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Analysis of Variance in Household Financial Portfolio Choice: Evidence from Spain*

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Abstract

We analyse the determinants of the household financial portfolio allocation using an estimator and a variance decomposition that take into account the constrained nature of household portfolio allocations. We apply these methods to a large data set of financial assets. Results show that the main factors underlying household financial portfolio choice in Spain are age and net wealth. Among others, there is also evidence of sizeable effects associated with risk aversion, education, liquidity constraints and income, but very modest effects are associated with family size and having accounts in stand-alone internet banks. Implications for policy are also derived.

1. Introduction

Starting with the seminal paper on portfolio choice by Markowitz (1952), the problem concerning household portfolio allocation has received increased attention both theoretically and empirically (Campbell (2006)). At the empirical level, household portfolios are found to vary significantly according to age, wealth and education, see the analysis for the US, France, Italy, the Netherlands, Sweden and the United Kingdom conducted by Guiso et al. (2003). Taxes and housing are also shown to affect portfolio decisions, see King and Leape (1998), Poterba and Samwick (2003), Cocco (2005) and Yao and Zhang (2005). The development of microdata on Spanish households has also allowed the analysis of portfolio allocation in Spain; see López Gómez (2006) and Mora and Escardibul (2008) for a general picture, Mayordomo (2007), Fernández-Fernández (2008) and Mayordomo et al. (2014) for the interaction between housing decisions and portfolio allocation, and Domínguez Barrero and López Laborda (2010) for tax effects.

Previous empirical papers share two main shortcomings. First, most distinguish only two broad categories of assets: riskless and risky assets. The risky alternative refers mainly to stockholding whereas other financial investments are frequently

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considered riskless assets. However, there may be cases where a finer division of assets is needed, as when one relies on cross-asset variation in marginal income tax rates to identify the effect of taxation on household portfolio. Second, the constrained, non-normal nature of asset portfolio data is hardly accounted for. A notable exception is Poterba and Samwick (2003), who estimated a complete system of two-way Tobit models taking into account the fact that the effect of each explanatory variable on the portfolio shares must sum to zero across all assets. However, Poterba and Samwick's (2003) estimator is non-robust to distributional misspecification and is also computationally difficult.

In this paper, we attempt to present a unified methodology for analysing decisions concerning portfolio allocation that is simple to implement and whose estimation relies on less than full distributional assumptions. For this purpose, we bring together two techniques already available in the literature. First, estimation follows the multivariate fractional logit procedure developed by Mullahy and Robert (2010) to analyse complete systems of time demand equations, as time demand and wealth allocation share some formal characteristics.[1] This estimator (as well as Poterba and Samwick's (2003)) makes it possible to ascertain the origin of the variation in the proportion of wealth invested in a certain asset, but is much simpler to implement and relies only on the correct specification of the conditional mean. Second, the variance decomposition technique developed by González Chapela (2013) is used to provide a quantitative ranking of the determinants of household portfolio allocations, namely to identify the explanatory variables that most differentiate the asset portfolio observations.

The importance of this exercise, which to the best of our knowledge has not been previously implemented in the portfolio choice literature, may be illustrated with two examples. First, suppose that the quantity of wealth proves to be more important than the amount of income for explaining cross-sectional differences in household portfolio allocation. Then, a government interested in modifying some aspect of that allocation had better change the distribution of wealth than the distribution of income. The second example is related to the Markets in Financial Instruments Directive of the European Union (MiFiD). This requires financial advisors to identify customer investment preferences and to customise their advice accordingly. Typically, identification takes place by way of self-disclosure of individual preferences and also by checking her financial, educational and professional status. Understanding the degree of consistency between self-declared investment preferences and observed personal and financial characteristics would make the development of adequate financial planning services easier.

We begin in Section 2 by reviewing the literature on household portfolio allocation to put forward factors affecting the portfolio choice. We then present the data and the statistical strategy in Sections 3 and 4, respectively. In Section 5, we illustrate our proposed methodology in an analysis of the allocation of financial wealth in Spain, using a relatively wide variety of financial assets and a rich set of explanatory factors. Section 6 contains the main conclusions.

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[1] The components of the multivariate vector are non-negative, may take on certain values with positive probability and add up to a constant.

2. Previous Literature

The literature on portfolio theory analyses how agents make investments. Results show, for example, that age, wealth and education are important factors explaining equity holdings of households. Also, households' degree of risk aversion is considered to be a relevant factor in explaining portfolio composition (see Guiso et al. (2002) for a review).

Empirical results do not clearly follow the theoretical predictions. For example, wealth is expected to negatively affect risky asset shares whereas evidence suggests a positive or even constant relationship (Campbell (2006), Guiso et al. (2002)). The share of risky assets is found to be low at young ages and either increasing or hump-shaped over the life cycle (Ameriks and Zeldes (2004), Poterba and Samwick (2001)), contrary to what theoretical models claim. The literature has endeavoured to extend standard models to be able to explain these divergences. Among the additional variables considered, labour income risk, health risks and some sort of measure for credit or liquidity constraints have been included in empirical studies. The general result found is that the existence of labour or health risks negatively affects the proportion invested in equity shares (Guiso et al. (1996), Fratantoni (1998)). Furthermore, households having some borrowing constraints end up investing less in risky assets (see, among others, Guiso et al. (1996) and Yamishita (2003)).

Gender has been shown to be a key issue within the area of investment behaviour. There is an increasing body of literature that documents evidence of gender affecting investment decision-making (Jianakoplos and Bernasek (1998), Fehr-Duda et al. (2006), Croson and Gneezy (2009)). Barber and Odean (2001) specifically document the effects of males' over-confidence on trading and investment behaviour. Correspondingly, they show that marriage changes some male perceptions and decisions with respect to investment. In the same vein, Bertocchi et al. (2011) show that single women have a lower propensity to invest in risky assets than married females or males.

Real estate and private business ownership have also been considered in investment analyses (Flavin and Yamashita (2002), Cocco (2005), Yao and Zhan (2005) and Jin (2011)). This is based on the evidence that owning a home or a business have associated price and income risks, respectively. Further, they might be substitutes for stockholding, as investing in owner-occupied housing or in private business holdings reduces the percentage of investment in stockholdings (Cocco (2005), Jin (2011) and Heaton and Lucas (2000)). The final portfolio composition will therefore depend on real estate and private business ownership, and empirical results indicate a negative impact of these assets in the share of stocks.

Financial literacy and financial education are other important factors to be considered (Van Rooij et al. (2011), Lusardi and Mitchel, (2014), Von Gaudecker, (2015)). The degree of financial education can affect economic decision-making and hence financial investment with regard to different savings propensity, fewer retirement investments or larger financial errors (Bernheim and Garrett (2003), Lusardi and Mitchell (2007) and Calvet et al. (2007)).

These papers concentrate mainly on stockholding decisions. However, restricting the analysis to the share of stocks in the household portfolio leaves investment in other risky assets out of the picture. It assumes that the share of just one risky asset can determine investment behaviour when there might be other assets with different risk characteristics in place. In other words, within this framework, a household holding 30% of its wealth in stocks and 10% in fixed rate assets (with risk) would be considered to have the same portfolio composition and risk as a household with the same share of equity but zero investment in fixed rate assets. In line with this argument, some recent papers introduce other assets but restrict themselves to stockholdings and mutual funds (Campbell (2006), Calvet et al. (2007) and Wermers (2011)) or stocks, private business and real estate (Jin (2011)).

