An assessment of housing and financial wealth effects in Spain. Aggregate evidence on durable and non-durable consumption

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Abstract Recent developments in housing and financial markets have led to fresh interest in the empirical evidence on wealth effects on consumption. This paper aims at providing up-to-date estimates of wealth effects by using a vector error correction model (VECM) approach to account for endogeneity and allow for the possibility of more than one variable equilibrating the system, in the same vein as previous work by Lettau and Ludvigson in the US. The breakdown of wealth into its housing and financial components leads to additional possibilities of adjustment to reach the long run equilibrium. In addition, the model accounts for potentially different values of the parameters linking consumption and wealth when distinguishing between durable and nondurable goods.

JEL classification: E21, C32

1 Introduction

Recent developments in housing and financial markets have led to fresh interest in the empirical evidence on wealth effects on consumption. The varied and controversial results in the empirical literature, as well as the doubts on whether residential assets may really affect consumption in a similar way as financial wealth does, have maintained a debate over the actual magnitude of wealth effects and the relative size of its housing and financial components.

This paper aims at providing up-to-date estimates of wealth effects in Spain by using a vector error correction model (VECM) approach to account for the endo-

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geneity of several variables. This also makes it possible to incorporate not only a self-correction mechanism in consumption -as empirical consumption functions with an error correction term do- but also the possibility of other variables equilibrating the system, in the same vein as previous work by Lettau and Ludvigson in the US. The analysis follows the same approach of Sastre and Fernández-Sánchez (2005), who distinguished between durable and non-durable consumption to better describe aggregate consumption in Spain. In the current analysis a more recent sample and new definitions of some variables have been incorporated.

This paper is organized as follows. Section 2 describes some stylized facts about recent developments in Spanish private consumption and household savings rate. Section 3 provides the theoretical background which is the basis for using the cointegration analysis as our empirical approach. This methodology is briefly explained in section 4 together with a short description of the data set. The main empirical results are reported and interpreted in section 5 and the last section presents some brief conclusions.

2 Stylised facts of wealth effects in Spain

Up to 2008 the savings ratio of Spanish households fluctuated within a range of 10 to 15 % of gross disposable income (Figure 1). To a large extent, these fluctuations are associated to cyclical movements, which have an impact on income expectations and thereby on the propensity to save. Thus, in the crisis of the first half nineties the savings rate increased, although with an erratic pattern, and decreased during the booming period of the second half of that decade. In the mild downturn experienced in the early years of this century the ratio of savings to income increased slightly to drop again until 2007. In the last two years this ratio has risen again. This time in a very sharp way, as a consequence of the deterioration in economic perspectives and the increased uncertainty derived both from the financial crisis and the growth of unemployment.

Household net worth seems to have also contributed to these developments as it can be seen in Figure 1. During the second half of the nineties the unprecedented fall in real interest rates experienced by the Spanish economy and the subsequent increase of financial wealth boosted household spending above income growth, thus pushing down the savings rate and raising the ratio of net financial wealth to consumption (Figure 2). After the reversal of equity prices, financial wealth decelerated in the early years of this century, but total wealth still provided an important support for consumption due to the contribution of housing wealth.

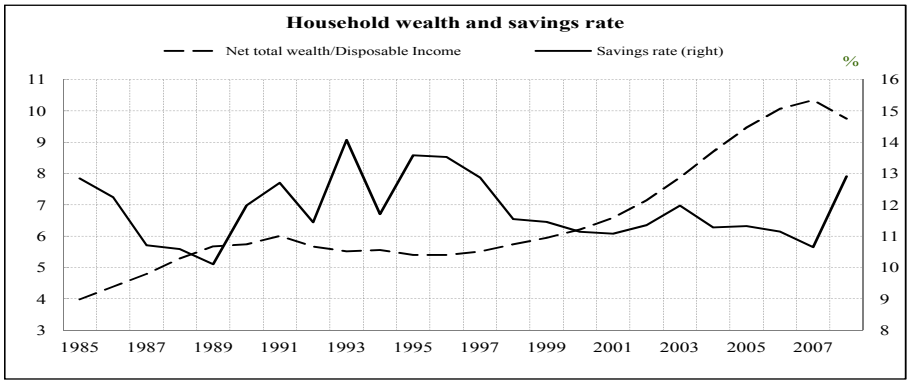

Fig. 1

When considering the response of consumption to wealth, differences may arise as regards the durability of expenditure and the type of assets[1]. This debate has not settled down yet and seems to be country-dependent. In the case of Spain, a key feature is the fact that residential assets, mainly the primary residence, are very homogenously distributed across income groups. Not only the home ownership rate is very high -more than 80-, but also about 70% of households are owners of their homes in the lowest income quintile, as compared to 41% in the US and 44% in Italy (see Table 1). This suggests that the response of consumption to housing wealth might be fairly high in Spain. On the other hand, the fact that housing is rarely used as collateral for consumption loans –home equity withdrawal- would imply a housing wealth effect on consumption lower than in other countries where this is a more common practice.

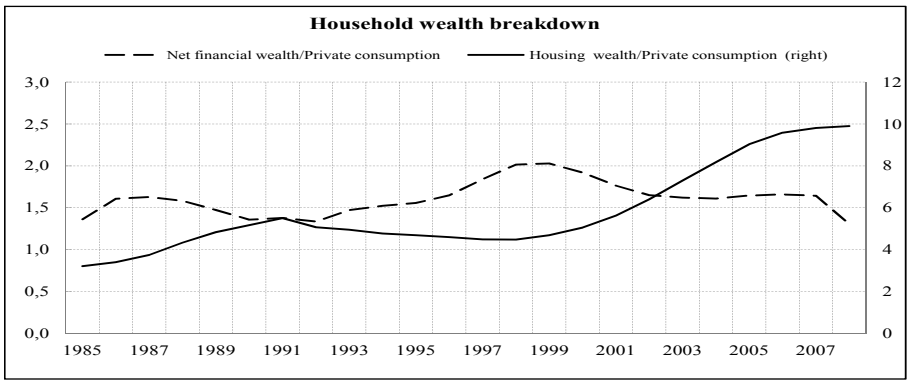

Fig. 2

[1] See a summary of this debate in section 2.1.4 in Altissimo et al. (2005).

Table 1 Household holdings of primary residence

			% of households
Percentile of income	Spain	USA	Italy
1st quintile	70.7	41.4	44.3
2st quintile	78.6	55.2	59.8
3st quintile	81.0	69.3	73.2
4st quintile	85.8	83.9	79.1
80 - 90	87.8	92.6	
90 - 100	92.9	94.3	87.1*
All families	**81.3**	**68.6**	**68.7**

(*) 5th quintile

Source: Encuesta financiera de las Familias 2005 (ES)
Survey of Consumer Finances 2007 (USA)
Survey of Household Income and Wealth 2006 (IT)

The distinction between consumption of durable goods and non-durables may prove to be useful to better understand the relationship between spending decisions, savings and wealth accumulation. Expenditures on durables share similar characteristics to investment in capital goods and also participate of some similarity to savings. As in the case of capital goods, the acquisition of durable goods entails the allocation of a big amount of resources to a good which will produce returns or consumption services for several periods in the future. The variability and pro-cyclical pattern of durable consumption is fairly high, as it also happens with capital goods, and larger than the variability of non-durable spending. These differences, which are quite evident for Spanish durable and non-durable consumption data (Figure 3), suggest that the link between spending on durables and lifetime wealth may differ considerably from the one linking non-durables to their long-run fundamentals. For instance, most developments in Spanish private consumption on non-durables have closely tracked labour income growth, giving rise to a fairly stable pattern in the consumption to income ratio since the economic crisis of the early nineties (Figure 3). In the previous years, the process of convergence of Spanish economy to the European standards had gradually reduced consumer spending rate out of labour income. On the other hand, the ratio of durable expenditure to labour income showed a lower average level in the early nineties as compared to the following years, as well as wide swings in the whole period 1987-2008, due to fairly large differences in the average growth of these two variables during prolonged periods of time (lower panel of Figure 3). To give account of the behaviour of durable consumption during those periods, other variables than labour income appear to be needed.

