DETERMINANTS OF HOUSING PRICES IN SPANISH' URBAN AREAS

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Abstract.

Residential price level in Spain varies broadly among markets. Real state theory explains that prices depend on market characteristics such as vacancy level, land availability, construction offer elasticity to respond to high or low speed to changes on the demand, as well as economic growth potentiality, industrial and services activities located inside urban areas, etc.

Price analysis in main Spanish main cities show that tensions appear to exist in some of them where economic activity is not as dynamic as others (Taltavull, 1999). These tensions are reflected in price levels in places where main economic activities are not the most efficient ones. This paper tries to find evidence of the existent relationship between residential prices and economic factors that are demand determinants such wages, migrations and productive structure, among others. It uses panel data and GLS methodology to capture relationship between prices and other economic and demographic factors and demographic nature.

The results show how some relationships appears to exist between price levels and families' waged income as well as with population into 71 different main cities in Spain.

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INTRODUCTION

The relationship between labor and the housing market has been present in the economic literature on residential markets from the outset. The traditional focus is oriented to demonstrate how evolution of employment impels housing demand through diverse ways, such as having influences on householder formation and, inside the context of life cycle theory, relocation of workers and demand for a higher level of housing quality that potentiates residential market in the new companies' area where they are settle down. The use of labor market indicators as key factors within residential demand is founded in the literature from the initial research (Maisel, 1963, Arcelus and Meltzer, 1973) and *ab initio*, the analysis of existing relationship between the labor market and urban areas has been of interest, as well as its expansion and prices (Muth, 1969).

Recently this focus has been re-undertaken analyzing growth's relationships between economic activity and the expansion of the cities. There are numerous previous research projects that contrast the expansion of the residential areas located around the biggest cities with both the increase in the size of their labor markets and the growth in the productive capacity of the sectors into the area. This phenomenon is generating a series of studies in Europe that analyze, on the one hand, competitive formulas among the cities through to attract location of industries, and on the other hand, changes in labor mobility depending on residential markets' characteristics. For example, Schimtt and Henry (2000) demonstrate how the existence of medium sizes cities has positive effects on both employment and the rural population's changes reaffirming territory integration and limiting agglomeration effects on the population in the big cities. Coulson (1999) confirms that local shocks on productive sectors are more important for the urban growth than the national ones; especially those that affect on industry, services or in the public sector activities. Clark and Withers (1999) contrast the relationship between the changes in the employment and the residential relocation. Pogodzinski (1995) contrasts the negative impact that has the shortage of housing on labor mobility generating a reduced labor supply in those residential markets that have such imbalances.

Population concentration in cities' phenomenon that has occured in Europe over the last two decades is plentiful in this focus, and the responsibility for housing price expansion in the city centers and urban

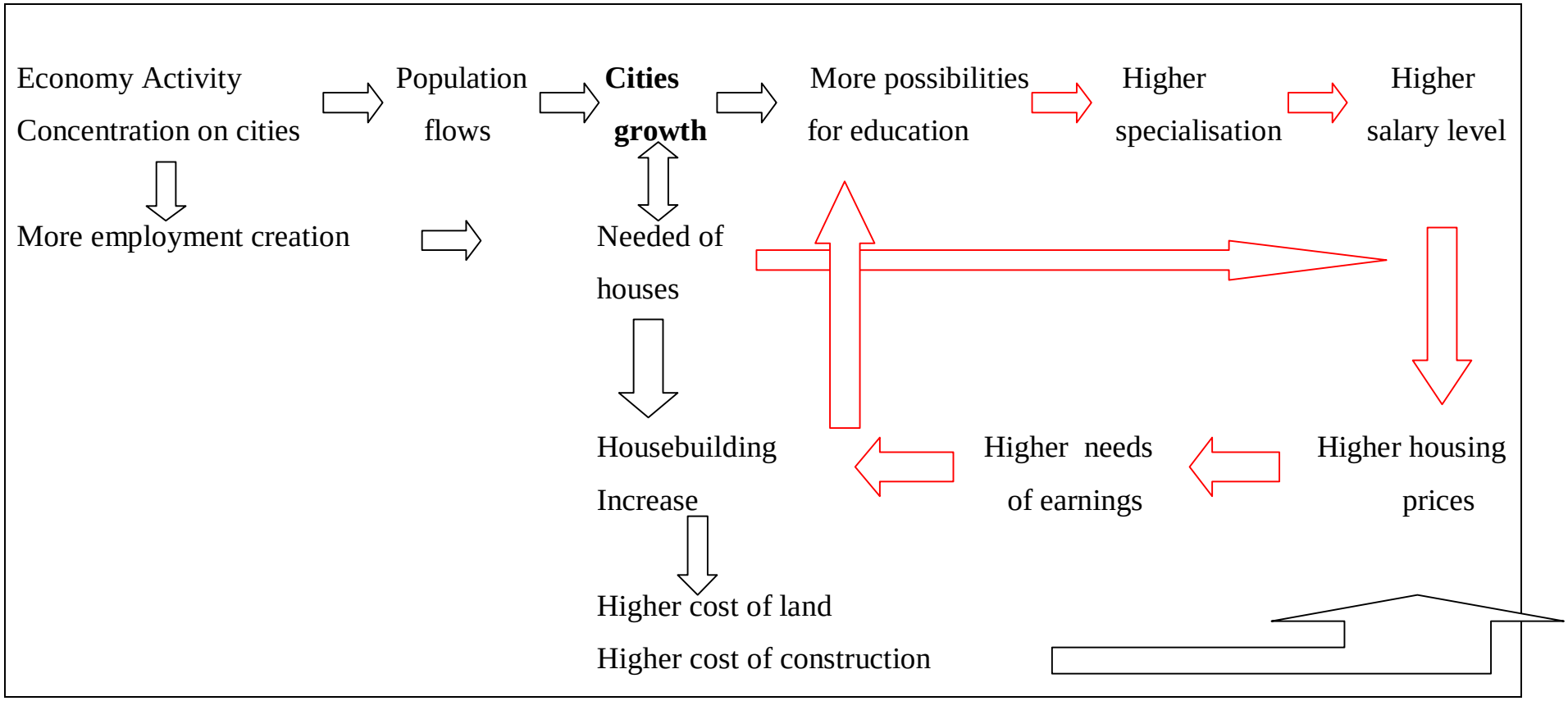
areas surrounding at higher production and rents' rates, is attributed to own housing market mechanisms, (Meen and Andrew, 1998). Voith (1999), for example, contrasts how the growth in the city's employment has a significant effect on the residential values in home areas and business centers and how it decreases with the distance from them. Tse and Webb(1999) explain how housing appreciation is independent from inflation in the long term, showing a particular evolution, and Potepan (1996) finds an important relationship suggesting that household income and construction costs are the most important factors causing housing prices to vary between metropolitan areas. The biggest levels of family income in cities seem to be explained by a greater both degree of specialization and productivity by the workers located in it, although this advantage is compensated for by the existence of a higher cost of living (Glaeser, 1998,142).

