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DO WEALTH FLUCTUATIONS GENERATE TIME-VARYING RISK AVERSION? ITALIAN MICRO-EVIDENCE ON HOUSEHOLD ASSET ALLOCATION

by Giuseppe Cappelletti*

Abstract

Data from the Italian Survey of Households Income and Wealth (SHIW) are used to study portfolio allocations change in response to fluctuations in wealth. In particular I test for the prediction of models with habit formation that changes in liquid wealth will affect households' risk aversion and risky asset investment. After controlling for the decision to enter and leave the risky asset market, I find, in contrast with other studies (Brunnermeier and Nagel, 2008 and Chiappori and Paiella, 2008), that changes in wealth do help to explain changes in asset allocation.

JEL Classification: D14, D31, G11.
Keywords: portfolio allocation, risk aversion, habit-formation.

Contents

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1 Introduction

The recent financial turmoil severely cut into the value of households' financial assets. A year after the onset of the crisis, the financial wealth of European households had fallen by almost 8% and that of Italian households by 7%. The fall was even sharper in the US, bringing the level backdown to that registered at the end of 2006.

In the same period the share of stocks in total household wealth shrank considerably. Between the second quarter of 2007 and the third quarter of 2008 the share of risky assets in the main European countries fell on average from 30% to just over 20%; the same pattern holds for the US. In Italy, the share of risky assets - stocks, share of mutual funds and corporate bonds - declined from 52% to 46%. The decline was due not only to the fall in the market value of stocks but also to substantial portfolio reallocation to safer assets, a process that itself may have accentuated the crisis and increased market turbulence. Changes in households' asset allocation can be attributed not only to lower expected returns or increased risk but also to changing attitudes to risk. Understanding how much the crisis has actually altered risk aversion is important to gauge the evolution of the crisis and prospects for recovery. This paper tests the extent to which risk aversion is affected by changes in wealth, as some theoretical models predict.

The hypothesis of time-varying risk aversion has been investigated extensively. One line of research suggests that risk aversion varies with wealth because of habit formation. Becker and Stigler (1977) and Becker and Murphy (1988) argue that people may be addicted not only to alcohol or cigarettes but also to consumption levels and standards of living This means that individual welfare depends not only on how much people consume but also on whether consumption is higher or lower than their reference level, which can be thought of as a habit level or status. Under preferences characterized by habit formation, riskless assets represent insurance against future consumption falling below the habit level. As a result, the optimal demand for riskless assets is tied to the habit level of consumption. When wealth increases relative to habit - owing, say, to capital gains - risk aversion declines and the optimal share of risky assets increases; and the converse when wealth falls.

That is, habit formation implies that relative risk aversion varies with wealth. This can be relevant in periods of financial boom or bust when rapid price changes in price may influence portfolio choices not only by lowering expected future returns and increasing volatility but also by reducing wealth. Under the hypothesis of habit formation, a reduction in wealth results in higher risk aversion and reallocation towards safer assets which can amplify market turbulence. Habit formation may also imply slower recovery, as the willingness to hold risky assets can not be restored until wealth regains pre-crisis levels.

Using the framework of Brunnermeier and Nagel (2008), I test the predictions of the model on data from Italian Survey of Households Income and Wealth (SHIW) from 1989 to 2008. The findings support the prediction of habit formation models. In particular, changes in liquid

wealth help to explain changes in households asset allocation. With respect to similar analyses for US data, I control for households' choice of holding risky assets. Most previous studies consider only households that actually have some risky assets ignoring entry into and exit from risky asset classes, and hence potentially censoring the observation of portfolio choices. To tackle this problem I use the Heckman two-step procedure and obtain new and different results.

The paper is organized as follows. The next section presents surveys the related literature, Section 3 presents the model and the Euler equation that guides the estimation, Section 4 describes the data and estimation equation counterpart, Section 5 examines the aggregate implications of the micro findings, and Section 6 concludes.

2 The literature

Habit formation models have proven very successful in explaining many dynamic asset pricing phenomena and macroeconomic facts. In the asset pricing literature, they have been used to explain the equity premium puzzle (Constantinides (1990), Abel (1990), Campbell and Cochrane (1999)), the procyclicality of stock prices, the countercyclical variation of stock market volatility (Harvey (1989)), and the term structure of interest rates (Buraschi and Jiltsov, 2007). Habit persistence frameworks may also help to explain business cycles (Boldrin, Christiano and Fisher, 2001), savings and growth (Carroll, Overland and Weil, 2000), and response of consumption to monetary and other shocks (Fuhrer, 2000). In international dynamic asset pricing models the introduction of habit formation can help to explain international market correlations and volatilities (Aydemir, 2008).

