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I. INTRODUCTION

House prices in Spain rose dramatically between 1985 and 1990. Real house prices in Madrid went up between 110% and 170% during this period, depending on the index used. Chart 1 shows the evolution of real house prices (for new dwellings) in Madrid in recent years[1]. In addition to the boom in the second half of the 1980s, we can see another less intense boom around 1979 (the latter would be more pronounced than the former in terms of the house price to per capita income ratio). Stretching the memory back even further, Spain also saw an important boom in house prices in the early 1970s (unfortunately there does not appear to be any complete series on these prices prior to 1976).

Why is that such considerable fluctuations occur? What are the reasons behind the evolution in house prices? To shed some light into these questions it is worth comparing the different situations in two other European countries. In Germany house prices respond to population growth, income and demographic factors (i.e. migration, the dynamics of household formation, etc.)[2]. Housing is basically a home in which to live. Conversely, in the U.K. the investment motive plays a key role when deciding to purchase a house, because the rate of return on investment in housing has at times reached 100% in a single year. In Germany, the return on housing capital was negative throughout most of the 1980s, without substantial fluctuations. Apart from the different levels of nominal interest rates with repect to inflation (which responds to factors beyond the housing market), there are other significant differences between the two countries which help to explain for the different behaviour (for a detailed description, see Muellbauer (1991)). Firstly, there are fiscal differences: in the U.K., as in Spain, interest payments on home loans are tax deductible (up to an upper loan limit); however, in Spain (unlike the U.K.) there is a property tax, income from property is taxed and investment in housing is deductible. Secondly, interest on home purchase loans in Spain have been basically fixed, as in Germany, but recently floating rate loans (which have been the norm in the UK) have appeared. Fixed loan rates lead to a more countercyclical behaviour in the housing market. Thirdly, there

are differences in the loan to house value ratio; this variable is important due to its decisive impact on the return on capital. A young British couple with a small level of savings can usually obtain a mortgage loan to by a house for 85% to 95% of its value. Such loan to value ratios considerably increase the return on any investment in housing. Until now the situation in Spain was closer to that of Germany, where first time buyers, (generally older) had to save significantly before being able to make the necessary initial payments. Lastly, transaction costs, which also come into play when evaluating the return on a housing investment, are higher in Spain and Germany than in the U.K.

It is important therefore to find out empirically to what extent home purchases in Spain are driven basically by the investment motive or by the more basic motive of consumption of housing services. This paper investigates which are the determinants of house prices in Spain and their relative importance for the 1976-1991 period.

The knowledge of the mechanism of house price determination is essential for economic policy decisions, given the impact of the housing market on the rest of the economy. High house prices are obviously very costly in terms of public funds if it is intended to achieve the objective of housing policies, i.e. to enable each family to have a home. However, house prices may also have important consequences on other areas of the economy. The fall in the UK savings rate in recent years has been partly attributed to the rise in consumption by homeowners, who felt wealthier as a result of the rise in house prices. This increase in consumption is also responsible, to a certain extent, for the worsening of the balance of payments deficit (see Muellbauer and Murphy (1990, 1991)). Bover, Muellbauer and Murphy (1989) analyse the effects of house prices on the labour market, and show that wage pressure is related to regional differences in house prices (by constraining workers mobility)[3,4].

This paper is organized as follows. Section II contains a theoretical model of the housing market. Section III describes our empirical model, the data used and the estimates obtained. Section IV discusses the results and presents the conclusions.

II. AN INTERTEMPORAL HOUSING MODEL

The appropriate framework for studying the demand for housing is an intertemporal model which takes into account phenomena that cannot be analysed with one period models. For example, the commitment to future payments as a result of undertaking a mortgage or the effect of expected future price changes can only be studied within an intertemporal model.

This section presents an intertemporal model from Poterba (1984) and Meen (1990) that will be the basis for our empirical analysis.

1. Rental Price

The desired amount of housing services (HS^d) for a representative agent depends basically on the real rental price of these services (R) and on real income (Y).

$$HS^d = f(R, Y) \tag{1}$$

R is the real price paid by consumers for the flow of services derived from a unit of housing stock in each period. Other consumer characteristics can also be added, namely demographic variables.

A production function links the supply of housing services HS^s to the housing stock (H), which is assumed to be fixed in the short term.

$$HS^s = h(H) \tag{2}$$

The equilibrium rental price is the one for which $HS^d=HS^s$, i.e. $R=R(H, Y)$. The individual will consume housing services until their marginal value, R, equals their marginal cost.