The idea to see the cities like big centers with more possibilities for education that give the opportunity to obtain higher waged earnings, is in the base of the metropolitan areas expansion in a feedback process. In this sense, Eaton and Eckstein (1997) predict that the biggest cities provide (and will continue to provide) the best environment possible, one that favors learning, work force education and growth prospects, because of the higher levels of human capital that are concentrated on them, with both bigger wages for worker and housing prices. Instead of this last issue, workers are willing to remain living in the cities, although they have freedom to migrate to other cheaper cities where the cost of living is lower. The idea of a vicious circle existing involving more work specialization – higher wages – higher residential prices is also in Muellbauer and Murphy (1994) that stresses the existence of self-reinforcing feedbacks where price differences generate regional income variations which, in turn, have further effects on house prices. It could be explained graphically in Diagram 1.

In most of the research, the relationship focused on the housing market and prices and the labor market in the metropolitan context, usually thinks about the potential for expansion in the employment sector, generating a new demand (for new or existing units) of houses. It impels the expansion of the cities towards ' and which is further and further away, and it increases the value of those places where shortage of supply factors are, as land, that is to say, in the city centers, tensing its prices. The mechanism that is usually investigated and contrasted is, then, that accepted by the quasi-automatic theory and local residential market in which a fixed supply of units exists and a leap forward in demand (because a higher number of families that want to live in the area or because an increases in the earning), generates an impulse in the housing prices.

New and more profound research into the processes is limited especially into how the demand-pull is reflected in housing prices. The most in depth studies concentrate on analyzing how construction costs is transmitted to housing prices when tensions from acceleration of building activity appears, how changes in income works on them or different ways through inflation affect. But few of them analyze the relationship between salaries and housing prices, that is to say, the relationship between a families purchasing capacity when buying a house and residential prices in the urban concentrations. The distinction in the concept is important, because the existence of different residential price levels between urban areas implies that the salaried earnings will not have the same effect on the residential accessibility depending on the market where the house is being sold, and how accessible the house is for the family independent of the prices, in opposition to areas where access is more difficult so prices are lower. It also

DIAGRAM 1


Economy Activity
Concentration on cities
Population
flows
Cities
growth
More possibilities
for education
Higher
specialisation
Higher
salary level
More employment creation
Needed of
houses
Housebuilding
Increase
Higher needs
of earnings
Higher housing
prices
Higher cost of land
Higher cost of construction

means that a transmission effect could exist between housing prices and salaried earning as with increased earnings the individual would have an effect on higher prices that could increase at the same time as the purchasing capacity.. The greatest accessibility possible would rebound in the area progressively losing its accessibility advantage due to an increase in residential values.

In Taltavull (1999) the existence of different salary-earning levels and residential prices throughout Spain is confirmed. Applying the different credit restriction ratios to evaluate the workers' purchasing capacity, the research confirms that problems regarding housing market access do not exist in some areas where housing prices are stronger or where salaried earnings are lower. It also verifies that these market access possibilities change depending on the cycle, in the instance where the effect of inflation on nominal salaries is reduced, where housings prices have grown substantially at the same time as the creation of new employment opportunities.

The objective of this research is to discuss in detail what has already been found empirically verifying the existence of any influence experienced between family waged earnings and housing prices, independently of both increased levels of activity and population concentration in larger cities with relevance to the different Spanish cities.

To focus on salaried earning implies that one is attempting to quantity a family's purchasing capacity and how this is dictated by their salary. Looking at the cities one can see that the demand for primary residences is greater than that for second homes. The distinction between both markets can prove confusing in certain capitals, such as the main ones (Madrid and Barcelona) that possess important secondary residences in their housing parks; or others cities in which both types of use coincide, such as Alicante or Málaga. However, core analysis here confirms the relationship between salaried earnings and housing prices and how the demand for the first home is based on salary derived income.

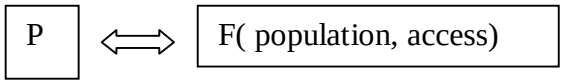
The organization of this paper is as follows: Section one includes some theoretical formulations affecting the relationships between housing prices and regional variables that justify their evolution. In section two, the empiric pattern and results are presented, contrasting between the 71 Spanish cities evaluated in the research, that are provincial[1] capitals or cities whose population is bigger than 100.000 inhabitants. In the third section some interpretations of results obtained are offered and, in final section the summary is presented.

1. - Theoretical approach

The underlying concept is that city price (a habitual central residential district in Spain) doesn't only react according to the number of families that arrive at the market but also depending on its access capacity, so that although there are many families, if they have few possibilities to enter in the market through the property, the prices won't grow. However, if the householder were to possess increased purchasing capacity, the variations in this situation would make the prices react simultaneously with the changes in the population. If this were the case, as the classic principles of housing demand state, the determinant of a family purchasing capacity would transmit their variations to the prices, which would

[1] Ceuta and Melilla are not been included because of lack of salaries and house price statistics.

mean that it would be necessary to analyze the components of this purchasing capacity in order to define the pattern to be contrasted[2]. The idea therefore is to contrast how residential prices could be affected by the accessibility for the families resident in the cities, causing a flow of demand to arrive entering into the market, that is to say:



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The accessibility could be defined as the capacity that the family (i) has to enter into the residential market at the moment (t), when they are buying a house. It depends mainly on **three factors** independently of the house unit selection process: a) the possibility to obtain a mortgage, b) the capital assets available (saved) to pay the difference between the price of the house plus the transaction costs, and the nominal fee of the mortgage, and c) the capacity to re-pay the monthly repayments plus the interest derived from the mortgage that the family will have to maintain during one period of time from now to (T), being the duration of the financial operation. .