Despite the successful macroeconomic applications there is still little evidence on whether habit formation fits microdata. One attempt was Dynan (2000) who tests for habit formation using household data. Using a simple model, he derives a correlation between habit and the evolution of consumption over time, but using data on food consumption from the Panel Study on Income Dynamics (PSID) he finds no evidence of habit formation. Ravina (2005), instead, using US panel data on credit-card accounts in California, finds a positive and significant effect of habit on household consumption choices. As noted a key implication of habit is that relative risk aversion should vary with wealth, in contrast with constant relative risk aversion (CRRA) models. Hence, an increase in wealth should imply a temporary decrease in relative risk aversion. The empirical evidence on whether these models fit actual investors' preferences is mixed. Lupton (2003) and Brunnermeier and Nagel (2008) look at the implications of habit formation for households' stock market investment, not consumption choices as such. Lupton (2003) estimates a proxy for habit level and shows that, consistent with the theory, it is negatively related to the share of the household portfolio invested in stocks. By contrast, Brunnermeier and Nagel (2008) analyze the link between idiosyncratic wealth changes and portfolio allocation and conclude against habit persistence. Wachter and Yogo (2009) develop a life-cycle model in which households have non-homothetic utility over two types of consumption goods, basic

and luxury. Their calibrated model predicts that the share of risky assets rises only with a permanent increase in wealth; that is that households with higher permanent income are less risk-averse and consequently allocate more of their wealth to stocks. To control for changes in permanent income, Wachter and Yogo propose to use changes in consumption.

Assuming CRRA preferences Chiappori and Paiella (2008) test whether relative risk aversion is constant. Using panel data for Italian households from 1989 to 2008 to analyze how individuals' portfolio allocation between risky and riskless assets varies in response to changes in total financial wealth, they find the elasticity of the risky asset share to be small and statistically insignificant. That is, their study supports the CRRA hypothesis.

Here, once households' decision to enter or leave the risky asset markets is controlled for , there is evidence for habit formation and time-varying risk aversion, in contrast to Brunnermeier and Nagel (2008) and Chiappori and Paiella (2008).

3 The model

I borrow the simple model of portfolio choice used by Brunnermeier and Nagel (2008), which illustrates how relative risk aversion can be time-varying when agents' preferences reflect habits, subsistence levels, or similar features. I consider a representative agent, infinitely lived in a discrete time environment. The agent's wealth in each period t is denoted as W_t ; it is received before consumption, C_t, occurs. There are two assets for investment: a risky asset, with return R_t and a riskfree asset with constant return R_f. In each period the agent chooses the level of consumption and the proportion of saving, $W_t - C_t$, invested in the risky asset, α_t, in order to maximize the expected discounted sum of future levels of consumption:

$$\max E \sum_{t=0}^{\infty} \delta^t \frac{(C_t - X)^{1-\gamma}}{1-\gamma} \tag{1}$$

subject to the inter-temporal budget constraint

$$W_{t+1} = (1 + R_{p,t+1})(W_t - C_t) \tag{2}$$

where δ is the subjective discount factor, γ is the curvature of the utility function, $R_{p,t+1} := \alpha_t (R_t - R_f) + R_f$ is the total return on the portfolio chosen, and X is habit. Consumption paths with $C_t \leq X$ for some date with non-zero probability are assigned infinitely negative utility. The risky asset returns have a log-normal distribution with constant expected returns and constant volatility. In this setting expected returns and expected volatilities of all assets are constant.[1]

The level of habit is assumed to be constant. This should be thought as an approximation to a model in which X varies slowly or to a model with an external habit that does not depend

[1] This assumption can be relaxed once a time effect is introduced in the estimation.

on the agent's choice. This model yields the following equation:

$$\alpha_t \approx 1 - \frac{X}{(W_t - C_t) R_f} \tag{3}$$

That is, the share of risky assets depends positively on the level of habit and negatively on the level of cash in hand. Linearizing equation 3 Brunnermeier and Nagel obtain:

$$\begin{aligned} \alpha_t &\approx 1 - e^{(x - w_t)} \\ \alpha_t &\approx k - \rho (x - w_t) \end{aligned}$$

where $x \equiv \log\left(\frac{X}{R_f}\right)$, $w_t \equiv \log(W_t - C_t)$.[2] Taking first differences gives the following equality is obtained:

$$\Delta\alpha_t = \rho \Delta w_t \tag{4}$$

The same relation holds with time-varying habit, but it should require that the variation in habits is small with respect to that in wealth. Chiappori and Paiella (2008) estimate a similar equation assuming constant risk aversion for each household but variation between households.[3]