2. User cost of capital

Let us suppose that there are two goods; housing services (which are assumed to be proportional to the housing stock) and a composite consumption good (C). Assuming a real discount rate of ρ, individuals maximize their intertemporal utility function

$$\int_0^\infty e^{-\rho t} \mu(H,C)\, dt \qquad (3)$$

where μ is the utility in each period, which depends on H and C, subject to the period to period budget constraint

$$C + S + PV\ X = (1-\Theta)Y + (1-\Theta)iA \qquad (4)$$

where

S = real savings

Θ = marginal tax rate

Y = real income

A = real assets

X = new purchases of housing

PV = real house price

i = nominal interest rate

The maximisation is also subject to technical restrictions which describe the evolution of the asset stocks over time

$$\dot{H} = X - \delta H \qquad (5)$$

$$\dot{A} = S - \pi A \qquad (6)$$

where a dot over a variable represents its time derivative, δ is the housing stock depreciation rate and π is the general rate of inflation. Note that if to the budget constraint (4), together with the technical restrictions (5) and (6), we

add the additional condition of "no Ponzi-game" (whereby the individual cannot borrow indefinitely to finance the interest and principal of his debt), we obtain an intertemporal budget constraint.

From the first order conditions it follows that the marginal rate of substitution (μ_h/μ_c) between housing and consumption is

$$\frac{\mu_h}{\mu_c} = PV\left[(1-\Theta)i - \pi_{NV} + \delta\right] \qquad (7)$$

where the inflation rate of nominal house prices (π_{NV}) is the sum of the general rate of inflation (π) and the rate of inflation of real house prices.

An important limitation on this analysis is that it assumes that capital markets are perfect. Let us see how this assumption can be relaxed. On the one hand, if we assume that the cost of borrowing (i_p) differs from the opportunity cost of the funds (i_o), it can be shown that the interest rate in equation (7) is a weighted average of the two rates, that is,

$$\frac{\mu_h}{\mu_c} = PV\left\{(1-\Theta)[Li_p+(1-L)i_o] - \pi_{NV} + \delta\right\} \qquad (8)$$

where L is the loan to value ratio.

On the other hand, if we assume that there is a limit on the total amount that can be borrowed, Meen (1990) shows that (7) can be written as follows

$$\frac{\mu_h}{\mu_c} = PV\left[(1-\Theta)i_p - \pi_{NV} + \delta + \frac{\lambda}{\mu_c}\right] \qquad (9)$$

where i_p is the credit interest rate and λ is the shadow price of the credit constraint. In periods of credit rationing the user cost increases by λ/μ_c,

which is the ratio of the shadow price of the restriction (λ) divided by the marginal utility of the composite consumption good.

In these cases the budget constraint separates net financial assets A into gross assets and loans outstanding.

3. Asset market equilibrium condition

Homeowners equate the marginal cost with the marginal benefit of housing services

$$R = \omega \, PV \tag{10}$$

where $\omega=(\mu_h/\mu_c)/PV$. This is the basic asset market equilibrium condition. To study the evolution of house prices over time, we write this condition as follows

$$P\dot{V} = \omega \, PV - R \tag{11}$$

When $P\dot{V}=0$, investors do not expect capital gains and house prices adjust until agents voluntarily hold the existing housing stock in their portfolios.

III. EMPIRICAL SPECIFICATION OF THE HOUSE PRICE EQUATION

1. Basic specification

The basis of our empirical model is a discrete time approximation to equation (10). In logs we have for period t

$$\log PV_t = \log R_t - \log \omega_t \qquad (12)$$

Note that R_t is unobservable. As explained by Meen (1990), the division of the housing market in two, one relative to housing services and the other to housing as an asset, is an artificial one and, therefore, R_t does not correspond to data on rents or imputed rentals. We will follow the standard practice of substituting R_t with its determinants (from the reduced form equation implied by the equilibrium condition in the market for housing services).

To specify ω_t, we will take into account that capital markets are not perfect. Particularly, we will assume that the cost of borrowing differs from the opportunity cost (equation (8)). We will also approximate λ/μ_c by means of a credit variable in an attempt to reflect the effects of credit rationing and the deregulation of the mortgage market in the early 1980s. Note that λ/μ_c, which is not directly observed, theoretically precludes ω_t from being negative. In practice, since we add to the equation an unrestricted approximation for λ/μ_c along with the other components of ω_t, the observable part of ω_t is negative for most of the sample period (for this reason, we will use its level rather than the logarithm). Lastly, it should be noted that since it can be assumed that the depreciation rate for housing, δ, does not vary over time, it will be included in the constant term.