The first factor involves the performance and specialization of financial system in terms of its readiness to satisfy the mortgage demand and the use of measures for credit restriction. The financial system usually acts in the Mortgage market applying different ratios that are conceived as mechanisms for decreasing risk such as solvency ratio (price/income), effort of payment ratio (payback /income), the credit/value ratio and maturity ratio (life time of mortgage[3]) are. Existing studies show how the granted mortgage has little risk when the value of the first factor value is between 2 and 3,5, the second one is near to 30%, the third one is 80% and as for the fourth, the minimal time length oscillates around 12 to 15 years. Financial cost plays a decisive role within the second factor when defining the recurrent payments for this concept that families will have to confront. Minimum conditions fulfilled, there is no reason to consider the presence of credit restriction measures applied by financial system except during the crisis periods.

If one were to consider that a potential buyer would not enter the market if he did not obtain the necessary credit, the determinant of those ratios would also help us to see how this factor would allow those families to sucesfully purchase a house. If one were also to consider the access to city's main residence district and the buyers that have their revenues derived mainly from their wages, formally the ratios could be defined in the following way:

a) *Solvency ratio*:

$$\mathbf{Rs_{it} = [\ P_{it} / Is_{it}\ ]} \qquad \mathbf{Para\ i = 1\ldots n\ ,\ t = 1\ ..T}$$

Where:

P_i = House price of a unit with 90 m2 square metres (average are a surface of housing stock in Spain) in the region i at the time t.

[2] Everytime, this exercise is made taken that families enter into the housing market through the property, and they use to do this because it is used into Spanish market, because they are thinking to live on it a long time, advantages are selecting to buy a house instead to rent a house and rent market is narrow. With this focus, we can not here into account investment characterístics that make to take decisión to buy (Capital earnings, finantial rate of return..) or taxes ones.

[3] This indicators are used as reference by financial institutions when they classify their borrower in terms of prime and risk level and before a mortgage is granted. Their use is related with rationing credit and mortgages, as in Kent, 1980 or Lienneman y Wachter, 1989.

Is_i = Total annual waged income in each professional category for the proceeding year in the region i at the time t.

b) *Effort of Payment ratio*:

$$Re_{it} = [\ \Sigma_{j=1,12}\ A_{ij} / Is_{it}\ ] * 100 \qquad \text{With } i = 1\ldots n$$

Where:

A_{ij} = is the monthly mortgage repayment including payback and interest charges during period *T of the life of credit*. This amount is calculated as a yearly constant quantity of repayment that depends of the average of mortgage in each region i a standard mortgage interest rate in the market. It is say:

$$[\Sigma_{j=1,12} A_{ij}]_t = A_{it} = f\ (Cm_{it},\ r_{it})$$ Where:

Cm_{it} = Amount of mortgage average credit granted in region (i) in the moment (t).

r_{it} = average interest rate for mortgages in region (i) at moment (t).

Is_i = Total annual waged earning income in each professional category a year proceeding in the region i at the time t.

Monthly terms could be taken to define this ratio taken into account repayment and wages earning, where extra salaries are included..

c) *Credit/value Ratio*. By definition,

$$Rcv_{it} = [\ Cm_{it} / P_{it}\ ] = 80\% \quad , \quad \text{that means} \qquad Cm_{it} = [\ P_{it} \times 80\%\ ]$$

d) *Maturity Ratio*. It is the duration of the mortgage, from a minimum of 12 to 15 years

$$Rm_{it} = T > 12 \text{ años}$$

The **Second Factor** is the availability of capital saved that has to bridge the gap between the price of the house and the amount of mortgage credit granted, that is,

$$Ah_{it} = [\ P_{it} - Cm_{it}\ ] = [\ P_{it}\ (1 - Rcv_{it})\ ] = P_{it} \times 0.2 \qquad \text{Where} \quad i = 1\ldots n$$

As minimum value, financial institutions strictly apply the credit/value ratio[4].

The **third factor** is the capacity to cover monthly repayments plus the interest. Depending on this, the stable earnings (salary) today should be enough to cover the repayments plus the interest from the mortgage, assuming that, as the life-cycle hypothesis maintains, in the future the mentioned revenues will increase aliviating the families' effort to re-payments mortgage. The minimum of these mentioned revenues can be divided into two levels, that is that necessary in order to meet the minimum rent and the Englund and Pearsson[5] minimum income for the property, that is, that amount that allows one to maintain the financial liabilities and the cost of the transaction, maintenance and fiscal expenses

[4] Taltavull (1999) contrast how credit/value ratio is not applied in some regions during expansion period reflected on high levels of mortgages credits comparing to housing prices average. This occurs in some cities and province capitals.

[5] Englund and Persson, 1982.

generated by property. Focusing the analysis on the latter, earnings should be such that annual salary perceptions reasonably covers mortgage liabilities and the other property expenses without affecting the normal homely ones, such as food, clothing, education or sanitary needs, etc. The degree of commitment concerning to the amount of annual mortgage repayments is a subjective issue that depends of families decisions and their living requirements. However, if it is taken into account that this requirement coincides with the mortgages solvency ratio, and that mortgage is not granted if their values are not enough (as otherwise financial risk could increase in excess for lender bank), it could be said that this factor is the one that responds to the family's financial ratio requirements.

In this way, a families capacity to access the housing market with most that their earnings being derived from wages and living in a medium-big city, depends on:

$$\text{Access} \iff f(Rs_{it},\ Re_{it},\ Rcv_{it},\ Rm_{it},\ Ah_{it},\ Is_{it}) \qquad (1)$$

Transforming this expression,

$$F(P_{it} / Is_{it}\ ,\ A_j / Is_{it},\ ,\ Cm_{it} / P_{it}\ ,\ T,\ Ah_{it}\ ,\ Is_{it})$$

And operating on it:

$$\text{Access} \iff f(Is_{it},\ P_{it}\ ,\ r_{it}) \qquad (2)$$

Access capacity improves if the salary revenues increase, if it grows above residential prices rates, if prices stabilize or decrease or if interests rate go down. In these four cases, the mentioned ratios would improve their value (they would diminish) showing earnings on the capacity to enter into the residential property market. Note that if housing access depends of prices and prices depends of variables related with access, it means that a vicious circle is presented generating that better behavior of access' determinant is transmitted on higher prices making the accessibility lower.

