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The impact of unanticipated wealth effects on consumption: evidence from Spanish panel data

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Abstract

Purpose – The purpose of this study is to estimate the housing wealth effect on non-durable consumption using data from the Spanish Survey of Household Finances (Encuesta Financiera de las Familias, SHF) for the period 2002–2017.

Design/methodology/approach – The authors aim at identifying the effect of anticipated and unanticipated housing wealth changes on consumption with the sample of homeowners, following Paiella and Pistaferri (2017).

Findings – Results of this study lead us to conclude that there exists a strong housing wealth effect on consumption for the Spanish households.

Originality/value – The authors provide evidence against the permanent income model. They also analyse how the results change with income expectations, age and the household indebtedness rate. Finally, they detect a strong excess sensitivity to income.

Keywords Wealth effect on consumption, Subjective expectations, Instrumental variables, Panel data

Paper type Research paper

1. Introduction

The 2008 financial crisis as well as the subsequent economic development produced a renewed interest in studying the wealth effect on consumption [1]. This interest has been reinforced by the recent attention given to the relevance of monetary policy and the mechanisms through which its impacts are transmitted, particularly with regard to consumption [2].

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According to the life cycle model, individuals smooth their consumption across time to maintain a constant marginal utility between periods. The only source of uncertainty in the standard version of the model is related to unexpected changes in earnings. However, even when income remains constant, variations in asset prices will alter wealth and might have effects on the optimal consumption path. This is referred to as the wealth effect on consumption in the empirical literature, as Paiella and Pistaferri (2017) noted.

Previous empirical research on the wealth effect on consumption has used diverse sorts of data: aggregate, cross-country and household-level data. Studies using aggregate data include Lettau and Ludvigson (2001, 2004). Case *et al.* (2005), Ludwig and Sløk (2004) and Slacalek (2009) provide cross-country studies. Finally, Juster *et al.* (2006) and Di Maggio *et al.* (2020) use household-level data. Further, other papers that study the relationship between wealth and consumption are Paiella (2007), Arrondel *et al.* (2019), Fisher *et al.* (2020), Trivin (2022) and Cutanda and Sanchis-Llopis (2022), with microeconomic data, and Carroll *et al.* (2011) and Kichian and Mihic (2018), with aggregate data.

Despite relying on the consumption intertemporal choice model, the majority of studies analysing the wealth effect on consumption do not distinguish between exogenous and endogenous wealth changes or between anticipated and unanticipated changes, as noted by Paiella and Pistaferri (2017). This might be due to the lack of information on subjective expectations in the statistical microeconomic databases available [3]. The distinction between anticipated and unanticipated changes is crucial in the study of wealth effects, as the *pure* wealth arises specifically from the exogenous component of unanticipated wealth changes (i.e. due to changes in the asset prices). Further, if expectations are rational, consumption should only react to unexpected wealth changes.

In this work, we analyse the housing wealth effect for Spain, distinguishing between endogenous/exogenous and anticipated/unanticipated wealth changes, using data from the Survey on Household Finances (*Encuesta Financiera de las Familias*, SHF) for the period 2002–2017. This data set provides information on subjective expectations for home wealth since 2011. We consider Spain an interesting case study, as it is one of the three countries (together with the USA and Ireland) that suffered a bubble in housing prices that burst at the onset of the financial crisis. Further, the Spanish rate of homeownership is one of the highest among the developed countries. Thus, it seems relevant to analyse what happened during the housing bubble.

The findings show the existence of (anticipated and unanticipated) housing wealth effects on Spanish non-durable consumption, which provides evidence against the permanent income model with rational expectations. We do not observe this effect, however, among the youngest or those who anticipate higher-than-average future income. Furthermore, neither the rate of indebtedness nor the variation in mortgage have an impact on the link between non-durable spending and wealth. We also find that the relationship between non-durable consumption and housing wealth broke along the upswing phase of the real estate bubble and emerged again after the financial crisis. Finally, we detect a strong excess sensitivity to income.

The rest of the paper is organised as follows. Section 2 presents the theoretical model. In Section 3, we describe the data used. Section 4 is devoted to the empirical model. Finally, in Section 5, we discuss the results. And Section 6 concludes.

2. The theoretical model

In the classic infinite horizon model with liquid assets and perfect capital markets, individual consumption depends on expected wealth. Using Deaton (1992), the individual consumption in period t is given by:

$$C_{i,t} = \frac{\alpha r}{1+r}\left[A_{i,t} + \sum_{k=0}^{\infty}\left(\frac{1}{1+r}\right)^{k} E_{i,t}y_{i,t+k}\right] = \frac{\alpha r}{1+r} W_{i,t} \quad (1)$$

where $C_{i,t}$ is real nondurable consumption for individual i and period t, r is the real rate of return (assumed constant), α is the marginal propensity to consume out of permanent income (assumed to be constant), $E_{i,t}$ is the mathematical expectations operator, conditional on the individual information in t ($I_{i,t}$) and $W_{i,t}$ is the life-cycle expected wealth in period t.

In expression (1), researchers typically use present, rather than predicted, measures for wealth. This is so as there were not appropriate measures for wealth (until very recently) to account for individual expectations in the empirical investigation of wealth effects on consumption. As a result, research based on current wealth links changes in current consumption to changes in current wealth:

$$\Delta C_{i,t+1} = \gamma + \gamma_w \Delta W_{i,t+1} \quad (2)$$

Since our objective is to estimate the housing wealth effect on consumption, from now on the variable $W_{i,t}$ will refer to this wealth. In this approach, studying wealth effects on consumption consists of testing the statistical significance (and value) of the coefficient γ_w [4].

We would like to note that, from a theoretical point of view, the existence of a pure housing wealth effect on consumption is controversial. As pointed out by Buiter (2010), it should not exist in a representative agent model, as real estate wealth is simultaneously considered as an asset and a consumption good. However, the empirical evidence is overwhelmingly in favour of the existence of a housing wealth effect (Campbell and Cocco, 2007; Paiella, 2009; Disney and Gathergood, 2011; Aladangady, 2017; Guren *et al.*, 2021; Christelis *et al.*, 2021).