Therefore, the basic empirical model is

$$\log PV_t = \alpha_o + \alpha_1 \log Y_t + \alpha_2 \log H_t + \beta_1 \left\{ \pi_{NV_t} - (1-\Theta_t)[L_t\, i_{pt} + (1-L_t) i_{ot}] \right\} + u_t \qquad (13)$$

The disturbance term, u_t, captures among other things measurement errors in the different empirical approximations adopted, mainly when approximating the series of house prices in Spain by the one in Madrid.

2. Data

As we shall see throughout this section, the lack of data has had an important influence on the strategy followed in the empirical analysis.

(i) Firstly, mention should be made of our house price data. The data that we use is an annual series of prices of new devellings (not subsidised by the public sector) in Madrid, which is regarded as an approximation to the price of devellings at the national level. This series was chosen because it was the longest one available, beginning in 1976. The correlation between house prices in Madrid and its surrounding area and house prices at the national level, for the years in which the comparison is possible, is 0.97 in levels and 0.75 in first differences. These correlation coefficients have been calculated using quarterly data produced by the MOPT for the period 1987-1990. Appendix 1 discusses the limitations of the series used and describes the existing data in Spain on house prices. Our maximum sample period runs from 1976 to 1991. The dependent variable (shown in chart 1) is the real house price, in logs, (PN/P), where P is the consumption deflator.

The other variables in the equation are as follows (for a more detailed description of the data, sources and the assumptions made, see Appendix 2):

(ii) Real per capita personal disposable income, in logarithms, lagged one period to avoid possible problems of simultaneity, $\log(YD/P^{*}POB)_{-1}$.

(iii) The rate of return on housing, which is defined as

$$B_t = \frac{\Delta \log PN_t - (1-\Theta_t)[L_t\, i_{pt} + (1-L_t) i_{ot}]}{(1-L_t)} \qquad (14)$$

where L is the loan to value ratio. There is no statistical information on the variation of L over time. It will be assumed (see information in Levenfeld (1988)) that 20% of the price is paid in cash by the buyers and 80% is financed with loans. At the end of the 1980s, a substantial amount of this 80% were mortgage loans, whereas a large proportion had previously consisted of personal loans or credit granted by the seller; however, it is not possible to distinguish empirically between these two sources. Therefore, for the entire sample period L=0.8. We use the overall credit rate and the time deposit rate for i_p and i_o, respectively (provided by Cuenca (1991)). We believe that the opportunity cost is the rate earned by a time deposit account, which has traditionally been the most widely used form of liquid savings. It is difficult to have an aggregate measure for the tax rate, Θ, because of the different marginal tax rates for individual. We will use the actual average personal income tax rate. The rate of return on housing will also be lagged one period.

(iv) Our measure of housing stock is $\log(HS_{-1}/POB)$ where HS denotes the housing stock. Here it would be necessary to adjust the housing stock taking into account the proportion of officially-sponsored housing, because increases in private or public sponsored housing will not

influence house prices in the same way. Unfortunately, we were unable to obtain the proportion of officially-sponsored housing for the whole sample period (see Appendix 2).

Other variables considered are as follows:

(v) λ/μ_c. An approximation frequently used in the literature to try to capture the effect of credit restrictions is the stock of credit for unsubsidised housing (SC). Appendix 2 describes the construction of this series in detail; however, it should be noted here that the series for Savings Banks is not satisfactory and contains significant measurement errors.

(vi) As mentioned in the discussion on the theoretical model, a possible determinant of the demand for housing services is the proportion of people in household formation age, for example, the proportion of the population aged 20 to 34, log(POB2034/POB).

3. Estimation

The basic estimated model suggested by the theory is shown in column 1 of Table 1. Since some variables are not yet available for 1991, and due to the lags used, the sample period used for the estimates in Table 1 is 1978-1990. In view of these estimates, it turns out that the real per capita income and the rate of return on housing are important determinants of real house prices. The coefficients are significant and in line with results obtained for other countries. The following section analyses the implications of these results. The lagged per capita housing stock does not have a significant effect on the real house price according to these estimates. This surprising result might be due to the heterogeneity of the available stock variable (officially - and privately- sponsored) and, to a lesser extent, by the extrapolations that

we had to perform to obtain an annual housing stock series. The stock of credit for housing is included in the equation in the second column to reflect the possible effects of credit restrictions (λ/μ_c). Log(SC/YD) is not significant either, but once again this could be due to the considerable measurement errors inevitably committed in constructing a stock of credit series for privately-sponsored housing purchases. Lastly, we explored the possible effect of demographic variables in column 3, without detecting a significant effect. Several authours have stresssed the importance of these effects (see, for example, Mankiw and Weil (1988)).

