

Who lost the most?
Financial Literacy, Cognitive Abilities, and the
Financial Crisis*

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Abstract

The aim of this paper is to study how and to what extent private households are affected by the recent financial crisis and how their financial decision making is influenced by this shock. Our analysis, based on SAVE, a representative panel of German households, reveals that individuals with low levels of financial knowledge are less likely to have invested in the stock market and are therefore in general less likely to report losses in wealth due to the financial crisis. However, individuals with lower levels of financial literacy sold their assets which lost in value with a higher likelihood. This reaction of individuals with low financial literacy to short-term losses might have substantial long-term consequences, especially in the light of increasing individual responsibility for old-age provision.

Keywords: financial literacy, cognitive ability, financial crisis, life-cycle savings, saving behavior, portfolio choice

JEL Classification: D91, D14, G11

1 Introduction

The recent financial downturn and economic crisis provided a major challenge for financial institutions, politicians, companies and private households around the world. A concern is how and to what extent private households were affected by the financial and economic crisis and how their financial decision making is influenced by the shock. There was no housing or mortgage crisis in Germany in 2007/2008. Thus, the losses (or gains) in wealth of German households are purely related to the composition of financial portfolios and their adjustments in the course of the crisis. While households with a large share of equity in their portfolio are likely to have suffered from the economic downturn, households could gain high returns on time deposits, saving accounts and government bonds at the same time.¹

In this paper, we examine the portfolio composition of German households. Our first objective is to determine financial losses suffered by individual households at the end of 2008. Furthermore, we relate financial losses to socio-demographic characteristics and measures of financial literacy as well as cognitive abilities in order to determine who lost the most. The central questions to be answered are:

- Are individuals with lower financial literacy and cognitive abilities more frequently affected by financial losses due to the crisis?
- Are individuals with lower financial literacy and cognitive abilities affected more severely if loss is measured as a percentage of wealth?
- And are individuals with lower financial literacy and cognitive abilities more likely to realize their loss?

Despite the short-term perspective of our analysis, the financial crisis can have substantial effects on the long-term financial well-being of households depending on their reactions. If markets recover and households have long-term investment horizons we should not see lasting negative effects of the crisis. However, if individuals shy away

¹The German DAX, which measures the development of the 30 largest and best-performing companies on the German equity market and represents around 80% of the market capital authorized in Germany (<http://deutsche-boerse.com>) dropped by about 40% during 2008. In contrast to this the returns on private deposits with a duration of less than 2 years increased from an average of 3.6% in 2007 to an average 4.25% in 2008 (<http://www.bundesbank.de/statistik>).

from risky investments or feel confirmed in their scepticism towards financial markets, it will have substantial consequences, particularly in the light of the recent pension reforms and increasing individual responsibility for old-age income.

Our analysis is based on SAVE, a representative panel of German households that contains very detailed information on their financial and socio-economic situation as well as financial literacy and cognitive abilities. We use information from the surveys conducted in the early summer of 2007, 2008, and 2009 and make extensive use of a special module of questions regarding the financial crisis that were added to the questionnaire in 2009.

Our analysis reveals that individuals with low levels of financial knowledge fared relatively well during the financial crisis. They are less likely to have invested in the stock market and are therefore in general less likely to report losses in wealth due to the financial crisis. Thus, we confirm the finding by Calvet et al. (2007) and van Rooji et al. (2007) that individuals with low levels of financial knowledge stay out of risky assets. Conditional on stock market participation we find that individuals with low financial literacy did not incur larger losses measured as a fraction of their wealth. However, individuals with lower levels of financial literacy sold the assets which have lost in value with a higher likelihood. General cognitive abilities do not seem to play any significant role.

The paper is organized as follows: In section 2 we give a brief overview of the literature on household investment behavior and develop our hypotheses. Section 3 describes the SAVE data and the variables used for our analysis. In section 4 we report answers to the questions raised above. In section 5 we perform some robustness checks of our results. We conclude in section 6 with a brief discussion.