Going back to our model, Paiella and Pistaferri (2017) suggest a method to separate the anticipated from the unanticipated wealth effect. This method uses data on individuals subjective expectations. Assuming that individual's wealth is composed of J different assets, $A^j_{i,t}$, with prices $p^j_t, j = 1,\ldots,J$ [5], wealth in period t will be given by:

$$W_{i,t} = \sum_{j=1}^{J} W^j_{i,t} = \sum_{j=1}^{J} p^j_t A^j_{i,t} \quad (3)$$

The wealth effect is the consumption reaction to exogenous changes in wealth rather than endogenous changes. To differentiate between endogenous and exogenous changes, they define exogenous wealth changes as those that arise from variations in asset prices, whereas endogenous changes are those related to deliberate modifications of individual portfolios. Thus, $\Delta W_{i,t+1}$ can be decomposed as:

$$\begin{aligned}\Delta W_{i,t+1} &= \sum\nolimits_{j=1}^{J} W^j_{i,t+1} - \sum_{j=1}^{J} W^j_{i,t} = \sum_{j=1}^{J} p^j_{t+1} A^j_{i,t+1} - \sum_{j=1}^{J} p^j_t A^j_{i,t} \\ &= \sum_{j=1}^{J} p^j_{t+1}\left(A^j_{i,t+1} - A^j_{i,t}\right) + \sum_{j=1}^{J}\left(p^j_{t+1} - p^j_t\right)A^j_{i,t} = \Delta W^E_{i,t+1} + \Delta W^X_{i,t+1} \end{aligned} \quad (4)$$

where $\Delta W^{E}_{i,t+1}$ is the expected endogenous change in wealth and $\Delta W^{X}_{i,t+1}$ is the corresponding expected exogenous change. Further, Paiella and Pistaferri (2017) extend their analysis to distinguish between anticipated and unanticipated exogenous wealth changes by introducing the subjective expectations on asset prices. So, to decompose the total exogenous wealth change into the anticipated and unanticipated components, they add and subtract $E_t p^j_{t+1}$ to obtain:

$$\Delta W^{X}_{i,t+1} = \sum_{j=1}^{J}\left(E_{i,t}p^j_{t+1} - p^j_t\right)A^j_{i,t} + \sum_{j=1}^{J}\left(p^j_{t+1} - E_{i,t}p^j_{t+1}\right)A^j_{i,t} = \Delta W^{XA}_{i,t+1} + \Delta W^{XU}_{i,t+1} \quad (5)$$

where $\Delta W^{XA}_{i,t+1}$ is the anticipated exogenous increase in wealth and $\Delta W^{XU}_{i,t+1}$ is the unanticipated one.

This approach points out the weaknesses of earlier empirical research on wealth effects as: empirical tests for wealth effects on consumption might be biased, given that the measures used to account for wealth changes might be contaminated by endogenous changes, and individual data is more appropriate to empirically analyse wealth effects because aggregate data could provide biased estimates of the wealth effect in the presence of heterogenous economic behaviour.

Following Paiella and Pistaferri (2017) procedure, testing for wealth effects on consumption would imply estimating the following equation instead of previous equation (2):

$$\Delta C_{i,t+1} = \gamma + \gamma_A \Delta W^{XA}_{i,t+1} + \gamma_U \Delta W^{XU}_{i,t+1} \quad (6)$$

that allows for different responses to anticipated and unanticipated changes. In this equation, γ_U captures the "pure" wealth effect on consumption. It is important to note that, according to the permanent income hypothesis with rational expectations, consumption should not react to anticipated changes in wealth, which implies that the estimate of γ_A should be zero in a regression of equation (6).

3. The data

In our empirical exercise, we use data from the Spanish *Survey on Household Finances,* SHF (Encuesta Financiera de las Familias), for the period 2002–2017, which collects information every three years. The SHF is a rotating unbalanced panel where about 6,000 individuals are interviewed in each wave. The study gathers comprehensive data on household wealth and assets, income, consumption and demographic characteristics. We use all the waves that were available at the time of conducting this research that have subjective expectations on the house wealth value starting in 2011. Thus, we have three observations about these expectations [6].

Spain is characterised by a low rate of rental homes. In our sample, 2002–2017, more than an 86% of households own their home, while about 9% live in a rented house. The remaining households live in free houses (about 5%) or in other tenancy regimes [7]. As we aim at estimating the pure wealth effect, the high rate of home owners we observe in our data is an advantage, as these individuals would be more affected by the wealth effect [8]. The composition of owners versus renters does not seem to have changed significantly in the recent years, despite the housing bubble.

In Table 1, we report some summary statistics of our sample [9]. We distinguish between homeowners and renters. The largest difference we observe between these samples is the average age. Thus, for house renters, the average age is 40 years, whereas for house owners, it is about 48.5 years. As regards the number of members and the number of adults in the

Variables	Home renters	Home owners
No. of members	2.63	2.72
No. of adults	2.24	2.35
Age head	40.13	48.52
Education 1	2.3%	3.0%
Education 2	32.9%	27.6%
Education 3	14.8%	14.0%
Education 4	10.0%	11.5%
Education 5	5.2%	3.3%
Permanent workers	33.2%	35.9%
Self-employed	6.2%	8.8%
Unemployed	14.2%	6.8%
Retired	13.2%	25.5%
Number of observations	2,506	24,781

Table 1. Descriptive statistics (weighted means). Home renters and home owners' samples

Notes: Educational dummies: Education 1 correspond to illiterate individuals (reference dummy); Education 2 corresponds to individuals with primary and secondary education; Education 3 captures specialised courses and labour insertion programmes in Spain; Education 4 corresponds to any special education requiring to have previously completed the secondary education; and Education 5 corresponds to college education
Source: Authors' own work

household, we observe similar figures for both samples. For the education level variables, the sample of house renters shows higher rates in Education 2, 3 and 5 as compared to the owner sample, which shows a higher rate in Education 4. Regarding the labour market, the sample of owners has a larger percentage of permanent contract workers as compared to the renters (35.9% vs. 33.2%) and exhibits a significantly higher rate of self-employed workers (8.8% vs. 6.2%). The rate of unemployed homeowners (6.8%) is lower than that of the renters (14.2%). We also observe a higher percentage of retired home owners than renters (25.5% vs. 13.2%).

The survey provides information on the subjective expectations of housing wealth, which is the main variable of interest in our study. For this variable, the survey reports five points of the subjective cumulative density function, although we group these points into three (see the procedure in Appendix 2). As pointed out by Paiella and Pistaferri (2017), the answers to these questions allow for the retrieval of relevant parameters of the housing wealth expectation distribution at the individual level. In contrast to the subjective expectations on asset returns in Paiella and Pistaferri (2017), the SHF questions about subjective expectations on housing wealth show a null non-response rate.