In this paper, we analyse a relatively wide set of risky and non-risky assets available to households. Both the simultaneous analysis of the different categories of risky and non-risky assets and the use of an empirical methodology that takes into account the constrained nature of household portfolio allocations, represent an improvement over the traditional analysis that may enrich our understanding of household financial portfolio choice. As a consequence, we may better understand decisions associated with household finance and qualify previous evidence on determinants of household portfolio allocation.

3. Data

The data for this study is taken from the Spanish Survey of Household Finances (EFF), a useful source of information about assets, debts, income and other characteristics of Spanish households and their members. The EFF has been conducted by the Banco de España every three years since 2002. We use data from the 2008 wave, which has become part of the first wave of the European Central Bank's (ECB) Household Finance and Consumption Survey. Furthermore, the 2008 wave collected observations for a time period between a decade of strong growth and a dramatic recession, so that the lessons derived might be less contaminated by the business cycle. The data we use are those provided directly by the Banco de España.

Important features of the EFF are the oversampling of wealthy households and the imputation of "No Answer" and "Don't Know" replies for all the variables in the survey.[2] To make statements about the population, we use the cross-sectional weights provided by the EFF2008 (variable *facine3)*, so that wealthy households are weighted down to fit their share in the population. As described in Barceló (2006), five imputed values are provided in the EFF2008 for each missing value. To make inferences from the five imputed datasets (known as implicates), we first analyse each of the five implicates by complete-data methods and then combine the results as explained in Bover (2011) or ECB (2013, Ch. 7).

The total number of completed interviews collected in the EFF2008 is 6197. Some of these households (64%) have participated since 2002 or 2005, whereas the remaining 36% were incorporated so as to preserve cross-sectional representativeness and overall sample size. We discarded 291 households who reported zero financial wealth. This leaves us with 5906 households.

The EFF2008 collected information on the amount invested by the household in nine different types of financial assets: accounts and deposits usable for payments,

[2] Since the distribution of wealth in the population is heavily skewed, and some types of assets are held by only a small fraction of the population, a standard random sample would not contain enough observations for the analysis of wealth. Also, due to the sensitivity of the issue of household finances, item non-response is an inherent characteristic of wealth surveys.

accounts and deposits not usable for payments, listed shares, unlisted shares and other holdings in companies, mutual funds, fixed-income securities, life insurance and pension schemes, managed accounts and a catch-all category for other financial assets.

From the previous literature on investment choice, we have selected a total of 16 characteristics whose influence on households' financial portfolio composition is to be assessed. These explanatory variables can be classified as characteristics of the household and characteristics of the reference person.[3] The characteristics of the household are income, net wealth,[4] degree of risk aversion, number of members, whether the household owns its home, owns some private business, is liquidity constrained and whether it holds some account in stand-alone internet banks. The characteristics of the reference person are age, gender, education level, marital status, health status, whether he/she has never worked, is self-employed or works in the financial sector.[5]

The degree of risk aversion is taken from a direct answer to a question on the financial risk the household is willing to take when making investments. Similarly, a household is considered to be liquidity constrained if it declares not to have asked for a loan in the last two years, or if it has asked, the loan has been denied. We do not consider the impact of taxes on portfolio composition because the marginal tax rate is endogenous to the choice of portfolio (King and Leape (1998)), and to be able to meaningfully decompose the total variation in the dependent variable into explained and unexplained variation, the explanatory variables are to be uncorrelated with the disturbance. This, of course, is an important limitation of the methodology proposed in this paper.

Each of those 16 characteristics is represented by a set of dummy variables whose elements are taken from Banco de España reports on the EFF2008 (e.g., see Banco de España (2010)).[6] Table 1 presents descriptive statistics for all the variables used in this study.

[3] We use the figure of reference person as a way of organising the data consistently. The reference person status is assigned by the EFF2008 to the person (or one of the persons) responsible for accommodation. Usually, he/she is the member more involved in handling the economic issues of the household. When this is not the case, using only the reference person's characteristics may introduce errors in some explanatory variables. Bhatta and Larsen (2011) show that the presence of classical measurement error in an explanatory variable may bias all parameter values in the multinomial logit context, although the impact on partial effects has not been analysed.

[4] Household income is calculated as the sum of labour and non-labour incomes for all household members in 2007, but it is expressed in euros of the first quarter of 2009. Net wealth is defined as all assets minus the outstanding debt.

[5] Since traditional variables used in the literature to account for financial literacy are not available in EFF2008, we use "Holding some account in stand-alone internet bank" and "working in the financial sector" as alternative measures for financial literacy.

[6] We used the Bayesian information criterion to select between a model with age, the log of income and the log of net wealth entered as quadratic functions, and a model with age, income and wealth entered as dummy variables. In each of the 5 datasets with imputations, the favoured model had age, income and net wealth entered as dummies.

Table 1 Descriptive statistics, the Spanish Survey of Household Finances 2008

Explaining variable (€1000)	*Mean*	*SD*	*Min*	*Max*	*25th pctl*	*50th pctl*	*75th pctl*	*% = 0*
Financial assets	37.2	188.6	.001	35,150	1.8	7.2	26.9	
(1)	8.7	27.0	0	4000	0.9	2.8	7.3	3.2
(2)	9.8	63.5	0	7000	0	0	0.5	74.0
(3)	8.9	150.0	0	35,000	0	0	0	84.9
(4)	0.7	9.6	0	1400	0	0	0	98.5
(5)	6.6	30.1	0	9448	0	0	1.0	72.3
(6)	0.2	7.9	0	1430	0	0	0	99.4
(7)	2.3	32.9	0	8845	0	0	0	93.2

Household characteristics (%)	*Mean*	*Reference person's charac. (%)*	*Mean*
Income pctl < 20	18.3	Age < 35	13.7
Income pctl 20-40	20.1	Age 35-44	22.6
Income pctl 40-60	19.9	Age 45-54	20.4
Income pctl 60-80	20.5	Age 55-64	16.5
Income pctl 80-90	10.5	Age 65-74	14.9
Income pctl ≥ 90	10.7	Age 75+	11.8
Net wealth pctl < 25	22.7	Female	48.7
Net wealth pctl 25-50	24.6	Less than a high school diploma	68.6
Net wealth pctl 50-75	26.0	Exactly high school	12.7
Net wealth pctl 75-90	15.9	More than a high school diploma	18.7
Net wealth pctl ≥ 90	10.7	Married	64.1
Not willing to take financial risks	83.9	Very good health	22.7
Fairly risk inclined	13.9	Good health	52.5
Quite risk inclined	1.8	Acceptable health	18.4
Pretty risk inclined	0.4	Poor health	5.5
Family size = 1	18.5	Very poor health	0.9
Family size = 2	29.7	Never worked	8.3
Family size = 3	25.4	Self-employed	8.7
Family size = 4	21.4	Works in the financial sector	3.8
Family size = 5+	5.1		
Home owner	83.9		
Business owner	14.7		
Liquidity constrained	17.8		
Account in stand-alone internet bank	0.6		

Notes: Data are of 5906 households from the EFF2008. All estimates are calculated using cross-sectional weights and incorporate the missing-data uncertainty. Financial assets are made up of (1) accounts and deposits usable for payments, (2) accounts and deposits not usable for payments, (3) shares, (4) fixed-income securities, (5) life insurances and pension schemes, (6) managed accounts and (7) other financial assets. Money values are in euros of 2009Q1.