Household net worth, which kept a rather stable ratio to income up to the mid-nineties and progressively increased since then, is the main candidate but not the only one. The fact that the acquisition of durable goods entails a big-ticket purchase

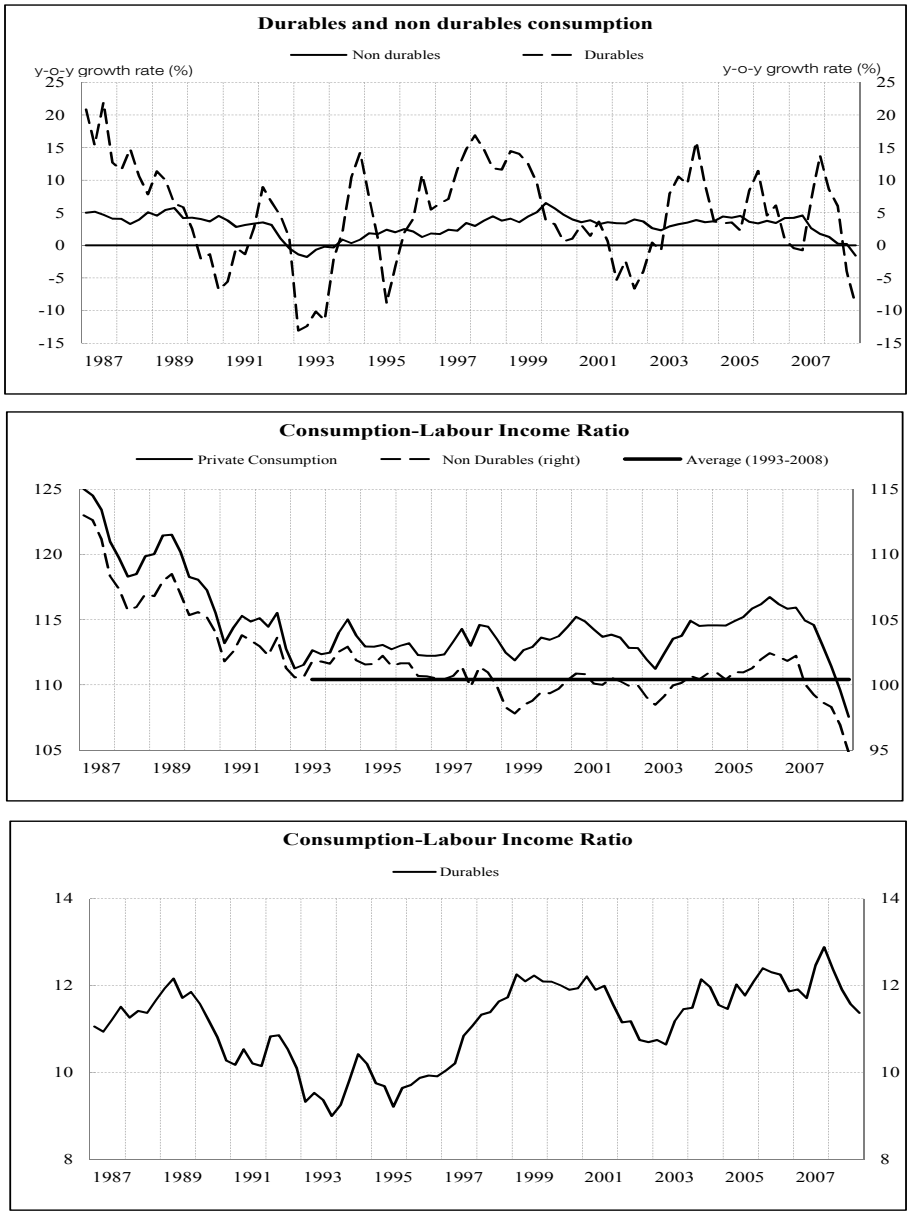

Fig. 3

implies a need for financing for many households, which suggests that financing conditions -interest rate, availability of loans- may also play a significant role. Credit availability for durable purchases remained quite subdued since 1990 until 1997 (Figure 4), which might help to explain the fall in the ratio of durables to labour

income in those years. The increasing profile of the spending rate on durables since the mid-nineties might be associated to the big fall in real interest rates or, perhaps, to developments in the relative price of durable goods, which has shown a declining trend over the last twenty five years. A negative relationship between this last variable and expenditure on durables can also be observed in the short to medium run (lower panel of Figure 4).

In previous empirical studies on aggregate consumption in Spain which model separately spending in durable and non-durable goods similar variables have been considered. In Estrada (1992) expenditure on durables in the long-run is related to disposable income and the relative price of energy, which captures one of the components of durables user cost. This study also stressed the need of considering other variables than income to explain the long-run behaviour of durables, especially those related to credit market conditions. In this same vein, Bover and Estrada (1994) found a significant direct effect of purchase of the main residence on durable expenditure, at least in the late eighties. In Estrada and Buisán (1999) three main spending decisions of households were analysed: non-durable spending, durable consumption and residential investment, using two definitions of income -labour and disposable

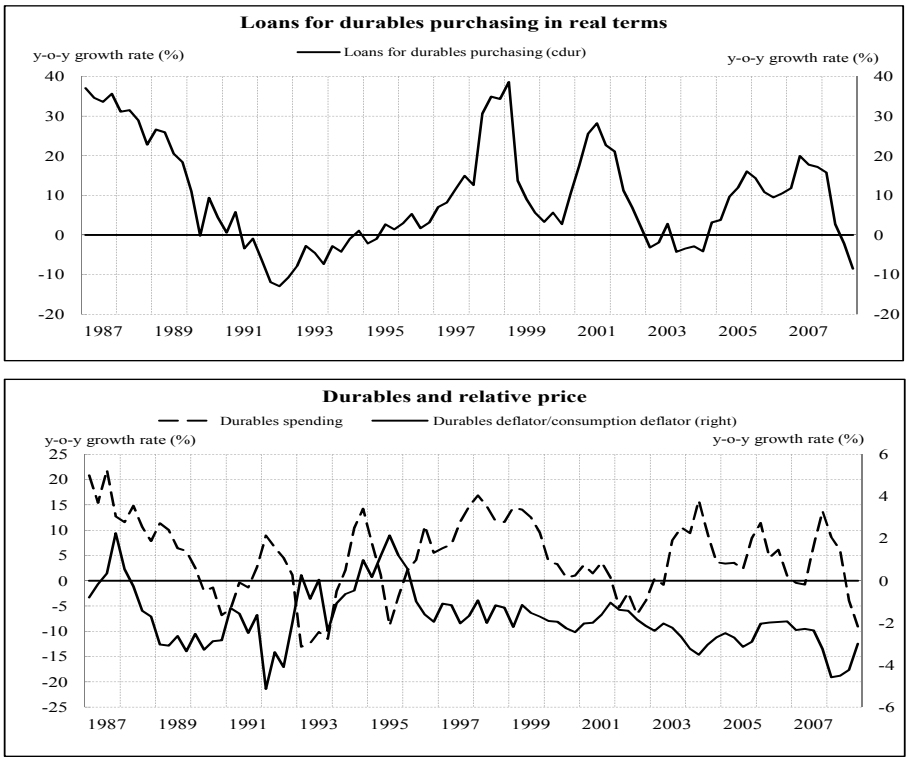

Fig. 4

income- and two types of wealth -financial and residential-. These authors found that financial wealth was a significant long-run determinant of both durables and non-durables, when labour income was used[2], and that the relative price of energy was also needed to explain the long-run path of durable spending. Sastre and Fernández-Sánchez (2005) estimated a model for those same decision variables -non-durable spending, durable consumption and residential investment- by using a multivariate framework (VECM). They found that both durable and non-durable expenditure tended to move closely together with both components of wealth -financial and residential- and labour income in the long run, and in the case of spending on non-durable goods, together with the real interest rate. Lastly, Bover (2005) obtained estimates of the wealth effect by using micro-data (the Survey of Spanish Household Finances). She found that the largest effects were for owner occupied housing, with financial wealth effects being smaller.