The focus is to know if influences between the access factors exist so that they could come from waged earnings rising or from interest rate behavior, affecting the capacity for purchasing houses, and that could be transmitted to housing prices as a result of the surge in demand generates by them. In concrete, this paper try to contrast if a transmission effect between the revenues and the prices exists, so that consistent relationships are obtained in the following equation:

$$P_{it} = f(Is_{it})$$

Where i = 1 …n Spanish provincial capitals and urban metropolitan areas with more than 100.000 inhabitants.

Because here we try to study what happen with this relation into Spanish cities market where main householders are concentrated, house prices also depends of the market size in terms of potential population demand. This factor is included in the empiric adjustment as well as the different levels of available salary revenues for the regions to which the analyzed cities belong. The aim in the case of the Spanish cities is to contrast the consistent relationship found by Potepan between the average revenues levels and the prices that ' …*suggest that income differences have (..) strong impacts in changes on metropolitans prices'* and that *'... the population growth also has an important one and relative impact on the housing prices* ' (Potepan, 1999, 244), that is reflected in the following function:

$$P_{it} = f(Is_{it}, Pob) \quad (3)$$

2.- Methodology, data and fit results

To carry out the empirical contrast fitting this function for the capital, a pool data technique is used with panel of 71 Spanish cities that include all provincial capitals plus cities with more than 100.000 inhabitants[6], and statistics about annual salary earnings, residential prices and population for an annual period that covers from 1987 to 1999.

Capitals and large cities' prices are measured by extracting the housing prices series of 71 cities included in a Fomento Ministry database (MFOM[7]); data is chosen and weighted according to the appraisal values that experts carry out in order to be used by the financial system that lend mortgages. The annual [8] prices are used for each city, disaggregated in three series, the average values, the prices of used housings units (resale market) and new housing .

Family waged earning are measured through the National Institute of Statistics (INE) database named 'Survey of Wages' this provides information on the average monthly salary and two more categories referring to levels of these revenues, maximum and minimum, as well as the detail for productive sectors and geographical areas (Autonomous Communities).

To interpret the results correctly, it could appear necessary to carry out a differentiation between cities depending on existent productive specialization structure, because this is a direct determinant of average waged earning levels. Given that, this information disaggregated by cities doesn't exist, with the purpose of capturing the more similar levels of revenues to those generated in each city, these are weighted with the existent productive structure in the region. It is considered here that the large part of the population generate their salary structure depending on the local productive sectors and those with greater relevance in the region. This is similar to supposing that productive characteristics in metropolitan areas (level regional I or II sub-regional) determine structure and levels of earning for resident population's wages in the most important cities, that is to say, it assimilates the provincial productive structure to the existent one in the cities, supposing that they are the center that channels the productive activity from all local territory. Taking into account the biases of this restriction[9], this research uses the structure of their GDP by sectors for provinces estimated by the Bilbao-Vizcaya-Argentaria Bank Studies Service.

Population is included in this research as a measure of the demand potentiality, including annual observations regarding the total of, both, people existent in each municipality at any given time. They are obtained from the INE Data Bank , from the 1991 Census and *Padrón* of 1996 and 1998.

Given the existent differences between the cities and regions where they are located, to contemplate indicators that allow discrimination between the geographical situation and influences seems reasonable. The inclusion of this kind of variable could be found in others models where relationships are

[6] 52 provinces are studied here but Ceuta and Melilla are not included because of lack of statistics on prices an wages in these areas.

[7] Thanks to Carmen Marcos, head of Statistics Department of MFOM, because availability of database.

[8] There are not more time desegregation for cities.

[9] Moreover, higher proportion of salaried staff in Spanish economy is concentrated into cities, because of this, waged-earnings are a good indicator of family income in metropolitan areas.

contrasted between income and localization affecting housing prices in metropolitan areas. Two examples are in Ozanne and Thibodeau (1983) and Fortura and Kushner (1986), they considered how coastal locations for some metropolitan areas would topographically constrain the amount of land available for housing development. Manning (1989) included some location characteristics such as climate, neighborhood, and natural environment. He considers that their value is likely to be capitalized into land and housing prices, but this research did not find positive evidence of these factors affecting housing prices. Rose (1989) who has obtained significant results regarding the influence of the geographical factors of location on housing prices among the metropolitan areas. In the present research a dummy variable has been included that discriminates between the coastal localization (value 1) and non coastal (value 0) of the cities included.

The fundamental use of housing stock in capital and main cities in Spain is concerned with primary residences (Taltavull,1999). However, differences also exist in the use of residential stock use between cities which can be explained by the proximity of other residential markets. This research seeks to capture these differences including two factors involving specialization named Vp and Vs, that measure the proportion of inhabited properties that were used as home for the families (Vp) or as second home (Vs) from the total census in 1991. With these factors defining city residential use, the aim is to identify the orientation of the demand and the effect of specialization on the prices. The data has been taken from INE's Population's Census and Housings.

Lastly, as a measure of market width, an indicator of the total operations of annual housing sale + purchase in each city, is used. A proxy variable that captures its behavior is the number of appraisals carried out. The information is taken from the database of prices from MFOM.

The panel data represents all of Spanish capitals and larger cities, 45.9% of the total population and between a 43% to 47% of Spanish residential market size. They include a maximum of 923 observations, three dependent variables and 15 endogenous variables, distributed throughout the time period from 1987 to 1999 with annual data.

The analysis method is based on the application of the methodology of regression by means of Generalized Least Square (GLS) on the data organized in a panel. A regression estimating model with fixed effects and Weighted cross-section coefficients has been carried out, that allows us to obtain the stable relationships between the variables in the time but distinguishing the behavior (and the differences) between capitals. This methodology is selected following two indications from the literature. Firstly, it is respecting the use of panel data with small dimensions (Hsaio, 1986,41-43), and secondly, because the correct theoretical framework to be used in regional empiric contrasts will be respected (Meen and Andrew,1998,IV). First one recommends the application of a model of fixed effects as the most appropriate method to take advantage of all the available information in small bases, because the fixed-effects model is more accurate when assesing differences between factors, while at the same time taking into account the random nature of the cross sectional units when carrying out the adjustment for GLS estimates. The second one, the interest to capture the space dependence in the models of prices should respect the discrepancies between the areas, because of this, it is most appropriate to model with heterogeneity of coefficients to represent the degree of variation between the regions.