It is worth exploring the possible influence of such demographic variables as log(POB2034/POB), because if they proved to be important in determining the demand for housing services, we would have a leading indicator of future demand. In fact, if we consider the model (in colum 3) without including the real per capita income, the effect of the demographic variable is significantly positive, but the Durbin Watson statistic (=1.47) indicates the presence of a residual autocorrelation which had previously been captured by the real per capita income variable.

In columns 4 and 5 we estimate the basic model which includes real per capita income and the lagged measure of the rate of return on housing capital lagged. The difference is that in column 5 the rate of return is not tax adjusted. The results of both estimates are practically identical[5], but the advantage of the model that does not include a tax adjustment is that it can be estimated up to 1991. The estimated equation on which the conclusions are based is:

$$\log(PN/P) = \underset{(13.75)}{34.097} + \underset{(4.43)}{0.152}\left[\frac{\Delta \log PN - (0.8i_p + 0.2i_o)}{0.2}\right]_{-1} + \underset{(12.14)}{3.716}\log(YD/P*POB)_{-1} \qquad (15)$$

DW=2.05, adjusted R^2 =0.964, standard error of the regression =0.064, sample period: 1978-1991, t-ratios in brackets.

The regression adjusts well with only two variables (plus a constant), and given the small number of observations available this is particularly important. The value of the DW statistic indicates no autocorrelation in the residuals (despite the fact that its distribution is not the one usually tabulated since there are two predetermined variables). The residuals autocorrelation coefficient is -0.12 (t=0.37) and shows that there are no dynamics left in the residuals to be modelled. After equation (15) had been estimated, the data point corresponding to house prices in Madrid in the first six months of 1992 became available. With this new observation, we carried out an out sample prediction test. The result is that the observed value of the endogenous variable falls inside the 95 percent prediction interval.

Other empirical studies on house prices are based on a model which is derived as a reduced form of housing supply and demand equations (see, for example, Hendry (1984) and Nellis and Longbottom (1981)). Some variables that are not present in our model appear to have a significant influence in these studies. To test the importance of these variables in our model we will add then to the specification in column 5 (Table 1) one by one, because of the small number of observations available. The results are shown in Table 2.

The first column of Table 2 includes the cube of the lagged rate of return (B_{-1}^{*3}). Hendry (1984) stresses its importance in trying to measure the

speculative "frenzy" in times of substantial capital gains or losses) as a result of owning a home.

The theoretical literature is not conclusive as to whether the nominal or real interest rate should be used. In times of expected high inflation nominal interest rates rise and, although the present value of real payments remains unchanged, it may give rise to problems in the initial loan repayment years, since the increase in nominal payments will undoubtedly be greater than any increase in nominal income (see Kearl (1979), Schwap (1982) and Meen (1990), among others). In an attempt to capture the potential effect of the nominal rate, in column 2 (Table 2) we added $(i_p)_{-1}$ to our specification.

In columns 3 and 4 (Table 2) we introduced other variables which, according to Ericsson and Hendry (1985) (see also Dicks (1990)), are important when modelling prices of new dwellings. These variables are construction costs and the stock of uncompleted dwellings (specifically, the logarithm of real construction costs in materials and energy, log(COC/P), and the logarithm of the stock of uncompleted dwellings divided by the population, log(VIT/POB)).

Finally, in the case of Spain it has often been argued that the increase in housing prices after 1985 was due in part to the massive entry of black money in the real estate market following the law on the tax treatment of certain financial assets in 1985. In an attempt to test this hypothesis we introduced (column 5) a variable which measures the amount of real hoarded money per capita (constructed in Jareño and Delrieu (1991)).

None of these variables have a significant effect in our equation.

IV. RESULTS AND CONCLUSIONS

In this section we explain the results obtained from the model for house prices (equation (15)), although it should be borne in mind that with the sample period available it was only possible to capture the peak in prices in the second half of the 1980s and the smaller peak at the end of the 1970s.

