluations, housing development also rises with some lags. When many developers are in the market housing supply industry works under perfect competition what determines markets with larger increases on new housing supply rather than on housing prices.

But it is also common to find the existence of barriers to development in several cities especially in the larger ones. The common barriers would take the form of scarce supply of land, land regulations, permission regulations, non-market interventions (like the one coming from housing policy) or market privileges or power. This type of problems is well summarized in Taltavull (2014). When land regulations are flexible, they have weaker effects on new housing decisions to build and developments evolves accordingly with the demand until the land supply is scarce. In the absence of land supply and severe barriers to build, any demand pressure results in a growth of house price. Some cities where housing prices grow quickly could have experienced such limitation. Those situations can be captured by the new supply elasticity in every city (See Taltavull and Gabrielli 2016 for the supply elasticity classification).

Then, summarizing the literature, the process to which any change on economic productivity can affect housing prices can be defined as a 'virtual circle' which starts with an impulse coming from any economic sector in the city (Figure 1).

Figure 1. Circle between economic activity and housing prices





The circle goes rounding until the housing prices become unaffordable for a part of the demand which should, then, look for a more affordable houses outside the city and commute towards other urban areas. When the prices reach a certain level to become unaffordable for the main households, then new houses remain in the market, increasing the vacancy rate, and stopping house price revaluation.

However, the impact of housing and real estate construction in the city is a controversy. In wealthy and smart cities, construction and building renovation are intense due to those cities contribute to strongly human capital creation in sectors with larger and increasing wages (Glaeser and Maré, 2001) and requires efficient, modern and advanced buildings. Larger quality construction is associated to longer building life that is a sign of sustainable construction and larger productivity of the real estate investment. A smart city requires innovative buildings promoting efficiency in the economic activities which also increases their productivity. Smart buildings reduce energy consumption, emissions and creates better environment to work and live, contributing to increase the productivity. That is, high productivities' cities requires 'modern buildings' that is, continuous housing quality renovation (investment) making the stock largely efficient and increasing the housing costs.

There is a paradox when modern cities promote building renovation, rise the productivity and increase housing costs which affects negatively to housing affordability. Housing prices acts as a limit of the inflow of the new workers into a city with large productivity gains reflected in larger wages and income gains.

The aim of this paper is to test empirically whether some selected Spanish cities show relationships between productivity, efficiency and housing prices. To do that, this paper choose the 50 province capital cities in Spain.

Those cities are very different in relation to their structure and organization as well as in their housing markets. Information about economic competitiveness, population mobility, housing densification, construction, prices and demographic indicators are collected in order to show how those variables could explain differences on cities.

Variables are at the aggregate level for every city. There isn't available micro data for some of the key indicators which would allow to test at the individual level the relationships as Glaeser (2006) did. Some variables are in time series shape for a period from 2004 to 2016 while others only are available for a shorter period addressing the panel methodologies as the best tool to perform the analysis.

III Methodology

The methodology follows, as explained below, two main step: the exploratory analysis and the empirical evidence about the relationship between productivity and housing prices. Main problem in this topic is the data availability and the shape of data structure at city level. Main Spanish statistics are aggregate at province level and only few cities have got available long time series observation at city level to be used in an empirical exercise. That's why this paper follows the two steps: Firstly, it uses the available data according to the literature to give a 'picture' of cities allowing to establishes hypothesis related to productivity and housing prices, and then using the variables with longer time series to test the productivity-premium hypothesis.

The variable of interest is city productivity. In Spain there are no data measuring the total income produced in a city and some databases (micro-data) with evidence about productivity have the information at firm level, non-aggregated and mostly belong to



restricted databases. This paper has reconstructed the city productivity based on the disposable income by household and using information from two sources: City audit (Eurostat) which publishes the disposable income by household (DIh) for some selected years, and the Spanish Regional Accounts (INE) which publishes the total GDP produced in provinces for a long period. Using the latter as a proxy, the former has been rebuilt from 2005 until 2014 estimating the missing years by every city. Once DIh has been obtained, the total city production is assumed to be the sum of the all household living in the city¹ times the average disposable income. Then, a proxy of the city's productivity of labour is calculated following the formulae (1):

$$ProdL_i = \left[\frac{(DIh_i * hh_i)}{Pocu_i} \right] \quad (1)$$

And the productivity by firm in the city follows the formulae (2):

$$ProdF_i = \left[\frac{(DIh_i * hh_i)}{firms_i} \right] \quad (2)$$

Where 'i' refers to the city, DIh_i is the disposable income by household in the city 'i', hh_i is the number of households living in the city, Pocu_i is the number of workers in the city 'i' and firms_i is the number of firms located in the city.

