Does income uncertainty affect Spanish household consumption?

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ABSTRACT

The aim of this paper is to study empirically the existence of precautionary saving in Spain using the micro data provided by the Spanish Survey of Household Finances. Using the panel component of these data I construct a measure of income risk, and use it to test for the strength of precautionary saving. I find that an increase of 1% in the standard deviation of income reduces household consumption by 5-7% depending on the specified model.

Keywords: income risk; precautionary saving; panel data

JEL codes: D12, D14, D91

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1. INTRODUCTION

In this paper I test the effect that income uncertainty has on household consumption using panel data for Spanish households. I use the Spanish Survey of Household Finances (EFF hereafter), an official survey provided by the Bank of Spain which contains which provides information about different aspects of the economic and financial situation of Spanish households for several years.

The existence and strength of the precautionary motive for saving, as well as which is the most appropriate measure to proxy the uncertainty, is an unresolved question in the empirical literature testing the precautionary saving hypothesis (for a survey about precautionary saving see Browning and Lusardi, 1996; or Attanasio and Weber, 2010).

Three approaches to estimate the importance of precautionary saving have been used in empirical works: reduced for estimates, simulation models and subjective expectations. This paper follows the first approach and uses objective data to estimate income risk. In particular, the paper is framed in the empirical works which proxy income uncertainty using observed life-cycle income variation and the variability of income (Kazarosian, 1997; Carroll and Samwick, 1998; Guariglia, 2001; Ventura and Eisenhauer, 2006).

The main feature of this paper is to provide evidence about precautionary saving in Spain exploiting the panel component of the survey for deriving a measure of income risk using the individual data on income for a period of 8 years. The analysis is performed in two steps. In a first step I estimate a measure of income risk based on panel data from 2007 to 2014. In particular, I calculate the average household real income over the period and its standard deviation for each household as proxies of household normal income and income uncertainty, respectively. Related to this I show that this measure correlates with some variables that are commonly thought to be related to risk, like self-employment, age, etc. In a second step, I relate the variable of income uncertainty to consumption, testing whether uncertainty affects household consumption in 2014, the last available year of the survey.

The main contribution of this paper is to provide evidence about precautionary in Spain. Since our econometric results show a negative impact of uncertainty on household consumption we can conclude about the evidence of the existence of precautionary saving in Spain. This is an important contribution because, although most empirical works find evidence of an effect of uncertainty on savings, not in many countries there is evidence about this motive for saving (US, Italy, UK, Germany and few others).

In the case of Spain, there is not too much evidence about precautionary saving and the majority of the papers proxy the uncertainty trough unemployment risk. Albarrán (2000) uses micro-data from a rotating panel, the Spanish Family Expenditure Survey, to analyze

precautionary saving associated with income risk. He finds that cohort-specific risk and aggregate risk affect consumption growth. Barceló and Villanueva (2010) using data from the EFF find evidence in favour to the existence of precautionary savings proxying the probability of losing employment by the type of contract that the main recipients of income at household has. In a following paper, Barceló y Villanueva (2016), using the same survey, find that older workers covered by fixed-term contracts accumulate more financial wealth than other workers. Campos and Reggio (2015), using consumption panel data, find that households reduce consumption in response to the realization of negative news on future income growth contained in the unemployment rate. Lugilde et al. (2018) use the Spanish EFF and the Labour Force Survey, and find that subjective measures tend to generate a non-significant impact on consumption, and show that the impact of the objective measures is different depending on the moment of the business cycle they are studying. The uncertainty measured through the jobless rate becomes an important source of income uncertainty only in a context when it is high and rising while, on the contrary, the job insecurity measure is significant at all business cycle horizons as well as regardless of the econometric specification.

So that, to the best of my knowledge, is the first paper providing evidence about precautionary saving in Spain measuring income uncertainty from observed household real income data during a period of time.

We obtain that the results weakly differ depending on the consumption variable used as dependent variable in our model. When using the logarithm of the household consumption we obtain that an increase of 1% in the income uncertainty will decrease consumption in about 7%, however using the ratio between consumption and average income the effect is lower, given the average normal income and consumption in the sample, consumption will decrease by 5%.

After this introduction, the paper is organized as follows. Section 2 briefly summarizes the existing literature about precautionary saving and the available empirical evidence for Spain. Section 3 provides a description of the constructed uncertainty measure and shows that this measure correlates with some variables that are commonly thought to be related to risk. Section 4 presents the econometric model and the results. Finally, Section 5 concludes.

2. REVIEW OF THE LITERATURE

When consumption decisions are made under uncertainty, and individuals are prudent and seek protection from risk, there is a significant negative impact on current consumption. Under some specific properties of the utility function (utility is increasing and concave and marginal utility is convex) uncertainty generates a positive extra-saving, the so-called “precautionary saving” (Leland, 1968).

The relevance of this motive for saving is an issue addressed mainly empirically. In spite of a large number of studies, the empirical findings have yielded mixed results. The results range from no significant influence of the precautionary saving motive to the accumulation of wealth (Skinner, 1988; Dynan, 1993) to a small influence between 1%-4.5% (Guiso et al., 1992; Lusardi, 1997, 1998) and to results up to more than 50% (Dardanoni, 1991; Carroll andm Samwick, 1998).

Moreover, in empirical literature there is no consensus about the intensity of the precautionary reason for saving, nor on which is the most appropriate measure to approximate the uncertainty. Three approaches to estimate the importance of precautionary saving have been used in empirical works: reduced for estimates, simulation models and subjective expectations. Works following the first approach attempts to estimate the impact of income risk on the reduced forms of consumption or wealth; that is, to estimate reduced form equations inspired by the PIH model with a role for precautionary saving. This approach also provides evidence in favour or against precautionary saving but does not deliver estimates of the parameters of the utility function (such as the coefficient of relative prudence).