Finally, it is important to remember that Spain experienced a house bubble that burst in 2008, at the beginning of the financial crisis. To properly value our data on subjective expectations, it is important to acknowledge that our data pertain to the last years of the bubble decline phase. The average predicted likelihood that the house value would increase (drop) by at least 2% over our sampling period is 18.5% (27.1%), while the average expected probability that the house value will remain steady is 54.4%.

The measure of consumption we use is total non-durable consumption [10]. The measure we consider for income accounts for all types of household income except for asset income. Specifically, to obtain income, we add all the declared income from work, self-employment, unemployment benefits, pensions and any other declared perceived income not accruing from any asset. We also calculate a Stone price index for our measure of consumption, using the corresponding CPI for the expenditures that compose this aggregate, taken from the Spanish National Statistical Office (INE), and for total consumption, which is used to deflate our measures of wealth and income.

In our analysis, we use a gross of mortgage measure of housing wealth [11]. This is the appropriate measure according to the procedure used to separate anticipated from unanticipated house price changes.

4. The empirical model

The main objective of this work is to estimate the effect of housing wealth on consumption in Spain, distinguishing between expected and unexpected exogenous changes in housing wealth. The SHF offers details on house wealth subjective expectations, which are crucial for estimating the housing wealth effects.

The estimation of equation (6) assumes that data are accessible every year, although the SHF collects data every three years. Subjective expectations of housing wealth are provided for the following year, while consumption and wealth data are recorded for each survey year. This generates a timing problem for using the data on expectations that we circumvent, following and Paiella and Pistaferri (2017), assuming that housing wealth follows an AR(1) process. Using this procedure, we derive the following empirical equation [12]:

$$\Delta C_{i,t+1} = \gamma' + \gamma_A \Delta W^A_{i,t-2} + \gamma_U \Delta W^U_{i,t-2} + \gamma_z Z_{i,t+1} + \varepsilon_{i,t+1} \tag{7}$$

In the empirical specification, we will also control for demographic variables through the vector $Z_{i,t+1}$. The estimation of this equation points to the need to use panel data to adequately control for housing wealth and subjective expectations of housing wealth. We estimate this specification using instrumental variables and the generalised method of moments to mitigate endogeneity and measurement error problems. We check for the goodness of fit and the validity of the instruments set through the Hansen's test of overidentifying restrictions. This equation decomposes the total exogenous housing wealth change into the expected and unexpected components. Using equation (7) to test for these components requires that the real value of the assets (house) does not change between $t-2$ and $t+1$. In our empirical implementation, this requirement is fulfilled by selecting only the subsample of homeowners who do not sell their main or primary home.

In this equation, γ', γ_A, γ_U and γ_z are parameters to be estimated, and $\varepsilon_{i,t+1}$ is an error term with the usual properties. Additionally, we also consider two dummies for the subperiods before and after the financial crisis. During the 2000s, there were many changes in the housing and mortgage credit markets that could justify a varying housing wealth effect along the cycle.

From here, we investigate if our findings are affected by individuals expectations for future income, their amount of debt or their age. We will also conduct two robustness tests of the estimation results. The first one will verify if our estimates are robust to the inclusion of income as an additional regressor. Income change is frequently included in the empirical research on the wealth effect specification. Confirming that the effect of income (or its change) on consumption (or Euler first-order conditions) is statistically significant provides evidence against the permanent income model with rational expectations (excess sensitivity of consumption to income). Our second robustness test consists of adding the change in the mortgage to equation (7) to test whether this variable affects the consumption-wealth link [13]. If individuals take advantage of the increase in house prices to increase their mortgage to finance an increase in consumption, the parameter of the change in mortgage will be positive and statistically significant in the regression of equation (7), especially if we use in the test a gross measure of housing wealth. The resulting equation to estimate is similar to

Browning *et al.* (2013) model, although they decompose income changes in their anticipated and unanticipated components and include the after-tax interest rate as an additional covariate.

Note that if individual fixed effects exist and are correlated to unanticipated wealth change, estimating equation (7) by OLS would provide biased estimates. To avoid this problem, the estimation of equation (7) requires using robust methods, such as an instrumental variable approach.

In our empirical application, we use data on expectations to fit individual-specific subjective distributions. To compute the moments of this distribution, we make some assumptions about the underlying density function. Following Paiella and Pistaferri (2017), we assume a normal distribution for the subjective expectations on the house value (in Figure 1 we plot the distribution of household wealth) [14], $W_{i,t+1}$, with mean $E_{i,t}W_{i,t+1}$ and variance $var_{i,t}W_{i,t+1}$ [15].

The SHF gathers information for different months of the year that might have implications for our study [16]. It is likely that the economic environment for households, when answering the question on the value of their home, changes across different recording points, which could bias the empirical findings. To solve this issue, Paiella and Pistaferri (2017) propose modelling the expectation generation process to take into consideration the potential temporal differences. According to this, households' expectations depend on previous actual monthly returns as well as on a number of demographic factors. We follow this approach to *fill the blanks* and predict individual subjective expectations, assuming that housing price expectations are determined by an autoregressive process (see Appendix 3). This enables us to solve the timing problem mentioned above.

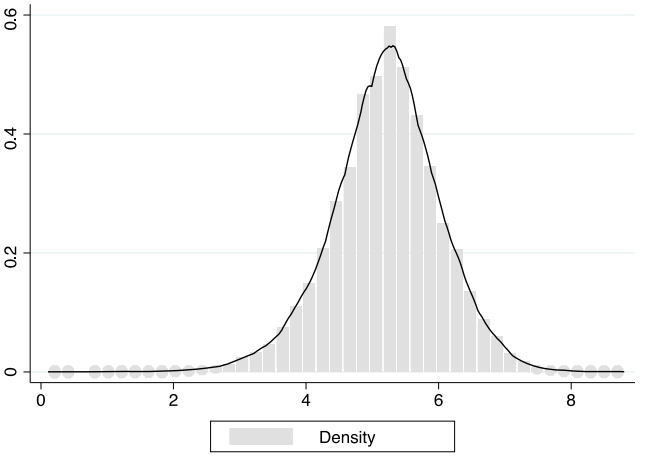

Figure 1.
Distribution of the log of the price of the primary/main house of the household in the SHF, 2002–2017

Notes: The bars represent the distribution of the log of the price of the house declared in the survey. The sample mean amounts to 5.201, and 0.821 is the standard deviation. The curve represents a fitted normal distribution (with the same mean and standard deviation) and a kernel density estimate of the empirical density
Source: Authors' own work

5. Results

In this section, we discuss the estimation results. We first report the house wealth effect for the sample of homeowners. Further, we will qualify the main results by selecting different samples that will account for the individuals' expectations for future income, their level of indebtedness and different age groups. Finally, we present the findings from two robustness tests.