3 Theoretical background

The empirical analysis described in the next sections is based on the approach initiated by Lettau and Ludvigson (2001), who derived the implications of the intertemporal budget constraint to the long-run cointegration relationship between consumption, income and wealth. Their work resorted to that of Campbell and Mankiw (1989), who obtained an expression for the log consumption-total wealth ratio by taking a first-order Taylor expansion of the budget constraint, solving forward the resulting difference equation and imposing a transversality condition. The resulting expression is:

$$c_t - w_t \approx E_t \sum_{t=1}^{\infty} \rho_w^i (r_{w,t+i} - \Delta c_{t+i}) \tag{1}$$

where lower case letters denote log variables, r_w = log (1 + R_w) is the average net return of total wealth (W), and ρ_w is the steady-state ratio of new investment to total wealth, (W - C)/W. This expression makes it clear that the consumption-total wealth ratio embodies household expectations of both future wealth returns and consumption growth.

Total wealth includes assets (A) –real and financial- and human wealth (H), which is not observable. However, an approximate expression with only observable variables on the left hand side can be obtained by assuming that labour income (y^L) can be thought of as the dividend of human capital and by using an approximation to log total wealth, i.e. $w_t \approx \theta a_t$ + (1- θ) h_t (θ is the steady state share of non-human

[2] With disposable income, financial wealth was only relevant in the case of non-durable spending.

wealth in total wealth). The expression in observable variables is:

$$c_t - \alpha_a a_t - \alpha_y y_t^L \approx E_t \sum_{t=1}^{\infty} \rho_w^i (\theta r_{a,t+i} + (1-\theta)\Delta y_{t+1+i}^L - \Delta c_{t+1}) \qquad (2)$$

The net return of total wealth, r_w, is the average of returns on non-human wealth, r_a, which may vary over time, and labour income growth. If wealth returns and consumption growth are assumed to be stationary, then consumption, labour income and assets must be tied together by a cointegrating relationship. Thus, the expression on the left hand side represents deviations from their common trend which, according to the right hand side, may reflect expectations of future returns to assets, future changes to labour income, planned growth of consumption or some combination of the three. Likewise, the existence of a cointegration relationship implies that the system (c, a, y^L) can be represented as a Vector Error Correction Model (VECM) with at least one of the three variables adjusting in case of deviations from their common trend[3].

4 Data and econometric methodology

The cointegration relationship among log consumption, wealth and labour income implied by the lifetime budget constraint is analysed in a VECM framework, where consumption is broken down into durable and nondurable spending. Then, at least two cointegrating relationships are expected. A priori assumptions about the set of variables that are weakly exogenous are not required under this framework, they can rather be easily tested through t-ratios of certain parameters.

The variables used in the empirical analysis (Figure 5) were taken from quarterly national accounts in most cases. Other data sources also used are quarterly financial accounts, censuses of houses and house price data released by the Housing Ministry. Quarterly data of durable and nondurable consumption were obtained from the yearly consumption breakdown by type of goods and function (COICOP classification) which were interpolated by using appropriate quarterly short-run indicators. Labour income is defined as disposable non-property income, which differs from the definition used in Sastre and Fernández-Sánchez (2005)[4]. Nominal variables are expressed in real terms by using the consumption deflator. A more detailed description of data is summarised in the Appendix 1.

[3] See Engle and Granger (1987).

[4] Sastre and Fernández-Sánchez (2009) offers a comparison of several alternative definitions of labour income in Spain.

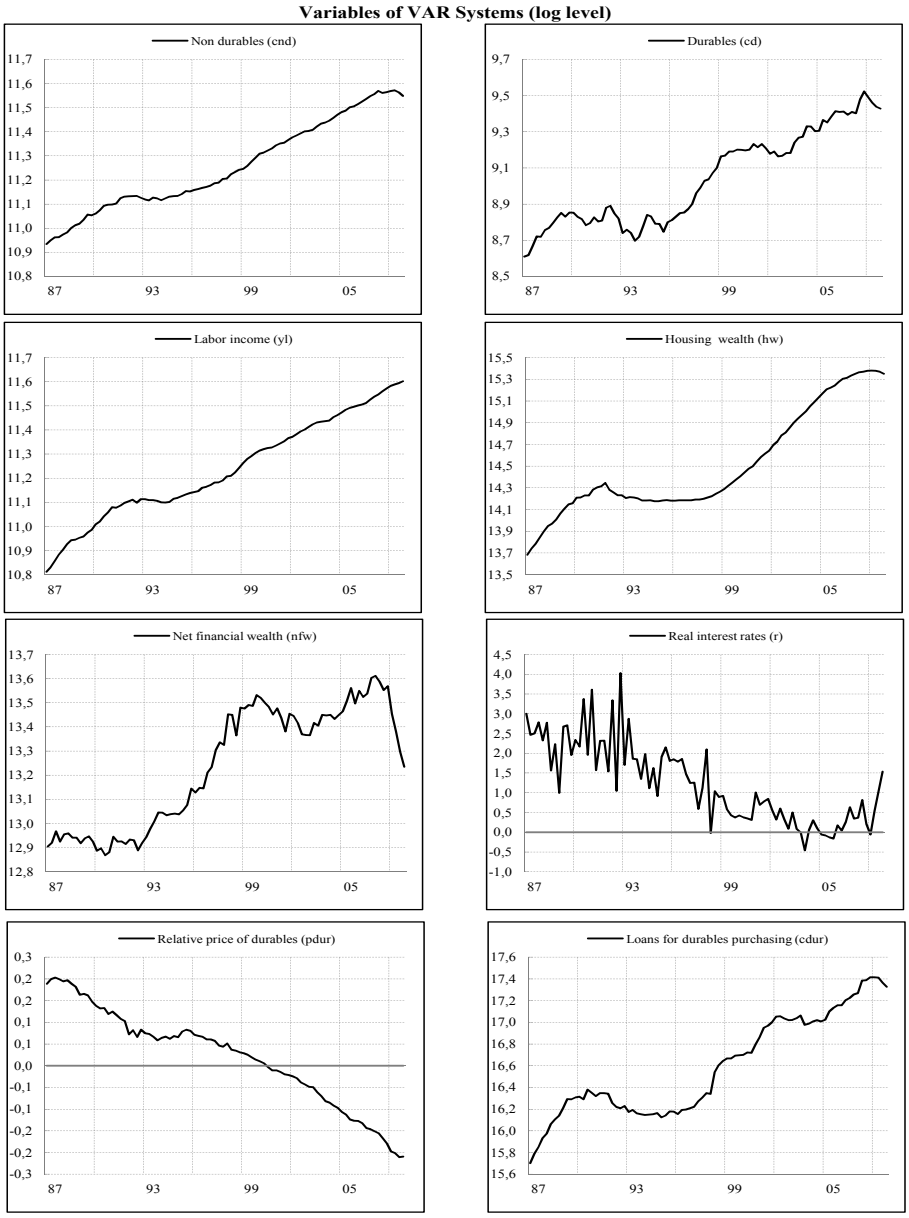

Fig. 5

Cointegration relationships are analyzed by adopting the Johansen approach, as outlined in Johansen (1995), which produces maximum likelihood estimates of long-run parameters. The first step under this approach is to estimate an unrestricted VAR