Studies following the second approach estimate the paths of consumption and wealth in models with precautionary saving, matching simulated data to observed wealth and consumption distributions. Structural estimations deliver estimates of the parameters of the utility function but require the utility function, the budget constraint, the sources of risks, and the income process to be specified. Pioneering in this approach are Gourinchas and Parker (2002) and Cagetti (2003) who calibrate an explicit life cycle optimization problem using empirical data on the magnitude of household-level income shocks, and search econometrically for the values of parameters such as the coefficient of relative risk aversion that maximized the model"s ability to fit some measured feature of the empirical data. The intensity of the precautionary motive emerges, in each case, as an estimate of the coefficient of relative risk aversion.

Another direct strategy to analyse the existence of precautionary saving is the use of subjective expectations from survey questions data (Lusardi, 1997; Guiso et al., 1992; or Mastrogiacomo and Alessie, 2014). The literature based on subjective expectations attempts to avoid the problem of lack of information that is not observed by the econometrician by asking people to report quantitative information on their expectations. This literature relies on survey questions to elicit information on the conditional distribution of future income, and measures shocks as deviations of actual realizations from elicited expectations. Hayashi (1985) is the first study to adopt this approach. Another use to subjective expectations is to measure expected consumption growth and expected consumption risk in Euler equation with precautionary saving using survey data that record respondents" own assessments of these variables. This is an

alternative method to the simulation models to directly test precautionary saving through the estimation of the relative prudence coefficient.

This paper is framed within the empirical works which proxy income uncertainty using observed life-cycle income variation (Kazarosian, 1997; Carroll and Samwick, 1998; Guariglia, 2001; Ventura and Eisenhauer, 2006). In particular, the uncertainty is proxied through the income variability following the first mentioned approach (reduced for estimates) and using objective data to estimate income risk. Since the main prediction of the precautionary saving model, with respect to the life cycle–permanent income model, is that saving and wealth are related not only to the first moment, but also to higher moments of income, a wide branch of the literature has estimated uncertainty by the income variability. Consumers accumulate not only to offset future declines in income, but also to insure against income risk, proxied traditionally by the standard deviation or the variance of income. There have been several methods to deal with the measurement of income risk in the works using objective micro data.

A popular method with cross-section data is to use an aggregate estimate of income variance by categorizing sample observations into groups according to socio-economic characteristics, e.g., occupation, age, education, etc. (Dardanoni, 1991). The within-group income variance is then used as a proxy for individual income variance (Dardanoni, 1991; Miles, 1997; or Mishra et al., 2013; follow this approach). To be valid, this method requires assuming that each individual relies on the same set of variables to form expectations and that the individuals and the econometrician have the same information set. Miles (1997) calculates the variance of income and its standard deviation like measure of uncertainty based on a household"s characteristics and on the estimated cross-section relations between characteristics and the (square of) the unforecastable component of income and finds a strong precautionary saving from U.K. data. Also Dardanoni (1991) finds that around 60% of saving in UK is due to precautionary motives, he groups the households according to economic occupations and calculates the variance of labour income levels within each group as uncertainty measure. Mishra et al. (2013) provide the evidence of precautionary savings among self-employed farm households in US but they obtain that the percentage of total farm household wealth accumulated as a result of precautionary motive is only 8%. They categorize sample observations by operator"s age, educational attainment, primary occupation, year in which the observations are made and farm typology and use the within-group income variance as a proxy for individual income variance.

Some works using panel data follow a similar method using not only the information from panel but also the individual characteristics in order to derive a measure of income risk (see Carroll, 1994; Kazarosian, 1997; or Guariglia and Rossi, 2002). Using a panel data from the National Longitudinal Survey (NLS) of U.S., Kazarosian (1997) approaches individual-

specific income uncertainty with the standard deviation of the residual of each individual"s estimated age-log income profile. With panel data from the British Household Panel Survey (BHPS), Guariglia and Rossi (2002) calculate the variance of the earnings equation residuals in the years following as income volatility. The two works show evidence of precautionary saving. On the other hand, Carroll (1994), using Italian PSID data, measures uncertainty through the variance of normalized income and the standard deviation of normalized income (besides through the Equivalent Precautionary Premium (EPP) as (theoretical) measure of income uncertainty) and finds that all three measures decrease consumption with uncertainty arises.

When using micro panel data allows for a direct test whether people change their behavior due to changes in risk according to theoretical predictions. For that, others works (Carroll and Samwick, 1998; Guariglia, 2001; or Ventura and Eisenhauer, 2006) exploit the panel structure of the data to calculate the permanent/normal income from the household real income over the considered period and the variance of this income. Carroll and Samwick (1998) include the log of the variance of the log of income as atheoretical measure of uncertainty (besides the log of relative Equivalent Precautionary Premium) and find that both coefficients are highly significant for all three measures of wealth considered (very liquid assets; non-housing non-business wealth and total net worth). Guariglia (2001) uses British Household Panel Survey (BHPS) data (years 1991 to 1998) to estimate three household specific measures of earnings uncertainty and test precautionary saving.[1] The first of them is obtained taking the square of the difference between detrended household earnings in 1991 and 1998 and dividing it by seven to have an annual rate. The second is the variance of income, Y_t, over the eight available waves (this measure assumes that all income shocks are transitory). The last measure is the variance of income over waves two to eight (variance of $Y_t - Y_{t-1}$ and contrary to previous assumes that all income shocks are entirely permanents). Guariglia concludes that there is a strong precautionary motive for saving for all measures of uncertainty employed. Ventura and Eisenhauer (2006) use the Survey of Household Income and Wealth (SHIW) to analyze three principal saving motives: intertemporal saving, bequest motive and precautionary saving.[2] They select households with income reported in both 1993 and 1995, and among them they focus only on savers. To capture the precautionary motive, for each household, they calculate the average real income and its variance between these two years, which they use initially as proxies of current income and risk, respectively, in a saving equation. Then,

[1] Guariglia (2001), as in Lusardi (1998), also constructs an additional measure as a function of the subjective probability of job loss given for households

[2] To investigate intertemporal saving, they divide this sample into two broad groups: those whose head of household is under age 65, and those whose head of household is 65 years of age or older. From these, they try to identify cohorts created on the basis of three characteristics of the head of the household: gender, education and area of residence. The difference in average income between young and old cohorts, is used as proxy for the intertemporal saving.