2 Related Literature and Hypotheses

2.1 Stock Market Participation

One of the central findings of capital market theory is that every household should invest part of their wealth in risky assets in order to profit from the risk premium.² Over the

²This result is based on Markowitz (1952), Merton (1969, 1971), and Samuelson (1969). For a comprehensive overview of the literature on strategic asset allocation see Campbell and Viceira (2003)

life-cycle the absolute amount of assets held in stocks should increase until retirement and decrease thereafter. Without fixed cost of stock market participation the relative amount of stocks in the portfolio should decrease with age; young investors should hold 100% of their assets in stocks.³ These results persist even when controlling for a variety of income risk and other background risks.⁴ Empirical examinations of households' portfolio choice reveal that many households do not hold equity.⁵ This phenomenon is known as the stock market participation puzzle. One of the arguments put forward to explain the reluctance of households to invest in risky assets is the existence of fixed participation cost (e.g., Mankiw and Zeldes (1991), Haliassos and Bertaut (1995), Vissing-Jorgensen (2002, 2003), and Calvet et al. (2007)). Mankiw and Zeldes (1991) find that stock market participation increases with income and education. They argue that this is in line with the existence of participation cost because, firstly, high income households have larger portfolios and can afford to pay the fixed participation cost, and secondly, the cost of information acquisition is lower for highly educated households. However, they also find that even among households with more than \$100,000 of liquid assets participation in equity is below 50% and conclude that information cost must be substantial or non-economic reasons influence households' behavior. The introduction of a fixed cost of stock market participation in the model of Campbell and Viceira (2003) merely shifts stock market entry to later ages but does not fundamentally change the predictions of the model. Vissing-Jorgensen (2002) and (2003) estimates that a fixed participation cost of around 50 dollars in 2003 can explain non-participation of half the households in her sample. Andersen and Nielsen (2010) find that fixed entry and participation costs in monetary terms can account for roughly one third of non-participation in the stock market. They conclude that participation seems to be influenced by other factors like for example behavioral biases and cognitive abilities. The authors show that the proba-

as well as Curcuru et al. (2004).

³See Campbell and Viceira (2003) based on Campbell et al. (2001).

⁴See e.g. Cocco et al. (2005), Curcuru et al. (2004).

⁵See e.g. Mankiw and Zeldes (1991), Haliassos and Bertaut (1995), and Guiso et al. (2003) for international evidence. Börsch-Supan and Essig (2003) find that only around 17% of German households directly participate in the stock market. The amount would increase when including indirect stock holdings, however, the authors argue that there is a large overlap between direct and indirect stock holders. Based on aggregate data, Ramb and Scharnagl (2010) report that the share of direct equity holdings in German households' portfolios moved around 5% since the burst of the "dot com bubble" in 2000. The fraction of mutual funds in portfolios was around 14% in recent years.

bility of participation in the stock market after a windfall gain is significantly higher for educated and financially literate individuals. This is in line with other studies which find evidence that in particular individuals with lower financial knowledge and lower cognitive abilities are less likely to participate in the stock market.⁶ In particular, Grinblatt et al. (2010) find evidence that even among the most affluent individuals higher IQ increases stock market participation. This implies that individuals with high financial literacy and high cognitive abilities face lower cost of acquiring information and thus lower participation cost than individuals who know little about financial markets and have low cognitive abilities. In addition to this, Calvet et al. (2007) suggest that individuals with low financial literacy might be aware of their weakness and stay out of risky markets to avoid investment mistakes like for example under-diversification. Furthermore, individuals who invest in the stock market have an incentive to acquire knowledge and thus participants have higher levels of financial literacy than non-participants. Moreover, McArdle et al. (2009) and Cole and Shastry (2009) propose several alternative mechanisms through which cognitive abilities and financial education could be related to financial market participation. For example, time preferences simultaneously influence the investment in education and saving behavior. Thus, it is hard to determine causality. However, for our analysis the mechanism that drives stock market participation of households is only of secondary importance. Assuming that the financial crisis was an unanticipated exogenous shock, financial losses of individuals should be closely related to stock market participation and thus, our first hypothesis on the effect of the crisis is:

Hypothesis 1: Households with higher financial literacy/cognitive abilities are more likely to hold risky assets in their portfolio (select portfolios with a higher expected return at higher risk). Thus, they are more likely to incur losses due to the financial crisis.

2.2 Under-Diversification and other Investment Mistakes

There is a growing literature which investigates the relationship between financial investment mistakes, cognitive abilities and financial literacy. The central finding is that

⁶See e.g. Guiso and Jappelli (2005), Calvet et al. (2007), van Rooji et al. (2007), Christiansen et al. (2008), Christelis et al. (2010), McArdle et al. (2009), Cole and Shastry (2009), and Grinblatt et al. (2010).

individuals with lower cognitive abilities and lower financial knowledge are more likely to suffer from biases and make investment mistakes.⁷ Kimball and Shumway (2010) suggest that the most plausible reason is that less financially literate investors are better informed and therefore are better at managing their portfolios.