model such as:

$$Z_t = \sum_j \Gamma_j Z_{t-j} + \xi_t \tag{3}$$

where Z is the vector of n endogenous variables and ξ a vector of white noise error terms. The VAR system can also be expressed in vector error correction form:

$$\Delta Z_t = \sum_j \Gamma_j \Delta Z_{t-j} + \Pi Z_{t-1} + \xi_t \tag{4}$$

Π is the *(n x n)* matrix of long-run parameters of the dynamic system. The cointegration test is based on the rank of this matrix, *r*, which indicates the number of long-run relationships among the endogenous variables in the VAR. If $0 < r < n$, then Π can be decomposed as $\Pi = \alpha ß$, where ß is a (*r* x *n*) matrix which describes the r linear combinations of the variables which are stationary and α is a (*n* x *r*) matrix of coefficients which define the adjustment path of each endogenous variable to deviations from the long-run relationships given by ßZ. To identify α and ß several identifying restrictions are needed to be imposed on these matrices. The number of restrictions necessary to identify the long-run is k, such that $k \geq r^2$. In general, if k = r^2 the system is exactly identified and when $k > r^2$, the system is overidentified and these overidentifying restrictions may be tested by conducting likelihood ratio tests.

5 Econometric results

5.1 The basic empirical model

A VAR is specified over the period 1987.Q1 to 2007.Q4 for the following endogenous variables: nondurable consumption (cnd), durable consumption (cd), labour income (yl), housing wealth (hw), net financial wealth (nfw) and real interest rate (r). The assumption that all variables included in the system are integrated of order one -I(1) processes- appears to be validated by the sample data (see Table 2). The null hypothesis of one unit root cannot be rejected for all the variables except for the real interest rate, which seems to be borderline stationary in this period of time[5]. In the case of housing wealth, the null hypothesis cannot be rejected at the 10% significance level. The lag order of the VAR was chosen so as to obtain well

[5] In previous studies with Spanish data it was found that the real interest rate was integrated of order one. The fact that the sample used in this paper includes more years of the EMU period, may help to understand why this variable is closer to be stationary, which is the usual assumption in theoretical models and in section 3. The real interest rate can be included in the VAR even under

Table 2 Unit root test

$$(H_0\text{: p =1 en } \Delta X_t = \alpha + (\rho - 1)X_{t-1} + \sum_{i=1}^{p} \Delta X_{t-p} + \varepsilon_t$$

Level	p	ADF	Δ	p	ADF	Δ^2	p	ADF
cnd	1	0.32	Δcnd	2	-3.7352**	Δ^2cnd	-	-
cd	5	-0.81	Δcd	4	-3.9140**	Δ^2cd	-	-
yl	1	-0.87	Δyl	1	-4.4903**	Δ^2yl	-	-
nfw	2	-1.82	Δnfw	2	-3.8013**	Δ^2nfwr	-	-
hw	2	-0.98	Δhw (b)	1	-1.9501*	Δ^2hwr	2	-9.4827**
nw	2	-0.83	Δnw	1	-3.4678*	Δ^2nwr	-	-
r	1	-2.46	Δr	1	-12.953**	Δ^2r	-	-
pcd	2	-1.20	Δpcd	1	-5.5223**	Δ^2pcd	-	-
pdur	1	1.78	Δpdur	2	-6.1014**	Δ^2pdur	-	-
cdur	2	-1.92	Δcdur	1	-4.3694**	Δ^2cdur	-	-

(a) All variables are in logs except the real interest rate and the consumption deflator.
Sample period: 1981 (3) to 2008 (4)
(b) The value of ADF test refers to a regression without constant. which was not significant.
cnd: Real non-durable consumption
cd: Real durable consumption
yl: Real labor income
nfw: Real net financial wealth
hw: Real estate wealth
nw: Real total wealth
r: Real interest rate for house purchasing
pcd: Private consumption deflator
pdur: Relative price of consumer durable goods with respect to the private consumption deflator
cdur: Credit for durable purchasing in real terms
** Significant at 1% (critical value for T = 100 and constant -3.51. without constant -2.58)
* Significant at 5% (critical value for T = 100 and constant -2.89. without constant -1.94)

behaved residuals. In the Appendix 2, several diagnostics for this VAR system are reported, which suggest there is no evidence of serial correlation, heteroskedasticity or non-normality in the residuals.

The tests proposed by Johansen for the number of cointegrating relationships (Trace and Maximum-Eigenvalue statistics) are reported in Table 3 together with tests on the weak exogeneity of the variables under several hypothesis about the number of cointegrating relationships. In VAR systems with a large dimension the reduction of the size of the system becomes very important to improve the performance of cointegration tests in small samples [6]. Therefore, weak exogeneity tests are conducted in order to reduce the number of endogenous variables by imposing exogeneity restrictions accepted by the data. According to the Chi^2 tests it cannot be rejected that net financial wealth is weakly exogenous under two hypotheses (rank (Π) = 2 or 3). In this smaller VAR, with financial wealth being considered weakly exogenous, the Johansen tests for the number of cointegrating relations are not clear cut but point to three cointegrating relationships, although a lower rank could also be possible,

that assumption, since a stationary variable may be included together with others which cointegrate among themselves.

[6] See Greenslade et al. (2002).

Table 3 Johansen Cointegration Tests

Unrestricted VAR

Endogenous variables: [cnd. cd. yl. nfw. hw. r]
Conditioning variables in cointegrating relationships:[]

Eigenvalue	H0: rank (r)	Máx Eigenvalue		Critical value (95%)	Trace		Critical value (95%)
			(a)			(a)	
0.556	= 0	68.1**	48.6**	39.4	149.4**	106.7**	94.2
0.318	= 1	32.1	22.9	33.5	81.3**	58.1	68.5
0.292	= 2	29.0*	20.7	27.1	49.2*	35.1	47.2
0.138	= 3	12.5	8.9	21.0	20.2	14.5	29.7
0.085	= 4	7.4	5.3	14.1	7.8	5.6	15.4
0.004	= 5	0.3	0.2	3.8	0.3	0.2	3.8

Weak exogeneity tests (Chi2)

	cnd	cd	hl	nfw	hw	r
r = 2	2.1 [0.3]	5.8 [0.0]	19.4 [0.0]**	0.9 [0.6]	11.1 [0.0]**	8.6 [0.0]*
r = 3	14.7 [0.0]**	19.3 [0.0]**	29.5 [0.0]**	0.9 [0.8]	11.6 [0.0]**	16.8 [0.0]**

VAR with financial wealth weakly exogenous

Endogenous variables: [cnd. cd. yl. hw. r]
Conditioning variables in cointegrating relationships:[nfw]

Eigenvalue	H0: rank (r)	Máx Eigenvalue		Critical value (95%)	Trace		Critical value (95%)
			(a)			(a)	
0.553	=0	67.7**	51.6**	33.5	141.8**	108.1**	68.5
0.314	= 1	31.7*	24.1	27.1	74.1**	56.5**	47.2
0.291	= 2	28.9**	22.1*	21.0	42.4**	32.3*	29.7
0.100	= 3	8.8	6.7	14.1	13.5	10.3	15.4
0.054	= 4	4.7*	3.5	3.8	4.7*	3.5	3.8

Weak exogeneity tests (Chi2)

	cnd	cd	hl	hw	r
r = 2	1.8 [0.4]	5.8 [0.0]	19 [0.0]**	10.6 [0.0]**	8.8 [0.0]*
r = 3	17.6 [0.0]**	23.4 [0.0]**	29.2 [0.0]**	11.1 [0.0]*	17.4 [0.0]**

(a) Correction for sample size. Reimers (1992). In the Chi2 tests the significance level is in brackets

as suggested by the maximum eigenvalue test with small sample correction[7]. Some ambiguity also arose in Sastre and Fernández-Sánchez (2005) who presented results for both cases, r = 2 and r = 3. Cointegrating relationships were normalized in non-durable and durable consumption variables, in the case of r = 2, while under r = 3, the third relationship was normalised in labour income.