exploiting the estimated regression coefficients as well as mean values of the variables, they calculate point estimates of absolute and relative prudence, and obtain that each young household saved 15.2% of its total annual saving by precautionary purposes.[3]

In this paper I also make use of the panel component of the survey and perform the estimation in two stages. Firstly, exploiting the panel structure, I calculate the average household real income over the period and its standard deviation for each household. Then I use these variables as proxies of household normal income and income uncertainty, respectively, in a cross-sectional regression of consumption. The assumption under that is that individuals use their own past incomes to forecast their future income and have rational expectations. As pointed by Dynan (1993), the household consumption changes only in response to unexpected changes in income (Dynan 1993, pag. 1105) so, in this paper we test the existence of precautionary saving analyzing the effect of the uncertainty on consumption (see Dardanoni, 1991; Dynan; 1993; Carroll, 1994; Miles, 1997; Banks et al., 2001; Benito, 2006; or Lugilde et al., 2018; among others).

Although most empirical works find evidence of an effect of uncertainty on savings all these analysis are concentrated in the same economies so not in many countries there is evidence about precautionary saving (US, Italy, UK, Germany and few others).

This is not the first paper providing evidence on precautionary saving in Spain. Albarrán (2000) uses micro-data from a rotating panel, the Spanish Family Expenditure Survey, to analyze precautionary saving associated with income risk. He finds that consumption growth is not affected by household-specific risk but by cohort-specific and aggregate risk. Barceló and Villanueva (2010) using data from the EFF find evidence in favour to the existence of precautionary savings proxying the probability of losing employment by the type of contract that the main recipients of income at household has. In a following paper, Barceló y Villanueva (2016), using the same survey, analyze the effect the changes in severance payment have on wealth accumulation and find that older workers covered by fixed-term contracts accumulate more financial wealth than other workers. Campos and Reggio (2015), using consumption panel data, find that households reduce consumption in response to the realization of negative news on future income growth contained in the unemployment rate (calculated from the Spanish Labor Force Survey according to the level of education and age of the primary earner in the household). Lugilde et al. (2018) use the Spanish EFF and the Labour Force Survey and find that subjective measures generate a non-significant impact on consumption, and hence on

[3] They also estimate an alternative measure of income risk linking real income to its social and demographic determinants, such as age, gender, education level, marital status, etc. as a measure of unpredictable income risk. From that, they estimate an income profile and proxy income risk for each household using the absolute percentage forecasting error getting that the share of total saving attributable to precautionary motives is about 36%.

saving, and the impact the objective measures have is different depending on the moment of the business cycle. Only in a context when unemployment is high and rising it becomes an important source of uncertainty while the job insecurity that the household reference person faces, generate a significant negative impact on consumption at all business cycle horizons as well as regardless of the econometric specification.

Thus, the evidence about precautionary saving in Spain is no so large. So that, the main contribution of this paper is to provide empirical evidence about the effect the uncertainty has on consumption for the Spanish households. In addition, to the best of my knowledge, is the first paper showing evidence about precautionary saving in Spain measuring income uncertainty from observed household real income data during a period of time.

3. MEASURING INCOME RISK FROM THE EFF DATA

In the context of precautionary motive for saving the use of microeconomic panel data is preferred to analyze consumption behavior since allow capture the effects of individual income uncertainty along a specific period. For this reason, to perform the analysis of precautionary saving in Spain I use the EFF data. It is an official survey compiled by the Bank of Spain which has been published since 2002 (each three years) in order to obtain direct information about the financial conditions of the Spanish families. It is the only statistical source in Spain that allows the linking of incomes, assets, debts and expenditure of each household.[4] The survey of Banca d"Italia, Survey on Household Income and Wealth (SHIW), and the Survey of Consumer Finances (SCF) of the US Federal Reserve were the models that inspired this survey.

In this paper I focus in the panel component of the survey to analyze the existence and strength of precautionary saving in Spain. Since I want consider the normal income of the household, I work with a balanced panel including the households participating in the survey since 2008 for which eight years of income information is available.[5] The balanced panel comprises 1524 Spanish households.

The variable of household income is provided in the survey data and is constructed aggregating the data of individual income of household members, the income obtained from assets and the non-labor income received by the whole household. Therefore the income variable is the total gross income of the household, i.e. before taxes and social-security

[4] A more detailed description of the survey and the main variables used in the paper is in Appendix A. In particular, TABLE A1, in the Appendix, contains the list of variables used in the model and their description while TABLE A2 provides a descriptive table of the main characteristics of households in the sample.

[5] We could consider also the households participating since 2005 in order to have a wider period of analysis but doing that the sample is drastically reduced by half (876 households in the sample). For that, we have decided work with the household belonging to the panel from 2008 to 2014 but we provide also the results for the panel 2005-2014 in Appendix B. The main results remain for the subset of households which are in the panel from 2005.

contributions. The income data are available for years 2007, 2008, 2010, 2011, 2013 and 2014 and expressed in real terms (2014 euros) using the Consumer Price Index (CPI) as deflator.[6] From this information exploiting the panel component I calculate the household average income over the whole period (2007-2014) and from that, calculate the standard deviation of the household income. These variables are used as proxies of the household normal income $\overline{(\bar{Y})}$ and income risk (SDY), respectively. This allows test the effect that the uncertainty about future income has on household consumption in the year 2014.

