



The impact of measured income uncertainty on Spanish household consumption at the end of the Great Recession

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Accepted: 10 May 2024 / Published online: 24 June 2024
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Abstract

The aim of this paper is to study empirically the existence of precautionary saving in Spain at the end of the Great Recession 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 uncertainty for each household from the observed household real income 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 8.8% when using the logarithm of the household consumption as dependent variable; however, when using the ratio between consumption and average income as dependent variable, given the average normal income and consumption in the sample, consumption will decrease by 8.1%.

Keywords Income uncertainty · Precautionary saving · Panel data · Survey of Household Finances · Great Recession

JEL Classification D12 · D14 · D15 · D81

1 Introduction

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

Responsible Editor: Gerlinde Fellner-Röhling.

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This work analyzes whether uncertainty affects household consumption in 2014, the considered as the end of the Great Recession in our country. The Spanish Great Recession is the economic crisis that began in 2008 and ended in 2014, according to the national accounts, based on data elaborated by the National Institute of Statistics (INE). Unemployment, which was at an all-time low in the spring of 2007 (7.95%), reached an historic high in the first quarter of 2013 (27.16%). The GDP growth was negative since the beginning of 2009 until the first quarter of 2014 when started to register positive values again. Wages and salaries also registered a negative growth rate during the considered period of crisis recovering a positive growth path at the beginning of 2014. According to the data of the Bank of Spain, public debt (as % of GDP) suffered an increase of 65 percentage points between 2008 and 2014 when started to recover previous values. The evolution of these indicators, among others, allow to establish the period of the Spanish Great Recession between 2008 and 2014, even when it took more years for the Spanish economy to recover to pre-crisis levels for some of the macroeconomic variables.

The Great Recession was the most important shock on our economy over the last years. During that period uncertainty borne by households increased and for that reason I have decided to analyze the effect it has on household consumption at the end of the crisis. To do that I exploit the panel component of the survey for deriving a measure of income uncertainty (using the individual data on income for a period of 8 years, 2007–2014) and then test whether uncertainty affected household consumption in 2014.

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; Attanasio and Weber 2010; Lugalde et al. 2018; or Baiardi et al. 2020). Among the three approaches used in empirical works to estimate the importance of precautionary saving: reduced form estimates, simulation models and subjective expectations, this paper follows the first one and uses objective data to estimate income uncertainty. 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).

Although most empirical works find evidence of an effect of uncertainty on savings, not in many countries there is evidence enough about this motive for saving (the US, Italy, the UK, Germany and few others). In the case of Spain, there is not too much evidence about precautionary saving and most of the papers proxy the uncertainty trough unemployment risk (Albarrán 2000; Barceló and Villanueva 2010; Barceló y Villanueva 2016; Campos and Reggio 2015; Lugalde et al. 2018).

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 uncertainty. The analysis is performed in two steps. In a first step I estimate a measure of income uncertainty 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 uncertainty, 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.

Since the econometric results show a negative impact of uncertainty on household consumption, I can conclude about the evidence of the existence of precautionary saving in Spain. The results obtained weakly differ depending on the consumption variable used as dependent variable in the model. When using the logarithm of the household consumption, I obtain that a 1% increase in the income uncertainty will decrease consumption in about 8.8%. However, when I use 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 8.1%. To the best of my knowledge, it is the first paper concluding about the elasticity of consumption regarding income uncertainty. Other works test the impact of income uncertainty on household consumption (see Carroll 1994; or Miles 1997), but their results are not in elasticity terms.

This paper provides empirical evidence about precautionary savings in Spain after a convulsed period such as the Great Recession years in which households had to adjust their consumption patterns. Given the little evidence of that for this country this could be considered the main contribution of this paper. Moreover, to the best of my knowledge, this is the first paper providing evidence about precautionary saving in Spain measuring income uncertainty from observed household real income data during a period.

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 uncertainty. 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. Despite the large literature on that, 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 form estimates, simulation models and subjective expectations. Works following the first approach attempt to estimate the impact of income uncertainty 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 (Miles 1997; Kazarosian 1997; Lugalde et al. 2018; among others). 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 Cagett (2003), who calibrate an explicit life cycle optimization problem by 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 features 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; Mastrogiamomo and Alessie 2014; or Christelis et al. 2020). 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's (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 form estimates) and using objective data to estimate income uncertainty. 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 uncertainty, proxied traditionally by the standard deviation or the variance of income. There have been several methods to deal with the measurement of income uncertainty 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 each individual to rely on the same set of variables to form expectations and the individuals and the econometrician to have the same information set.