To identify the cointegrating relationships it is needed to impose some identifying restrictions on the value of long-run coefficients. In order to do so it is helpful to incorporate prior information from economic theory or other analyses, especially in VAR systems with small samples as it is our case. Therefore, the dynamic ordinary least square (DOLS) method proposed by Stock & Watson (1993) is used to obtain a robust range of values for long-run parameters. This method takes into account the possible endogeneity of regressors in a single equation framework and it seems to be more precise in small samples than several system estimators. Table 4 offers

[7] See Reimers (1992).

these estimates for two equations: non-durable spending and durable consumption. According to them the elasticity of non-durables to income lies in the range (0.5 - 0.6) across several specifications and the elasticity to aggregate wealth could be about 0.1 - 0.2, depending on whether an aggregate definition of wealth is used or the breakdown in its housing and financial components [8]. The real interest rate appears as no significant, in contrast to previous studies. The estimated equation for durable consumption is less informative, since the coefficient of labour income and interest rate are poorly determined, in terms of magnitude and sign. The high correlation of wealth with income and also with the real interest rate appears to pose serious difficulties to obtain precise estimates of the separate effect of each of them. Wealth parameters seem somewhat more robust, at least its sign and relative size, being the elasticity of the financial component the largest.

The parameters of the cointegration relationships were estimated in a multivariate framework by applying the Johansen method (Table 5). These relationships were normalised and identified so as to define the long-run paths of non-durable spending, durable consumption and the inverse of the ratio of non-durables to income, a kind of "savings from non-durables" $(yl - cnd)$. The elasticity of non-durables to income has been fixed at a value close to 0.5, similar to that used in the study by Sastre and Fernández-Sánchez and in accordance with the estimates obtained from Stock-Watson procedure. In comparing the current estimates with the results of that study, the elasticity to total wealth, which was 0.22 there, is very similar when using disaggregated wealth since the sum of the elasticity to housing and financial wealth also adds up to 0.22. On the other hand, interest rate semi-elasticity becomes borderline significant, with a wrong sign. The collinearity between each component of wealth and the real interest rate, and the fact that this variable seems to be borderline stationary suggest the convenience of removing it from the VAR, at least to estimate

Table 4 Stock and Watson Estimates (*)

	Non durable consumption			Durable consumption			
	(A)	(B)	(C)	(A)	(B)	(C)	(D)
Labour income (yl)	0.64	0.57	0.51	0.91	-0.18	-0.4	-
	(0.03)	(0.05)	(0.05)	(0.26)	(0.29)	(0.24)	
Total wealth (nw)	0.12	-	-	0.07	-	-	-
	(0.01)			(0.09)			
Housing wealth (hw)	-	0.11	0.13	-	0.29	0.34	0.23
		(0.01)	(0.01)		(0.07)	(0.06)	(0.02)
Net financial wealth (nfw)	-	0.07	0.09	-	0.72	0.76	0.59
		(0.02)	(0.02)		(0.13)	(0.11)	(0.04)
Real interest rate (r)	-0.54	-0.05	-	-5.46	1.74	-	-
	(0.44)	(0.57)		(3.37)	(3.63)		

(*) Standard errors in brackets

[8] The restriction that the long run elasticities of income and wealth should add-up to one is understood as a constraint on the whole household demand –private consumption and housing investment-. In this way it has been considered in the quarterly econometric model of Bank of Spain. See Ortega et al. (2007).

Table 5 Consumption VAR: disaggregated wealth and interest rate (a)

Endogenous variables: cnd. cd. yl. hw. r
Conditioning variables:nfw
Sample period: 1987 (1) to 2007 (4)

Long run (ß-coeff.)		cnd*	cd*	yl*
non-durable	cnd	-	0.00 [-]	1.00 [-]
durable	cd	0.00 [-]	-	0.00 [-]
labor income	yl	0.50 [-]	0.50 [-]	-
housing wealth	hw	0.13 [0.01]	0.11 [0.04]	0.00 [-]
net financial wealth	nfw	0.09 [0.02]	0.68 [0.07]	0.00 [-]
real interest rate	r	0.84 [0.35]	0.00 [-]	0.00 [-]
Error correction (a-coeff.)		(cnd -cnd*)	(cd -cd*)	(yl -yl*)
	Δcnd	0.03 [0.11]	0.03 [0.02]	0.07 [0.05]
	Δcd	-1.32 [0.48]	-0.46 [0.1]	-0.89 [0.20]
	Δyl	0.25 [0.09]	0.02 [0.02]	-0.05 [0.04]
	Δhw	0.18 [0.07]	0.02 [0.01]	0.02 [0.03]
	Δr	0.72 [0.24]	0.1 [0.05]	0.11 [0.10]

LR-test. rank=3: $Chi^2(4) = 26.938$ [0.0000] **

(a) Standard errors in brackets. In the likelihood ratio test. the significance level is in brackets.

the long-run co-movements among the other variables.

Then, a new VAR is estimated with the following variables: non-durables, durables, labour income and housing wealth, together with net financial wealth, which is treated as a weakly exogenous variable. In this case the values of the parameters of non-durable spending are similar to the ones seen before while those of durable consumption appear somewhat undetermined due to the collinearity between income and wealth. Thus, two alternatives are presented in Table 6: the first one with elasticity of durables to labour income of 0.5 and a high value for the coefficient of financial wealth, and the second one, with unit elasticity to income and a lower parameter of financial wealth, while housing wealth becomes non-significant. The restrictions implied by both specifications are not rejected at conventional significance levels thus pointing out the difficulty of disentangling the link between durable spending, income and wealth, at least with this sample data. Nonetheless, the relationship between non-durable expenditures and wealth is well determined and fairly robust to several specifications. The recursive estimation of these coefficients also behave fairly stable (see Figure 6).

Then, it may be obtained an approximate idea of the magnitude of the wealth effects on consumption, since non-durables stand for about 90 % share of total consumption. The elasticity of non-durables to housing wealth is very similar to the one corresponding to financial wealth (Table 6) -leaving aside the possibility that the portion of transitory changes may be larger in financial wealth-. Because of very

Table 6 Durable and non durable consumption VAR

Basic model (a)

Endogenous variables: cnd. cd. yl. hw
Conditioning variables:nfw
Sample period: 1988 (1) to 2007 (4)

Long run (β-coeff.)		cnd*	cd*	yl*
non-durable	cnd	-	0.00 [-]	1.00 [-]
durable	cd	0.00 [-]	-	0.00 [-]
labor income	yl	0.50 [-]	1.00 [-]	-
housing wealth	hw	0.13 [0.00]	0.01 [0.04]	0.00 [-]
net financial wealth	nfw	0.12 [0.01]	0.40 [0.07]	0.00 [-]
Error correction (a-coeff.)		(cnd -cnd*)	(cd -cd*)	(yl -yl*)
	Δcnd	-0.34 [0.15]	0.02 [0.02]	0.02 [0.06]
	Δcd	-2.30 [0.73]	-0.45 [0.09]	-1.36 [0.32]
	Δyl	0.35 [0.13]	0.01 [0.02]	0.02 [0.06]
	Δhw	0.65 [0.35]	0.08 [0.05]	0.34 [0.16]