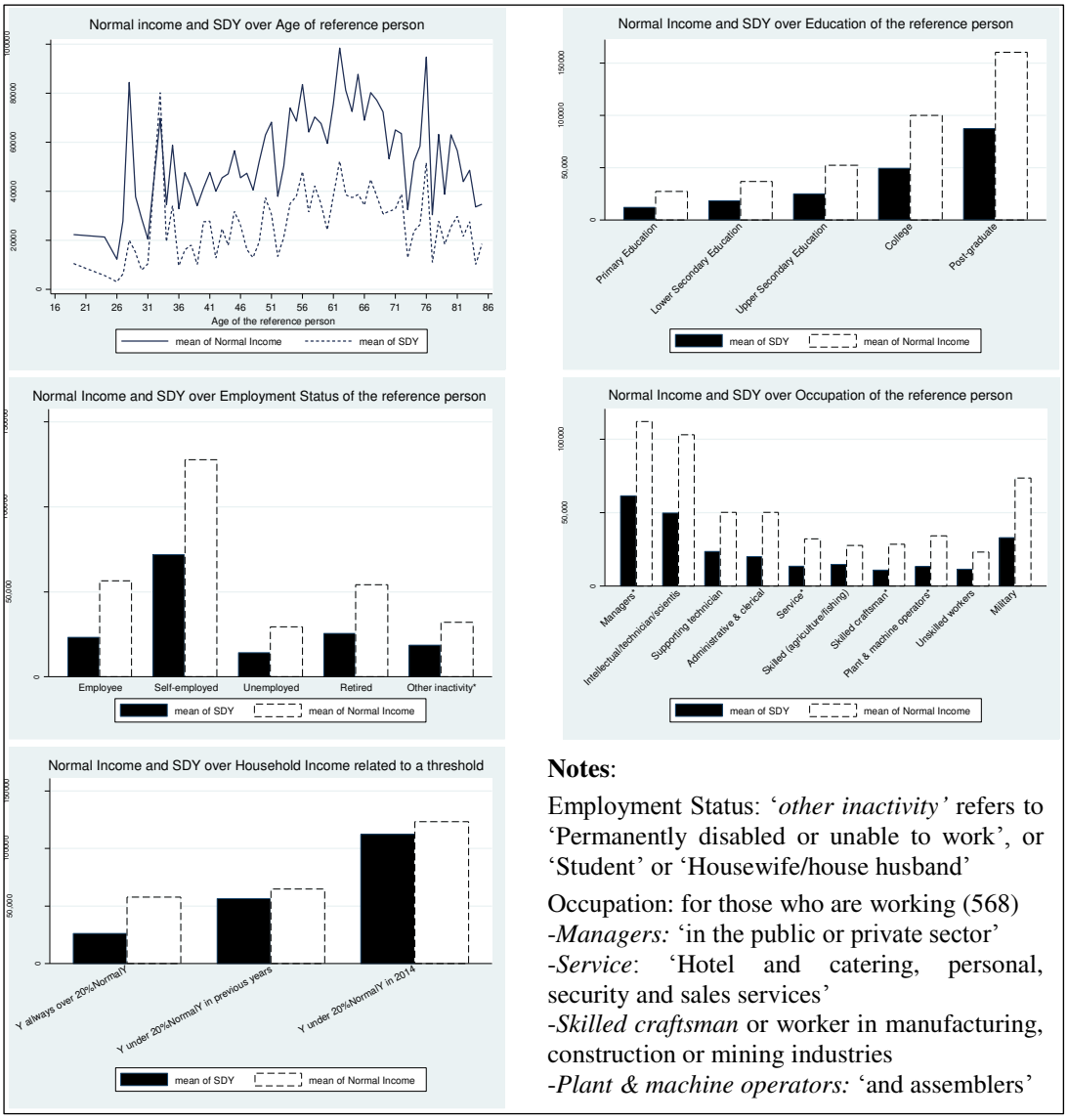
From the household average income I construct a control variable capturing if the household income was under a threshold defined as the 20% of the average income of the period in some year.[7] Only the 4.54% of the households had income under the 20% of its average income in some of the previous years and that only the 1.73% of the households the current income, income of 2014, is under the threshold. I include this variable in the consumption regressions in order to check if that has some effect on consumption and if it varies depending on the moment in which that occurs, 2014 or some of the previous years.

The estimated measure of income risk (SDY) correlates with some variables commonly related to risk. Figure 1 collects several graphs showing the relationship between the standard deviation of income, SDY, and different characteristics of the household reference person commonly related to risk. In this survey the reference person is self-determined and can be defined as the person, or one of the persons, responsible for the accommodation (it will normally be the person in the household who chiefly deals with the financial issues)

[6] To adjust household income to 2014 euros, factors were 1.1001 for 2007, 1.0962 for 2008, 1.0448 for 2010, 1.0205 for 2011 and 0.9896 for 2013 (Banco de España, 2014).

[7] Deidda (2013) stablish this same income threshold but for excluding the households whose earnings were under it.

Figure 1. Relation between the SDY and different household characteristics



Notes:

Employment Status: '*other inactivity'* refers to 'Permanently disabled or unable to work', or 'Student' or 'Housewife/house husband'

Occupation: for those who are working (568)
-*Managers:* 'in the public or private sector'
-*Service*: 'Hotel and catering, personal, security and sales services'
-*Skilled craftsman* or worker in manufacturing, construction or mining industries
-*Plant & machine operators:* 'and assemblers'

Own elaboration from EFF balanced panel data.

The graphs show the expected relation between the standard deviation of the income (in relation with the normal income) and the different variables supporting thus the use of this variable as proxy for the income uncertainty borne for the household.

The youngest and elderlies exhibit a higher standard deviation of income in relation with the average income, being this more acute for the first (especially for those between 26 and 35 years old). Among the different levels of education those with a "post-graduate" have the highest standard deviation of income (being, in average, the 54% of their average normal income) while those with "primary education" have the lowest. Those who are "self-employed" jointly with those "permanently disabled or unable to work, or student or housewife/house husband" (that is, "other inactive") have the highest uncertainty and the "employees" have the lowest. Among the different occupations, the "managers in the public or private sector",

followed by the employed in the category "skilled workers in agriculture and fishing" and the "unskilled workers", have the highest income uncertainty respect to their average normal income while "skilled craftsman or worker in manufacturing, construction or mining industries" jointly with "plant and machine operators and assemblers" have the lowest income uncertainty. Respect to the variable capturing whether household income was under the 20% of normal income in some year, the graphs shows that those with income under the defined threshold in 2014 have the highest uncertainty respect to their household normal income while those whose income was always over the threshold have the lowest. That supports the adequacy of our proxy of uncertainty for capturing the uncertainty effect on household consumption.