One of the most investigated deviations of investors from optimal behavior is lack of diversification.⁸ In their comprehensive study of 60,000 US brokerage accounts Goetzmann and Kumar (2008) for example find that on average investors hold under-diversified portfolios. The degree of diversification increases with age, income, education, and sophistication.⁹ Specifically, they find that under-diversified investors overestimate specific industries, and local stocks, and are sensitive to past returns. Thereby they earn 2.4% lower annual returns than diversified investors. Kimball and Shumway (2010) discover that financially literate investors are less likely to apply naive diversification heuristics, like the 1/n rule. Moreover, they invest fewer amounts of their assets in company stocks; and they are less frequently suffering from a home bias. Guiso and Jappelli (2008) also find that a lack of diversification is related to a lack of financial literacy. They argue that financially illiterate investors are likely to undervalue the benefits from diversification—or even ignore them altogether—and additionally have difficulties to assess the correlation between their assets' returns. Thus, individuals with high financial knowledge hold a larger number of different assets in their portfolio. Similarly Grinblatt et al. (2010) find that individuals with higher IQ invest in a larger number of different stocks and are more likely to hold mutual funds in their portfolio.

Additionally, Goetzmann and Kumar (2008) find that investors with better diversification are also better at selecting stocks with higher returns, probably also because they are better informed. The authors identify a small group of active investors who are under-diversified and perform very well—most likely a group of very well informed investors. Grinblatt et al. (2009) observe that high IQ investors on average earn 11% higher returns than low IQ investors.

If financially literate investors are better at managing their portfolios in “normal times” they most probably were also better prepared during the financial crisis. Thus,

⁷See, e.g., Benjamin et al. (2006), Agarwal et al. (2009), Kimball and Shumway (2010).

⁸See, e.g., Blume and Friend (1975), Moskowitz and Vissing-Jorgensen (2002), Vissing-Jorgensen (2003), Campbell (2006), Calvet et al. (2007), Goetzmann and Kumar (2008).

⁹They define sophisticated investors as those who “trade options, engage in short-selling, and have greater investment experience” (p.435).

we hypothesize:

Hypothesis 2a: Conditional on stock market participation, households with higher financial literacy/cognitive abilities are better at managing their portfolios. Thus, they suffer smaller losses as a percentage of their wealth.

On the other hand, Odean (1998) argues that overconfidence leads investors to overestimate the precision of their own evaluation of signals which leads them to hold portfolios that are more risky than the portfolios of non-overconfident investors with the same degree of risk aversion. Moreover, Barber and Odean (2001) find that overconfident investors trade too much and thereby lower their returns. Furthermore, they find that men tend to be more overconfident than women with similar sophistication. If men on average hold riskier portfolios due to overconfidence compared to women, they should have incurred larger losses as a fraction of their wealth compared to their female counterparts. Therefore, we propose the following hypothesis:

Hypothesis 2b: Conditional on stock market participation, households with a male decision maker are more likely to suffer from overconfidence compared to households with female decision makers with a similar degree of financial literacy and cognitive ability. Thus, men compared to women hold riskier portfolios and incur larger losses as a percentage of their wealth.

2.3 Portfolio Adjustments

The German stock market lost about 40% of its value in the course of 2008. For investors with constant relative risk aversion the lower value of risky assets relative to total wealth should lead investors to buy additional equity in order to hold the fraction of risky assets in their portfolio constant. However, in the course of the crisis a strong tendency to shift from risky to less risky assets has been observed on the aggregate level. Many investors sold their equity in particular at the trough of the crisis in October 2008 (Bundesverband Investment und Asset Management e.V. (2009)) and thus did not only incur paper losses but realized their losses. The re-balancing behavior of households has been subject to many examinations. A variety of different rational as well as irrational reasons for active re-balancing have been examined for example by Odean (1998), Coval and Shumway (2005), Locke and Mann (2005), Massa and Simonov (2005), and Calvet et al. (2009).

In order to understand the mechanisms that were driving individuals' reactions to the financial crisis, we have to examine their motives. It is unclear if the realization of losses can be seen as a financial investment mistake from an ex ante perspective. Ex post it seems that it would have been better not to sell assets which have lost in value but rather buy assets when prices were low and profit from markets' recovery. However, some households might have realized their losses in order to reduce their (future) tax burden. Moreover, if households had an ex ante rule to sell their stock as soon as the value dropped below a certain threshold in order to avoid suffering from a disposition effect (holding losers too long and selling winners too soon), the selling of loser stocks might have been plausible. We expect that individuals with higher financial literacy and cognitive abilities are more likely to apply these strategies.