LR-test. rank=3: $Chi^2(2) = 3.7007$ [0.1572]

Marginal propensity to consume

		cnd	cd
Housing wealth			
	(average)	0.020	0.000
	(2007)	0.012	0.000
Net financial wealth			
	(average)	0.066	0.024
	(2007)	0.064	0.026

Endogenous variables: cnd. cd. yl. hw
Conditioning variables:nfw
Sample period: 1988 (1) to 2007 (4)

Long run (β-coeff.)		cnd*	cd*	yl*
non-durable	cnd	-	0.00 [-]	1.00 [-]
durable	cd	0.00 [-]	-	0.00 [-]
labor income	yl	0.50 [-]	0.50 [-]	-
housing wealth	hw	0.13 [0.00]	0.14 [0.03]	0.00 [-]
net financial wealth	nfw	0.12 [0.01]	0.52 [0.06]	0.00 [-]
Error correction (a-coeff.)		(cnd -cnd*)	(cd -cd*)	(yl -yl*)
	Δcnd	-0.35 [0.14]	0.02 [0.02]	0.01 [0.05]
	Δcd	-1.84 [0.68]	-0.45 [0.09]	-0.90 [0.24]
	Δyl	0.34 [0.13]	0.01 [0.02]	0.01 [0.04]
	Δhw	0.57 [0.33]	0.08 [0.05]	0.26 [0.12]

LR-test. rank=3: $Chi^2(2) = 3.7007$ [0.1572]

Marginal propensity to consume

		cnd	cd
Housing wealth			
	(average)	0.020	0.002
	(2007)	0.012	0.002
Net financial wealth			
	(average)	0.066	0.031
	(2007)	0.064	0.034

(a) Standard errors in brackets. In the likelihood ratio test. the significance level is in brackets.

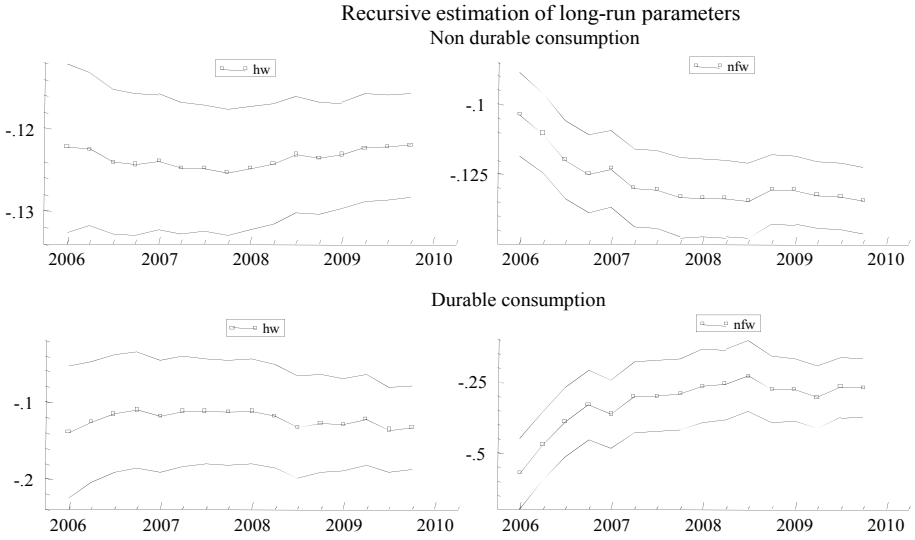

Fig. 6

different ratio of consumption to wealth, the marginal propensity to consume non-durables (mpc) out of financial wealth is however far larger, about 6 cents, than the mpc out of housing wealth, between 1 and 2 cents [9]. On the other hand, one euro rise in financial wealth would be associated with an increase of about 2.5-3.5 cents in durables, while one euro rise in housing equity would have a negligible effect. Thus, total consumption would increase between 1 and 2 cents with a one euro rise in housing wealth and about 9-10 cents with a one euro rise in net financial wealth [10]. These results are in line with the estimates obtained for other European countries, like France or Italy, for which housing wealth is associated with smaller changes in consumption than non-housing assets. The main difference is the effect of financial wealth, which appears somewhat larger in Spain than in these two countries, although the estimates with more recent data point to a lower effect of net financial wealth (see Figure 6).

In this restricted VAR the third cointegration relation involves labour income and non-durable consumption with a unit coefficient (yl – cnd), and captures the stable behaviour of the ratio of non-durable spending to labour income in Spain since the early nineties, as described in section 2 [11]. This relationship together with the cointegrating vector linking non-durable spending, wealth and labour income imply that

[9] Bover (2005) reports a mpc out of housing wealth of about 2 cents with Spanish household data.

[10] These estimates should be viewed as a first approximation to the link between consumption and wealth since no distinction has been made between permanent and transitory movements in the variables.

[11] Sastre and Fernández-Sánchez (2005) also obtained this same stationary relationship when they considered that the cointegration rank was 3.

there are other stationary relationships linking wealth components and income.

In addition to the parameters of the ß matrix, the long run properties of the endogenous variables in the VAR also depend on the adjusting mechanisms which allow equilibrating the system when there are deviations from the long run paths, i.e. the α-coefficients or loadings. These coefficients indicate the reaction of each endogenous variable in the VAR to departures from the estimated long run paths. This makes it clear why these systems are called Vector Error Correction Models (VECM). In cases of multi-cointegration –several cointegrating relations-, as is our case, the equilibrating mechanisms may become varied and complex.

In the two systems shown in Table 6, the deviations of non-durable spending from its long-run path (cnd*) -given by income, housing and financial wealth and the ß-coefficients- are closed by changes in three variables: a self-correction in non-durables given by the negative coefficient of Δcnd to (cnd – cnd*), and a reaction in labour income and housing wealth, both with a positive sign. If consumption expenditures are above their long-term trend, as made it clear in section 3.1, that must be either because of expectations of higher future returns to assets, or expected increases of labour income, or because of a lower planned consumption growth, or a combination of them. Since consumers take into account relevant information to form their expectations it happens that, in practice, these expectations end up being self-fulfilled to a certain extent, i.e. labour income and housing wealth returns react as consumers expected to do [12]. In the case of departures of durable consumption from its long-run path (cd - cd*), these are adjusted via a self-correction in durables. These expenditures do not only react to this gap, but also to those situations in which the non-durables deviate from its long-run path (cnd – cnd*), i.e. durables are used as an adjusting mechanism when there is an "excessive" consumption in non-durables. Likewise, when the ratio of non-durable spending to labour income is above or below its long-run level –the third cointegrating relation- there is also a response of spending on durables. The interpretation of this is as follows. If this ratio is above its long-term value, that implies that savings (yl – cnd) are below its long-run value, and -according to Campbell (1987)- this may be seen as reflecting consumers expectations of higher future income growth which make consumers react by increasing their holdings of durables. This kind of reaction fits well with the stylized fact that durable consumption tends to anticipate business cycle movements. The last adjusting mechanism captured in these VECMs is a reaction of housing wealth to changes in that ratio of non-durables to income. When this ratio is below its long-run level, these savings (yl – cnd) are above it, feeding through housing wealth increases, which push up non-durables to reach its log-run equilibrium.

[12] According to Lettau and Ludvigson (2001) study, deviations from the common trend of consumption, labour income and asset wealth contain predictive elements for stock market returns in the US.

The equilibrating mechanisms either through income or asset returns (or both) were firstly described in Lettau & Ludvigson (2001) and have also been found in previous studies for several European countries [13]. The adjustment through durables when non-durables deviates from its shared trend with labour income and wealth and the quick response implied by the coefficient of its own error correction term both point to durable acquisitions as one of the main mechanisms used to smooth non-durable consumption. This interpretation fits well with the larger variability shown by durables as compared to non-durable spending which was pointed out in section 2.