4. Statistical Strategy

4.1 Multivariate Fractional Logit (MFL) Estimates

The relative share of financial wealth invested in asset m, m=1,…,M, is denoted y_m. For multivariate dependent variables whose components are non-negative, may take on certain values with positive probability and add up to 1, Mullahy and Robert

(2010) developed an attractive specification and a simple quasi-likelihood estimator that extends Papke and Wooldridge's (1996) fractional regression model to a multivariate context. Thus, let the population regression of y_m be of the multinomial logit form:

$$E\left(y_m \middle| \mathbf{x}\right) = \frac{\exp\left(\mathbf{x}\boldsymbol{\beta}_m\right)}{\sum_{l=1}^{M} \exp\left(\mathbf{x}\boldsymbol{\beta}_l\right)}, \quad m = 1,\ldots,M, \tag{1}$$

where $\mathbf{x} = \left(1, x_2, \ldots, x_K\right)$ is a random vector of explanatory variables and each $\boldsymbol{\beta}_m$ is a conformable vector of unknown parameters. This nonlinear specification ensures that each predicted relative asset share $\left(\hat{y}_m = \hat{E}\left(y_m \middle| \mathbf{x}\right)\right)$ lies between 0 and 1, that $\sum_{m=1}^{M} \hat{E}\left(y_m \middle| \mathbf{x}\right) = 1$ and that the partial effect of x_k on $E\left(y_m \middle| \mathbf{x}\right)$ is not constant but dependent on $\mathbf{x}$. An additional feature is that equation (1) is well-defined even if every y_m takes on 0 or 1 with positive probability. The normalisation $\boldsymbol{\beta}_1 = \mathbf{0}$ is generally imposed for identification purposes.

The multinomial logit log-likelihood function

$$l\left(\mathbf{b}\right) = \sum_{m=1}^{M} y_m \left(\mathbf{x}\mathbf{b}_m - \ln\left(\sum_{l=1}^{M} \exp\left(\mathbf{x}\mathbf{b}_l\right)\right)\right), \tag{2}$$

where $\mathbf{b} = \left(\mathbf{0}', \mathbf{b}_2', \ldots, \mathbf{b}_M'\right)'$ is a generic element of the parameter space, is an objective function associated with the linear exponential family (LEF) of probability distributions. Given a sample of N independent observations $\left\{\left(\mathbf{y}_i, \mathbf{x}_i\right) : i = 1,\ldots,N\right\}$, where $\mathbf{y}_i = \left(y_{i1}, \ldots, y_{iM}\right)'$, the quasi-maximum likelihood estimator (QMLE) of $\boldsymbol{\beta} = \left(\mathbf{0}', \boldsymbol{\beta}_2', \ldots, \boldsymbol{\beta}_M'\right)'$, $\hat{\boldsymbol{\beta}}$, is consistent for $\boldsymbol{\beta}$ and asymptotically normal provided that equation (1) and standard regularity conditions hold (Gourieroux et al. (1984)). We must take into account, however, that expression (1) might be misspecified, at least because some relevant explanatory variables might have been omitted from $\mathbf{x}$ (e.g., the marginal tax rate). Hence, $\hat{\boldsymbol{\beta}}$ is obtained from the maximisation problem

$$\max_{\mathbf{b}} \sum_{i=1}^{N} w_i l_i\left(\mathbf{b}\right), \tag{3}$$

where w_i denotes the cross-sectional weight, so that our estimated partial effects are measuring partial correlations between explaining and explanatory variables in the population.[7]

The average partial effect of the *k*th explanatory variable on the *m*th conditional mean (APE_{mk}) is calculated using the finite-difference method (e.g., see Cameron and Trivedi (2005, p. 123)). As $\sum_{m=1}^{M}\hat{E}\left(y_m|x\right)=1$, then $\sum_{m=1}^{M}APE_{mk}=0$. When a characteristic of the household or of the reference person is represented by more than one dummy variable, the APE is calculated by zeroing out all of the dummies in the set and then setting the corresponding x_k to 1 for all observations. Standard errors of APEs take into account sampling error (using the replicate weights provided by the EFF2008) and item non-response (using multiple imputation formulas). Replicate weights and multiple imputation were combined as explained in ECB (2013, p. 65). For each implicate, we specified 200 bootstrap replicates, a number that ensures that the deviation from the ideal bootstrap standard errors is less than 10% with probability amounting to at least .95 (Andrews and Buchinsky 2000).

4.2 Variance Decomposition and Goodness of Fit

The literature on generalised linear models has extended the analysis of variance to certain nonlinear contexts based on the concept of deviance. If $f_{\mathbf{y}_i}$ and $f_{\mathbf{p}}$ denote two LEF probability distributions associated with the random vector $\mathbf{y}$, centred, respectively, at a realisation of $\mathbf{y}$ and at $E\left[\mathbf{y}|\mathbf{x}\right]=\mathbf{p}$, then the estimated deviance between observations $\mathbf{Y}=\left(\mathbf{y}_1,\ldots,\mathbf{y}_N\right)$ and fitted values $\hat{\mathbf{P}}=\left(\hat{\mathbf{p}}_1,\ldots,\hat{\mathbf{p}}_N\right)$ is given by

$$K\left(\mathbf{Y},\hat{\mathbf{P}}\right)=2\sum_{i=1}^{N}\left(\ln f_{\mathbf{y}_i}\left(\mathbf{y}_i\right)-\ln f_{\hat{\mathbf{p}}_i}\left(\mathbf{y}_i\right)\right), \tag{4}$$

(McCullagh and Nelder (1989)). The difference $K\left(\mathbf{Y},\hat{\mathbf{P}}_0\right)-K\left(\mathbf{Y},\hat{\mathbf{P}}\right)$, where the sub-index 0 refers to the null model, measures the reduction in deviance achieved by the inclusion of explanatory variables.