Model to fit is:

$$Y_{it} = \alpha^*_i + \beta' X_{it} + u_{it}$$

Where Y_{it} dependent variables matrix of housing prices (with $i = 1.....3$)

α^*_i scalar constant representing the effects of those variables characteristic of the *ith* cities

β' parameter vector

$X_{it} = (x_{1it}..... x_{kit})$ exogenous variables matrix (k=15) that indicates individual values in a moment of time during period 1987-1999.

u_{it} error term that represents the effects of the omitted variables that are characteristic of both individual units and time periods.

Process of analysis implies two steps. Fist one is to study level and dependency of house prices in terms of variables explained behind. To each variable, the following equation is fitted:

$$y_{it} = \alpha^*_i + \beta' x_{it} + u_{it}$$

The method includes AR(1) adjustments in each of the applied models. Results are in Table 1[10], where significant and non-significant variables appear.

Second step is to deep on relationships that link changes on prices and salary earning. In this case, to each variable the following equation is fitted:

$$\delta y_{it} = \gamma^*_i + \lambda' z_{it} + \mu_{it}$$

where

λ' is the parameter vector

$Z_{it} = (\delta x_{1it}.....\delta x_{hit,} x_{(h+1)it}...x_{kit})$ exogenous variables matrix (k=15) where $x_1.....x_h$ are salaried earning vector.

3.- Interpretation of Results

Results obtained in the previous models fit suggesting the following conclusions:

a) In general terms, coefficient estimates between salaried earnings and housing prices provide evidence that some links between both indicators exist and suggest that part of the salaried earning obtained by workers every month could be reflected on values of the houses in the market where they reside in the long run.

b) Considering the averages weighted values of prices and salaried earnings, some divergent results are obtained from those when average and specific higher and lower values when both indicators are used, as well as those obtained when average salary revenues generated in each productive sector and each area are introduced into the model. Relationships with high and low level of salaried earning is very strong.

c) Population appears strongly significant in explaining the housing price levels in the capitals, both new and existing prices, that seems to confirm the idea that the size of metropolitan area

[10] Definition of variables are in Annex 1

and population that are located in it, affect the residential price levels. These agree with other similar results and with the principles of residential markets theory. This contrasting population effect refers to each city's residential market size and its dynamism generated as a result of changes in this factor. This result could be interpreted as the influence that the demand use (first residence-homes) has on metropolitan area that receive migration, regarding prices.

a. This factor is not significant in the first fit showing the average prices, although, on the other hand, the indicator of market size in terms of number of transactions is significant.

Sample: 1987 1999	**TABLE 1 Panel data results Model 1 GLS (Cross Section Weights)**								
/ Dependent Variable	**PM**			**PN**			**PU**		
Included observations: Total panel observations	13 852			13 852			13 852		
Independent V.	β	*t-stat*	*signif.*	β	*t-stat*	*signif.*	β	*t-stat*	*signif.*
SM	0,259	0,839	NO	-0,920	-1,053	NO	0,240	0,395	NO
SE	**0,462**	**6,114**	**YES**	**0,469**	**2,067**	**YES**	0,132	0,771	NO
SO	**0,503**	**4,474**	**YES**	**1,501**	**3,925**	**YES**	**0,455**	**1,586**	**YES**
Sind	0,004	0,038	NO	0,234	0,699	NO	0,138	0,652	NO
Scon	-0,078	-1,221	NO	-0,082	-0,424	NO	-0,025	-0,194	NO
Sser	-0,067	-0,480	NO	0,534	1,427	NO	0,240	0,892	NO
Eag	-0,109	-0,024	NO	-8,023	-0,636	NO	14,597	1,454	NO
Ein	1,734	0,378	NO	-8,216	-0,638	NO	9,835	0,896	NO
Econ	9,362	1,523	NO	18,264	0,951	NO	12,810	0,852	NO
Eser	-0,750	-0,197	NO	-2,511	-0,230	NO	9,785	1,061	NO
Vp	**-16,031**	**-3,564**	**YES**	**-20,709**	**-1,600**	**YES**	**-27,946**	**-2,548**	**YES**
Vs	**-15,668**	**-3,288**	**YES**	-21,319	-1,553	NO	**-29,748**	**-2,556**	**YES**
Pob	**0,014**	**3,303**	**YES**	**0,035**	**4,223**	**YES**	**0,030**	**4,616**	**YES**
Ts	-0,335	-1,116	NO	0,144	0,176	NO	-0,210	-0,419	NO
GEO	-487,373	-0,046	NO	25112,940	-1,053	NO	**43049,530**	**2,156**	**YES**
Weighted Statistics									
Adjusted R-squared	0,966			0,810			0,89		
F-statistic	1445.975			216,73			395,17		
Prob(F-statistic)	0,000			0,00			0,00		
Sum squared resid	1.069E+12			7,29E+11			4,91E+11		
Durbin-Watson stat	1.894			2,04			1,90		
Unweighted Statistics									
Adjusted R-squared	0,332			0,802			0,83		
Durbin-Watson stat	3,078			2,06			1.99		

d) In no model does economic structure appear to have significance, although its inclusion improves the adjustment. This fact suggest the existence of differences between economic characteristics of cities rather than provinces, supporting the fact that cities are more specialised in services, and industry is, increasingly, located outside of metropolitan areas. However, it is reasonable to assume that this type of weight that measures, the role of productive sectors in the contribution to the GDP could be no more efficient in catching wages-earning proportion of cities. This interpretation would be consistent with the fact that waged-revenues computed in this

model don't completely respond with the fixed salary levels. In other words, the increase in waged earnings registered in the statistics during the period reflecting the increase in the number of hours worked, more than a salary increase. This implies that the revenues in the sectors with lower wages could be compared with those with higher wages, in the cities and during the considered period.