Once showed the validity of the uncertainty proxy estimated, the following section tests the effect that the uncertainty about future income, measured trough the standard deviation of household income, has on household consumption in the year 2014. In particular, the consumption measure used is the non-durable consumption because it follows a more stable path than the durable consumption so the decrease in consumption when uncertainty arises would reflect the existence of a precautionary motive for saving. That is, since the increase/decrease on total consumption can be for a punctual expenditure in durables goods and not for the effect of the uncertainty, I have decided to analyze how the uncertainty affects the household non-durable consumption.[8]

4. ECONOMETRIC MODEL AND RESULTS

The econometric model relates the consumption of a household with a number of covariates related with the personal, family, work and financial characteristics of the households included in the sample. Specifically, assuming that the relationship among the dependent and independent variables can be expressed in a log-linear form, the models are:

$$log\ C_{i,t} = \beta_0 + \beta_1 log\bar{Y}_i + \beta_2 logSDY_i + \gamma Z_{i,t} + v_{i,t} \quad (1)$$

$$C_{i,t}/\bar{Y}_i = \alpha_0 + \alpha_1 log\bar{Y}_i + \alpha_2 logSDY_i + \theta Z_{i,t} + \varepsilon_{i,t} \quad (2)$$

Where β_0, α_0 are the intercept; γ, θ are vectors of parameters to be estimated; $Z_{i,t}$ is a vector of variables that reflect the main individual characteristics of each individual/household and the main economic determinants of consumption at time t (income, real and financial wealth, debt, risk aversion, family composition, age and education level of the reference person); $\bar{Y}_i$ is the household average income over the period (2007-2014); SDY_i is the standard deviation of household income (the proxy of uncertainty) and $v_{i,t}$, $\varepsilon_{i,t}$ are the error terms assumed independently and identically distributed as a $N(0, \sigma^2)$. The regressions are estimated for the last year of the survey, 2014, in order to analyze how the average income of the period

[8] A detailed definition of consumption is in the Appendix A.

and the standard deviation of the income affect the household consumption in this year (therefore, $t = 2014$). The economic variables are expressed in logarithms and refer to the whole household.[9] The age and the educational level are those of the household reference person. The difference between both models is the dependent variable, in (1) $logC_{i,t}$ is the logarithm of non-durable consumption of the i-th household in 2014 while in (2) $C_{i,t}/\overline{Y_i}$ is the ratio between non-durable consumption of the i-th household in 2014 and the average income of the i-th household for the period 2007-2014. The equations are estimated by OLS.

Therefore, I assess the existence of precautionary saving by analyzing the effect of household income uncertainty on consumption. If there is a precautionary saving, uncertainty in the current period (proxied by the standard deviation of income, SDY_i) should increase savings and thus decrease current consumption, i.e., we expect a negative sign on this uncertainty variable.

TABLE 1 shows the results of the estimations for 2014. Columns (2) and (4) summarize the estimation of the two consumption models including the uncertainty measure. In particular, column (2) shows the results for the model using the logarithm of non-durable consumption as dependent variable while column (4) summarizes the results for the model using the ratio between non-durable consumption and the average income as dependent variable. Columns (1) and (3) summarize the estimation of both consumption equations without any uncertainty measure to provide a baseline model. In general, the variables included in the estimations are significant (and show the expected signs) and the regressions have a relatively high goodness of fit, with an R^2 around 67% in the logarithm of consumption equation and about 39% for the equation of consumption-average income ratio, and the F-statistic suggests that the null hypothesis of jointly insignificance should be rejected.

[9] To avoid outliers we winsorize at the 1% all the economic variables (income, wealth, debt, consumption and, therefore, the average income and the standard deviation of it). We also do a change of scale when calculating the logarithm of these variables to avoid lose observations when the value of the variable is 0 (about the half of the households have zero value for the debt); specifically, we do the logarithm of the variable plus one (i.e., ln(*variable*+1)).

TABLE 1

The uncertainty effect on household non-durable consumption in 2014

	(1)	(2)	(3)	(4)
	$ln(Cons)$	$ln(Cons)$	$Cons\ /\bar{Y}$	$Cons\ /\bar{Y}$
Ln($\bar{Y}$)	0.436***	0.528***	-0.243***	-0.217***
	(0.020)	(0.029)	(0.013)	(0.019)
Ln(SDY)		-0.068***		-0.019**
		(0.016)		(0.009)
Ln(FW)	0.019***	0.017***	0.007*	0.007
	(0.005)	(0.005)	(0.004)	(0.004)
Ln(RW)	0.004	0.004	0.000	0.000
	(0.004)	(0.004)	(0.003)	(0.003)
Ln(debt)	0.028***	0.027***	0.013***	0.013***
	(0.002)	(0.002)	(0.001)	(0.001)
Credit constraints	0.001	0.008	0.030	0.032
	(0.038)	(0.038)	(0.028)	(0.028)
Risk aversion	-0.091***	-0.093***	-0.051***	-0.052***
	(0.031)	(0.031)	(0.016)	(0.016)
Family size	0.096***	0.090***	0.034***	0.033***
	(0.013)	(0.013)	(0.007)	(0.007)
Number of children	-0.005	-0.000	0.006	0.007
	(0.020)	(0.020)	(0.011)	(0.011)
Age	0.008***	0.007***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
Primary education	-0.081**	-0.077**	-0.037*	-0.035*
	(0.032)	(0.031)	(0.020)	(0.020)
Upper secondary education	0.004	-0.001	-0.012	-0.014
	(0.034)	(0.034)	(0.020)	(0.020)
College	0.105***	0.095**	0.044**	0.041*
	(0.038)	(0.038)	(0.022)	(0.022)
1. Y_t<0.2$\bar{Y}$ in at least one year before 2014	0.116**	0.173***	0.086**	0.102***
	(0.050)	(0.052)	(0.038)	(0.039)
2. Y_t<0.2$\bar{Y}$ in 2014	-0.130	-0.074	-0.047	-0.032
	(0.087)	(0.088)	(0.037)	(0.038)
_cons	4.163***	3.893***	2.675***	2.599***
	(0.190)	(0.199)	(0.103)	(0.115)
r2_a	0.6671	0.6706	0.3913	0.3926
N	1524	1524	1524	1524

Notes: Coefficient estimates. Cluster robust standard errors in parentheses.
Significance levels: *** p<0.01 ** p<0.05 * p<0.10.