Equation (15) shows that real income, with an elasticity of ϵ=3.7, has a substantial influence on the real price of housing. This elasticity is in line with estimates obtained for the U.K. (Meen (1990)) ϵ=3.00, Muellbauer and Murphy (1991) ϵ=2.6, Hendry (1984) ϵ=3.65)[6]. The equations in these last two studies condition house prices on the mortgage stock which is positively correlated to real income. Therefore, we would expect a higher elasticity in our model (Meen (1990)). The magnitude of the effect of the rate of return is also similar to that of Muellbauer and Murphy (1991), the only ones to include a variable of this kind, although other authors take into account unrestrictedly interest rates and house price inflation. This effect shows the importance of the investment motive in house purchases. Chart 3 shows the evolution of the rate of return on housing capital for an agent buying a house with 80% of the value financed with a loan, and the rate of return for an agent purchasing a home without loan (L=0). These series do not take into account the tax treatment of housing and, therefore, the actual return would be higher.

These results show that income growth, which drives the evolution of house prices in the medium term, has been responsible for over 70% of the increase in the real price of housing between 1985 and 1990 (see Chart 2). This effect was probably due in part to the improved borrowing conditions for the housing market as a result of the development of the mortgage market and the resulting increase in the agents ability to borrow; however, we were unable to pin down this effect with the available data on stock of credit. In the short term, we found that the evolution of the rate of return, and particularly of

interest rates, is a key factor in the evolution of house prices. A puzzle which has yet to be resolved is the role of the housing stock. The increase in the demand for housing services as a result of a considerable growth in per capita income and the high rate of return may have been aggravated by insufficient housing stock. We did not find evidence of this in the data available, but the data are scarce and overly aggregated. The surprising insensitivity of house prices to all types of demographic variables is, however, a robust result, corroborating the importance of the investment motive.

To conclude, as a prospect for the future, we can say that the current levels of per capita income have, in the medium term, raised the real price of housing. However, in view of the current negative rate of return on house purchases as an investment, in the short term the housing market will continue to be depressed for some time.

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APPENDIX 1: Data on house prices in Spain

A major problem in modelling the evolution of house prices is the lack of series covering a sufficiently long period of time. Specifically, there does not appear to be any continous series beginning prior to 1975.

The series we used for this study is a series on prices of new dwellings in Madrid prepared by Tecnigrama on the basis of simulated purchases. This series was chosen mainly because it is available from 1976. Obviously, we would have preferred to have a series at the national level, with information on both new and second-hand dwellings, but this information was only available as from 1985 or 1987 (as explained below where the existing series are detailed). It can be argued that Madrid is an approximation subject to measurement error. With regard to the difference between new and second-hand housing when modelling the new dwellings prices we will take into account factors that may specifically affect them.

There are other problems which are common to all the house price series available in Spain . They refer to prices per square metre in order to take into account the differences in the size of dwellings. However, prices do not increase proportionally to size. Therefore, using prices per square metre produces an upward bias in house prices as surface areas diminish (and vice versa). This brings us to the more general problem of the lack of mix-adjustment of house price statistics. Changes in the average prices of housing over time reflect price fluctuations, but they also reflect changes in the composition and quality of housing. These variations should be disentangled (see, for example, Fleming and Nellis (1981, 1985)). We cannot compare the price of houses for sale today (which may include such improvements as garage, air conditioning, common facilities, etc.) with those of houses fifteen years ago (which did not have such amenities) without standarising by characteristics, because we would be overstating the increase in prices. Also,

the composition of houses for sale has changed over time. If, for example, the relative importance of low cost housing (e.g. houses in the outskirts) increases, we will be understating the increase in prices if we do not take into account the composition. Obviously, this is not a problem if we are interested in price levels rather than in changes over time. Since this study refers to new house prices and the period addressed is relatively short, we considered that it was not necessary to try to make ad hoc adjustments in an attempt to reflect the qualitative change. Nevertheless, this matter will have to be addressed when devising house price statistics for Spain if, once we have observations for a longer period of time, we want the series to reflect actual price variations.

Below, we briefly list the available sources of information on non-officially-sponsored house prices without discussing the methodology or representativity of each series.

(i) The Ministry of Public Works and Transport (MOPT) has provisional data from 1987 to the present. These are quarterly data on both Spain and its autonomous communities, prepared from the surveyors' files (from an increasing number of credit institutions, for both new and second-hand dwellings but not officially-sponsored housing.

(ii) Banco Hipotecario, the state mortgage bank, has been publishing series of privately-sponsored house prices for Spain since the fourth quarter of 1985 (since the first quarter of 1987 for the autonomous communities) based on its own surveyors reports.