5.1 The house wealth effect on homeowners' consumption

We analyse the effect of changes in house wealth on non-durable expenditures using the homeowner sample. We select this sample as it is expected that they show a higher housing wealth effect, especially in periods when house prices fall. For the value of house wealth, we do not exclude the value of mortgages and use gross house wealth, as we aim at evaluating exogenous changes in housing wealth to be able to separate the anticipated from the unanticipated price change.

In Table 2, we present the results of estimating equation (7) [17]. As it can be checked in column 1, there exists a strong and statistically significant relationship between non-durable expenditure and *gross* house wealth. According to this estimate, the Spanish households react to a 10% increase in the house wealth growth rate by increasing non-durable expenditure growth by 0.52%, with a *p-value* of 0.745 for the Hansen test [18]. The only demographic variable statistically significant is the dummy for the sex of the head. Neither the other demographic variables nor the educational dummies are statistically significant. Further, the variables reflecting the situation in the labour market (dummies for unemployment of the head of the household or his wife or other similar characteristics) are also statistically significant and show the expected sign. These results, which confirm the housing wealth effect hypothesis, can be considered as evidence against the postulates of the canonical model of intertemporal choice in consumption. According to this model, there should not exist a house wealth effect, as the increase in housing prices would be offset by higher implicit rental costs, Buiter (2010) [19].

We would like to point out that the value of the housing wealth effect for Spain that our results imply is in the range of the values obtained for other economies, even when we use non-durable instead of total expenditure in the estimations (as many studies do). The marginal propensities to consume out of housing wealth derived from our estimate are 0.011 for gross housing wealth and about 0.02 after the crisis. This marginal propensity lies in the lower part of the range of values for the related literature with individual data [20].

In columns 2 and 3, we decompose the housing wealth changes in two components: the anticipated and the unanticipated effect. Thus, in column 2, we obtain that only the unanticipated housing wealth increase is statistically significant, while the anticipated one is not significant, in line with the implications of the canonical model of intertemporal choice for consumption. Further, the estimated parameter for the unanticipated increase in housing wealth amounts to 0.77%, above the value obtained when we did not decompose the housing wealth change. As regards the demographic and labour market variables, we get similar estimates as in previous column, except that now the variables number of members and number of adults are also statistically significant and the variable sex loses its statistical significance. In column 3, we further distinguish the housing wealth changes to account for the financial crisis. Therefore, we will have the anticipated and unanticipated components for two periods, before and after 2008. In this case, the expansion of the specification reduces marginally the significance level of the Hansen test (with respect to column 2). Nevertheless, the results we obtain do not seem to support the model as the housing wealth effect is only statistically significant after 2008, both for the anticipated and unanticipated wealth changes [21]. The parameter estimate we obtain in this case for both components is higher than 1.0%.

Variables	(1)	(2)	(3)
House wealth (HW)	0.052** (0.022)		
Anticipated HW		0.023 (0.028)	
Unanticipated HW		0.077** (0.039)	
Anticipated HW before			−0.002 (0.046)
Unanticipated HW before			−0.004 (0.055)
Anticipated HW after			0.118** (0.049)
Unanticipated HW after			0.109** (0.049)
Age head	−0.006 (0.038)	0.002 (0.011)	0.002 (0.011)
Age head sq.	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
No. of members	0.064 (0.053)	0.085*** (0.032)	0.087*** (0.031)
No. of adults	0.102 (0.064)	0.078** (0.037)	0.076** (0.037)
Sex head	−0.044** (0.020)	−0.010 (0.017)	−0.017 (0.020)
Education 1	0.029 (0.036)	−0.004 (0.072)	0.009 (0.068)
Education 2	0.039 (0.036)	0.021 (0.036)	0.034 (0.037)
Education 3	0.046 (0.041)	0.024 (0.040)	0.030 (0.040)
Education 4	0.014 (0.036)	−0.000 (0.003)	0.006 (0.035)
Education 5	0.023 (0.069)	−0.001 (0.066)	0.005 (0.070)
Unemployed head	−0.162** (0.069)	−0.176** (0.062)	−0.168*** (0.067)
Unemployed wife	−0.139* (0.073)	−0.145** (0.071)	−0.141** (0.073)
More than 1 job head	0.050 (0.171)	0.031 (0.165)	0.038 (0.173)
Temporary job wife	0.131* (0.077)	0.133* (0.079)	0.126* (0.074)
Wife expect to work in $t+1$	0.030 (0.041)	0.019 (0.079)	0.022 (0.037)
Time dummies	Yes	Yes	Yes
Number of observations	2,741	2,741	2,741
Test overidentifying restrictions Hansen's J $Chi^2(1)$	4.800	14.492	13.152
p-value	0.745	0.512	0.489

Notes: 1. The set of instruments in column (1) are: the first lag of all covariates (except age of the head squared, the educational dummies and the labour-related variables); the differences of the number of members of the household and of age of the head squared; the educational variables; the lag and the difference of the maximum credit available for the household; dummies for the wife looking for a job, being self-employed, unemployed, having more than a job, being a temporary worker or expecting to work in $t+1$; dummies for the head of the household being unemployed, having more than one job, being a part-time worker or expecting to work in $t+1$; the time dummies; and a constant; 2. The instruments in column (2) are the same than in column (1) plus a dummy for the head of the household being an employed person, the year in which the main house is purchased and the increase of the log of the house price. The instruments set in column (3) is the same than in column (2) plus a dummy for the wife being employed; 3. ***, ** and *mean statistically significant at the 1, 5 and 10%, respectively

Source: Authors' own work

Table 2.
House wealth effect on non-durable consumption (house owners' sample)

All in all, the results reported in Table 2 do not allow us to ascertain whether the wealth effect vanished and subsequently reappeared, as we do not know if this effect was statistically significant before the crisis [22]. These results confirm a strong housing wealth effect on non-durable spending after the financial crisis, given that both the anticipated and unanticipated housing wealth changes are statistically significant. Finally, this evidence is against the permanent income model.