In general, the results for the standard control variables are in line with previous analysis, with expected signs. Wealth impacts positively on consumption, but real wealth is not significant in both models. An explanation to this result can be that the value of the real estate

assets of households, which represents a substantial part of their total assets, fell dramatically as a result of the burst of the housing bubble and continued to experience significant reductions as a result of the continued fall in the price of housing. This decrease was only interrupted from the second quarter of 2014, with an increase of 0.3% in the annual average, after six years of decline. The evolution of real estate prices from its maximum level in the third quarter of 2007 has represented a loss of value of this asset of 37.2% in nominal terms (44.3% in real terms) up to the first quarter of 2014. Turning to the financial wealth, during the considered period households tended to accumulate financial assets. According to the Bank of Spain, compared to the first quarter of 2009, in 2014 the percentage of Spanish households with some financial asset was greater although the decrease in this percentage from 2011 (the increase in this percentage between 2009 and 2011 was higher in the lower half of the wealth distribution but also its decrease between 2011 and 2014 was greater for this group). For families with some kind of financial asset, the median value of these assets increased by 23.1% between 2009 and 2011 but decreased by 5.1% between 2011 and 2014.[10]

Income is significant in both specifications and the elasticity of income remains more or less stable between the baseline specification of the model and the specification with uncertainty which means that the estimated parameter is robust to the type of specification. But the sign of the variable change with the dependent variable: in the model with the logarithm of consumption as dependent variable, the income has a positive effect on consumption while in the model of the ratio between consumption and average income the impact is negative. It shows that as income increases, the propensity to save increases (or MPC declines). Since the magnitude of the coefficients in the model for the logarithm of consumption are lower than 1, therefore, as income increase, consumption goes one, but the elasticity is less than one.

The dummy variable reflecting whether the household is risk averse has a negative and significant coefficient in both models. However, the dummy collecting the existence of credit constraints in the households is not significant in any of the specifications. The relation between the level of indebtedness and household consumption is positive, reflecting that those with higher debt are also those with a higher consumption. Debt is for the most part mortgages and people with mortgages are richer than people without.[11]

Households whose income was under the threshold (defined as the 20% of the average income of the period) in some year before 2014 have a higher consumption in this last year

[10] See Banco de España (2014, 2017).

[11] The correlation between total debt and 'debt of other real estate properties different of main residence' is the highest (0.9411) among all the debt components. Only the 12.44% of the households have this type of debt which is mainly destined to the purchase of another house or flat (79.7% of those with a second property) and people with this mortgage are also the richest (their gross wealth is 2.17 times the wealth of those who haven't a second property).

(with significant coefficients), while those whose income is under the threshold in 2014 reduce their consumption but in this case the coefficients are not significant in any model. Household characteristics show the expected relations. Additionally, the estimated coefficients are, in general, robust to the specification as regards the inclusion of the uncertainty measure, even though they differ in magnitude between the two consumption models considered in our analysis.

In relation with the uncertainty measure, the standard deviation of household income shows a negative and significant coefficient in both models. So, an increase in the income uncertainty borne by the households reduces its current consumption, implying (given the level of household income) certain amount of precautionary savings. This result is in line with those of Albarrán (2000), Barceló and Villanueva (2016), Campos and Reggio (2015) or Lugilde et al. (2018) who also show evidence of precautionary saving in Spain in different periods of time and using different data sources. The main difference with these works is that we use an uncertainty measure derived from observed household income from panel data and most of the evidence about precautionary saving for Spain estimate unemployment risk or use rotating panel data. The effect the income uncertainty has on consumption is softer when we have into account the level of income than in absolute terms. The uncertainty measure has a larger impact on the logarithm of consumption (-0.068) than in the ratio consumption – normal income (-0.019). This reduction of 0.019 in the ratio $Cons\ /\bar{Y}$ when the SDY increases by 1% implies, given the average consumption and normal income in the sample, that consumption will decrease by 5.03% while in the model for the $ln(Cons)$, an increase of 1% in the SDY will decrease consumption by 6.8%.

The evidence obtained in this analysis for the Spanish households is consistent with the hypothesis that households adjust their consumption and savings to changes in the risk of income. Therefore, our results show evidence of the existence of precautionary savings in Spanish households in 2014.

5. CONCLUDING REMARKS

Earnings uncertainty is the source of uncertainty most frequently studied in the theoretical literature about precautionary savings and the income variability is the most common uncertainty proxy used in empirical works. Our paper contributes to the existing literature testing the effect the income uncertainty has on consumption of Spanish households. The main contribution of this paper is to provide evidence about precautionary saving in Spain measuring income uncertainty from the panel component of the EFF. I derive a measure of income risk using the individual observed data on income for a period comprising 8 years. From that I

calculate the standard deviation of household real income as proxy of the income uncertainty borne by the household and test the effect it has on household consumption in 2014.

According to our estimations, an increase of 1% in the standard deviation of household income decreases household consumption between 5% and 7% implying (given the level of household income) certain amount of precautionary saving.

An increase in the income uncertainty borne by the Spanish households reduces its current consumption, so that we can conclude about the evidence of the existence of precautionary saving in Spain. This evidence for the Spanish households is consistent with the hypothesis that households adjust their consumption and savings to changes in the risk of income.