Some works using panel data use not only the information from panel but also the individual characteristics in order to derive a measure of income uncertainty (see Carroll 1994; Kazarosian 1997; or Guariglia and Rossi 2002). The use of panel microdata allows to directly test whether individuals change their behaviour when there are changes in the uncertainty they bear according to theoretical predictions. For that, other works exploit the panel structure of the data to calculate the permanent/normal income from the household real income over a period and the variance of this income (see, for example, Carroll and Samwick 1998; Guariglia 2001; or Ventura and Eisenhauer 2006). Carroll and Samwick (1998) include the log of the variance of the log of income as an 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 1991–1998) 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 permanent). 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 uncertainty, respectively, in a saving equation. Then, exploiting the estimated regression coefficients as well as mean values of the variables,

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.

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 analysis in two stages. Firstly, by exploiting the panel structure, I calculate the average household real income over the period 2007–2014 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 (Guariglia 2001; follows a similar strategy). The underlying assumption 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 I test the existence of precautionary saving by analyzing the effect of the uncertainty on consumption (see Dardanoni 1991; Dynan; 1993; Carroll 1994; Miles 1997; Banks et al. 2001; Benito 2006; or Lugalde et al. 2018; among others).

Although most empirical works find evidence of an effect of uncertainty on savings, most of them are focused on the same economies, so there are not many countries where there is evidence about precautionary saving (the US, Italy, the UK, Germany and few others). In the case of Spain, there is a little evidence about the existence of precautionary saving. Albarrán (2000) uses micro-data from a rotating panel, the Spanish Family Expenditure Survey, to analyze precautionary saving associated with income uncertainty. 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 recipient of income at the 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 Labour Force Survey according to the level of education and age of the primary earner in the household). Lugalde 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 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 generates a significant negative impact on consumption at all business cycle horizons as

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

well as regardless of the econometric specification. Therefore, to provide empirical evidence about the effect the uncertainty has on consumption for the Spanish households is an important contribution of this paper.

3 Measuring income uncertainty from the EFF data

In the context of precautionary motive for saving the use of microeconomic panel data is preferred to analyze consumption behaviour since it allows to 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 (every three years) 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.

This paper focuses on the panel component of the survey to analyze the existence and strength of precautionary saving in Spain. Since I want to 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 it is constructed aggregating the data of individual income of household members, the income obtained from assets and the non-labour 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 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 the standard deviation of the household income (Guariglia (2001) follows a similar approach to calculate the income uncertainty measures). These variables are used as proxies of the household normal income (\bar{Y}) and income uncertainty (SDY), respectively. The use of an 8-year period to estimate the household normal income is because of the focus of this paper. Since the aim is to analyze the consumption/saving behaviour

⁴ A more detailed description of the survey and the main variables used in the paper is in Appendix A. In particular, Table 2, in the Appendix, contains the list of variables used in the model and their description while Table 3 provides a descriptive table of the main characteristics of households in the sample.

⁵ I could consider also the households participating since 2005 to have a wider period of analysis, but the aim of this paper is to test the existence of precautionary saving at the end of the Great Recession. For that, I have decided work with the household belonging to the panel from 2008 to 2014, the period of Great Recession.

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).

of Spanish households at the end of the Great Recession, using income information covering the crisis period seems to be the best way to address it.

From the household average income, I construct a control variable capturing if the household income was under a threshold defined as 20% of the average income of the period in some years (Deidda (2013) establish the same income threshold and excludes from the analysis the households whose earnings were under it). Only 4.54% of the households in the sample had income under 20% of its average income in some of the previous years and only for 1.73% of the households the current income, income of 2014, is under the threshold. I include this variable in the consumption regressions 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 uncertainty (*SDY*) captures current income shocks but, under the assumption that individuals use their own past incomes to forecast their future income and have rational expectations, it is a good proxy for future uncertainty. The supposition is that those households with high income variability could have also more uncertainty about future income as a projection of this income uncertainty that they have. In fact, the estimated measure of income uncertainty (*SDY*) correlates with some variables commonly related to uncertainty. To show that, I include below several graphs collecting the relationship between the standard deviation of income, *SDY*, and different characteristics of the household reference person commonly related to uncertainty. 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) (Fig. 1).