In practice, the data-generating process $f_{\mathbf{p}}$ is generally unknown, but the deviance can still be calculated if certain features of the data are assumed. Thus, let $\mathbf{y}$ have conditional mean $\mathbf{p}$ with mth element as given in (1) and conditional variance given by

$$V\left(\mathbf{y}|\mathbf{x}\right)=\sigma^2\mathbf{V}, \tag{5}$$

[7] Maximisation of (3) is readily conducted in Stata using the command *fmlogit* with the qualifier *[pweight=facine3]*.

where σ^2 is a dispersion parameter, $\mathbf{V}$ represents a matrix with mlth element $p_m\left(\delta_{ml}-p_l\right)$, and δ_{ml} is an indicator variable equal to 1 if $m=l$ and equal to 0 otherwise. Then, the deviance between $\mathbf{Y}$ and $\hat{\mathbf{P}}$ can be calculated as $-2Q\left(\hat{\mathbf{P}};\mathbf{Y}\right)$, where

$$Q\left(\hat{\mathbf{P}};\mathbf{Y}\right)=\sum_{i=1}^{N}w_i\left(\sum_{m=1}^{M}y_{im}\left(\mathbf{x}_i\hat{\boldsymbol{\beta}}_m-\ln\left(\sum_{l=1}^{M}\exp\left(\mathbf{x}_i\hat{\boldsymbol{\beta}}_k\right)\right)\right)-\sum_{m=1}^{M}y_{im}\ln y_{im}\right). \qquad (6)$$

As assumptions (1) and (5) might not be strictly true, we have included cross-sectional weights in (6) so that the resulting figure provides a measure of the discrepancy between observations and fitted values in the population. The reduction in deviance achieved by the inclusion of explanatory variables is given by $-2\left(Q\left(\hat{\mathbf{P}}_0;\mathbf{Y}\right)-Q\left(\hat{\mathbf{P}};\mathbf{Y}\right)\right)$.

An important restriction of $\mathbf{V}$ is that all elements outside the main diagonal are negative. In the hope of increasing the adequacy of $\mathbf{V}$ to our data, we have aggregated investments that are positively correlated in the population. This is the case of the amounts invested in listed and unlisted shares and mutual funds, whose aggregated asset category is simply named *shares* hereinafter. After this change, all pairwise population correlations between relative shares of the surviving seven types of assets are non-positive.

The increase in deviance when an explanatory variable is removed from the model provides a basis for testing exclusion restrictions. The quasi-likelihood ratio (*QLR*) test statistic is derived from that increase (e.g., see Wooldridge (2010, p. 429)). *QLR* has a χ^2 limiting distribution under the restricted model, with *df* given by the number of restrictions being tested. As each explanatory term can have associated non-zero coefficients in $M-1$ relative share equations, *df* will be proportional to $M-1$.

The commonly reported goodness-of-fit statistic R^2 is troublesome when applied to nonlinear contexts. González Chapela (2013) proposed a $\text{pseudo-}R^2$ for multinomial regression models (denoted R_Q^2) which, among other satisfying properties, lies between 0 and 1, is non-decreasing as explanatory variables are added to the model and can be interpreted as the fraction of total variance explained by the fitted model.

The results in terms of model comparison tests and goodness of fit of our statistical approach were compared to those yielded by alternative techniques (maximum likelihood and compositional data methods) by González Chapela (2013) in a tractable setup with M = 2. While the three techniques impose fairly different assumptions on data, as a matter of fact they yielded rather similar results. Of course, for a context in which M = 7, the technique employed in this paper has the edge on computational simplicity.

5. Results

Table 2 presents the MFL APEs. Each row of this table lists the APEs of a certain explanatory term on each of the relative asset shares. For example, holding other factors fixed, having a reference person with more than a high-school diploma is associated with a reduction in the proportion of financial wealth invested in accounts and deposits usable for payments of 6.17 percentage points (see column 1), and with an increase in the proportion invested in shares of 4.88 percentage points (see column 3). The row sum of APEs amounts to zero. The APEs of all the explanatory terms on the relative share of a certain asset are shown per column. Robust standard errors incorporating sampling design features and the missing-data uncertainty are presented in parentheses.

Table 2 Multivariate Fractional Logit Estimates of the Probability of Holding Seven Types of Financial Assets. Spanish Survey of Household Finances 2008. Average partial effects

	Dependent variables: see the table notes for complete description.						
Independent variables	***(1) AD_pay***	***(2) AD_Nopay***	***(3) Shares***	***(4) Fixed_Sec***	***(5) Life&Pen***	***(6) Man_Acc***	***(7) Other***
Income pctl 20-40	-.0343 (.0312)	.0211 (.0188)	.0006 (.0152)	.0059 (.0061)	.0104 (.0230)	-.0030 (.0025)	-.0008 (.0111)
Income pctl 40-60	-.0406 (.0332)	.0305 (.0199)	-.0109 (.0158)	-.0043 (.0040)	.0353 (.0230)	-.0035 (.0023)	-.0065 (.0122)
Income pctl 60-80	-.0643 (.0367)	.0640* (.0226)	-.0184 (.0170)	-.0036 (.0043)	.0398 (.0256)	-.0001 (.0034)	-.0174 (.0115)
Income pctl 80-90	-.1023* (.0439)	.0743* (.0280)	-.0144 (.0189)	-.0041 (.0045)	.0439 (.0269)	-.0026 (.0028)	.0052 (.0148)
Income pctl ≥ 90	-.0941* (.0439)	.0748* (.0325)	-.0060 (.0209)	.0007 (.0090)	.0292 (.0272)	-.0001 (.0034)	-.0045 (.0134)
Net wealth pctl 25-50	-.0821* (.0304)	.0472* (.0206)	.0195* (.0082)	.0035 (.0022)	.0187 (.0183)	-.0047 (.0039)	-.0021 (.0111)
Net wealth pctl 50-75	-.1459* (.0320)	.0809* (.0207)	.0357* (.0090)	.0101* (.0034)	.0237 (.0194)	-.0030 (.0043)	-.0015 (.0114)
Net wealth pctl 75-90	-.2158* (.0359)	.0884* (.0233)	.0740* (.0157)	.0081* (.0031)	.0603* (.0217)	-.0026 (.0052)	-.0124 (.0120)
Net wealth pctl ≥ 90	-.2944* (.0417)	.1171* (.0286)	.0997* (.0232)	.0091* (.0035)	.0682* (.0269)	-.0002 (.0055)	.0006 (.0147)
Fairly risk inclined	-.0518 (.0270)	-.0050 (.0168)	.0487* (.0116)	.0056 (.0042)	.0143 (.0153)	-.0015 (.0009)	-.0102 (.0071)
Quite risk inclined	-.0363 (.0697)	-.0209 (.0442)	.0536 (.0287)	.0029 (.0062)	.0055 (.0376)	-.0029* (.0009)	-.0020 (.0189)
Pretty risk inclined	-.1116 (.1055)	-.0079 (.0926)	.0080 (.0418)	.0587 (.0533)	.0456 (.0718)	-.0029* (.0009)	.0101 (.0386)
Family size = 2	.0252 (.0346)	.0209 (.0238)	.0022 (.0101)	-.0022 (.0074)	-.0273 (.0261)	-.0168 (.0123)	-.0020 (.0113)
Family size = 3	.0145 (.0388)	.0239 (.0254)	-.0014 (.0117)	-.0008 (.0072)	-.0192 (.0292)	-.0187 (.0132)	.0017 (.0118)
Family size = 4	.0254 (.0421)	.0040 (.0310)	-.0053 (.0117)	-.0022 (.0082)	-.0051 (.0321)	-.0177 (.0128)	.0009 (.0135)
Family size = 5+	.0749 (.0523)	-.0157 (.0364)	.0169 (.0254)	-.0054 (.0077)	-.0544 (.0307)	-.0194 (.0131)	.0030 (.0184)
Home owner	.0476 (.0356)	-.0501 (.0285)	-.0276 (.0204)	.0007 (.0045)	.0325* (.0164)	.0031* (.0013)	-.0062 (.0109)
Business owner	-.0344 (.0306)	-.0090 (.0213)	-.0228* (.0081)	-.0021 (.0028)	-.0176 (.0173)	-.0000 (.0026)	.0858* (.0214)