e) Estimation of location coefficient included in the model suggests a strong relation between geographic cities' characteristics and housing prices; so those cities located in coastal areas have a higher residential price level that interior ones, specially in the basic structure of prices, it is say, on existing homes values. This result agrees with other research, but in this case, it cannot be determined if it is derived from a shortage of land or higher land costs because no one of these variables have been included in the analysis.
    a. Low significativity of this factor in others models means that new homes prices depends largely from other factors like construction cost.

f) Focusing on the new housing price model, results indicate a consistent relationship between wages earnings and prices; it is stronger if one takes into account that a lower level of earning is considered instead of higher one. This result agrees with the evidence regarding residential demand behaviour during the nineties and eighties:
    i. Firstly, during this period, an increase in household creation took place in all levels of income, because of the entrance of last youths proceeding from the 70's baby-boom into the labour market. New households appeared in the market when new jobs were created and they were incorporated with different levels of education. This means that housing demand increased in all levels of income in Spain. These families were entering in the market at the same speed that employment grew, at a very accelerated rate, during last years of the nineties because of the massive creation of jobs (mainly temporary with low wages).
    ii. Secondly, after the contraction in residential demand at the beginning of nineties, the stronger latent housing demand was concentrated on sectors with smaller levels of earnings, that it is to say, those that could not buy a house in the last expansive cycle. The fall in mortgage interest rates in Spain from 11% to 5% in only a few months effected an acceleration in the housing purchasing capacity and improved this process, allowing families with smaller levels of waged earnings to enter into the market.
    iii. Population show a strong relationship with new housings prices. This fact suggests that demand is strongly directed towards new and more modern construction everywhere, contributing to these prices' growth This trend coincides with price increases similarly caused by growing construction and land cost (their effects are in model residuals), as well as those derived from an increasing family's wages-earnings.

g) If the existing-housing price model is analysed, results are similar, although some issues which agree with the housing demand theory, appear here very clearly:

i. In this case, only low level waged earnings are significant in this model. Given that existing units have lower values than new ones and general price levels in cities are higher, it could be understood that because of higher housing prices in cities, workers with lower wages have to demand existing units to which they have greater accessibility. The statistically significant relationship obtained in this equation between waged earnings and existing units prices suggests that new demand created when this type of family increase their revenues, also has a transmission effect on the residential prices.

ii. The lack of relation between existing unit prices and higher levels of earning (it is not significant) seems to indicate how this demand is weak and it does not seem to be directed mainly at this market niche.

iii. Relationships between housing prices, population and localization also seems to be strong in this existing unit market. This agrees with the theoretical principles that maintain how diversification of the demand towards different sub-markets of housing occurs when strong housing demand is generalised, with absorption of old and existing units.

iv. Lastly, this model is the only one that shows an excellent significance for the indicators of use structure in the city. Interpretation of the results is complex because it shows how a bigger specialization of the housing stock in the cities inversely affects the existing housing prices. This effect seems to suggest that more specialization in primary or secondary houses use in capitals could improve the construction of new units destined for this more generalised use. This could measure the increase in the existent supply (and vacant) in these markets as a consequence of demand and, therefore, biggest competition for sale that would decrease existing –units prices.

When changes on both prices and salaried earning are computed into the model, results explain others meanings of this relationships (Table 2).

Results shows a low power of explanation on Spanish cities' changes in prices (adjusted R squared values) but some sensibility to changes on earned income exist from high and low level of salaries and those from industry. These is a weak evidence of influence between both types of indicators, but the sensibility shows that some relationships could be demonstrated if specific and more developed data could be have about earned income of families in cities. Instead of that, some of relationships could means that:

1.- There are some evidence that changes on salaried earning could induce to changes in housing prices in Spanish cities but they are not main explanations of their behaviour.

	TABLE 2 Panel data results Model 2 GLS (Cross Section Weights)			
/ Dependent Variable	Sample: **ΔPM**	Sample: **ΔPN**	Sample: **ΔPU**	

	1989 1999			1990 1999			1990 1999		
Included observations: Total panel observations	11 781			11 710			11 710		
Independent V.	λ	*t-stat*	*signif.*	λ	*t-stat*	*signif.*	λ	*t-stat*	*signif.*
ΔSM	**0,983**	**2,330**	**YES**	-0,38	-1,46	NO	-0,18	-1,23	NO
ΔSE	**-0,593**	**-2,740**	**YES**	**-0,41**	**-2,79**	**YES**	**-0,28**	**-3,52**	**YES**
ΔSO	-0,304	-1,011	NO	**-0,54**	**-2,71**	**YES**	-0,10	-0,86	NO
ΔSind	**-0,313**	**-2,072**	**YES**	-0,03	-0,42	NO	**-0,19**	**-2,88**	**YES**
ΔScon	0,018	0,265	NO	0,04	0,96	NO	0,02	0,83	NO
ΔSser	-0,042	-0,343	NO	0,05	0,90	NO	0,00	0,06	NO
Eag	-0,103	-0,255	NO	-0,07	-0,23	NO	0,15	0,91	NO
Ein	-0,456	-1,155	NO	-0,01	-0,03	NO	0,23	1,49	NO
Econ	**-1,788**	**-2,836**	**YES**	0,30	0,58	NO	-0,04	-0,17	NO
Eser	-0,070	-0,206	NO	-0,11	-0,35	NO	0,14	1,05	NO
Vp	0,438	1,105	NO	0,14	0,37	NO	-0,11	-0,69	NO
Vs	0,448	1,057	NO	0,19	0,48	NO	-0,09	-0,55	NO
Pob	0,001	1,274	NO	**0,00**	**1,64**	**YES**	0,00	1,09	NO
Ts	**-0,180**	**-7,664**	**YES**	**-0,05**	**-3,23**	**YES**	**-0,02**	**-1,66**	**YES**
GEO	**-1461,893**	**-3,052**	**YES**	222,20	0,56	NO	-43,96	-0,41	NO
Weighted Statistics									
Adjusted R-squared	0,12			0,177			0,19		
F-statistic	14,051			15090			17.494		
Prob(F-statistic)	0,000			0,00			0,00		
Sum squared resid	6.55E+9			3.44E+8			1.37E+08		
Durbin-Watson stat	1.742			2,30			2.26		
Unweighted Statistics									
Adjusted R-squared	0,09			0,061			0,045		
Durbin-Watson stat	2.548			2,25			1.91		

2.- Main meaning have the size of the market, that it is measure by number of houses selling inside each city. It has a negative relationship that could means higher size of the market has less effect on housing prices changes.