(iii) Certain firms of surveyors prepare house price series, but they generally begin in the mid to late 1980s. The company Sociedad de Tasación, having extended its data starting in 1985, has annual data on standard quality

housing in Madrid from 1979, prepared personally by its managing director.

(iv) The Barcelona City Council recently published (3rd quarter 1991) a series of monthly prices from January 1975 to May 1991. These prices correspond to offers published in the press for second hand dwellings.

(v) Several real estate marketing companies have also constructed their own data on house prices. Specifically, as mentioned earlier, Tecnigrama has been preparing house price series for Madrid since 1976 (new houses) and since the end of the 1980s for other cities in Spain. TCI (Técnicos Consultores de Inversiones) also have new house prices for Madrid since 1979.

(vi) Lastly, for the period 1960-1974 there are data on average price, median price, price per square metre and median price per square metre for the Greater Madrid Area. These data were prepared on the basis of a survey conducted by CETA in 1974 for COPLACO. The sample addresses both privately -and officially- sponsored houses.

APPENDIX 2: Statistical Sources and Definition of Variables

CATE Amount of hoarded money. Compiled on the basis of the average life of the different denominations. Source: Jareño and Delrieu (1991).

COC Construction costs, materials and energy index. Source: Confederación Nacional de la Construcción.

HS Occupied housing stock (Main residence). Extrapolations based on the 1970 and 1981 Housing Censuses (INE - National Statistics Office), on the 1985 Family Expenditure Survey and on the 1989 Rental Survey (MOPU - Ministry of Public Works and Urban Planning). As for the ratio of officially-sponsored housing to total stocks we were only able to obtain annual data for 1980-81 and from 1985 to date, through the Family Expenditure Survey (INE). These data refer to the number of homes.

i_p Overall credit rate. Including (weighted by balances according to periods) mortgage loans, commercial discounts and loans and credits. Source: Cuenca (1991).

i_o Time deposit rate. Source: Cuenca (1991).

L Loan to value ratio. There is no statistical information on its variation over time. The ratio used for the period analysed was L=0.8. See Levenfeld (1988).

P Consumption deflator. Sources: Corrales and Taguas (1989).

POB Total population (National Accounts, 1980 base). Source: INE.

POB2034 Total population aged 20-24. Source: Labour Force Survey (INE).

PN Nominal price of new dwellings per square metre, Madrid. Source: Tecnigrama.

SC Here we ideally seek a measurement of the stock of loans to individuals for home purchases in the free market. Below we detail the data used for the different credit institutions.

(i) Private banks: From 1983 the "Home Loans to Individuals" series was used (Source: Bank of Spain Statistical Bulletin). It is assumed that most of these loans are free market home loans. For years prior to 1983 the "Distribution of Bank Loans by Activity. To Individuals" series was used (Source: Bank of Spain), multiplied by 9%, which is assumed to be the portion assigned to home purchases.

(ii) Savings Banks: From 1972 to 1981 the mortgage and personal (home) loan items from the Spanish Confederation of Savings Banks' "Statistical Report and Management Analysis" were used, with an adjustment to take into account Caja Postal (postal savings bank). The resulting series is adjusted to try to reflect only loans to individuals. From 1982 the corresponding "Home Loans to Individuals" series was used (Source: Bank of Spain). To approximate the proportion of free market loans we used free market real estate loan data (starting from 1986; Source: Bank of Spain) and data from the Spanish

Confederation of Savings Banks' "Statistical Report and Management Analysis".

(iii) Official credit institutions: Data on stock of credit for privately-sponsored houses are only available after 1986. Since this item accounted for only 4.2% of the credit system in 1987, and due to the difficulties in disentangling the proportion of credit for purchases from that for construction, we did not include official credit institutions in our measurement of stock of credit for privately-sponsored home purchases.

(iv) Mortgage companies: Data published on loans for privately-sponsored real estate starting in 1983, distinguishing between construction and purchases from 1986. Source: Banco Hipotecario de España Statistical Bulletin.

VIT Uncompleted dwellings. Source: INE.

YD Nominal personal disposable income. Source: Corrales and Taguas (1989).

Θ Effective mean rate $= \dfrac{\text{Net tax payable}}{\text{Taxable income}}$.

Source: "Annual report of the Tax Administration" and "Annual Report on the Tax Reform", Minitry of Economy and Finance.

NOTES

1. From data on prices of new dwellings prepared by Tecnigrama.

2. The discussion on the features of the housing market in Germany and the U.K. is based on Muellbauer (1991). For information on housing markets in other countries, see Holmans (1990).