On the other hand, if households sold their risky assets because they expected the future returns to be lower permanently, they were not well informed. Households with higher financial knowledge should have been better informed about the long-term development of future returns and thus were more likely not to sell their risky assets. Moreover, investors might have suffered from "myopic loss aversion" (investors give high weight to losses compared to gains and evaluate their portfolios too often) as argued by Benartzi and Thaler (2007) or were influenced by an atmosphere of panic. Benartzi and Thaler (2007) as well as Duflo and Saez (2003) find that particularly unsophisticated investors are strongly influenced by peer effects. Calvet et al. (2009) examine re-balancing behavior of Swedish households and observe that in particular financially sophisticated households were less likely to exit financial markets between 1999 and 2002 when the stock market declined. Assuming that financial sophistication is related to financial literacy and cognitive abilities one would expect individuals with low financial literacy/cognitive abilities to sell loser stocks more frequently.

Thus, we end up with two competing hypotheses:

*Hypothesis 3a: Households with **higher** financial literacy/cognitive abilities are more likely to realize their losses.*

and

*Hypothesis 3b: Households with **lower** financial literacy/cognitive abilities are more likely to realize their losses.*

The empirical analysis can contribute to clarify which of the two effects prevails.

Moreover, if individuals needed their funds to buffer unexpected shocks to income due to the crisis, it might have been rational to sell assets that lost their value. We will take care of this in the empirical part of our analysis.

3 Data

3.1 SAVE

We use SAVE, a panel of German households that contains detailed information on households' financial situation and socio-economic as well as psychological characteristics.¹⁰ The analysis is based on the surveys conducted in the early summer of 2007, 2008, and 2009, and we make extensive use of a special module of questions regarding the financial crisis which was added to the questionnaire in 2009. Currently there are 2,222 households in the panel.

Due to item non-response, the SAVE data set is imputed using an iterative multiple imputation procedure based on a Markov-Chain Monte-Carlo method (Schunk (2008)). The goal of this procedure is to increase the efficiency of our estimates due to a larger number of observations and to reduce the item non-response bias that occurs if observations with and without missing values differ systematically. For our analysis, all five multiply imputed data sets are used and the results are derived using Rubin's method (Rubin (1987, 1996)). In the case of our explained variables (absolute and relative loss, assets sold) and key explanatory variables (financial literacy and cognitive abilities), we do not use imputed values. Thus, our sample consists of 2,012 households. The socio-demographic characteristics of the sample are provided in table A1 in the appendix.

All descriptive statistics are weighted and results are representative for the German population.¹¹ For the regression analyses no weights are used.¹²

¹⁰SAVE was first conducted in 2001 by the Mannheim Research Institute for the Economics of Aging (MEA). Consecutive waves were in the field in 2003/2004, and every year since 2005. A detailed description of the scientific background, design and results of the survey can be found in Börsch-Supan, Coppola, Essig, Eymann and Schunk (2009).

¹¹The reference statistic to calibrate weights according to income and age classes is the German Mikrozensus. For a detailed description see Börsch-Supan, Coppola, Essig, Eymann and Schunk (2009), p. 48-52.

¹²Deaton (1997) mentions that "when the sectors [sub populations] are homogeneous, OLS is more efficient, and when they are not, both estimators are inconsistent. In neither case is there an argument

3.2 Measuring Financial Losses

3.2.1 Reported Losses

Absolute Financial Losses. We measure losses due to the financial crisis by directly asking households. The question in SAVE 2009 was phrased in the following way: *Have you and /or your partner personally suffered losses in wealth due to the financial crisis? If yes, how high was your total loss in 2008 in Euros?*¹³ At this point it is unclear if households reported paper or realized losses. However, we will elaborate on this in the course of our analysis.

About 79.5% of the households responded that they did not incur financial losses due to the crisis. 20.5% reported a loss. The average loss reported by households conditional on reporting a loss is 13,153 Euros. The median loss is 5,000 Euros. The distribution of losses is skewed to the right and is plotted in figure 1. The unconditional average loss of all households in Germany is 2,562 Euros. In comparison, the average loss of German households calculated on the basis of aggregate financial account statistics of the Deutsche Bundesbank is 3,105 Euros.¹⁴ The difference may at least partly be explained by the fact that some households have not reported paper losses.