The youngest and the elderly exhibit a higher standard deviation of income in relation to the average income, this being more acute for the former (especially for those between 26 and 35 years old). This is consistent with the idea that households with younger heads respond more strongly to the income uncertainty because households with the youngest household heads need to save more in order to build a buffer stock of savings and retired individuals face uncertainty with respect to their survival as well as medical and nursing home expenses which are not present in the middle-aged (Chamon et al. 2013; Kopecky and Koreshkova 2014) (Fig. 2).

Among the different levels of education those with a “post-graduate” have the highest standard deviation of income (being, in average, 54% of their average normal income) while those with “primary education” have the lowest. This could be related to the labour status or the occupation that individuals are performing in function of their educational attainment (Fig. 3).

As expected, those households whose reference person is “self-employed” jointly with those in which it is “permanently disabled or unable to work, or student or housewife/house husband” (that is, “other inactive”) have the highest uncertainty while the “employees” have the lowest. This is in line with the assumed in the literature: the self-employed have presumably higher income uncertainty (Leland 1968; Deidda 2013; Mishra et al. 2013) (Fig. 4).

Among the different occupations, “managers in the public or private sector”, followed by those employed in the category “skilled workers in agriculture and

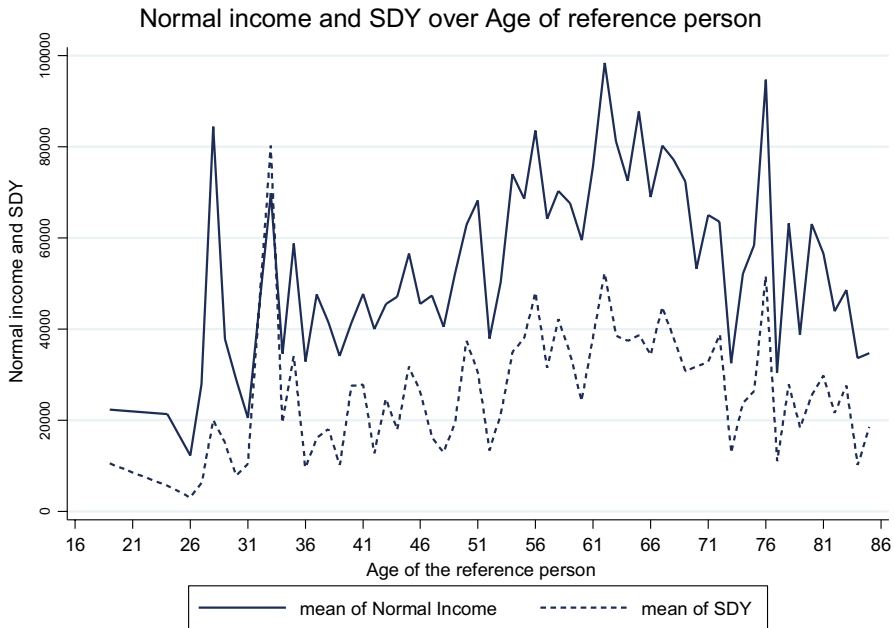


Fig. 1 Relation between the SDY and the age of the reference person. Own elaboration from the EFF balanced panel data

fishing”, have the highest income uncertainty in respect to their average normal income (for them the mean of the SDY is more than 50% of the mean of the normal income). In the sample considered, these occupations are also those with the highest ratio of self-employed and the managers are people with highest educational level. “Skilled craftsman or worker in manufacturing, construction or mining industries” jointly with “plant and machine operators and assemblers” have the lowest income uncertainty and have also a lower level of education than managers (nobody in these occupations is a postgraduate) (Fig. 5).

As regards the variable capturing whether household income was under 20% of normal income in some years, the graph shows that those whose income in 2014 was under the threshold defined have the highest uncertainty in respect to their normal household 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.