Appendix A: description of the survey and definition of the variables

All the EFF waves have two objectives, the first is to achieve a sample representative of the current population with an oversampling of wealthy households and the second is to convert part of this sample in a panel by re-interviewing households who participated in previous waves. Therefore, the main characteristics of this Survey are that includes an over-sampling of rich households and a panel component. This survey was developed for the years 2002, 2005, 2008, 2011 and 2014 and consists in the following sections:

(i) Demographic characteristics (all households)
(ii) Real assets (all households)
(iii) Debts (all households)
(iv) Businesses and financial assets (all households)
(v) Insurance policies and pension schemes (all households)
(vi) Employment situation and related income (all household members over 16)
(vii) Non-employment income / Income from real or financial assets received by the household in the preceding calendar year (all households)
(viii) Use of means of payment and new distribution channels (all households)
(ix) Consumption and saving (all households)

Questions regarding assets and debts refer to the whole household, while those on employment status and related income are specified for each household member over 16 years. In relation with consumption and saving questions, in contrast with the SCF, the questionnaire contains some questions about spending on nondurable goods and food, given the interest of the relationship between consumption, income and the different types of wealth. Most of the information relates to the time of the interview, although all income (before taxes) and labour status information is also collected relating to calendar year preceding the survey. The collection of this information is carried out with personal interviews of households, which took place between the last months of the current year and the second quarter of following year. These interviews were conducted with the help of computer, due to the complexity of the questionnaire.

Since the absence of response to isolated questions is an inherent characteristic of wealth surveys (and basing the analysis exclusively on the questionnaires duly completed in full would bias the results) the Bank of Spain has made imputations of non-observed values to facilitate the data analysis. The technique chosen in the EFF is a "stochastic multiple imputation", so that a distribution of possible values is estimated. In particular, the EFF imputes five values for each lost item of each household observation so these five values may vary depending on the degree of uncertainty about the imputation model.

An important feature of this survey is that since the second wave some households which had collaborated in previous editions have been interviewed again. So the combination of the samples allows observing a subset of households in different points in time. Additionally, in

each new wave a refreshment sample by wealth stratum is included to preserve the representativeness of the sample. In addition, to ensure the representativeness of the study, the sample, selected randomly, includes observations of all economic strata (including an oversampling of the rich) and has the support of the National Institute of Statistics for its elaboration.

A household is considered a panel household if at least one of its members in the current wave was a member of one of the participating households in the previous wave. The Bank of Spain conducted a thorough inspection of the panel state of households, its members, and the correspondence between waves. In the second and third waves the aim was to have a full panel component i.e. the aimed to re-interview all households that participated in the previous wave (EFF2002 and EFF2005, respectively) but, in the fourth wave (EFF2011) they did not aim to re-interview all households that participated in the EFF2008, they were decided to keep in the panel sample only all households participating since 2002 because they form a subsample of households in which almost ten years of their life-span can be observed. In contrast with the previous two waves, in the 2011 wave no replacements were provided for panel households. This allowed for a larger refreshment sample. In the fifth edition of the EFF (2014 wave), a rotation scheme that limits the maximum number of editions in which a household remains in the survey has been initiated. Specifically, the sample of the EFF2014 does not include households interviewed in the EFF2002.

List of the main variables included in the analysis and their definition

Income

The household income variable is the total gross income of the household. It comprises individual income of household members, income obtained from assets and non-labor income received by the whole household. When the household fails to provide a value for one of those components the Bank of Spain perform a direct imputation of the total. Two variables of total household income are included in the EFF data: one corresponding to the whole of previous year of the interview (2007, 2010 and 2013) and the other to the month in which the interview took place. Therefore, we proxy the annual household income during the year of the interview (2008, 2011 and 2014) multiplying the regular monthly income by 12 months.

Consumption

The consumption variable used is the annual household consumption on non-durables in 2014 and comprises the following expenditures/payments:

- Annual premium or the one-off premium for the life insurance policies the household has (both the insurance policies taken out by household members on their own decision and those not taken out on their own decision).

- Average annual payment for other forms of insurance (health-care, home and vehicle policies).
- Current monthly payment on the loans on the real estate property, including repayment of capital and interest.
- Current monthly payment on the loan taken out for the purchase of the main residence, including repayment of capital and interest.
- Current monthly payment on other loans that were not mentioned earlier, including repayment of capital and interest.
- Monthly rent paid for the house (give the amount for the most recent payment, and exclude, if possible, communal charges, repairs, water bills, etc) when the main residence is rented and when a part of the house if owned by the household: monthly rent paid for the part of the house that is not owned by the household.
- Money paid regularly (every month) to other people who are not members of the household, such as ex-partners, children who no longer live at home, parents, charities, etc. (excluding the money paid to household members).
- Household"s total average spending on consumer goods in a month, considering all household expenses such as electricity, water, mobile phones, condominium services, leisure, school/university, etc.

Since some variables refer to regular/average monthly expenditure instead annual expenditure I multiply them by twelve to obtain the annual value. The consumption variable used is the sum of all these annual expenditures.

Risk aversion

It is a self-reported variable by the household. The household has risk aversion when the answer they give to the question about "*the amount of financial risk the households are willing to run when they make an investment"* is that *"they are not willing to take on financial risk"*.

Credit constraints

Dummy variable collecting whether the household has credit constraints generated from the answer they give to some questions in the survey. We understand that the household has credit restrictions when:

A) have been denied a loan to them,

B) have been granted a loan for an amount less than that they requested or

C) they have not requested any loan because they believe it would not be granted.

This definition is the same used by Jappelli et al. (1998) in their first indicator of liquidity constraints.