The three cointegrating relations already described are shown in Figure 7. While the fitted long-run path of non-durables and labour income track very closely the observed variables, the fitted path of durables deviates from the observed data in a persistent way, mainly during the first ten years of the sample period. This suggests that there might be some missing variable in the estimated long-run relationship. This possibility is explored in the next section.

5.2 Extensions of the basic model

The main candidates to account for the departure of observed durables from its estimated long-term path are credit availability and the relative price of durables, as suggested in section 2. The decision to purchase a durable good implies an up-front payment, since the services obtained from that good extend over several periods. Then it may appear sensible to also differ the funding of that purchase over time by resorting to external finance and periodic payments of that debt instead of doing it through income saved from non-durable consumption at the time of purchasing durable goods. Another alternative to acquire durables is to liquidate financial assets. The empirical relevance of credit to understand consumption developments has been highlighted in several studies, some of them analysing the impact of financial liberalisation on aggregate consumption [14].

In order to explore the ability of credit to help understand developments in the acquisition of durables, a new VECM was formulated by adding the stock of loans for the purchase of durables to the basic empirical model of the previous section. This variable -which is first order integrated- experienced a strong growth in the second half of the eighties and stabilized, or even decreased, in the first half of the nineties,

[13] See the studies by Fernández-Corugedo et al. (2003) for the UK, Chauvin and Damette (2009) for France, Bassanetti and Zollino (2009) for Italy and Sastre and Fernández-Sánchez (2005) for Spain. In all of them income was found to adjust to restore the long-run equilibrium. In the case of Italy, housing wealth was also an adjusting mechanism.

[14] See, for instance, Japelli and Pagano (1994), Bacchetta and Gerlach (1997) and Aron et al. (2007).

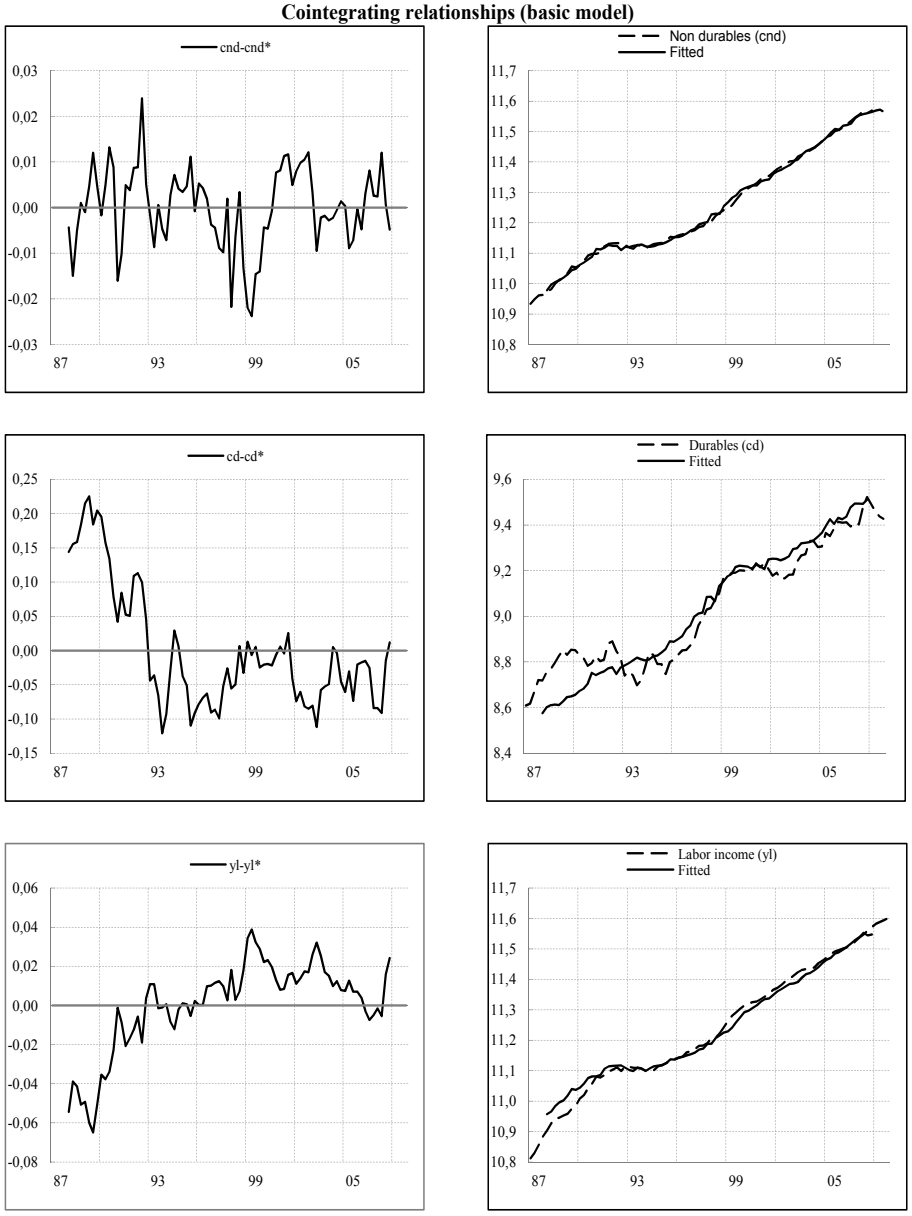

Fig. 7

showing a profile quite similar to developments in durables acquisition (Figure 5). The results of this estimation are reported in Table 7. According to it loans enter the long-run relation which determines the shared common trend of durables, income and wealth with a positive coefficient, though borderline significant. It also enters

the third relationship between non-durable consumption and labour income with a negative sign. This can be interpreted as a substitution effect between savings from non–durable spending and credit, two variables embedded in the consumer budget constraint at each period of time. This substitution is also channelled through a negative response of loans for purchasing durables to an increase in savings above its long-run -captured by the third cointegrating relation-, which is given by the α–coefficient of Δcdur to deviations from that relationship.

The other features of the basic model remain fairly similar except for the fact that net financial wealth enters now the relationship between labour income and non-durable consumption. This last relation becomes now a kind of linear combination of the second and third relationships of the basic model and results more difficult to interpret. Though the over-identifying restrictions implicit in this VECM are easily accepted, the introduction of credit transforms the third cointegrating relationship in a kind of approximation to a consumer budget constraint. Besides ofconsumption and labour income, this would include net property income, credit and financial assets. Under this set-up the mean-reverting behaviour of the non-durable to labour income ratio has implications over the long-run profile of the other variables of the budget constraint. Thus, some combination of them must also exhibit a stationary behaviour [15]. To determine which specific combination is an empirical matter which is farther from this analysis and may be addressed in future research. Another aspect to be considered is that credit is more likely to be linked to durables, income and wealth in the short to medium run than in the long-run. Then it should not appear in the cointegrating relationships and it would be better incorporated as an explanatory variable once the dynamics of the vector error correction is fully specified.

Another factor which is thought to have some explanatory power of the observed swings in the profile of durables over time is its relative price. A VAR system was estimated by adding the change in durables relative price to the basic empirical model of the previous section (Table 7). Although this variable is of a lower order of integration than the other endogenous variables, nothing precludes the possibility that a stationary variable appear in a relationship among other variables which cointegrate. In general, the relative price of durables was found to affect the long-run of durables with a negative sign. However, the best specifications in terms of not rejection of the identifying restrictions were those in which the relative price appears in the relation between income and non-durables. This may suggest that changes in the ratio of non-durables to labour income are related to changes in the relative price of durables. Thus, a slowing of relative price of durables will make more attractive those goods and consumers will tend to adjust down the ratio of non-durable spending to labour income increasing their savings.