3.- Population has only a few effect on prices' changes in the case of new units.

4.- A more complete and longer data base is needed to contrast this relationships.

4. - Summary

Research that is developed here follows the traditional point of view that expansion of the cities and urban areas affect the residential markets prices. Applying a simple model without excessive sophistication, the analysis is focused on the links that housing demand in the cities has on housing prices as a result of the process of growth and attraction of new population to the area. The analysis is derived from the evidence that different levels of city housing prices exist and that there is some influence between population and income on both expansion of metropolitan areas and the process of growth housing prices, as some studies maintain.

Using as a reference findings from previous models that contrast these relationships, the present research tries to obtain empiric evidence for 71 Spanish province capitals and bigger cities with more than 100.000 inhabitants, about the existence of a transmission effect between the families living in a city's waged-earning and the increase in housing values. Framework analysis focuses on the aim to explain how

residential demand for use reasons (i.e. for permanent residence by the families) in the cities could affect price levels. In the model, levels of earning have been discriminated in order to capture the relationships derived from high or low level of income; equation includes size of residential market, the specialization of housing stock and the potentiality of the demand measured through indicators such as localization, population and use formulas.

These indicators are included in a model that is derived from principles of residential accessibility and it allows concrete definition of the factors that determine the capacity for entrance into the housing market for those buying a house to live in a city. With data including cross-sectional and time series, a panel is built on the one a model is estimated with fixed effect and cross sectional coefficients, that allows us to obtain a joint relationship between variables and to individualize the effects in each cities.

Results suggest a strong relationships between waged earning and residential prices measured through the appraisal values of housings, in a scenario where inflation does not play an important role in either variables behaviour. Results are more consistent in explaining the evolution of new housing prices. The coefficient estimates for earnings show a high level of significance on both higher and lower level of waged revenues, although with more intensity from a lower level. These results agree with the strength of residential demand in Spain for these families, and show how changes and improvements in access conditions at the end of the period (not always explained by the increases in the revenues and more probably because of a reduction in mortgage interest rates) have contributed to their entrance into the market through property. The strong relationship also suggests that a part of this access gained could have been transferable to residential prices in the cities.

Another group of results, consistent with previous research, support the idea that the strength of people derived demand concentrated in big cities, as well as its localization, is capitalized on housing prices. The location of people in cities is a determinant factor in explaining the differences between housing values.

Fitting changes on prices, results show that a wake evidence on relationships between increasing on salary' earning and housing prices exist. Some sensibility appears that must be contrasted. More complete database on cities' indicators is needed to study this relationship.

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ANNEX 1.- VARIABLES DEFINITION AND SOURCES

VARIABLES INCLUDED INTO A PANEL DATA		
VARIABLE	SOURCE	MEANING AND UNITS
Pm	MFOM	Total average Housing prices. Pesetas per square metres
Pn	MFOM	New Housing prices. Pesetas per square metres
Pu	MFOM	Existing Housing prices. Pesetas per square metres
SM	INE	Waged earning per month and worker. Average. All workers and journey. Pesetas per worker and month
SE	INE	Waged earning per month and worker, Higher level (employees). Average. All workers and journey. Pesetas per worker and month
SO	INE	Waged earning per month and worker, Low level (workers). Average. All workers and journey. Pesetas per worker and month
Sind	INE	Waged earning per month and worker in the industry sector, Low level (workers). Average. All workers and journey. Pesetas per worker and month
Scon	INE	Waged earning per month and worker in the construction sector, Average level. All workers and journey. Pesetas per worker and month
Sser	INE	Waged earning per month and worker in service sector. Average. All workers and journey. Pesetas per worker and month
Eag	BBV	Productive specialization of Primary Sector. % of total value of GDP
Ein	BBV	Productive specialization of Secondary Sector. % of total value of GDP
Econ	BBV	Productive specialization of construction Sector. % of total value of GDP
Eser	BBV	Productive specialization of Primary Sector. % of total value of GDP
Vp	INE	Use structure of Housing stock in Spain. % of principal houses in Census 1991
Vs	INE	Use structure of Housing stock in Spain. % of secondary houses in Census 1991
Pob	INE	Population. Data basis 1991, 1996 y 1998 . Thousand of people
Ts	MFOM	Total number of transaction in the market. . Thousand of people
GEO		Dummy geographical. It is 1 if house is coastal; it has value 0 in any other circumstances.