To estimate equation 4 one must control for the variables outside the model that may cause common movements in the level of wealth and the risky asset share. For example, α_t and w_t may be correlated over the life-cycle. Therefore, I need to condition on household characteristics that should capture such aspect. This set of variables, denoted as q_{t-2}, comprises variables that are either constant or known at time $t-2$, and a vector of ones. In addition I include Δh_t, a vector of variables that capture major changes in family composition or asset ownership that could lead to preference shifts. The estimation equation becomes:

$$\Delta\alpha_t = \beta q_{t-2} + \gamma \Delta h_t + \rho \Delta w_t + \varepsilon_t. \tag{5}$$

Here, q_t includes a broad range of variables related to the life-cycle, background, and the financial situation of the household in each period. These controls include age and age squared, indicators for high school and college education and their interaction with age and age squared, dummies for gender and their interaction with age and age squared, marital status, number of children, number of persons in the household, and a dummy variable for unemployment in the two years between two consecutive surveys. The preference-shifter set of variables, Δh_t, comprises changes in household characteristics in the period: family size, number of children and dummies for home ownership, business ownership, and non-zero labor income.

The previous partial equilibrium portfolio choice model concerns the decision of a single

[2] In SHIW it is measured as post-consumption wealth for each year, so the definition of ω_t corresponds to the definition of wealth in the data.

[3] In this setting the estimate equation is not microfounded and relies on purely statistical considerations that require heterogeneity in risk aversion to be correlated with wealth. Instead Brunnermeier and Nagel model heterogeneity directly on the basis of habit formation.

household, holding aggregate quantities and prices constant. But if a change in wealth is common to all households, then they all want to change their exposure to risky assets. To isolate the effect of habit, I must eliminate aggregate changes in wealth and asset holdings and focus on household-specific variations; accordingly, a time fixed effect is introduced. There may be also local effects where asset holdings, household income and other sources of wealth variation depend on the local economy. To control for this, I interact the year dummies with dummies for the three SHIW geographical regions, which provides a set of year-region dummies. These regional dummies can be interpreted as proxy of a constant or slowly changing external habit (Grishchenko, 2005).

In this model agents would always invest in the stock market ($\alpha_t > 0$), because the optimal investment policy implies $W_t - C_t > \frac{X}{R_f}$. However, if there is a cost for investing, the household might choose not to participate (Vissing-Jorgensen, 2002, Gomes and Michaelides, 2005, 2003). This cost might be financial, opportunity (time and attention), or even psychological. By assuming fixed per-period market participation costs, changes in liquid wealth could imply entry or exit. A household whose wealth decreases might choose to exit the stock market for two reasons: with less wealth, the benefits of investing are smaller relative to the fixed level of costs; and in this model with habit, as liquid wealth declines the agent wants to invest less in stocks, further reducing the benefits. To test for this effect, in appendix I also examine the empirical relationship between changes in wealth and stock market entry and exit. This evidence could not discriminate between CRRA and habit models. In fact, entry into and exit from risky financial markets would occur even under CRRA preferences. However, habit formation, when the level of wealth is high enough for the investor to enter, the share of risky assets in the portfolio does not depend on liquid wealth.

4 The data description

Following Brunnermeier and Nagel (2008), I define risky liquid assets as the sum of corporate bonds, mutual funds and listed stocks at their reported values[4] and compute total liquid wealth by adding cash-like assets (bank and postal deposits and government securities). Including government bonds as safe assets is justified by the fact that usually they are held to maturity. A broader definition of risky financial wealth summing risky liquid assets with home equity and equity in private business is also considered. Total financial wealth is calculated by adding cash-like assets to this second definition of risky financial assets. Two risky asset shares are calculated: the liquid risky asset share (ratio of risky liquid assets to total liquid assets) and the financial risky asset share (risky assets over total financial assets). The income variable is the total household income.

Observations are weighted according to the SHIW sample weights in summary statistics

[4] When I check for robustness I have included also unlisted shares.

but not in the regression analyses (see Faiella and Gambacorta, 2007).[5] I use reported value not adjusted for under-reporting of financial wealth (see D'Aurizio et al., 2006). The panel component of SHIW has increased over time, and in the last wave was more than half of the sample. The number of households with positive risky assets has increased but still represents less than one fifth of the panel (Table 1).

Among participants in the stock markets the average share of risky assets has increased substantially (Chiappori and Paiella, 2008: and this holds also including home and private business equity, although it is more common to find households with some risky assets when this equity is counted. Households with positive risky financial assets have greater financial wealth and a larger share of risky assets.