[15] For instance, one possibility would be that the ratio of investment in durable goods and in financial assets to an aggregation of net property income and new loans for durables purchasing were stationary.

Table 7 Durable and non durable consumption VAR

Basic model and credit (a)

Endogenous variables: cnd. cd. yl. hw. cdur
Conditioning variables:nfw
Sample period: 1987 (1) to 2007 (4)

Long run (β-coeff.)		cnd*	cd*	yl*
non-durable	cnd	-	0.00 [-]	1.00 [-]
durable	cd	0.00 [-]	-	0.00 [-]
labor income	yl	0.50 [-]	0.50 [-]	-
housing wealth	hw	0.13 [0.01]	0.13 [0.04]	0.00 [-]
net financial wealth	nfw	0.10 [0.01]	0.19 [0.07]	0.17 [0.02]
durable credit	cdur	0.00 [-]	0.11 [0.06]	-0.04 [0.01]
Error correction (a-coeff.)		(cnd -cnd*)	(cd -cd*)	(yl -yl*)
	Δcnd	-0.21 [0.11]	0.04 [0.02]	-0.06 [0.06]
	Δcd	-1.80 [0.55]	-0.53 [0.10]	-0.86 [0.30]
	Δyl	0.30 [0.10]	0.03 [0.02]	-0.03 [0.05]
	Δhw	0.66 [0.24]	0.11 [0.05]	0.08 [0.14]
	Δcdur	-0.85 [0.63]	-0.04 [0.12]	-1.54 [0.35]

LR-test. rank=3: $Ch^2(2)$= 0.84828 [0.6543]

Basic model and relative price of durables (a)

Endogenous variables: cnd. cd. yl. hw. Δpdur
Conditioning variables:nfw
Sample period: 1988 (1) to 2007 (4)

Long run (β-coeff.)		cnd*	cd*	yl*
non-durable	cnd	-	0.00 [-]	1.00 [-]
durable	cd	0.00 [-]	-	0.00 [-]
labor income	yl	0.45 [-]	0.45 [-]	-
housing wealth	hw	0.14 [0.00]	0.12 [0.01]	0.00 [-]
net financial wealth	nfw	0.11 [0.01]	0.50 [-]	0.00 [-]
Δdurable price	Δpdur	0.00 [-]	0.00 [-]	-9.38 [1.49]
Error correction (a-coeff.)		(cnd -cnd*)	(cd -cd*)	(yl -yl*)
	Δcnd	-0.28 [0.12]	0.04 [0.02]	0.05 [0.03]
	Δcd	-1.21 [0.60]	-0.55 [0.11]	-0.35 [0.13]
	Δyl	0.37 [0.11]	0.01 [0.02]	-0.05 [0.02]
	Δhw	0.58 [0.27]	0.11 [0.05]	0.12 [0.06]
	Δ^2pdur	0.06 [0.12]	-0.03 [0.02]	-0.09 [0.03]

LR-test. rank=3: $Ch^2(5)$ = 9.8531 [0.0795]

(a) Standard errors in brackets. In the likelihood ratio test. the significance level is in brackets.

6 Conclusions

This paper offers an updated assessment of the magnitude of wealth effects on Spanish consumption by distinguishing the consumption of durables from that of non-durables. This breakdown makes it possible to uncover several differences in wealth effects: housing equity affects non-durable consumption with a marginal propensity to consume of 1-2 cents, while the mpc out of financial wealth is about 6 cents. In the case of the spending on durables the mpc out of financial wealth is lower while that of housing wealth is negligible. Thus, the strongest wealth effects concentrate on non-durable consumption which stands for 90% of total private consumption. These values are in line with those obtained in other studies, though the effect of financial wealth estimated in this paper may be somewhat higher and more comparable to the effect of non-equity net financial wealth [16].

Furthermore, the distinction between non-durable and durable expenditures enriches the analysis by providing a better understanding of the adjustments in consumer's decision variables. According to our empirical model durable consumption plays an important role as an adjustment variable to smooth consumption over time, as it reacts to situations of "excessive" or "scarce" expenditure on non-durables and also appears to anticipate future changes in labour income. On the other hand, the historical stability of the ratio of non-durables to income suggests that the aggregate of durables and "savings' –whose definition depends on the assumed consumer budget constraint- should also have been fairly stable, exhibiting a long-term substitution between them.

Lastly, there is also evidence that labour income and housing wealth adjust in the short run to achieve long-run equilibrium of non-durable spending, similarly to the findings of Chauvin & Damette (2009) and Bassanetti & Zollino (2009) for France and Italy, respectively. In the US the main adjusting mechanism comes instead from returns to financial wealth, as shown in Lettau & Ludvigson (2001, 2004).

[16] See Altissimo et al. (2005).

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Acknowledgements We wish to thank our discussants Valerie Chauvin (Banque de France) and Jean-Pierre Villetelle (Banque de France). We are also grateful to seminar participants at Banca dÍtalia, Alberto Cabrero, Josè Manuel Gonzàlez and Juan Peñalosa for their comments and suggestions.

Appendix1. Data sources

Non-durable consumption	National Accounts. Breakdown by expenditure function and conjuntural indicators. INE and Banco de EspaÃ±a
Durable consumption	National Accounts. Breakdown by expenditure function and conjuntural indicators. INE and Banco de EspaÃ±a
Labour Income	Disposable non-property income with household surplus net of fixed capital consumption and imputed residential rents. National Accounts and own calculations.INE and Sastre and Fernández-Sánchez (2009)
Housing wealth	Census of houses and house price. Housing Ministry
Net financial wealth	Household financial assets minus liabilities. Quarterly Financial Accounts Banco de España
Real interest rate	Nominal interest rate for house purchasing minus inflation as measured by private consumption deflator. Banco de España and INE
Relative price of durables	Durables deflator relative to private consumption deflator. National Accounts. Breakdownby expenditure function and conjuntural indicators. INE
Credit for durable purchasing	Nominal credit for durable purchasing of banks and savings banks divided by private consumption deflator. Banco de España and INE

Appendix2. Diagnostic tests for consumption VARs

Tests on residuals: (1987.I - 2007.IV; lag order = 4)

Endogenous variables: cnd. cd. hl. nfw. hw. r
Conditioning variables in cointegrating relationships:
Dummys: constant. I922. I923. d92I

	B-P(9)	LM(1-5)	NORM Chi2(2)	ARCH4
non-durable consumption (cnd)	3.707	0.69 [0.63]	1.77 [0.41]	0.59 [0.67]
durable consumption (cd)	7.054	0.89 [0.49]	2.31 [0.31]	0.39 [0.81]
labor income (yl)	3.297	0.43 [0.83]	3.48 [0.18]	0.23 [0.92]
net financial wealth (nfw)	14.888	2.30 [0.06]	0.78 [0.68]	1.98 [0.11]
housing wealth (hw)	3.836	0.88 [0.50]	4.58 [0.10]	0.73 [0.58]
real interest rate (r)	3.931	0.52 [0.76]	0.18 [0.92]	2.32 [0.07]

Endogenous variables: cnd. cd. hl. hw
Conditioning variables in cointegrating relationships: nfw
Dummys: constant. I922. I923. d92I

	B-P(9)	LM(1-5)	NORM Chi2(2)	ARCH4
non-durable consumption (cnd)	3.206	0.86 [0.51]	0.63 [0.73]	0.42 [0.79]
durable consumption (cd)	5.950	1.05 [0.40]	1.41 [0.49]	0.69 [0.60]
labor income (yl)	4.382	0.37 [0.86]	3.13 [0.21]	0.07 [0.99]
housing wealth (hw)	16.472	2.34 [0.05]	0.79 [0.67]	1.77 [0.15]