5.2 Potential channels behind the wealth effect

To investigate what might be the main drivers behind the wealth effect, we perform various empirical exercises [23]. First, we divide the sample between those individuals expecting the following year higher than usual income and the rest of individuals. With this exercise, we intend to verify if the relationship between individual non-durable consumption and wealth is affected

by expectations or uncertainty, given that the literature has identified the lack of information on this variable as the primary reason for the spurious positive relationship between wealth and consumption. Second, we analyse the impact of debts. For this exercise, we split the sample into two groups: households with a positive debt (of any kind) and those individuals without any kind of debt. Third, we divide the full sample into three age groups: less than 40, between 40 and 60 and more than 60 years old. In this exercise, our aim is to verify if the non-durable consumption-wealth relationship changes with age [24]. The purpose of these empirical checks is to delve deeper into the mechanisms at play in the relationship between wealth and consumption [25].

In Table 3, we compare the results, where we separate the total sample into two subsamples according to the expectations for income. In columns 1–3, we present the results for the optimistic individuals (those expecting higher than usual income), and in columns 4–6, we report the results for the complementary sample. As it can be checked, the consumption behaviour of the optimistic individuals is quite different from the consumption behaviour analysed previously in Table 2. In fact, the results indicate that the non-durable consumption of these individuals is not related to wealth, which can be explained by a deviation between the evolution of the expected income of these individuals and the current evolution of their wealth. Therefore, the consumption behaviour we find in Table 2 mainly reflects the consumption behaviour of individuals who expect either a decrease or no change in their income. This is verified by the results reported in columns 4–6 of Table 3. In fact, the wealth parameter estimated for these households is higher than the parameters reported in Table 2. In evaluating these results, it is important to consider two relevant factors: first, the number of optimistic individuals is about one quarter of the number of not optimistic individuals, which implies that the results reported in columns 1–3 might be more affected by measurement error than the results in columns 4–6; and second, our sample period can be conditioning our results, given that it covers both the upsurge and downturn phases of the Spanish housing bubble, which surely had a significant impact on individual expectations.

In Table 4, we report the results for the samples of individuals with and without debt. Thus, in columns 1–3, we have the results for the individuals without debt, and in columns 4–6, we report the results for the sample of individuals with debt [26]. The most relevant conclusion from these results is that it seems that debt does not affect the relationship

Variables	Individuals expecting an increase in their income (the following year) (1)	(2)	(3)	Individuals expecting no change or a decrease in their income (the following year) (4)	(5)	(6)
House wealth (HW)	−0.024 (0.069)			0.072*** (0.024)		
Anticipated HW		−0.042 (0.065)			0.027 (0.038)	
Unanticipated HW		−0.043 (0.092)			0.095** (0.049)	
Anticipated HW before			−0.082 (0.082)			0.037 (0.043)
Unanticipated HW before			−0.047 (0.100)			0.020 (0.051)
Anticipated HW after			0.133 (0.198)			0.122* (0.062)
Unanticipated HW after			0.110 (0.160)			0.113** (0.051)
Number obs.	591	591	591	2,150	2,150	2,150
Test overidentifying restrictions Hansen's J Chi2(1)	6.399	12.527	6.730	5.651	16.086	14.813
p-value	0.605	0.603	0.688	0.681	0.388	0.255

Notes: 1. All estimations include the set of demographic variables and time dummies (as in Table 2); 2. The instruments are the same used in the corresponding specifications of Table 2; 3. ***, ** and *mean statistically significant at the 1, 5 and 10%, respectively
Source: Authors' own work

Table 3.
House wealth effect on non-durable consumption. Conditional on the expectations on income

Table 4.
House wealth effect on non-durable consumption. Households debt vs. households without debt

Variables	Households without any type of debt (1)	(2)	(3)	Households with debts (mortgage or any other type) (4)	(5)	(6)
House wealth (HW)	0.040* (0.021)			0.071* (0.036)		
Anticipated HW		−0.003 (0.043)			0.053 (0.059)	
Unanticipated HW		0.084* (0.043)			0.093* (0.049)	
Anticipated HW before			−0.013 (0.059)			0.055 (0.053)
Unanticipated HW before			−0.016 (0.074)			0.044 (0.058)
Anticipated HW after			0.106* (0.057)			0.178 (0.114)
Unanticipated HW after			0.121* (0.068)			0.131* (0.079)
Number obs.	1626	1626	1626	1114	1114	1114
Test over identifying restrictions Hansen's J $Chi^2(1)$	5.685	16. 661	12.508	4.689	12.470	4.689
p-value	0.644	0.386	0.302	0.766	0.656	0.766

Notes: 1. All estimations include the set of demographic variables and time dummies (as in Table 2); 2. The instruments are the same used in the corresponding specifications of Table 2; 3. *means statistically significant at the 10%
Source: Authors' own work

between non-durable consumption and wealth, given that the results are quite similar across the different considered samples [27].

Table 5 shows the results for samples of different age cohorts: adults under the age of 40 (columns 1–3); individuals between the ages of 40 and 60 (columns 4–6); and individuals aged 60 or over (columns 7–9). In this case, the sample of younger people exhibits consumption patterns that are inconsistent with the life-cycle model postulates and lack any evidence of a relation to wealth. Contrarily, older people behave more consistently with the model and in line with the findings in Table 2. Further, this discrepancy is very similar to the one detected between individuals expecting higher income and the rest of individuals [28].

5.3 Robustness tests

Finally, in Table 6, we present a couple of robustness tests. First, in columns 1–3, we include among regressors the change in the log of the mortgage. Second, in columns 4–6, we include the change in the log of income. The comparison of the results in Tables 2 and 6 indicates that the inclusion of the log of the mortgage does not change our previous results. This new variable is never statistically significant, and the previous estimated housing wealth effects are barely changed. In light of the fact that we are using a gross mortgage measure of housing wealth, we believe that these results are particularly relevant. As a result, when combined with the earlier findings in Table 4, the results in Table 6 demonstrate that the change in mortgage debt has no impact on the rise in non-durable consumption. This result contrasts with the findings of Atalay *et al.* (2016), for Australia and Canada, or of de Andersen and Leth-Petersen (2021), for Denmark [29].