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

Once the validity of the estimated uncertainty proxy is shown, the following section tests the effect that the uncertainty about future income, measured trough the

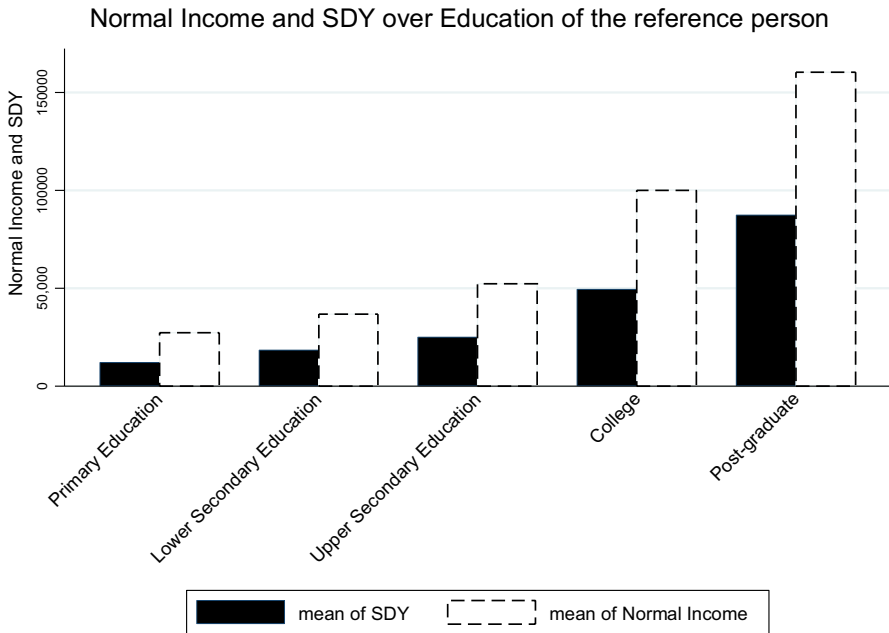


Fig. 2 Relation between the SDY and the education of the reference person. Own elaboration from the EFF balanced panel data

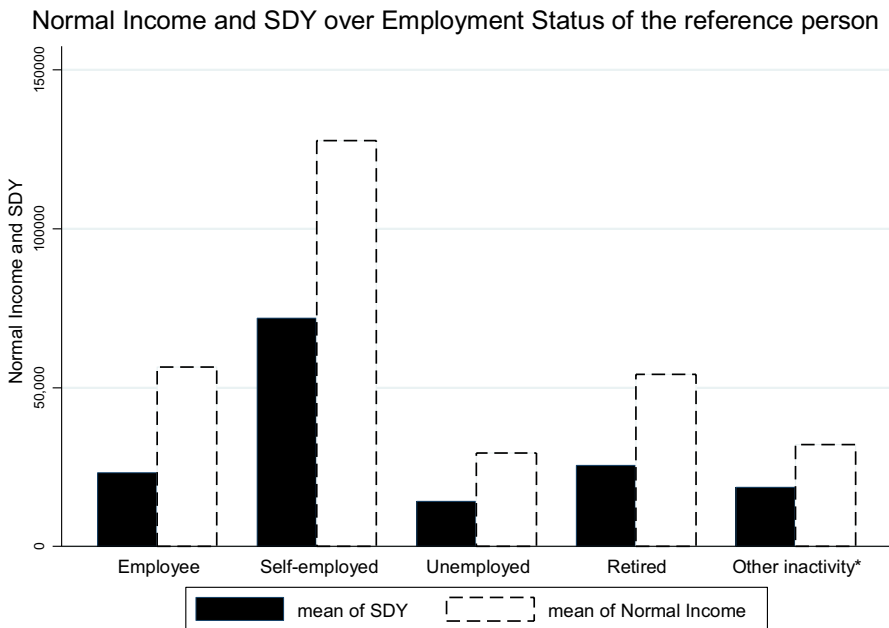


Fig. 3 Relation between the SDY and the labour status of the reference person. Own elaboration from the EFF balanced panel data. *Notes:* “other inactivity” refers to “Permanently disabled or unable to work”, or “Student” or “Housewife/house husband”