The risky market entry variable is a dummy equal to one for households that do not participate at $t-2$ and participate at t, and zero if the household does not hold stocks at $t-2$ and t. For households that did not participated to the survey in $t-2$, the variable is "missing".[6] The risky market exit variable is defined in similar fashion: equal to one for participants at $t-2$, but not at t, it is zero for households that participated at $t-2$ and t, and missing otherwise.

The proportion of households holding risky assets is 8% in the 1989-1995 sample and 18% in 1998-2008 (Table 2), a sharp increase consistent with evidence presented in Guiso et al. (2002). The table shows that there is a very little turnover in the group of participants, suggesting considerable inertia in Italian households' choice of asset classes. The share of the households with positive risky assets never exceeds 20%, compared with over 45% in the US data used in other studies. Moreover Italian stock market investors appear to differ sharply in term of wealth and income from the other households in the survey, this not the case for the US (see Brunnermeier and Nagel, 2008). In Italy stock market participants have higher wealth and income on average. And since much of aggregate wealth is concentrated at the top of the distribution, wealthy households are by far the most important group of stock holders in terms of number of shares. Compared with the US data used by Brunnermeier and Nagel, participation in risky markets and turnover are much lower. The share of liquid wealth invested in risky markets is scarcely a tenth of the value observed in the US surveys. These characteristics make the Italian sample markedly different from the one used in studies of the US household assets.

5 The results: wealth changes and asset allocation

Following Brunnermeier and Nagel (2008) I estimate equation 5 conditional on participation in the stock market in two consecutive surveys. The households holding risky assets in all periods are included in the sample more often; those without risky assets are not in the sample.

First I estimate equation (5) by OLS using all pooled observations. The habit model predicts that changes in liquid wealth will affect the liquid risky asset share, meaning that the coefficient

[5] The estimation results do not change if I use weighting.

[6] Hence the lower number of observations.

ρ should be statistically different from zero. Table 3 reports the estimation results for the sample of only households reporting a strictly positive amount of risky assets. In the first column, the only controls are year and regional dummies, but the following columns introduce income variables, preference-shifter controls and life-cycle controls. For all specifications the estimate of the coefficient of the percentage change in liquid wealth is greater than zero but not statistically significant. These results resemble those of Chiappori and Paiella (2008) and Brunnermeier and Nagel (2008).

This estimate assumes that both the change in liquid wealth and the changes in the risky asset share are measured without error. If I allow for measurement error the OLS estimates can be biased. To address this problem, I introduce instrumental variables for the variation in liquid wealth. Like Brunnermeier and Nagel I use as instruments quantile dummies of income growth in two consecutive waves and also include all monetary transfers, both recurrent and occasional (excluding pensions and social subsidies), from relatives and friends not living within the household. This last instrument is available only starting in 1995. The results are consistent with those obtained with OLS estimates. The coefficients are not statistically significant. These results do not support the hypothesis implied by habit formation models that asset allocation varies with wealth.

To check for robustness the analysis is repeated for every pair of consecutive surveys, and the coefficients are found to vary over time. The coefficient is positive for the most recent waves of the survey (2004-2006) which coincide with a bull stock market and a positive business cycle and it significant for the 2006 survey (Table 4).

The fact that households holding positive risky assets are over-represented in the sample could cause problems in the interpretation of the results. In general, truncating a sample on the basis of the response variable (in this case stock holding) may imply inconsistent estimators (Wooldridge, 2010[22]). In order to test for selection bias, the previous linear regression is run controlling for a dummy variable for household's inclusion in the previous or the next wave sample, and for the inverse Mills ratio (IMR), obtained from a probit regression on the probability of being included in the sample controlling for the lagged value of financial wealth and the number banks at which the household has at least one current account. Table 5 shows that none of these tests rule out a selection bias.

Adding the IMR does not generally produce a consistent estimate of the coefficients if there is a sample selection problem. In order to correct for this I use the Heckman (1979) two-step procedure: using in the probit part household composition and life-cycle controls, past labor income and past liquid assets.[7] These variables can be justified on the basis of their relation to risky market entry costs and the possibility of changing the portfolio allocation, even reducing the exposure to risky assets to zero, the previous results are reversed, which is suggesting that selection bias may be driven by latent variables (Table 6). This procedure gives a positive and

[7] As a robustness check other controls were tried, such as the number of bank accounts or financial transfers received.

significant estimate of ρ, rejecting the null hypothesis that the elasticity of risky asset share with respect to changes in liquid wealth is equal to zero. The point estimate implies that a 10% decline in liquid wealth induces to a decrease in the share of risky assets of almost 1 percentage point, e.g. from 50% to 49%. This magnitude is economically significant, and it increases if only the last three waves of the survey are considered. This evidence supports the thesis that asset allocation varies with wealth and it contrasts with Chiappori and Paiella (2008) and Brunnermeier and Nagel (2008), who do not control for sample selection. When changes in consumption are controlled for as proposed by Wachter and Yogo (2009) the results still hold.