Our second robustness test consists of including the change in the log of income as an explicative variable (see columns 4–6 in Table 6). Although it is customary that empirical consumption functions estimating wealth effects, both with individual or aggregate data, include income as a covariate, finding that it is statistically significant in an empirical consumption function (or in a Euler first-order condition) has been traditionally considered as strong evidence against the permanent income/life cycle model with rational expectations. In our case, similarly to what occurs in the empirical research on wealth effects, income is

Table 5. House wealth effect on non-durable consumption, by age groups

Variables	Up to 40 years old (1)	(2)	(3)	From 40 to 60 years old (4)	(5)	(6)	More than 60 years old (7)	(8)	(9)
House wealth (HW)	0.011 (0.071)			0.064* (0.033)			0.047** (0.023)		
Anticipated HW		0.026 (0.110)			0.038 (0.058)			−0.012 (0.040)	
Unanticipated HW		−0.019 (0.080)			0.090* (0.047)			0.090** (0.042)	
Anticipated HW before			0.012 (0.138)			0.016 (0.054)			0.003 (0.053)
Unanticipated HW before			−0.013 (0.151)			0.004 (0.071)			0.013 (0.060)
Anticipated HW after			0.058 (0.157)			0.113* (0.065)			0.075 (0.109)
Unanticipated HW after			−0.005 (0.137)			0.126* (0.066)			0.119* (0.073)
Number obs.	406	406	406	1099	1099	1099	1236	1236	1236
Test over identifying restrictions Hansen's J $Chi^2(1)$	9.351	15.289	9.572	8.106	15.408	17.751	3.852	13.088	11.122
p-value	0.334	0.488	0.496	0.516	0.564	0.293	0.733	0.503	0.224

Notes: 1. All estimations include the set of demographic variables and time dummies (as in Table 2); 2. The instruments are the same used in the corresponding specifications of Table 2; 3. ** and *mean statistically significant at the 1 and 5%, respectively
Source: Authors' own work

Table 6.
House wealth effect on non-durable consumption. Robustness tests

Variables	Robustness test for mortgage (1)	(2)	(3)	Robustness test for income (4)	(5)	(6)
House wealth (HW)	0.052** (0.022)			0.041** (0.020)		
Anticipated HW		0.012 (0.036)			0.023 (0.039)	
Unanticipated HW		0.081** (0.037)			0.073** (0.036)	
Anticipated HW before			−0.001 (0.042)			−0.008 (0.042)
Unanticipated HW before			−0.007 (0.051)			−0.009 (0.053)
Anticipated HW after			0.114** (0.052)			0.110** (0.047)
Unanticipated HW after			0.111** (0.055)			0.103** (0.050)
Mortgage debt	−0.005 (0.014)	0.001 (0.025)				
Mortgage debt before			0.236 (0.271)			
Mortgage debt after			0.035 (0.061)			
Income				0.164*** (0.044)	0.131*** (0.024)	
Income before						0.135*** (0.027)
Income after						0.111** (0.052)
Number obs.	731	731	731	2,741	2,741	2,741
Test over identifying restrictions Hansen's J $Chi^2(1)$	4.845	14.437	9.714	4.639	15.555	14.175
p-value	0.742	0.515	0.272	0.778	0.439	0.248

Notes: 1. All estimations include the set of demographic variables and time dummies (as in Table 2); 2. The instruments are the same used in the corresponding specifications of Table 2, plus the lag of the log of all the mortgage or income variables we add in each case; 3. ***, ** and *mean statistically significant at the 1, 5 and 10%, respectively
Source: Authors' own work

statistically significant, with an estimated parameter around 0.11–0.16. Further, the inclusion of income reduces, in all cases, the size of the estimated parameter for the housing wealth effect. These results, jointly with the results analysed in previous ones, reinforce the evidence found against the canonical model of intertemporal choice in consumption.

6. Conclusions

In this paper, we have empirically analysed the housing wealth effect on non-durable consumption using a sample of Spanish homeowners extracted from the SHF for the period 2002–2017. We consider this empirical exercise quite interesting for different reasons. First, the SHF is a relatively new database not sufficiently exploited for empirical analysis. This data set collects individual data on consumption, income, assets and liabilities, and thus wealth, which makes it especially attractive to analyse consumption and saving behaviour. Second, the behaviour of the Spanish real estate market is an interesting case, as it presents one of the highest ownership rates in the world. This high rate might be explained by specific cultural reasons, although there are other relevant factors, such as the fact that Spain is one of the most important tourist destinations in Europe [30]. And third, Spain is one of the three economies that experienced a real estate bubble during the financial crisis, jointly the USA and Ireland. And this bubble is entirely in the period covered by our micro-data.

To analyse housing wealth effects on non-durable consumption, we follow Paiella and Pistaferri (2017) method for decomposing anticipated from unanticipated changes in housing wealth. The canonical intertemporal consumption model with rational expectations implies that only unanticipated changes in wealth can affect consumption. Thus, the decomposition of wealth into anticipated and unanticipated changes is relevant as it provides a powerful test for one of the implications of the model. The estimation results we obtain for the full-period sample are in line with the predictions of the model. However, this is not the case for the estimation results for the two subperiods considered (before and after 2008). The effects turn out to be significant after the crisis, as we get that both the anticipated and unanticipated housing wealth changes are statistically significant after 2008. In conclusion, although our results support the housing wealth effect on non-durable consumption, they do not support the permanent income model with rational expectations.

The marginal propensities to consume derived from our estimated elasticities, around 0.015, are in line with the values in the low range of values obtained for other economies and are similar to previous values obtained for the Spanish economy. This allows us to conclude that the housing wealth effect increased in Spain after the financial crisis.

We have checked whether the wealth effect estimated for the total sample changes when the model is estimated for specific relevant subsamples. In this regard, our findings show that neither the non-durable consumption of individuals who expect higher-than-usual income nor that of younger people responds to changes in home wealth. The rate of debt accumulation or the different forms of debt had no impact on the housing wealth effect. Furthermore, based on our findings, non-durable consumption likewise does not vary in response to changes in the amount of outstanding mortgage.

Finally, we have also checked if our results change when we expand the specification with the growth rate of income. We get evidence of a strong excess sensitivity of consumption to income, constituting a new piece of evidence against the intertemporal consumption model. Noteworthy, the absence of statistical significance for the variable capturing mortgages and the statistical significance of the variable income remain even when we separate between anticipated and unanticipated housing wealth changes or when analysing different subperiods.

Further issues we plan to analyse in our research agenda include verifying if there are differences between housing wealth effects when separating the house wealth effects of the

main house and secondary houses, with special attention to the period of the real estate bubble. Further, we consider that more research is needed in analysing the differences in behaviour of homeowners and renters and, in general, in individual consumption and saving behaviour depending on the size of wealth and on the age of individuals.