Liquidity constrained	.0812* (.0220)	-.0553* (.0156)	-.0186* (.0090)	-.0036 (.0025)	.0005 (.0167)	-.0030* (.0010)	-.0012 (.0085)
Account in stand-alone internet bank	-.0883 (.0693)	.0543 (.0607)	.0066 (.0323)	.0137 (.0196)	.0037 (.0339)	.0038 (.0083)	.0062 (.0356)
Age < 35	.1030* (.0370)	-.0031 (.0242)	-.0136 (.0086)	-.0068* (.0032)	-.0982* (.0206)	-.0025 (.0021)	.0212 (.0180)
Age 35-44	.0170 (.0247)	.0103 (.0164)	.0115 (.0102)	-.0061 (.0032)	-.0443* (.0187)	.0001 (.0027)	.0115 (.0108)
Age 55-64	-.0117 (.0271)	-.0011 (.0185)	.0159 (.0096)	.0003 (.0041)	.0108 (.0192)	.0022 (.0021)	-.0165* (.0076)
Age 65-74	.0437 (.0280)	.0890* (.0216)	.0419* (.0119)	.0003 (.0053)	-.1464* (.0145)	-.0007 (.0028)	-.0279* (.0074)
Age 75+	.0618 (.0371)	.1198* (.0322)	.0247 (.0134)	.0021 (.0064)	-.1753* (.0138)	-.0003 (.0027)	-.0328* (.0067)
Female	.0246 (.0167)	-.0133 (.0134)	-.0113 (.0065)	.0002 (.0024)	.0013 (.0110)	-.0030* (.0015)	.0015 (.0072)
Exactly high school	-.0156 (.0283)	-.0031 (.0209)	.0158* (.0080)	-.0036 (.0024)	.0153 (.0160)	-.0014 (.0017)	-.0074 (.0075)
More than a high school diploma	-.0617* (.0240)	-.0008 (.0164)	.0488* (.0119)	.0003 (.0034)	.0147 (.0148)	-.0019 (.0014)	.0006 (.0096)
Married	-.0103 (.0225)	-.0163 (.0175)	-.0066 (.0095)	-.0054 (.0050)	.0340* (.0149)	.0040 (.0023)	.0007 (.0093)
Good health	-.0492* (.0242)	.0278 (.0175)	.0129 (.0075)	.0021 (.0028)	.0015 (.0137)	.0018 (.0015)	.0031 (.0072)
Acceptable health	-.0679* (.0298)	.0400* (.0204)	.0111 (.0105)	-.0030 (.0028)	.0016 (.0173)	.0025 (.0020)	.0157 (.0109)
Poor health	.0037 (.0468)	.0165 (.0282)	-.0187 (.0116)	.0029 (.0056)	-.0213 (.0276)	-.0011 (.0009)	.0180 (.0264)
Very poor health	.1007 (.1097)	-.0771* (.0321)	-.0220 (.0155)	-.0060* (.0023)	-.1124* (.0213)	-.0012 (.0009)	.1180 (.1104)
Never worked	.0377 (.0367)	.0304 (.0288)	.0015 (.0128)	-.0021 (.0035)	-.0466* (.0232)	-.0024* (.0009)	-.0184 (.0103)
Self-employed	.0090 (.0355)	-.0397 (.0254)	.0244 (.0161)	-.0009 (.0040)	.0166 (.0232)	-.0013 (.0027)	-.0080 (.0081)
Works in the financial sector	-.0775 (.0721)	.0151 (.0315)	.0062 (.0145)	.0017 (.0055)	.0692 (.0495)	-.0021 (.0012)	-.0126 (.0096)

Notes: Data are of 5906 households from the EFF2008. All estimates are derived from the MFL model. APEs are calculated using cross-sectional weights and incorporate the missing-data uncertainty. Robust standard errors incorporating sampling design features and the missing-data uncertainty are in parentheses. Dependent variables are relative shares of financial assets invested in (1) accounts and deposits usable for payments (AD_pay), (2) accounts and deposits not usable for payments (AD_Nopay), (3) shares (Shares), (4) fixed-income securities (Fixed Sec), (5) life insurances and pension schemes (Life&Pen), (6) managed accounts (Man_Acc), and (7) other financial assets (Other). Unreported categories: income pctl < 20, net wealth pctl < 25, not willing to take financial risks, one-person household, age 45-54, less than a high school diploma, very good health. *: Significant at 5 percent.

Column 1 presents the results for the most liquid and lowest return asset: accounts and deposits usable for payments, hereinafter referred to as the liquid asset. Focusing on the statistically significant effects at 5 percent, households with high income, high wealth, good health and more than a high school diploma have a lower proportion of their financial wealth invested in this asset. The economic impacts of these effects are very significant. In the case of income, the reduction in the proportion invested in the liquid asset is 10.23 percentage points at the 80-90 decile, and 9.41 percentage points at the highest decile. That is to say, if a household in the lowest income decile had 80 percent of its wealth invested in this asset, a household at the 80-90 income decile would have, on average, only 69.77 percent invested. In the case of net wealth, the reduction in the proportion invested in the liquid asset ranges from 8.21 percentage points for the second quartile to a remarkable 29.44 percentage points at the highest decile. Therefore, the economic impact of net wealth is higher: If a household in the lowest wealth quartile invests 80 percent of its financial wealth in the liquid asset, a household at the highest wealth decile invests 50.66 percent only. Having a good or acceptable level of health means a reduction in the proportion invested in the liquid asset of 4.92 and 6.79 percentage points, respectively, whereas having more than a high school diploma lowers the investment by 6.17 percentage points. Except for one age group, age and financial literacy (measured by working in the financial sector) show no statistically significant effects. There is only one characteristic with a statistically significant and positive effect: being liquidity constrained. This condition implies an average increase of 8.12 percentage points in the proportion invested in the liquid asset.

Wealth not invested in the liquid asset can be distributed among various assets with different risk profiles or invested in insurance and pension funds. We will look first at risky investment assets. The least risky alternative is accounts and deposits not usable for payments (column 2). Part of the financial wealth diverted from the liquid asset goes to this low risk investment in the case of older, high-income and wealthy households. In particular, APEs show an increase of approximately 12 percentage points for people aged 75 or older, 7 percentage points for high-income households, and between 5 and 12 percentage points for wealthy households. Altogether, the proportion invested in this asset could grow by as much as 31 percentage points when these three characteristics come into play together. The opposite is true for very poor health and liquidity-constrained households: They would invest 7.71 and 5.53 percentage points less, respectively, in accounts and deposits not usable for payments, which contrasts with these households' higher investments in the liquid asset. Households with acceptable health dedicate more funds to this asset taken from the liquid asset: 4 percentage points on average.