As a robustness check one can exclude the young, who might be subject to liquidity constraints, and the elderly[8], whose portfolio behavior seems to be quite different from the rest. The estimated elasticity is slightly lower but remains statistically significant. I also exclude households in the botton quartile of liquid wealth, in that for them changes in portfolio composition may be substantially affected by transaction costs. Again, the estimates confirm previous results.

An analogous analysis takes the financial risky asset share as dependent and financial wealth as explanatory variable. These variables include equity in private business and home equity, which are less liquid and less divisible. This perspective would be appropriate if households with CRRA preferences kept the proportion of financial wealth invested in risky assets, including home equity and business wealth, roughly constant. In that case, habit formation would imply that changes in financial wealth should lead to changes in the financial risky asset share. In fact, the results are confirmed: the variation in financial wealth does influence the change in the ratio of risky financial assets (Table 7). Point estimates imply that a 10% decline in financial wealth induces a 5 percentage point decrease in the risky asset share. The magnitude of the coefficient is greater than in Table 3 and is significantly higher than zero. Thus, the evidence is consistent with the predictions of the habit formation models. Estimating the same equation for every pair of consecutive surveys confirms that this result is robust for all waves of the SHIW starting in 1993 (Table 8); the coefficients of Δw are all positive and significant.[9]

6 Conclusion

The Italian Survey of Households Income and Wealth (SHIW) from 1989 to 2008 provides the data for investigating whether households attitudes towards risk vary over time. In particular, I test whether the propensity to hold risky assets changes with wealth, as models with habits formation suggest. With respect to similar analyses on US data, here possible selection bias is controlled for. That is, previous studies consider only households that actually hold some risky assets, which means that decisions of entry or exit from risky asset classes are ignored

[8] Defined as households whose head is older than 60 years.

[9] This result was also obtained in Paiella and Chiappori (2008), who explained it by reference to illiquidity of business equity holding.

and the observations of portfolio choices are censored. This problem is dealt with by applying the Heckman two-step procedure and this significantly affects the results. After controlling for selection bias, there is evidence of time-varying risk aversion; households' risk aversion rises when wealth falls, reducing the share of risky assets held by households in favor of safer assets. This finding contrasts with those of previous studies, i.e. Brunnermeier and Nagel (2008) and Chiappori and Paiella (2008).

These results could be important indeed in time of boom and bust, when changes in risk aversion can exacerbate financial markets fluctuations. Apart from changes in expected returns and volatility changes in financial wealth as such are likely to alter the propensity to hold risky assets. A point estimate finds that a decrease of 10 percent in financial wealth induces decline of nearly 1 percentage point in the share of risky assets due exclusively to heightened risk aversion. Increasing in risk aversion could impede the return to pre-crisis level of risky assets holdings, as this depends on a recovery in financial wealth itself.

Appendix: wealth changes and stock market partecipation

As Brunnermeier and Nagel have shown a model of asset allocation with habit implies that agents always participate in the stock market. However, it is sufficient to assume some cost of participating (see Vissing-Jorgensen (2002), Paiella (2007)) in order for changes in liquid wealth to induce stock market entry or exit.

This kind of relation can arise even in a model with CRRA preferences, because a decrease in liquid wealth reduces the benefits from investing in stocks relative to the fixed cost of participating. In a model with habit however a decrease in liquid wealth would also increase the risk aversion of agents who want to invest a smaller amount in risky assets, further reducing the benefits of participation.

In this light, it is interesting to investigate how changes in liquid wealth relate to stock market participation, because the existing empirical evidence (Bertaut and Haliassos, 1995; Mankiw and Zeldes, 1991; Vissing-Jorgensen, 2002) is drawn from cross-sectional analysis and not on panel data. Tracking changes in wealth could eliminate a possible correlation between liquid wealth and some unobserved fixed household characteristics that cause stock market participation.