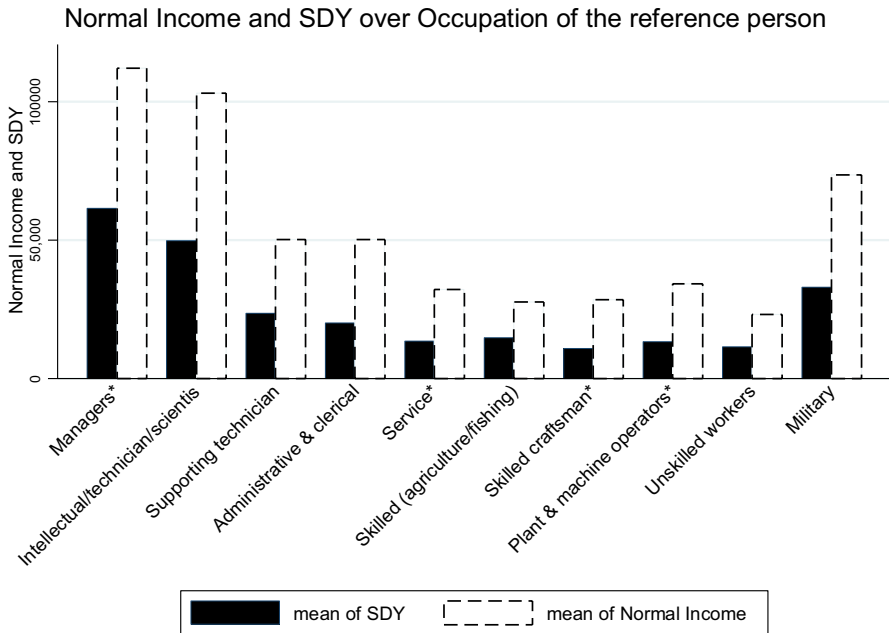


Fig. 4 Relation between the SDY and the occupation of the reference person. Own elaboration from the EFF balanced panel data. *Notes:* Occupation is displayed for those who are working (568). Managers: “in the public or private sector”. Service: “Hotel and catering, personal, security and sales services”. Skilled craftsman or worker in manufacturing, construction, or mining industries. Plant & machine operators: “and assemblers”

standard deviation of household income, has on household total consumption in the year 2014.⁷

4 Econometric model and results

The econometric model relates the consumption of a household with several covariates related to 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:

$$\log C_{i,t} = \beta_0 + \beta_1 \log \bar{Y}_i + \beta_2 \log SDY_i + \gamma Z_{i,t} + v_{i,t}. \tag{1}$$

⁷ Appendix A shows a detailed definition of consumption variable. The inclusion of durable goods on the variable is because these types of goods are often discretionary, and thus consumers can postpone purchases of such goods if they have uncertainty about their future personal finances and overall economic situation. Literature revolving around the role of psychological aspects of aggregate consumption highlight that consumer confidence primarily influences durables spending (see Garner 1981; Baghestani 2021; Bahestani and Fatima 2021; among others).

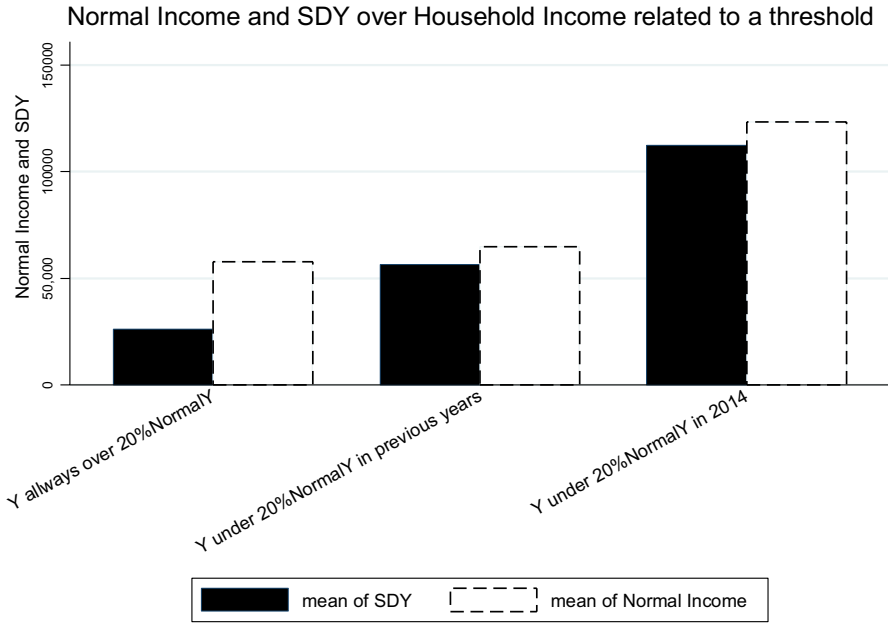


Fig. 5 Relation between the SDY and the defined threshold for household income. Own elaboration from the EFF balanced panel data

$$C_{i,t}/\bar{Y}_i = \alpha_0 + \alpha_1 \log \bar{Y}_i + \alpha_2 \log SDY_i + \theta Z_{i,t} + \varepsilon_{i,t} \tag{2}$$