Wealth can also be invested in shares, fixed-income securities, managed accounts and other assets. With respect to shares (column 3), older, wealthy and less risk-averse households choose to invest part of the wealth distracted from the liquid asset in this financial alternative. The implied effects tend to be smaller than those observed on the previous asset analysed, but they are still significant since these three characteristics may reach an effect of almost 20 percentage points when combined. Business owners and liquidity-constrained households invest, respectively, 2.28 and 1.86 percentage points less on shares, whereas more educated households prefer this asset to other risky choices, increasing their share by 4.88 percentage points on average. Overall, the increase in the proportion invested in shares would grow by up to 24 percentage points if the more educated were fairly risk-inclined, in the highest net wealth decile, and aged 65-74.

Wealthier households are the only ones that invest significantly more in fixed-income securities (column 4), although the average effect is small: 1.01 percentage points for the third quartile of net wealth, 0.81 percentage points for the 75-90 percentile group, and 0.91 percentage points for the highest decile. Young households take a small part of the wealth invested in the liquid asset from a reduction in their investments in fixed-income securities: 0.68 percentage points less on average.

Households with very poor health also invest less in this asset: the very poor health condition is associated to a reduction in the proportion invested of 0.60 percentage points.

Age does not show a linear relationship with respect to investments in precautionary savings (column 5). However, some of the age effects are very significant. A reduction of almost 18 percentage points invested in this asset is observed at the highest age interval. Households with very poor health and those that have never worked invest less in this asset and the size of these reductions is large: Having both characteristics at the same time would mean a reduction of approximately 16 percentage points. Higher wealth, being married and home-ownership are positively related with investments in life insurance and pension funds: Although their individual effects are small, they may reach some 13 percentage points when combined.

Risk-inclined or liquidity-constrained households, females and households who have never worked invest less in managed accounts (column 6). These effects, however, are economically negligible, ranging from -0.24 percentage points for households who never worked to -0.30 percentage points for females and liquidity-constrained households. Homeowners invest more of their wealth in this type of asset, but the increase is small (0.31 percentage points on average).

We look now at other financial assets (column 7). Investment in other assets decreases after middle age. This decrease ranges from 1.65 percentage points in the decade before retirement to 3.28 percentage points for households aged 75 or older. Households that are business owners have a higher proportion of wealth invested in this asset: an extra 8.58 percentage points on average.

It is interesting to note that the economic impact of the different characteristics on the proportion invested in each asset is not homogeneous. The APE analysis indicates that deposits and accounts usable and not usable for payments, shares and precautionary savings present more significant changes in their portfolio shares associated with the household features considered. On the contrary, milder differences can be observed for fixed rate, other assets and managed accounts categories.

Table 3 presents the results of a partial analysis of variance in households' financial portfolio composition using the concept of deviance given in section 4.2. (In order to simplify the layout of the table, possible overlaps among the explanatory characteristics are ignored.) The partial variance is calculated as the deviance explained by all 16 explanatory characteristics minus the deviance in the sub-model in which the characteristic of interest is removed. Also listed in Table 3 are the values, degrees of freedom and associated *p*-values of the *QLR* statistic for testing the statistical significance of each explanatory characteristic and of the overall model.

The total variance in the sample amounts to 10,212. When all 16 explanatory characteristics are included in $\mathbf{x}$, the model is able to explain 1621 units of this variance, implying an R_Q^2 of size 0.159. Age and net wealth are the major contributors to variance in the allocation of financial wealth: Their partial variances represent, respectively, 20.6 and 10.9 percent of the total variance. There is also evidence of sizeable effects associated with risk aversion, owning a business, being liquidity constrained and education: The *p*-value for testing the exclusion of each of these characteristics is below the 5% level of significance. Therefore, each of these characteristics significantly contributes to the predictive ability of the model even if all other 15 characteristics are included in $\mathbf{X}$. On the other hand, modest effects are associated with the other explanatory characteristics, including income and family size, so that, when considered individually, they do not serve as significant predictors for the allocation of financial wealth.

Table 3 Analysis of variance in the allocation of financial assets. Spanish Survey of Household Finances 2008

Source	*Partial variance*	*df*	QLR	$QLR(df)$	*Prob >* QLR
Model	1621	36	4.1	216	.000
Income	63.3	5	1.1	30	.305
Net wealth	177.8	4	3.9	24	.000
Risk aversion	52.5	3	1.7	18	.037
Family size	25.1	4	0.6	24	.926
Home owner	20.3	1	2.0	6	.065
Business owner	69.3	1	6.1	6	.000
Liquidity constrained	34.3	1	3.2	6	.004
Account in stand-alone internet bank	1.8	1	0.2	6	.981
Age	334.3	5	6.1	30	.000
Female	11.7	1	1.1	6	.331
Education	42.5	2	2.1	12	.017
Married	13.1	1	1.3	6	.256
Health status	51.7	4	1.3	24	.170
Never worked	12.5	1	1.2	6	.282
Self-employed	8.2	1	0.8	6	.562
Works in the financial sector	13.8	1	1.3	6	.255
Residual	8591	5869			
Total variance	10,212	5905			
R_Q^2	.159				

Notes: Data are of 5906 households from the EFF2008. All estimates are derived from the MFL model, and are calculated using cross-sectional weights and incorporate the missing-data uncertainty. Dependent variables are relative shares of financial assets invested in: accounts and deposits usable for payments, accounts and deposits not usable for payments, shares, fixed-income securities, life insurances and pension schemes, managed accounts and other financial assets.

5.1 Sensitivity Analysis

We have repeated the analysis with data from the EFF2011, which pertain to a period of economic and financial distress in Spain. Table 4 presents descriptive statistics for all the variables used in this study in 2011. Table 5 and Table 6 present the estimated APEs and the partial analysis of variance, respectively. Overall, the model fits somewhat better the 2011 data: $R_Q^2 = 0.188$. Furthermore, the data show lower dispersion in 2011 ($\hat{\sigma}^2 = 1.044$) than in 2008 ($\hat{\sigma}^2 = 1.622$). Results on personal characteristics affecting asset investment are in line with those obtained for 2008. Similarly, the main contributors to variance are, again, age and net wealth, and there are also significant effects associated with owning a business, risk aversion, education and being liquidity constrained. However, health status, income, family size, home-ownership and financial literacy have become significant predictors for the allocation of financial wealth in 2011. In particular, health status is the third contributor to variance in the allocation of financial wealth, after age and wealth. Having liquidity constraints is the fourth contributor closely followed by income.