TABLE A1

Brief description of the variables used in the analysis

VARIABLE	VARIABLE NOTATION	BRIEF DESCRIPTION
Normal household income †	$\bar{Y}$	Average income of the household over the period 2007-2014
Standard deviation of income †	SDY	Standard deviation of the household income
Non-durable consumption †	C	Annual non-durable consumption of the household in 2014
Ratio consumption – normal income	$C/\bar{Y}$	Ratio between non-durable consumption of the household in 2014 and the average household income over the period 2007-2014
Financial Wealth †	FW	Financial wealth
Real Wealth †	RW	Real wealth
Debt †	$debt$	Debt value
Credit constraints	Credit constraints	Dummy taking value one when the household has credit constraints
Risk aversion	Risk aversion	Dummy taking value one when the household is risk averse
Family size	Family size	Household size in 5 categories: 1, 2, 3, 4 and 5 or more members
Number of children	Number of Children	Number of children in the household (under 18 years)
Income is under a threshold defined as the 20% of the average income of the period in some year	Household income under the 20% of $\bar{Y}$	Variable collecting if the household income was/is under the 20% of $\bar{Y}$
	$Y_t > 0.2\bar{Y}$ in all years	Current income over $0.2\bar{Y}$ in all years
	$Y_t < 0.2\bar{Y}$ in at least one year before 2014	Current income lower than $0.2\bar{Y}$ in at least one of the previous years
	$Y_t < 0.2\bar{Y}$ in 2014	Current income lower than $0.2\bar{Y}$ in 2014
Age ‡	Age	Age
Educational level ‡	Primary education	Highest educational level reached: None studies or Primary education
	Lower Secondary education	Highest educational level reached: Lower Secondary education
	Upper Secondary education	Highest educational level reached: Upper Secondary education and First stage of Tertiary education (Vocational training)
	College	Highest educational level reached: Tertiary education and Doctoral studies

Notes: † All these variables are in logarithm in the consumption regression, notation: $Ln(variable)$ ‡ These variables refer to the reference person.

TABLE A2

Average, Median and Standard Deviation of the variables included in the analysis

	Average	Median	Standard Deviation
C	22319.42	16494.20	19117.51
$\bar{Y}$	59073.39	35814.02	71547.79
$C/\bar{Y}$	0.522	0.479	0.279
SDY	28955.44	11962.72	45623.43
FW	2.74E+05	28646.8	8.59e+05
RW	6.90E+05	2.28E+05	1.44e+06
$Debt$	28816.77	0	68688.86
$Ln(C)$	9.765	9.711	0.675
$Ln(\bar{Y})$	10.555	10.486	0.881
$Ln(SDY)$	9.474	9.39	1.249
$Ln(FW)$	9.882	10.254	2.999
$Ln(RW)$	11.926	12.336	3.039
$Ln(debt)$	3.908	0	5.102
Credit constraints	8.60%	-	0.281
Risk aversion	0.817	-	0.387
Family size	2.498	2	1.160
Number of children	0.320	0	0.677
$Y_t > 0.2\bar{Y}$ all years	93.73%	-	-
$Y_t < 0.2\bar{Y}$ in at least one year before 2014	4.54%	-	-
$Y_t < 0.2\bar{Y}$ in 2014	1.73%	-	-
Age	62.77	64.0	13.70
Primary education	33.40%	-	0.472
Lower Secondary education	13.30%	-	0.339
Upper Secondary education	23.20%	-	0.422
College	30.18%	-	0.459
Sample size	1524 households		

Notes: all the variables refer to the 2014 year, since is the one in which we analyze the existence and strength of precautionary saving. Economic variables are in 2014 euros. The demographic individual variables refer to the household reference person.

Source: EFF panel data (balanced panel using 2008, 2011and 2014 waves).

Appendix B: the uncertainty effect on household non-durable consumption in 2014: estimation results for the panel from 2005 to 2014

TABLE B1

The uncertainty effect on household non-durable consumption in 2014: estimation results for the panel from 2005 to 2014.

	(1)	(2)	(3)	(4)
	$ln(Cons)$	$ln(Cons)$	$Cons\ /\ \bar{Y}$	$Cons\ /\ \bar{Y}$
Ln($\bar{Y}$)	0.408***	0.516***	-0.233***	-0.193***
	(0.030)	(0.045)	(0.018)	(0.026)
Ln(SDY)		-0.079***		-0.029**
		(0.025)		(0.013)
Ln(FW)	0.023***	0.020***	0.007	0.006
	(0.007)	(0.007)	(0.005)	(0.005)
Ln(RW)	0.004	0.003	-0.002	-0.002
	(0.006)	(0.006)	(0.005)	(0.005)
Ln(debt)	0.029***	0.029***	0.012***	0.012***
	(0.003)	(0.003)	(0.002)	(0.002)
Credit constraints	0.009	0.012	0.029	0.030
	(0.050)	(0.050)	(0.034)	(0.034)
Risk aversion	-0.135***	-0.132***	-0.054***	-0.053***
	(0.040)	(0.040)	(0.019)	(0.019)
Family size	0.102***	0.097***	0.035***	0.034***
	(0.018)	(0.018)	(0.008)	(0.008)
Number of children	-0.018	-0.017	-0.002	-0.001
	(0.026)	(0.026)	(0.013)	(0.013)
Age	0.008***	0.007***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
Primary education	-0.087**	-0.082**	-0.023	-0.021
	(0.042)	(0.041)	(0.025)	(0.025)
Upper secondary education	-0.000	-0.007	-0.004	-0.006
	(0.043)	(0.042)	(0.022)	(0.022)
College	0.099**	0.086*	0.046*	0.041*
	(0.047)	(0.047)	(0.024)	(0.024)
1. Y_t<0.2$\bar{Y}$ in at least one year before 2014	-0.016	0.035	0.016	0.034
	(0.058)	(0.059)	(0.029)	(0.029)
2. Y_t<0.2$\bar{Y}$ in 2014	-0.201	-0.150	-0.045	-0.026
	(0.146)	(0.144)	(0.048)	(0.049)
_cons	4.434***	4.108***	2.595***	2.473***
	(0.271)	(0.288)	(0.122)	(0.136)
r2_a	0.6415	0.6453	0.3695	0.3724
N	876	876	876	876

Notes: Coefficient estimates. Cluster robust standard errors in parentheses.
Significance levels: *** p<0.01 ** p<0.05 * p<0.10.
Economic variables are in 2014 euros. (Factors for 2004 and 2005 are 1.2209 and 1.1770, respectively).

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