Table 9 presents the results of probit regressions. The first four columns estimate the probability of a household's entering the stock market. The last four estimate the probability of exiting the stock market. The table shows the marginal effects, that is, the effect on the probability of entry or exit, evaluated at the sample means of the explanatory variables and at the 90th percent percentile of the variation in liquid wealth. The regressions include all the preference shifter and life-cycle controls. In the sample 1989-2008, there is a significant coefficient for the change in log liquid wealth. The point estimate of 0,01 in the first column implies that an increase in liquid wealth of 10% implies almost a percentage point increase in the probability of investing in stocks. For the 90th percentile in terms of change in log liquid wealth, i.e. focusing on the households that have had a greater positive change in their liquid wealth, the point estimate increases and the effects of a 10% increase in liquid wealth leads to a more than 1 percentage point rise in the probability of participation. The exit regressions in the last four columns show that the probability of exiting the stock market is negatively related to changes in liquid wealth. The magnitudes of the point estimates are smaller than for the entry regressions. The overall effects are similar to those obtained by Brunnermeier and Nagel (2008). To summarize, changes in liquid wealth are one of the factors in changes in stock market participation. The positive effect is consistent with time-varying risk aversion due to wealth changes, but it is also consistent with CRRA preferences in a model with fixed per-period participation costs.

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Table 1: Summary Statistics

Year	SHIW # Obs	SHIW # obs Panel (1)	Holders of risky liquid assets			Holders of risky financial assets		
			SHIW # obs Panel	Risky liquid assets (2)	Total liquid wealth (2)	SHIW # obs Panel	Risky financial assets (2)	Total financial wealth (2)
1989	8,274	1,206	73	14,610	65,231	1,120	66,288	79,251
				52,500	109,120		76,984	87,111
1991	8,188	2,187	153	17,446	71,744	2,187	93,940	108,469
				38,640	81,642		136,452	144,888
1993	8,089	3,470	342	29,998	90,219	3,315	122,598	140,211
				62,351	114,415		195,244	205,436
1995	8,135	3,645	392	40,459	110,543	3,479	135,845	156,030
				79,327	140,560		197,508	216,271
1998	7,147	2,669	590	52,776	102,176	2,542	151,856	178,761
				115,171	154,137		292,247	327,250
2000	8,001	3,873	917	49,434	94,892	3,766	163,688	191,567
				114,494	213,101		278,119	326,100
2002	8,011	3,605	830	51,823	94,355	3,495	195,046	222,756
				120,854	257,206		328,467	381,676
2004	8,012	3,604	792	50,396	82,230	3,509	225,267	248,864
				85,120	116,965		383,520	402,123
2006	7,768	3,957	716	58,885	90,773	3,828	239,137	264,359
				176,172	208,822		434,538	453,585
2008	7,977	4,345	759	47,833	53,212	4,210	257,168	263,219
				121,426	111,750		642,594	645,273

Notes: (1) The number of observations refers to the number of households in the survey who were interviewed also in the previous survey. (2) Amounts are in thousands of 2002 euros. Averages and standard deviation (below each figure) of individual values, per year. Total liquid wealth consists of risky and riskless liquid assets. Total financial wealth consists of risky and riskless financial assets including business equity.

Table 2: Summary Statistics

Variable	Mean	10th pct	Median	90th pct.	N
All Households, 1989 - 1995					
Liquid wealth	24,448	369	8,869	59,689	32,684
Financial wealth	112,063	2,898	65,590	258,821	32,686
Disposable Income	26,050	9,136	22,134	46,396	32,686
Labor Income	11,942	0	10,076	30,995	32,686
Stock mkt participation	0.081	-	-	-	32,686
Stock mkt entry	0.042	-	-	-	32,328
Stock mkt exit	0.605	-	-	-	32,633
All Households, 1998 - 2008					
Liquid wealth	30,114	174	8,753	61,298	46,916
Financial wealth	210,021	3,099	124,443	455,150	46,916
Disposable Income	27,519	9,600	22,680	49,280	46,916
Labor Income	11,206	0	8,159	29,487	46,916
Stock mkt participation	0.175	-	-	-	46,916
Stock mkt entry	0.073	-	-	-	45,590
Stock mkt exit	0.503	-	-	-	46,767
Stock Market Participants in the panel, 1989 - 1995					
Liquid wealth	92,581	14,407	55,848	202,492	959
Financial wealth	305,676	53,747	209,199	644,517	960
Disposable Income	43,375	18,337	38,290	71,356	960
Labor Income	18,050	0	16,122	41,837	960
Stock mkt participation	-	-	-	-	960
Stock mkt entry	-	-	-	-	942
Stock mkt exit	-	-	-	-	960
Stock Market Participants in the panel, 1998 - 2006					
Liquid wealth	87,320	13,206	45,839	171,609	4,604
Financial wealth	429,483	62,500	276,288	826,868	4,604
Disposable Income	42,245	18,929	36,518	68,498	4,604
Labor Income	16,650	0	14,596	39,000	4,604
Stock mkt participation	-	-	-	-	4,604
Stock mkt entry	-	-	-	-	4,604
Stock mkt exit	-	-	-	-	4604

Notes: (1) Amounts are in thousands of 2002 euros. Descriptive statistics are computed from individual values, per year. Total liquid wealth consists of risky and riskless liquid assets. Total financial wealth consists of risky and riskless financial assets including business equity. (2) The number of observations refers to the number of households in the survey.