Notes

1. This is connected to the high debt accumulated prior to the crisis and the impact of some speculative bubbles in several countries, particularly the real estate bubble. Many studies have examined the link between debt and consumption patterns. See, for example, Dynan (2012), Mian *et al.* (2013), Mian and Sufi (2011) and Baker (2018).
2. See, for example, Flodén *et al.* (2017) or Kaplan *et al.* (2018).
3. There are some papers that distinguish between anticipated and unanticipated changes without using subjective expectations. These are Campbell and Cocco (2007) and Browning *et al.* (2013).
4. To estimate wealth effects, using equation (2) has an important empirical drawback: an OLS regression between consumption and current wealth could be spurious if consumption were related to the expectations on income or if both were jointly and simultaneously related to a third variable.
5. Given that all our measures of wealth are in real terms, we are implicitly assuming that these prices are expressed in relative terms with respect to the current general price index, P_t.
6. The SHF database uses multiple stochastic imputation techniques to minimise non-response rates and provides five different imputation files for each wave of data. To properly interpret the results, all coefficients and standard errors reported in the results are adjusted to account for the multiple imputation techniques implemented in the data. In this paper, we use the procedures and codes to manage these imputation files in estimation procedures provided by the Bank of Spain. A limitation of our study is that we were unable to use the *svy* command to estimate a more accurate variance using the EFF 1000 replicate weights to account for the cluster and stratification design of the survey. We estimate our models using the *Stata GMM* or *xtivreg* commands that are not supported by the *svy* command.
7. To evaluate these rates, one should bear in mind that the SHF overestimates the proportion of wealthy households. Nevertheless, the Bank of Spain provides weights to calculate national representative values.
8. The separate analysis of the samples of owners versus renters is classical in the empirical research of the housing wealth effect. We have calculated weighted means for each group of households.
9. We drop individuals with missing or zero values in relevant variables (non-durable and food expenditure, and total household income) and end up with a sample of 34,661 observations. We also discard observations for households in the upper 5% of the income distribution.
10. Individuals should answer the survey about their total non-durable consumption.
11. Thus, we will check the robustness of the results by adding the change in mortgage as a covariate.
12. For the derivation of the empirical equation, see Appendix 1.
13. Campbell and Cocco (2007) use the change in mortgage payments rather than the proper mortgage change.
14. Figure 1 provides evidence that the normality assumption does not seem unreasonable for the distribution of household wealth in Spain.
15. See Appendix 2 for details on the computation of the moments of the distribution.
16. We draw attention that the households interviewed by the SHF each month are different from those interviewed the previous month.

17. We have also estimated equation (7) for the whole sample using total wealth. A priori, one could expect that different types of individuals (retired, widowed, homeowners, renters, [. . .]) might have different consumption behaviour. The results we obtain with these samples are similar to those obtained with the homeowners' sample, except for the size of the wealth effect estimate. Further, we have verified that the results are very similar if we restrict the sample to households whose reference person has not changed his/her civil status (single, married, widowed, [. . .]) along the sample period. This sample represents about 35% of the total sample. These results are available from the authors upon request.
18. We estimate a higher effect for homeowners as compared to the total sample, which is in accordance with the results obtained by Zhang (2019) for the Netherlands. Further, when we run a similar regression for total expenditure, the estimated total wealth effect amounts to 0.81%. Additionally, we also tried with food expenditure, with similar results. These results are not reported but are available from the authors upon request.
19. Further, it should be noticed that we get similar estimates for the demographic and labour variables when using total wealth, which indicates that the relationship between non-durable consumption and wealth is very similar for the different types of wealth considered.
20. See Browning *et al.* (2013), Atalay *et al.* (2016), and compare these and other results in Zhang (2019) or Di Maggio *et al.* (2020). Further, our results are similar to those obtained by Bover (2005) using the 2002 SHF wave.
21. The prior finding in Column 2 and the fact that, according to the representative agent model, a pure home wealth impact should only be observed when the change in the price of the house is caused by a bubble make this last result relevant. See Buiter (2010).
22. Note that these results might be compatible with asymmetric responses of non-durable consumption to wealth housing changes. We thank an anonymous referee for suggesting this explanation.
23. We thank an anonymous referee for suggesting these exercises, which have enhanced the understanding of the results.
24. We do not consider an age band below 40 years due to the reduced size in the number of individuals.
25. For each specification of these exercises, we maintain the same instrument set as in Table 2.
26. The results for the sample of individuals with debts different to mortgage are not reported as they are very similar to the results reported.
27. We draw attention to the large proportion of people who are debt-free compared to the entire sample, which may be related to the SHF disproportionate representation of the population wealthier segment. Further, we should also notice that another factor is the significant presence of elderly households in the sample. Debt may possibly play a more significant role in the association between non-durable consumption and wealth for poorer people than for rich people, but this hypothesis would need to be confirmed using a different statistical survey.
28. Note that it is reasonable to assume that younger people will be more optimistic than older people in the way in which this term is used in the text. This result is in line with Campbell and Cocco (2007). We are grateful to an anonymous referee for pointing out this.
29. We recall that any of these economies experienced a real estate bubble in the period they analyse.
30. Spain is a golden retirement destination for many northern Europeans during the last 30–40 years.

31. We have confirmed that the results are robust to using alternative observations on subjective expectations, given that there are five questions on subjective expectations on housing wealth in our data.

32. Specifically, we have also tried with the lagged values of the housing wealth obtained from the previous monthly records in the SHF and the previous monthly data of the price of the m^2 of housing in the Spanish housing market, taken from an external statistical source (idealista.com). Both were worse predictors than lagged monthly averages of individual subjective expectations.