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, 2014, to analyze how the average income of the period 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.⁸ The age and the educational level are those of the household reference person. The difference between both models is the dependent variable, in (1) $\log C_{i,t}$ is the logarithm of consumption of the i -th household in 2014 while in (2) $C_{i,t}/\bar{Y}_i$ is the ratio

⁸ To avoid outliers, I winsorize at 1% all the economic variables (income, wealth, debt, consumption and, therefore, the average income and the standard deviation of it). I also make 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, I do the logarithm of the variable plus one (i.e., $\ln(\text{variable} + 1)$).

between 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 (approximated by the standard deviation of income, SDY_i) should increase savings and thus decrease current consumption, i.e., a negative sign on this uncertainty variable is expected.

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 total consumption as a dependent variable while column (4) summarizes the results for the model using the ratio between consumption and the average income as a 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 62% in the logarithm of consumption equation and about 34% for the equation of consumption-average income ratio, and the F-statistic suggests that the null hypothesis of jointly insignificance should be rejected.

In general, the results for the standard control variables are in line with previous analyses, with expected signs. Wealth impacts positively on consumption, both real and financial wealth. During the period considered households tended to accumulate financial assets. According to the Bank of Spain, as compared to the first quarter of 2009, in 2014 the percentage of Spanish households with some financial assets 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 2014.⁹

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 a 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 magnitudes of the coefficients in the model for the logarithm of consumption are lower than 1, therefore, as income increases, consumption goes one, but 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 (values close to zero) but not significant.

⁹ See Banco de España (2014, 2017).

Households whose income was under the threshold (defined as 20% of the average income of the period) in some years before 2014 had a higher consumption that year (but with no significant coefficients), while those whose income was under the threshold in 2014 reduced their consumption (with significant coefficients). Household characteristics show the relations expected. 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 the analysis.

In relation to the uncertainty measure, the standard deviation of household income shows a negative and significant coefficient in both models. Therefore, 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 Lugalde 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 I 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 taking into account the level of income than in absolute terms. The uncertainty measure has a larger impact on the logarithm of consumption (-0.088) than on the ratio consumption—normal income (-0.026). This reduction of 0.026 in the ratio $Cons/Y$ when the SDY increases by 1% implies, given the average consumption and normal income in the sample, that consumption will decrease by 8.1% while in the model for the $\ln(Cons)$, an increase of 1% in the SDY will decrease consumption by 8.8%.¹⁰

These results go in line with other works showing a strong precautionary motive for saving. Thus, for the UK, Dardanoni (1991) claims that more than 60 percent of savings arise as a precaution against future income risk, Miles (1997) concludes that doubling income variability for the typical household reduces consumption by, on average, almost 5% or Guariglia and Rossi (2003) also a strong precautionary motive for saving. Using US data, Carroll's (1994) results suggest that a one-standard-deviation increase in uncertainty decreases consumption from 3 to 5 percent; Carroll and Samwick (1998) find that between 32 and 50% of wealth in the sample is attributable to the extra uncertainty or Kazarosian (1997) obtains that a doubling of uncertainty increases the ratio of wealth to permanent income by 29%. Ventura and Eisenhauer (2006) obtain that on average, each young Italian household saved 15.2 percent of its total annual saving, by precautionary purposes while Lusardi (1997) finds that precautionary accumulation ranges from 16 to 24% of total wealth accumulation.

¹⁰ Since the increase/decrease on total consumption could be for a punctual expenditure in durables goods and not for the effect of the uncertainty, I have also tested the effect income uncertainty has on non-durable consumption because it follows a more stable path than the durable consumption. The results also show a decrease in non-durable consumption when uncertainty arises which reflect the existence of a precautionary motive for saving and support that income uncertainty has a negative impact on consumption. Appendix B contains a table (Table 4) with the estimation results for the non-durable consumption model.