Table 4 Descriptive Statistics, the Spanish Survey of Household Finances 2011

Explaining variable (€1000)	*Mean*	*SD*	*Min*	*Max*	*25th pctl*	*50th pctl*	*75th pctl*	*% = 0*
Financial assets	49.1	410.5	.001	145,188	2.0	9.4	34.0	
(1)	8.7	29.0	0	12,000	0.9	3.0	9.0	2.1
(2)	11.2	65.7	0	40,000	0	0	0	75.4
(3)	15.3	360.7	0	144,012	0	0	0	84.0
(4)	0.8	36.9	0	25,000	0	0	0	97.8
(5)	9.2	63.5	0	5000	0	0	1.0	72.2
(6)	0.5	20.4	0	5000	0	0	0	99.7
(7)	3.3	30.1	0	8200	0	0	0	87.7

Household characteristics (%)	*Mean*	*Reference person's charac. (%)*	*Mean*
Income pctl < 20	18.9	Age < 35	11.0
Income pctl 20-40	19.1	Age 35-44	22.0
Income pctl 40-60	20.6	Age 45-54	21.5
Income pctl 60-80	20.4	Age 55-64	16.7
Income pctl 80-90	10.5	Age 65-74	14.8
Income pctl ≥ 90	10.5	Age 75+	14.0
Net wealth pctl < 25	23.6	Female	44.9
Net wealth pctl 25-50	24.7	Less than a high school diploma	68.5
Net wealth pctl 50-75	25.6	Exactly high school	10.9
Net wealth pctl 75-90	15.6	More than a high school diploma	20.7
Net wealth pctl ≥ 90	10.5	Married	62.9
Not willing to take financial risks	87.4	Very good health	20.6
Fairly risk inclined	11.0	Good health	50.7
Quite risk inclined	1.1	Acceptable health	20.8
Pretty risk inclined	0.5	Poor health	7.1
Family size = 1	19.6	Very poor health	0.9
Family size = 2	30.2	Never worked	4.6
Family size = 3	24.6	Self-employed	9.9
Family size = 4	20.5	Works in the financial sector	3.5
Family size = 5+	5.1		
Home owner	83.7		
Business owner	14.7		
Liquidity constrained	19.3		
Account in stand-alone internet bank	0.9		

Notes: Data are of 5899 households from the EFF2011. All estimates are calculated using cross-sectional weights and incorporate the missing-data uncertainty. Financial assets are made up of (1) accounts and deposits usable for payments, (2) accounts and deposits not usable for payments, (3) shares, (4) fixed-income securities, (5) life insurances and pension schemes, (6) managed accounts and (7) other financial assets. Money values are in euros of 2011.

Table 5 Multivariate Fractional Logit Estimates of the Probability of Holding Seven Types of Financial Assets. Spanish Survey of Household Finances 2011. Average partial effects

	Dependent variables: see the table notes for complete description.						
Independent variables	***(1) AD_pay***	***(2) AD_Nopay***	***(3) Shares***	***(4) Fixed_Sec***	***(5) Life&Pen***	***(6) Man_Acc***	***(7) Other***
Income pctl 20-40	-.0912*	.0343*	.0018	-.0007	.0430	.0041	.0087
	(.0291)	(.0175)	(.0122)	(.0023)	(.0220)	(.0032)	(.0178)
Income pctl 40-60	-.1466*	.0471*	.0087	.0102	.0632*	.0003	.0171
	(.0329)	(.0185)	(.0131)	(.0060)	(.0225)	(.0011)	(.0196)
Income pctl 60-80	-.1460*	.0364	.0236	.0103	.0585*	.0004	.0168
	(.0332)	(.0200)	(.0155)	(.0073)	(.0212)	(.0008)	(.0211)
Income pctl 80-90	-.1425*	.0561*	.0140	.0047	.0624*	.0008	.0046
	(.0439)	(.0275)	(.0156)	(.0048)	(.0248)	(.0011)	(.0270)
Income pctl ≥ 90	-.1759*	.0595*	.0239	.0196	.0780*	.0005	-.0056
	(.0411)	(.0281)	(.0180)	(.0106)	(.0281)	(.0009)	(.0218)
Net wealth pctl 25-50	-.1024*	.0473*	.0248*	.0089	.0252	.0022	-.0060
	(.0323)	(.0182)	(.0127)	(.0050)	(.0194)	(.0018)	(.0153)
Net wealth pctl 50-75	-.1654*	.0909*	.0316*	-.0010	.0287	.0001	.0150
	(.0333)	(.0186)	(.0091)	(.0038)	(.0207)	(.0002)	(.0185)
Net wealth pctl 75-90	-.2545*	.1279*	.0434*	.0056	.0672*	.0004	.0100
	(.0354)	(.0226)	(.0111)	(.0044)	(.0257)	(.0007)	(.0188)
Net wealth pctl ≥ 90	-.3731*	.1339*	.1153*	.0066	.0803*	.0046	.0325
	(.0389)	(.0258)	(.0225)	(.0054)	(.0324)	(.0044)	(.0241)
Fairly risk inclined	-.1214*	.0397*	.0652*	.0047	.0133	.0008	-.0024
	(.0273)	(.0201)	(.0145)	(.0048)	(.0159)	(.0014)	(.0153)
Quite risk inclined	.0704	-.0958*	.1071*	-.0045	-.0274	.0076	-.0574*
	(.0656)	(.0213)	(.0398)	(.0035)	(.0521)	(.0082)	(.0070)
Pretty risk inclined	-.2146	-.0869*	.0204	-.0055	-.0045	-.0002	.2915*
	(.1160)	(.0383)	(.0559)	(.0055)	(.0569)	(.0041)	(.1066)
Family size = 2	-.0178	-.0170	-.0071	.0074	.0184	.0005	.0155
	(.0344)	(.0239)	(.0147)	(.0050)	(.0216)	(.0009)	(.0150)
Family size = 3	-.0360	-.0138	-.0166	.0042	.0224	.0044	.0354*
	(.0391)	(.0267)	(.0166)	(.0051)	(.0243)	(.0038)	(.0157)
Family size = 4	-.0368	-.0190	-.0224	.0024	.0409	.0018	.0331
	(.0400)	(.0272)	(.0161)	(.0047)	(.0260)	(.0018)	(.0179)
Family size = 5+	.0249	-.0852*	.0059	-.0044	.0371	.0001	.0216
	(.0565)	(.0301)	(.0260)	(.0027)	(.0319)	(.0012)	(.0238)
Home owner	.0613	-.0582*	-.0082	-.0099	.0455*	.0006	-.0312
	(.0341)	(.0273)	(.0183)	(.0084)	(.0174)	(.0012)	(.0204)
Business owner	.0307	-.0356	-.0404*	-.0075*	-.0106	-.0008	.0642*
	(.0309)	(.0200)	(.0093)	(.0029)	(.0189)	(.0007)	(.0225)
Liquidity constrained	.0288	-.0708*	-.0258*	-.0063*	.0111	-.0011	.0642*
	(.0260)	(.0139)	(.0093)	(.0032)	(.0197)	(.0008)	(.0171)
Account in stand-alone internet bank	-.1844*	.1595*	.0087	-.0053	-.0358	.0282	.0291
	(.0773)	(.0797)	(.0196)	(.0034)	(.0295)	(.0202)	(.0380)
Age < 35	.0982*	-.0090	-.0030	-.0082*	-.0675*	.0002	-.0107
	(.0373)	(.0241)	(.0142)	(.0031)	(.0283)	(.0045)	(.0200)
Age 35-44	.0372	.0080	-.0075	-.0041	-.0630*	-.0007	.0300
	(.0287)	(.0177)	(.0101)	(.0036)	(.0185)	(.0007)	(.0183)
Age 55-64	-.0050	.0119	.0039	-.0011	-.0019	.0023	-.0100
	(.0252)	(.0165)	(.0093)	(.0035)	(.0227)	(.0023)	(.0147)
Age 65-74	.1150*	.0603*	.0174	.0102	-.1539*	.0001	-.0490*
	(.0243)	(.0197)	(.0111)	(.0066)	(.0157)	(.0012)	(.0111)
Age 75+	.1154*	.0779*	.0231	.0179	-.1741*	.0011	-.0613*
	(.0289)	(.0213)	(.0138)	(.0148)	(.0174)	(.0021)	(.0114)
Female	.0079	.0002	-.0095	-.0003	.0040	.0014	-.0038
	(.0187)	(.0147)	(.0075)	(.0028)	(.0121)	(.0010)	(.0103)
Exactly high school	-.0447	.0152	.0095	-.0071	.0272	.0010	-.0011
	(.0294)	(.0197)	(.0120)	(.0036)	(.0202)	(.0016)	(.0154)
More than a high school diploma	-.0123	-.0004	.0229*	-.0066*	.0091	.0004	-.0130
	(.0245)	(.0190)	(.0103)	(.0026)	(.0139)	(.0007)	(.0116)