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Appendix 1. Derivation of the empirical equation to estimate

Data in the SHF are collected every three years, thus we consider that the increases in consumption and wealth are measured over a three-year period, and we get the following expression from equation (1):

$$\Delta C_{i,t+1} = C_{i,t+1} - C_{i,t-2} = \gamma' + \gamma_w \left(W_{i,t+1} - W_{i,t-2}\right) \tag{A.1}$$

By decomposing housing wealth as the product of the (real) housing price and the value of the asset *house*, we obtain equation (A.2):

$$\Delta C_{i,t+1} = \gamma' + \gamma_w \left[p_{t+1} A_{i,t+1} - p_{t-2} A_{i,t+1}\right] \tag{A.2}$$

And adding and subtracting the subjective expectations for housing wealth, $E_{i,t-2} p_{t+1} A_{i,t+1}$, we obtain:

$$\Delta C_{i,t+1} = \gamma' + \gamma_w\left[\left(E_{i,t-2}p_{t+1}A_{i,t+1} - p_{t-2}A_{i,t-2}\right)\right] + \left(p_{t+1}A_{i,t+1} - E_{i,t-2}p_{t+1}A_{i,t+1}\right) \tag{A.3}$$

This equation is affected by an expectation timing problem, given that the SHF t-2 wave provides the expectation for one period ahead ($E_{i,t-2}p_{t-1}A_{i,t-1}$) but not the expectation we need ($E_{i,t-2}p_{t+1}A_{i,t+1}$). To solve this issue, and following Paiella and Pistaferri (2017), we assume that housing wealth follows an AR(1) process as follows:

$$W_{i,t} = \rho W_{i,t-1} + \xi_t = \rho p_{t-1}A_{i,t-1} + \xi_t \tag{A.4}$$

From this expression, we can estimate ρ. Using the law of iterated expectations, we can write:

$$\begin{aligned} E_{i,t-2}p_{t+1}A_{i,t+1} &= E_{i,t-2}W_{i,t+1} = \hat{\rho}E_{i,t-2}W_{i,t} = \hat{\rho}^2E_{i,t-2}W_{i,t-1} \\ &= \hat{\rho}^2E_{i,t-2}p_{t-1}A_{i,t-1} \end{aligned} \tag{A.5}$$

Therefore, using this procedure, we can retrieve the subjective expectation we need for housing wealth.

Given that the objective of our research is to estimate the pure wealth effect exclusively associated with a change in the price of housing, we can write equation (A.3) as:

$$\Delta C_{i,t+1} = \gamma' + \gamma_w\left[\left(\hat{\rho}^2E_{i,t-2}p_{t-1}A_{i,t-2} - p_{t-2}A_{i,t-2}\right) + \left(p_{t+1}A_{i,t-2} - \hat{\rho}^2E_{i,t-2}p_{t-1}A_{i,t-2}\right)\right] \tag{A.6}$$

Additionally, to empirically estimate the effects of the expected and unexpected components of wealth change, we will distinguish the parameters associated with them:

$$\begin{aligned} \Delta C_{i,t+1} &= \gamma' + \gamma_A\left(\hat{\rho}^2E_{i,t-2}p_{t-1}A_{i,t-2} - p_{t-2}A_{i,t-2}\right) + \gamma_U\left(p_{t+1}A_{i,t-2} - \hat{\rho}^2E_{i,t-2}p_{t-1}A_{i,t-2}\right) \\ &= \gamma' + \gamma_A\Delta W^A_{i,t-2} + \gamma_U\Delta W^U_{i,t-2} \end{aligned} \tag{A.7}$$

Assuming that variables are in logarithmic terms, this equation implies that the housing wealth effect on consumption is estimated through the relationship between the growth rates of the relevant variables.

Finally, we will also control for demographic variables through the vector $Z_{i,t+1}$, so that equation (A.7) will become:

$$\Delta C_{i,t+1} = \gamma' + \gamma_A\Delta W^A_{i,t-2} + \gamma_U\Delta W^U_{i,t-2} + \gamma_z Z_{i,t+1} + \varepsilon_{i,t+1} \tag{A.8}$$

Appendix 2. Modelling the housing price expectations

In the SHF, the head of the household has to report the likelihood that the value of her/his home would remain unchanged, increases (decreases) between 2% (3% in the year 2011) and 6% or increases (decreases) by more than 6% in the following year. We group these five points into three: the probability that the value decreases by 2% or more, $Pr(W_{i,t+1} \leq 0.98\, W_{i,t}|I_{i,t})$; the probability that it remains stable, $Pr(W_{i,t+1} = W_{i,t}|I_{i,t})$; and the probability that it increases by 2% or more, $Pr(W_{i,t+1} \geq 1.02\, W_{i,t}|I_{i,t})$.

Using the recorded household probabilities and discarding the expectation for housing price stability, we have the following expressions:

$$Pr\left(W_{i,t+1} \leq 0.98 W_{i,t}^{h} | I_{i,t}\right) = 1 - \Phi\left(\frac{0.98 W_{i,t} - E_t W_{i,t+1}}{\sqrt{var_t W_{i,t+1}}}\right) \quad \text{(A.9)}$$

$$Pr\left(W_{i,t+1} \geq 1.02 W_{i,t}^{h} | I_{i,t}\right) = \Phi\left(\frac{E_t W_{i,t+1} - 1.02 W_{i,t}}{\sqrt{var_t W_{i,t+1}}}\right) \quad \text{(A.10)}$$

where Φ denotes the cumulative distribution function, CDF, of the normal distribution. We observe the empirical probabilities on the left-hand side of the above expressions from the survey and have two equations with two unknowns, $E_{i,t}W_{i,t+1}$ and $var_{i,t}W_{i,t+1}$ [31].

Appendix 3. Filling the blanks in the subjective individual expectations

Following Paiella and Pistaferri (2017), if $E_{i,t:m}W_{i,t+1:m}$ denotes the household i expectation in period t of house wealth value in period $t + 1$, with m denoting the month of the interview, we assume that subjective expectations for house wealth are given by:

$$E_{i,t:m} W_{i,t+1:m} = \beta_0 + \sum_{\tau=1}^{T} \beta_\tau W_{i,t+1:m-\tau} + \beta_z ZZ_{i,t} + \upsilon_i \quad \text{(A.11)}$$

where β_j, for $j = 0$, τ and z, are parameters to be estimated and $ZZ_{i,t}$ is a set of demographic variables (the number of members and adults of the household, the age of the household head and its square, the year of purchase of the house, labour and educational dummies).

Since we are assuming that changes in house prices are the only factor affecting changes in housing wealth, it is important to highlight that (A.11) is actually an autoregressive process for housing prices. In our autoregressive approach, we chose T = 6. In any case, and differently from Paiella and Pistaferri (2017), we have used other variables than the proper lagged house price to predict the individual subjective expectation. Finally, the best predictor has turned out to be the monthly previous averages of the individual subjective expectations [32].

For all survey years, including those prior to 2011, the first year for which we collect data on subjective expectations, we use the estimates obtained from the estimation of equation (A.11) to predict individual subjective expectations on housing wealth for the purpose of being used to separate the anticipated and unanticipated increases in housing wealth.

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