3. It should be noted here that Spain is the European country with the lowest percentage of rented houses (between 11% and 15%, depending on the source). However, this information may be misleading since, for example, in the U.K. (37%) local council housing (the equivalent of officially sponsored housing in Spain which is sold at non-market prices) is rented.

4. The influence of housing prices on consumption or labour mobility in Spain is the subject of current research.

5. This does not mean that the tax system is not relevant in the calculation of the return on housing capital, but that the adjustment for taxes that can be made with our data is for too aggregated and does not capture the incidence of the fiscal treatment of home purchases.

6. It can be easily seen that since Muellbauer and Murphy (1991) use log(PN*POB/YD) as the dependent variable, we have added one to their elasticity to make it comparable to ours. The same type of argument applies to Hendry's (1984) elasticity, although only approximately, because his study normalises by the housing stock rather than by the population.

TABLE 1

Sample period 1978-1990					
log (PN/P)	1	2	3	4	5
Constant	42.720 (11.35)	42.969 (6.72)	43.371 (10.05)	42.436 (12.34)	42.88 (12.95)
$\left[\frac{\Delta \log PN-(1-\Theta)(0.8i_p+0.2i_o)}{0.2}\right]_{-1} = B_{-1}$	0.097 (2.13)	0.088 (2.04)	0.084 (2.10)	0.090 (2.58)	--
$\log(YD/P^*POB)_{-1}$	4.547 (5.27)	4.813 (5.89)	4.88 (8.69)	4.744 (11.21)	4.798 (11.76)
$\log(HS_{-1}/POB)$	0.229 (0.27)	--	--	--	--
log(SC/YD)	--	-0.009 (0.1)	--	--	--
log(POB2034/POB)	--	--	-0.101 (0.39)	--	--
$\left[\frac{\Delta \log PN-(0.8i_p+0.2i_o)}{0.2}\right]_{-1} = B^*_{-1}$	--	--	--	--	0.085 (2.57)
DW	2.12	2.13	2.14	2.12	2.11
Adjusted R^2	0.973	0.973	0.974	0.976	0.976
Standar error of the regression	0.050	0.050	0.050	0.047	0.047

Estimation method: ordinary least squares
t-ratios in brackets.

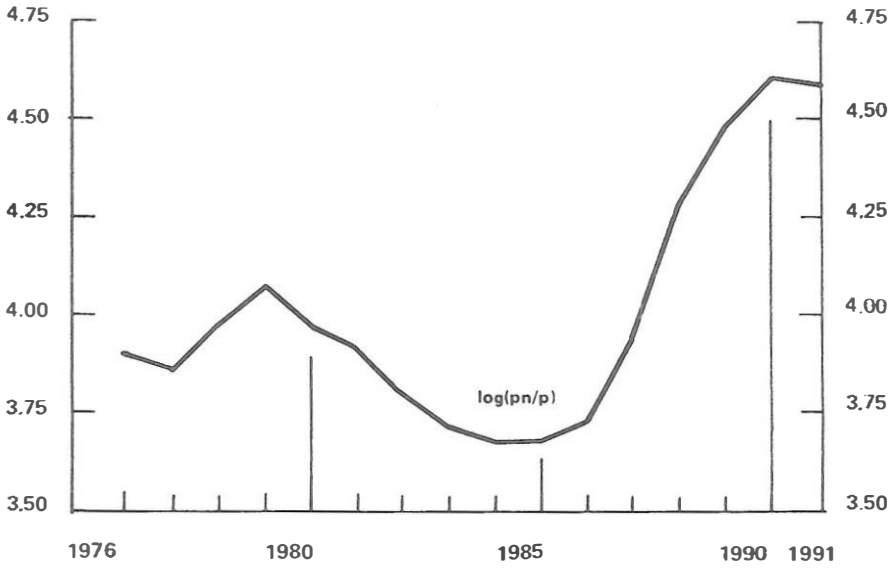
TABLE 2

Sample period 1978-1990					
log (PN/P)	1	2	3	4	5
Constant	42.871 (12.27)	43.859 (10.88)	41.329 (10.78)	43.064 (10.23)	42.728 (9.43)
$\left[\frac{\Delta \log PN - (0.8i_p + 0.2i_o)}{0.2}\right]_{-1} = B^*_{-1}$	0.088 (1.90)	0.069 (1.42)	0.114 (2.36)	0.083 (2.10)	0.086 (2.12)
$\log(YD/P*POB)_{-1}$	4.797 (11.15)	4.910 (10.07)	4.757 (11.41)	4.763 (7.73)	4.777 (8.11)
B^{*3}_{-1}	-0.004 (0.10)	--	--	--	--
$(i_p)_{-1}$	--	-0.459 (0.47)	--	--	--
log(COC/P)	--	--	0.321 (0.84)	--	--
log(VIT/POB)	--	--	--	0.043 (0.78)	--
log(CATE/P*POB)	--	--	--	--	0.002 (0.05)
DW	2.09	2.13	2.13	2.10	2.10
Adjusted R^2	0.973	0.974	0.975	0.973	0.973
Standard error of the regression	0.050	0.049	0.048	0.050	0.050

Estimation method: ordinary least squares
t-ratios in brackets.