Married	.0146 (.0260)	-.0000 (.0172)	-.0050 (.0099)	-.0108 (.0058)	.0069 (.0161)	-.0028 (.0024)	-.0029 (.0130)
Good health	.0001 (.0225)	.0022 (.0162)	-.0031 (.0094)	-.0118 (.0065)	-.0100 (.0141)	.0012 (.0010)	.0215* (.0090)
Acceptable health	-.0489 (.0291)	.0014 (.0196)	-.0209* (.0103)	-.0191* (.0069)	-.0070 (.0176)	.0002 (.0007)	.0943* (.0226)
Poor health	-.0016 (.0414)	-.0281 (.0262)	-.0330* (.0126)	-.0197* (.0073)	.0210 (.0457)	.0003 (.0012)	.0611 (.0340)
Very poor health	-.0007 (.0963)	-.0622 (.0502)	-.0220 (.0259)	-.0214* (.0069)	-.0653 (.0561)	-.0006 (.0005)	.1723 (.0957)
Never worked	.0372 (.0499)	-.0049 (.0259)	.0066 (.0210)	-.0084* (.0018)	.0059 (.0431)	-.0008 (.0007)	-.0355* (.0129)
Self-employed	-.0762 (.0428)	.0250 (.0340)	.0437* (.0210)	.0075 (.0086)	-.0128 (.0230)	.0016 (.0037)	.0112 (.0166)
Works in the financial sector	-.0309 (.0575)	.0266 (.0452)	.0093 (.0145)	-.0054 (.0028)	.0395 (.0283)	-.0004 (.0010)	-.0387* (.0177)

Notes: Data are of 5899 households from the EFF2011. All estimates are derived from the MFL model. APEs are calculated using cross-sectional weights and incorporate the missing-data uncertainty. Robust standard errors incorporating sampling design features and the missing-data uncertainty are in parentheses. Dependent variables are relative shares of financial assets invested in (1) accounts and deposits usable for payments (AD_pay), (2) accounts and deposits not usable for payments (AD_Nopay), (3) shares (Shares), (4) fixed-income securities (Fixed_Sec), (5) life insurances and pension schemes (Life&Pen), (6) managed accounts (Man_Acc) and (7) other financial assets (Other). Unreported categories: income pctl < 20, net wealth pctl < 25, not willing to take financial risks, one-person household, age 45-54, less than a high school diploma, very good health. *: Significant at 5 percent.

Table 6 Analysis of Variance in the Allocation of Financial Assets. Spanish Survey of Household Finances 2011

Source	***Partial variance***	***df***	QLR	$QLR(df)$	**Prob >** QLR
Model	2055	36	6.1	216	.000
Income	92.2	5	1.8	30	.007
Net wealth	242.6	4	5.6	24	.000
Risk aversion	121.8	3	5.0	18	.000
Family size	50.4	4	1.8	24	.010
Home owner	33.1	1	4.0	6	.001
Business owner	50.6	1	6.1	6	.000
Liquidity constrained	98.2	1	8.6	6	.000
Account in stand-alone internet bank	16.0	1	2.5	6	.023
Age	351.0	5	7.9	30	.000
Female	3.5	1	0.6	6	.742
Education	23.8	2	1.8	12	.045
Married	13.4	1	1.9	6	.072
Health status	124.4	4	4.2	24	.000
Never worked	9.8	1	1.4	6	.197
Self-employed	12.6	1	2.0	6	.063
Works in the financial sector	9.0	1	1.3	6	.256
Residual	8861	5862			
Total variance	10,916	5898			
R_Q^2	.188				

Notes: Data are of 5899 households from the EFF2011. All estimates are derived from the MFL model, and are calculated using cross-sectional weights and incorporate the missing-data uncertainty. Dependent variables are relative shares of financial assets invested in: accounts and deposits usable for payments, accounts and deposits not usable for payments, shares, fixed-income securities, life insurances and pension schemes, managed accounts and other financial assets.

The financial crisis could be one of the reasons behind the significance of these new variables. Income is probably the first to suffer in the event of a financial and economic crisis. In fact, in 2011 the mean and median of the income distribution decreased by 3.5 and 8.5 percent in Spain, respectively (Banco de España, 2014). As a response to this economic recession, the Spanish government adopted austerity policies, and made large cuts in public expenditure. Recent evidence shows that the interaction of fiscal austerity, economic shocks and decreasing social protection can trigger further health and social crises since income reduction, growing healthcare costs and cuts in services prevent patients from accessing care in time (Karanikolos *et al.*, 2013).

6. Conclusions

The problem concerning household portfolio allocation has received increased attention both theoretically and empirically. This paper adds to the empirical literature firstly by using an appropriate regression model that takes into account the boundability of portfolio allocation decisions. Second, we use this model to estimate the individual reaction of an unusually wide collection of assets to changes in personal and household characteristics, which enriches our understanding of household financial portfolio choice. Third, we provide an empirical methodology, also adapted to the constrained nature of household portfolio data, which makes it possible to pinpoint the importance of each explanatory factor in accounting for the variance of the household portfolio allocation.

Our results show that the main factors behind the variability of the allocation of financial wealth in Spain in 2008 and 2011 are age and net wealth, which account for approximately 20 and 11 percent, respectively, of the total variance observed in each year. There is also evidence of sizeable effects associated with risk aversion, education, business ownership and liquidity constraints, plus income and health-status effects in 2011. On the other hand, very modest effects are associated with gender and having some account in stand-alone internet banks (this latter being a proxy for financial literacy), which, considered individually, do not serve as significant predictors for the allocation of financial wealth.

An implication of these findings is that both age and net wealth, and probably risk aversion, income and education, should be taken into account when looking at household portfolio composition decisions. This information can be used to develop targeted interventions aimed at promoting participation of households in the financial markets, for example by investing in stocks, or encouraging precautionary investments, such as life insurance or pension funds. As our multifactorial estimation suggests, wealth is the main determinant of investing in private pension schemes and a very significant factor for investing in shares. Another important practical implication is the better understanding of the personal and financial characteristics that would make the development of adequate financial planning services easier. Education, wealth, attitude toward risk and income could be good proxies to have a better understanding of customers and therefore to be in a better position to offer them the most suitable financial investment instruments.

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