Table 3: Changes in the proportion of liquid wealth invested in risky assets (OLS estimates)

	Sample: 1989 - 2008			
	OLS	OLS	OLS	OLS
D log liquid wealth	0.009	0.0097	0.0098	0.0099
	(0.0063)	(0.006)	(0.006)	(0.006)
D log income	-	-1.4821	-1.0788	-0.8861
	-	(1.649)	(1.769)	(1.832)
Log income t-2	-	0.0293	0.746	0.711
	-	(1.120)	(1.347)	(1.377)
Preference shifter	N	N	N	Y
Life-cycle controls	N	N	Y	Y
Year-region FE	Y	Y	Y	Y
R2	0.086	0.0868	0.092	0.0932
N	3251	3249	3249	3249

Notes: The left-hand-side variable is the first difference in the share of liquid wealth invested in risky liquid assets. Heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses.

Table 4: Changes in the proportion of liquid wealth invested in risky assets (rolling OLS estimates)

	1998	2000	2002	2004	2006	2008
	OLS	OLS	OLS	OLS	OLS	OLS
D log liquid wealth	0.002	-0.007	0.025	0.040	0.0545 ***	-0.0541 ***
	(0.024)	(0.018)	(0.016)	(0.017)	(0.016)	(0.014)
D log income	4.035	0.013	3.251	-1.029	-10.069 **	-3.405
	(7.692)	(4.402)	(4.212)	(5.204)	(3.999)	(5.740)
Log income t-2	-1.007	4.800	-1.971	4.135	-0.373	-1.495
	(1.477)	(3.561)	(3.375)	(3.408)	(3.375)	(3.966)
Preference shifter	Y	Y	Y	Y	Y	Y
Life-cycle controls	Y	Y	Y	Y	Y	Y
Year-region FE	Y	Y	Y	Y	Y	Y
R2	0.09	0.07	0.04	0.05	0.11	0.10
N	229	495	562	526	459	513

Notes: The left-hand-side variable is the first difference in the share of liquid wealth invested in risky liquid assets. Estimation is made year by year using data for all households who were interviewed also in the previous survey. Heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses.

Table 5: Tests for selection bias based on lagged/forward selection dummy and the inverse Mills ratio)

	OLS	OLS	OLS
D log liquid wealth	0.021 **	0.0322 ***	0.025
D log income	-0.636	-0.864	3.251
Log income t-2	1.717	0.940	-1.971
Selected in previous wave	-2.909 *	-	-
Selected in next wave	-	-3.351 **	-
Inverse Mills ratio	-	-	3.042 *
Preference shifter	Y	Y	Y
Life-cycle controls	Y	Y	Y
Year-region FE	Y	Y	Y
R2	0.09	0.05	0.09
N	1666	1561	3236

Notes: The left-hand-side variable is the first difference in the share of liquid wealth invested in risky liquid assets. Significance levels: 1% (***); 5% (**), 10% (*).

Table 6: Changes in the proportion of liquid wealth invested in risky assets (Heckman two-step procedure)

	Sample: 1989 - 2008			
	OLS	OLS	OLS	OLS
D log liquid wealth	0.0094*	0.0102*	0.0095*	0.0095*
	(0.006)	(0.006)	(0.006)	(0.006)
D log income	-	0.4974***	-0.8061	-0.6235
	-	(0.034)	(2.300)	(2.319)
Log income t-2	-	0.9441***	1.2779	1.329
	-	(0.030)	(3.074)	(3.226)
Preference shifter	N	N	N	Y
Life-cycle controls	N	N	Y	Y
Year-region FE	Y	Y	Y	Y
Probit equation				
Past liquid wealth	1.07e-06 ***	1.07e-06***	1.07e-06***	1.07e-06***
	5.61e-08 ***	5.61e-08 ***	5.61e-08 ***	5.61e-08 ***
N. banks	1.3015***	1.3012***	1.3013***	1.3013***
	(0.107)	(0.107)	(0.107)	(0.107)
Past labor income	0.944***	0.9441***	0.9438***	0.9438***
	(0.030)	(0.030)	(0.030)	(0.030)
Preference shifter	Y	Y	Y	Y
Life-cycle controls	Y	Y	Y	Y
Year-region FE	Y	Y	Y	Y
N	3251	3251	3251	3251

Notes: The left-hand-side variable is the first difference in the share of liquid wealth invested in risky liquid assets. In the lower panel the probit first step estimation results are reported. In the upper panel the main equation second step estimates are reported. Significance levels: 1% (***); 5% (**), 10% (*).