TABLE 2	GLS (Cross Section Weights) Fixed Effects						
Dependent Variable		PM	PN	PU	PM	PN	PU
		β	β	β	λ	λ	λ
Algeciras	Alge	4219,1	-29206,7	-57377,3	502,745	-91,27	-21,64
ALMERIA	ALM	-34516,1	-22146,3	-34637,0	1197,856	1,48	647,93
CADIZ	CAD	-38371,5	5412,5	-16271,9	1085,592	46,61	132,83
CORDOBA	COR	-66036,6	7543,8	-823,8	-123,542	10,88	-16,63
GRANADA	GRA	-50290,9	5513,2	20131,6	255,755	-85,95	563,75
HUELVA	HUE	-52336,0	-13291,1	-41254,3	1328,471	-288,27	25,13
JAEN	JAEN	16447,4	-2584,5	-8878,1	155,352	99,57	152,62
Jerez	Jer	-48390,0	7175,7	-2929,2	-549,265	-212,70	-224,63
MALAGA	MAL	-75830,4	-38485,4	-34362,7	943,473	-248,08	354,62
SEVILLA	SEV	-46878,9	4157,0	-11091,7	-264,570	-243,13	-139,11
HUESCA	HUES	-6328,5	-24088,7	-25589,0	-287,978	-4,95	111,49
TERUEL	TER	-8676,8	-25813,1	-32526,2	461,468	7,85	-138,21
ZARAGOZA	ZAR	-73662,5	-22272,5	-4497,4	342,049	-81,22	270,37
Gijón	Gij	-84066,5	-41147,6	-36475,2	1,962	-298,84	427,46
Oviedo	Ovi	-82984,2	-3109,9	22092,7	385,583	-81,34	-25,26
Palma de Mallorca	PMa	-57274,9	-21734,6	-43244,4	1,009	320,16	154,83
La Laguna	LLag	-44183,9	-1339,4	-12850,3	1,084	112,85	399,51
PALMAS (LAS)	PALM	-40276,8	2867,8	-16262,1	1,139	123,51	371,41
SANTA CRUZ DE TENERIFE	SCRUZT	26114,5	3460,0	-7554,1	8,299	19,42	251,37
Santander	Sant	-68172,8	37450,4	9735,7	-52,902	-71,60	-158,09
ALBACETE	ALB	-43608,6	4731,3	-808,0	191,973	393,25	230,70
CIUDAD REAL	CREAL	-50435,8	11194,7	10383,5	694,372	-25,98	55,36
CUENCA	CUEN	44664,1	26620,8	20491,7	115,877	311,64	87,45
GUADALAJARA	GUAD	-54268,0	42387,8	30183,1	139,571	-240,51	-220,13
TOLEDO	TOL	35921,8	20138,5	12365,8	441,510	-243,77	-13,26
AVILA	AVIL	-50976,0	4588,6	6109,7	409,981	-21,90	165,65
BURGOS	BUR	42883,3	35430,8	22410,3	-410,744	106,82	-71,56
LEON	LEON	-77061,6	7801,0	-7052,8	304,322	-70,17	-86,41
PALENCIA	PALEN	-67421,1	9731,2	-7988,6	120,191	342,27	-19,25
SALAMANCA	SALAM	-59406,9	15814,0	2814,7	188,154	101,13	24,32
SEGOVIA	SEGO	-41984,9	14923,8	4235,9	74,980	80,81	78,75
SORIA	SOR	6722,1	3652,6	-21245,5	-257,161	287,30	-33,59
VALLADOLID	VALLAD	-57516,4	11341,8	21284,3	48,175	-271,56	-53,52
ZAMORA	ZAMO	9277,4	-6802,5	-8165,3	-527,056	132,69	42,44
Badalona	Badal	-35493,6	-8007,3	-34093,6	1805,516	128,95	116,17
BARCELONA	BARCE	-42835,2	-737,8	3497,7	1548,180	-626,39	236,26
GIRONA	GIRO	21778,5	-2521,0	-9754,6	256,788	92,92	-15,57
Hospitalet	Hosp	-28770,3	28882,4	21043,9	137,984	276,83	69,74
LLEIDA	LLEIDA	-72906,5	-12137,6	-36165,1	1539,967	149,24	11,26
Mataró	Matar	22502,9	-15081,1	-42808,6	1585,459	-97,19	18,98
Sabadell	Sabad	-37896,1	14645,9	5677,6	968,448	115,39	146,14
Sta. Coloma	SColo	-46009,0	21903,3	4154,3	735,366	291,20	174,65
TARRAGONA	TARRA	-71518,6	-26557,6	-50685,6	2094,973	-241,42	49,27
Terrasa	Terra	-53803,2	5666,7	5460,4	720,623	98,32	67,86
ALICANTE	ALICA	-56702,8	-18022,5	-19094,0	1377,939	-169,29	70,65

TABLE 2 (cont)	GLS (Cross Section Weights) Fixed Effects						
Dependent Variable		PM	PN	PU	PM	PN	PU
		β	β	β	λ	λ	λ
CASTELLON DE LA PLANA	CASTE	20926,6	-7193,4	-38630,7	1348,241	88,42	76,30
Elche	Elche	-49154,5	-19861,1	-44023,1	2189,016	-171,42	136,75
VALENCIA	VALEN	-43329,1	-19879,6	-31043,3	254,360	-157,66	535,53
BADAJOZ	BADAJ	-53397,0	4442,5	20027,3	848,351	-106,00	420,23
CACERES	CACER	-34152,8	20017,6	13077,6	1491,961	-19,89	-33,65
CORUÑA (LA)	CORU	-53155,9	8220,0	-21240,9	444,145	-22,63	12,33
LUGO	LUGO	10926,8	3214,9	-21705,8	1023,439	-127,70	-181,17
ORENSE	OREN	-66841,2	10875,7	4861,9	1408,441	144,49	200,69
PONTEVEDRA	PONTEV	-56426,2	-6071,9	-36426,1	-529,021	-244,79	-11,55
Santiago COMPO	Santiago	-68172,8	37450,4	9735,7	1797,261	-71,60	-158,09
Vigo	Vigo	-44296,5	-3670,3	-12214,7	376,836	-42,54	319,61
Alcalá de H.	Alcalá	-61022,8	-2607,7	447,1	-222,373	13,47	48,10
Alcorcón	Alcor	-49065,2	8977,6	1817,7	-12,904	348,95	74,05
Fuenlabrada	Fuenla	-55941,0	-7753,5	-2670,5	-241,056	30,69	213,30
Getafe	Getafe	-49227,5	1249,7	-1131,8	-121,812	108,44	9,21
Leganés	Legan	-40444,3	2320,7	11147,6	-217,330	211,97	142,46
MADRID	MADR	-86801,7	11862,9	12562,6	-121,883	-479,83	-136,53
Móstoles	Mosto	-53249,1	-6830,5	-1437,6	1522,654	36,71	183,41
Cartagena	Cartag	-40812,5	-5448,0	-28549,1	-13,400	-73,47	13,79
MURCIA	MURC	-46568,6	18864,4	27771,7	-8,681	74,58	115,67
Pamplona	Pampl	15517,4	11401,8	-21613,9	-159,170	567,64	-50,37
Baracaldo	Baracal	-7248,3	-18594,3	-7673,0	-108,156	286,52	179,48
BILBAO	BILB	7754,0	-1728,1	9503,8	1147,134	-55,78	101,40
SAN SEBASTIÁN	SSEBAS	51618,7	17172,8	10123,2	36,540	-186,60	-15,00
VITORIA	VITOR	-1171,5	-5382,5	1829,9	-294,589	433,97	450,78
LOGROÑO	LOGR	-24775,9	-39434,9	-42888,0	1348,241	83,91	-181,98