Chart 1

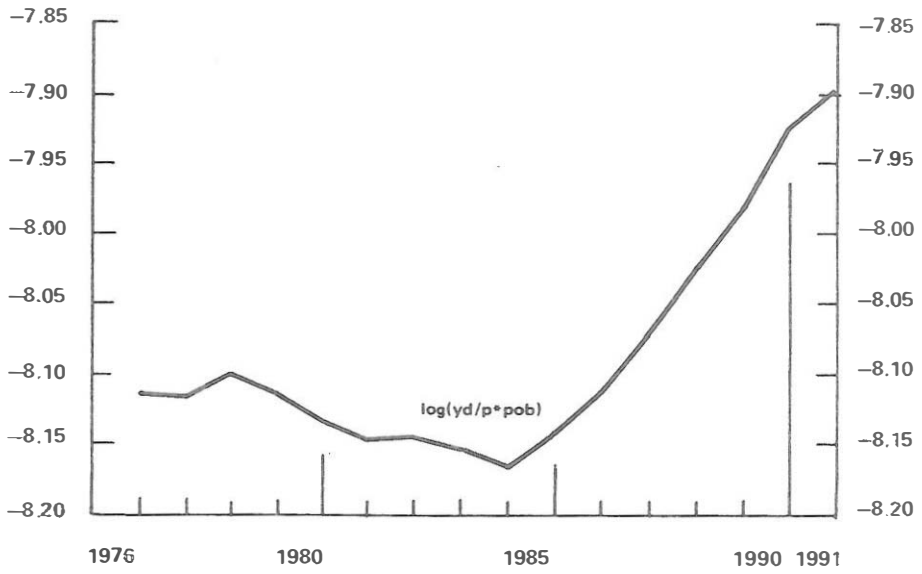
REAL HOUSE PRICES
Madrid



Source: Tecnigrama.

Chart 2

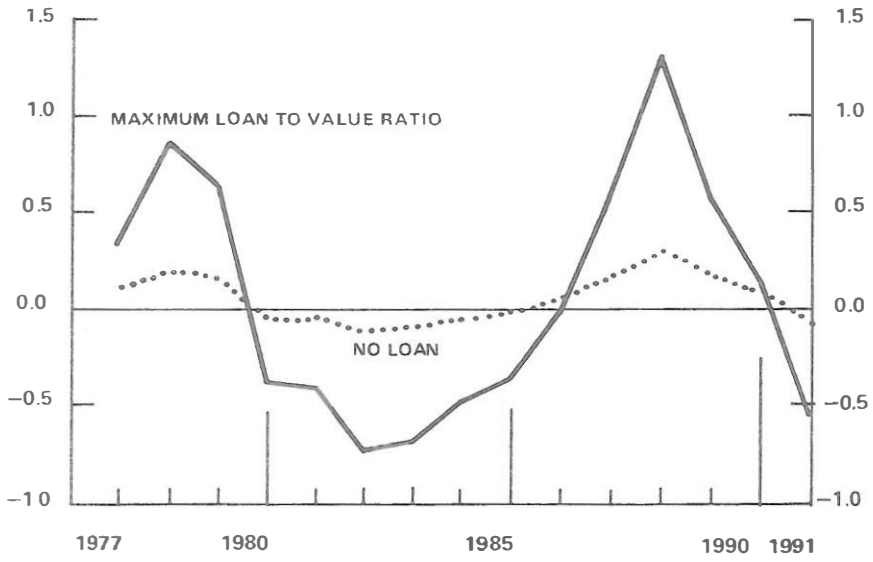
REAL PER CAPITA INCOME



Source: See table 1

Chart 3

RATES OF RETURN ON OWNER–OCCUPIED HOUSING
(excluding tax adjustment)



Source: See table 1

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Teléfono: 338 51 80
Alcalá, 50. 28014 Madrid