Table 7: Changes in the proportion of financial wealth invested in risky assets (OLS estimates)

	Sample: 1989 - 2008			
	OLS	OLS	OLS	OLS
D log financial wealth	4.288 ***	5.641 ***	5.625 ***	5.537 ***
	(-0.219)	(0.298)	(0.298)	(0.0192)
D log income	-	-.945 *	-1.241 **	-1.223 **
	-	(0.561)	(0.587)	(0.599)
Log income t-2	-	0.465	0.045	-0.384
	-	(0.527)	(0.582)	(0.584)
Preference shifter	N	N	N	Y
Life-cycle controls	N	N	Y	Y
Year-region FE	Y	Y	Y	Y
R2	0.056	0.077	0.078	0.079
N	30,377	19,787	19,787	19,787

Notes: The left-hand-side variable is the first difference in the share of financial wealth invested in risky financial assets. Heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. Significance levels: 1% (***); 5% (**), 10% (*).

Table 8: Changes in the proportion of financial wealth invested in risky assets

	1993	1995	1998	2000	2002	2004	2006	2008
	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
D log financial wealth	6.607 ***	6.048 ***	8.086 ***	5.982 ***	6.712 ***	8.801 ***	6.161 ***	2.898 ***
	(1.213)	(0.890)	(0.7698)	(0.902)	(0.806)	(0.840)	(0.876)	(0.790)
D log income	-2.816	-1.597	-1.107	0.7018353	-4.642 ***	-2.607	-4.407 ***	2.697
	(2.025)	(1.343)	(1.533)	(1.955)	(2.025)	(1.659)	(1.930)	(1.816)
Log income t-2	-1.162	-0.846	2.153	-3.254 *	-2.422	-0.697	-4.719 ***	2.937 *
	(3.028)	(1.267)	(1.981)	(1.892)	(1.543)	(1.549)	(1.761)	(1.654)
Preference shifter	Y	Y	Y	Y	Y	Y	Y	Y
Life-cycle controls	Y	Y	Y	Y	Y	Y	Y	Y
Region FE	Y	Y	Y	Y	Y	Y	Y	Y
Adj. R2	0.112	0.064	0.150	0.087	0.121	0.160	0.107	0.056
N	1,043	2,560	2,275	1,862	2,562	2,505	2,579	3,150

Notes: The left-hand-side variable is the first difference in the share of financial wealth invested in risky financial assets. Estimation is made year by year using data for all household who were interviewed also in the previous survey. Heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. Significance levels: 1% (***); 5% (**), 10% (*).

Table 9: Changes in liquid wealth and risky market entry and exit (Probit estimate)

	Entry				**Exit**			
	mean	mean	mean	p90	mean	mean	mean	p10
D log liquid wealth	0.011	0.011	0.108	0.015	-0.009	-0.001	-0.001	-0.002
	0.017	0.001	0.001	0.002	0.001	0.000	0.000	0.003
	(0.017)	(0.001)	(0.001)	(0.002)	(0.001)	(0.0001)	(0.0001)	(0.0028)
D log income	0.208	0.014	0.012	0.016	0.011	0.001	0.001	0.001
	0.080	0.006	0.006	0.008	0.005	0.001	0.000	0.001
	(0.08)	(0.006)	(0.006)	(0.008)	(0.005)	(0.0005)	(0.0004)	(0.0008)
Log income t-2	0.416	0.026	0.024	0.033	0.032	0.003	0.002	0.004
	0.068	0.005	0.005	0.007	0.005	0.001	0.001	0.000
	(0.068)	(0.005)	(0.005)	(0.007)	(0.005)	(0.00056)	(0.0005)	(0.0001)
Preference shifter	N	N	Y	Y	N	N	Y	Y
Life-cycle controls	N	Y	Y	Y	N	Y	Y	Y
Year-region FE	Y	Y	Y	Y	Y	Y	Y	Y
Pseudo R2	0.106	0.120	0.012	0.012	0.110	0.128	0.132	0.132
N	7883	7883	7883	7883	7883	7883	7883	7883

Notes: Estimates are marginal effects evaluated at sample averages and the 90th percentile of the explanatory variables. Standards errors are reported in parentheses.

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