Table 1 The uncertainty effect on household consumption in 2014

	(1)	(2)	(3)	(4)
	$\ln(\overline{Cons})$	$\ln(Cons)$	$Cons/\overline{Y}$	$Cons/\overline{Y}$
$\ln(\overline{Y})$	0.403*** (0.023)	0.522*** (0.035)	-0.218*** (0.009)	-0.182*** (0.016)
$\ln(SDY)$		-0.088*** (0.019)		-0.026*** (0.009)
$\ln(FW)$	0.031*** (0.006)	0.028*** (0.006)	0.010*** (0.003)	0.009*** (0.003)
$\ln(RW)$	0.020*** (0.004)	0.020*** (0.004)	0.010*** (0.002)	0.010*** (0.002)
$\ln(\text{debt})$	0.003 (0.003)	0.002 (0.003)	0.001 (0.001)	0.000 (0.001)
Credit constraints	-0.045 (0.038)	-0.035 (0.038)	-0.004 (0.019)	-0.001 (0.019)
Risk aversion	-0.069** (0.035)	-0.071** (0.035)	-0.045*** (0.016)	-0.046*** (0.016)
Family size	0.108*** (0.015)	0.101*** (0.015)	0.032*** (0.006)	0.030*** (0.006)
Number of children	0.010 (0.023)	0.016 (0.023)	0.013 (0.010)	0.015 (0.010)
Age	0.005*** (0.001)	0.005*** (0.001)	0.002*** (0.001)	0.002*** (0.001)
Primary education	-0.045 (0.035)	-0.041 (0.035)	-0.008 (0.017)	-0.007 (0.017)
Upper secondary education	0.028 (0.037)	0.021 (0.037)	-0.002 (0.017)	-0.004 (0.017)
College	0.136*** (0.041)	0.122*** (0.041)	0.050*** (0.019)	0.046** (0.019)
1. $Y_t < 0.2 \overline{Y}$ in at least one year before 2014	-0.026 (0.062)	0.048 (0.066)	0.000 (0.026)	0.022 (0.028)
2. $Y_t < 0.2 \overline{Y}$ in 2014	-0.250*** (0.090)	-0.177* (0.092)	-0.052** (0.025)	-0.031 (0.026)
_cons	4.196*** (0.220)	3.845*** (0.231)	2.316*** (0.090)	2.211*** (0.099)
r2_a	0.6138	0.6195	0.3379	0.3418
N	1524	1524	1524	1524

Coefficient estimates. Cluster robust standard errors in parentheses

Significance levels: *** $p < 0.01$ ** $p < 0.05$ * $p < 0.10$

In the case of Spain, the scant evidence shows mixed results. Albarrán (2000) concludes that a 1% increase in the variance of cohort component of risk would imply that households raise their precautionary saving by 2.8% and Campos and

Reggio (2015) find that a one-point increase in the unemployment rate was related to a reduction in household consumption of more than 0.7% per equivalent adult. However, Barceló and Villanueva (2016) obtain a stronger effect and conclude that mature temporary workers save an extra 40% of income in liquid assets and Lugalde et al.'s (2018) results show that the labour conditions that the individuals face in the workplace may become an important source of uncertainty.

To the best of my knowledge, it is the first paper concluding about the elasticity of consumption with respect to income uncertainty. The results show that an increase of 1% in the standard deviation of household income decreases household consumption between 8 and 8.8%. From my point of view, this large reaction of consumption can be explained in part because of the macroeconomic context (end of a crisis -after a period of expansion and economic growth- which made families worry about uncertainty) and is in line with works finding a strong precautionary motive for saving.

5 Concluding remarks

Earnings uncertainty is the source of uncertainty most frequently studied in the theoretical literature about precautionary savings and income variability is the most common uncertainty proxy used in empirical works. This paper contributes to the existing literature by testing the effect that income uncertainty has on the consumption of Spanish households. The main contribution of this paper is to provide evidence about precautionary saving in Spain by measuring income uncertainty from the panel component of the EFF. I derive a measure of income uncertainty by 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 that it had on household consumption in 2014.