Housing prices, starts and transactions comes from the Ministry of Fomento database, which is available in its website (<http://www.mfom.es>). Rest of information in prices and interest rates comes from the Spanish Institute of Statistics (INE) and Bank of Spain (BdE).

The rest of the indicators have been used for descriptive and exploratory analysis as the available time series are so short to allow them for sophisticated tests. They comes from Eurostat, City Audit.

The analytical process followed in this paper has two step.

1st.- Exploratory analysis describing how extent the differences among the three cities relate to the three groups of indicators describing a smart city: productivity (economic growth, labour variables, income and population), city features (transport, firms, size and other characteristics) and housing market features (density, new construction, transaction, housing prices). The idea in this step is to use selected indicators in order to save a picture of how their characteristics could show them closer to what is known as a 'superstar city' in the sense of Gyourko et al (2006:26). The literature has given evidence of that the following relationships appears (Glaeser, 2006, Hsieh and Moretti, 2015):

- I. Superstar cities exhibit larger price to rent ratios than others
- II. The demand is reflected more in house price growth rather than in housing new units construction, that is, the superstar cities shows low elasticity of supply

¹ As the disposable income is the results (at aggregate level) of add all sources of income (salaries, transfer, capital returns, property returns..) less indirect taxes (see European System of National and Regional Accounts (SEC-2010))



- III. Larger income comes from high productivity, high-income/skill workers shows larger level of mobility, so as strong mobility is a signal of superstar cities.
- IV. As the superstar city is an expensive one, most middle-income workers commute –in the city from other closer urban areas.
- V. Changes on employments are negatively related to increase on housing prices
- VI. Housing prices are related to the productivity level.

With the available data, evidences I to IV only can be empirically tested in a descriptive way. However, it is possible to test V and VI.

Albeit of lack of data, the analysis here does permit to identify strong signs of superstar city in Bilbao and Madrid, but not in Valencia, and give some partial empirical evidence of the limits in the city expansion due to housing costs.

2nd.- Step. To test V and VI relationships, a panel is built and regression model are used to give initial evidence of the relationships among productivity, housing prices and employment.

Using panel methods, the following relationships are explored:

$$Ph_{it} = \alpha_t + \sum_{i=1..n}(\beta_t z_{it})_t + \delta[P_{it}] + \varepsilon_{it} \quad (3)$$

where P is the productivity of city 'I' in time 't'. Z_{it} is a matrix of control variables related to a smart city. Parameters to be estimated are α , β , and δ . The latter is the parameter of interest as it captures the sensibility between housing prices and city productivity. The model includes fixed effects by city and δ is allowed to vary on time as the theoretical relationship is not direct. Endogeneity will also controlled in the equation (1). The relationship between employment and housing prices can be estimated simultaneously in the model by including the variable capturing number of effective works as part of the matrix Z.

V.- Conclusions

This paper presents some evidence about the relationships between economic productivity and housing prices in main Spanish cities. Find evidence of the effect of how productive and efficient would be a city is not an easy task as the measure of such productivity is not clearly define at the minute. The city productivity concept has several perspectives, not only the economic one (production by worker), but is a key issue for future analysis as it would explain the reasons to understand how cities compete in better conditions and highlight the ways to apply policy measures to improve the cities' quality.

An approach to those variables affecting the competitiveness and productivity is made here applied to Spanish cities. The paper highlights the need of proper statistics which allow the researchers to use robust available techniques to solve the questions of what drives city housing prices, the impact of the economic growth on them and measure the impacts.

Two analytical approaches have been followed: An exploratory analysis with data identification, classification and description following the theoretical approach, and an empirical analysis finding evidence of the effect of city productivity on housing prices.



The previous evidence shows the ways to follow: Competitive cities increase wealth and affect to housing prices, making them to increase; Rising housing prices increase commuting by expulsing medium-level income households from the city looking at more affordable housing market in the surroundings; Extreme increase on housing costs would break the virtual cycle of competitiveness—wealth—jobs--large salaries—rising housing prices by expulsing workers from the city, and, then, reducing production resources (workers) and acting as barriers for firms preventing the economy to growth. Lastly, excessive housing costs expulse basic demand and would reduce construction activity contributing to a further increase on housing prices in the metropolitan area. Lack in supply and rising prices is the final results of a distorted housing markets but wealthy housing mechanism improve productivity and city wealth.