According to the estimations, an increase of 1% in the standard deviation of household income (uncertainty measure) reduced its current consumption between 8.1 and 8.8% implying (given the level of household income) a certain amount of precautionary saving. Therefore, I 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 uncertainty of income.

In addition, to the best of my knowledge, this 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 (Carroll 1994; or Miles 1997; also test the effect the income uncertainty on consumption but for US and UK) and also concluding about the elasticity of consumption in respect to income uncertainty.

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 it includes an over-sampling of rich households and a panel component. This survey was developed since 2002 (each three years) and consists of 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 to 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 was also collected relating to the calendar year preceding the survey. The collection of this information was carried out with personal interviews of households, which took place between the last months of the year in question and the second quarter of the following year. These interviews were conducted with the help of a 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 ones aimed at 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 decided to keep in the panel sample only all the 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-labour 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 the previous year of the interview (2007, 2010 and 2013) and the other to the month in which the interview took place. Therefore, I proxy the annual household income during the year of the interview (2008, 2011 and 2014) by multiplying the regular monthly income by 12 months.

Consumption

The consumption variable used is the annual household consumption 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 is 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 food, electricity, water, mobile phones, condominium services, leisure, school/university, etc.
- Annual expenditure on vehicles, jewellery, artworks, antiques.
- Annual expenditure on household equipment (carpets, drapes, curtains, furniture or household appliances)

Since some variables refer to regular/average monthly expenditure instead of 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. The household has credit restrictions when they:

- A) Have been denied a loan to them,
- B) Have been granted a loan for an amount less than that they requested or
- C) 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.

See Tables 2 and 3

Table 2 Brief description of the variables used in the analysis

Variable	Variable notation	Brief description
Normal household income ^a	\bar{Y}	Average income of the household over the period 2007–2014
Standard deviation of income ^a	SDY	Standard deviation of the household income
Total consumption ^a	C	Annual total consumption of the household in 2014
Ratio consumption—normal income	C/\bar{Y}	Ratio between household consumption in 2014 and the average household income over the period 2007–2014
Financial wealth ^a	FW	Financial wealth
Real wealth ^a	RW	Real wealth
Debt ^a	$debt$	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 the age of 18)
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} $Y_i > 0.2 \bar{Y}$ in all years $Y_i < 0.2 \bar{Y}$ in at least one year before 2014 $Y_i < 0.2 \bar{Y}$ in 2014	Variable collecting if the household income was/is under 20% of \bar{Y} Current income over $0.2 \bar{Y}$ in all years Current income lower than $0.2 \bar{Y}$ in at least one of the previous years Current income lower than $0.2 \bar{Y}$ in 2014
Age ^b	Age	Age
Educational level ^b	Primary education Lower secondary education Upper secondary education College	Highest educational level reached: None studies or Primary education Highest educational level reached: Lower Secondary education Highest educational level reached: Upper Secondary education and First stage of Tertiary education (Vocational training) Highest educational level reached: Tertiary education and Doctoral studies

^aAll these variables are in logarithm in the consumption regression, notation: $Ln(variable)$

^bThese variables refer to the reference person

Table 3 Average, median and standard deviation of the variables included in the analysis

	Average	Median	Standard deviation
C	18,938.57	14,180	16,231.19
\bar{Y}	59,073.39	35,814.02	71,547.79
C/\bar{Y}	0.443	0.398	0.245
SDY	28,955.44	11,962.72	45,623.43
FW	2.74E+05	28,646.8	8.59e+05
RW	6.90E+05	2.28E+05	1.44e+06
$Debt$	28,816.77	0	68,688.86
$Ln(C)$	9.587	9.56	0.699
$Ln(\bar{Y})$	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		

All the variables refer to the 2014 year, since is the one in which I 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, 2011 and 2014 waves)

Appendix B

See Table 4.

Table 4 The uncertainty effect on household non-durable consumption in 2014

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

Coefficient estimates. Cluster robust standard errors in parentheses

Significance levels: *** $p < 0.01$ ** $p < 0.05$ * $p < 0.10$

Acknowledgements I am really grateful to Tullio Jappelli for his helpful comments and guidance. All remaining errors are mine.

Funding Open Access funding provided thanks to the CRUE-CSIC agreement with Springer Nature.

Declarations

Conflict of interest No funding was received to assist with the preparation of this manuscript. The author has no relevant financial or non-financial interests to disclose.

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