[Figure 1 about here]

In order to evaluate how well households estimate their losses we simulate financial losses on the basis of their portfolios at the end of 2007. We apply the approach taken by Börsch-Supan, Gasche and Ziegelmeyer (2009), i.e., we use households' portfolio composition at the end of 2007 and apply average returns of these assets during 2008. We deduct the simulated wealth level at the end of 2008 from the wealth level at the end of 2007 to obtain paper losses and gains during 2008. To construct our simulated loss variable we exclude gains as our direct question only covered losses. According to the simulation about 29.6% of households in Germany were affected by losses in financial wealth. The difference compared to reported losses can be due to the fact that some

for weighting." (p. 70)

¹³We do not compare households' balance sheets at the end of 2007 and 2008 as the net wealth position of households can also be influenced by consumption-saving decisions and bequests, etc.

¹⁴Estimated on the basis of Deutsche Bundesbank (2009): Geldvermögen und Verbindlichkeiten der privaten Haushalte. Tabelle aus der Finanzierungsrechnung; http://www.bundesbank.de/statistik/statistik_wirtschaftsdaten_tabellen.php

of the households did not report their paper losses when asked directly. Furthermore, some households might be unaware of the fact that they were affected by the financial crisis. We will comment on this aspect after we introduce measures of financial literacy and cognitive abilities. The average simulated loss of households is 2,658 Euro. This is quite close to the reported average loss of 2,562 Euros.¹⁵ Conditional on reporting a loss the average simulated loss is 10,692 Euros, i.e. the value is below the average reported loss of 13,153 Euros. We also analyze the difference between simulated and reported losses on the individual level and find that about 13% underestimate their losses and about 22% overestimate their losses. For 64% of the respondent both, reported and simulated losses are zero. The deviations can be due to misreporting of the households as well as due to the imprecise estimation of simulated changes in wealth during 2008. We calculated the returns on asset classes using average returns of these assets as we do not have information of the precise composition of households' portfolios. Overall, we come to the conclusion that households on average seem to have a plausible notion of their losses during the financial crisis. We will comment on the deviation in more details below.

Relative Financial Losses. We divide financial losses by households' total financial wealth at the end of 2007. Total financial wealth is constructed using deposits held in savings accounts, building savings contracts, fixed income securities, stocks, stock mutual and real estate funds, life insurance contracts, private and employer-based pension wealth as well as other financial assets. On average households lost about 3.6% of their gross financial wealth. Conditional on suffering a loss, households lost about 18.6% of their gross financial wealth. The median loss is 9.5%. Overall, about 9.2% of the households lost more than 10% and about 1.8% lost more than half of their financial assets. The average simulated loss relative to financial wealth at the end of 2007 is 3.7% which is again quite close to the reported one.

Additionally we relate losses to total wealth. Thus, we add housing and business wealth as well as other real assets (e.g. jewelery, antiques etc.) to our financial wealth variable. Related to their total gross wealth at the end of 2007, households on average lost 1.7% of their wealth. Conditional on reporting a loss, the fraction of total wealth lost is 8.9% with a median of 2.5%. 3.8% lost a fraction of wealth higher than 10% of all assets. Less than 1% of all households lost more than half of their total wealth.

¹⁵The correlation of simulated and reported losses is 0.52 (p-value 0.000).

3.2.2 Realized Losses

As a follow up question we asked respondents: *What did you do with the assets that lost in value? We kept the assets. / We sold some of the assets. / We sold all of them.*

This question was only asked conditional on reporting a loss. Thus, 458 households gave an answer to this question. 75.2% responded that they kept the loser assets in their portfolio. Thus, these households reported paper losses. 13.2% report that they sold all of the assets that lost in value and 11.6% sold at least some of them (see table 1). For the analysis conducted later on we construct a variable equal to 1 if households sold some or all of their assets.

[Table 1 about here]

Table 1 also relates the absolute and relative losses of households to their reaction. We find that the average loss of households who kept their assets is little over 12,000 Euros. The average loss of households who sold some of the assets is almost twice as large (about 23,500 Euros). However, the loss of households who sold all their assets is only around 9,000 Euros. Investors who kept their assets on average lost 17.4% of their wealth which is about 23% less than the average relative losses of investors who sold some or all of their assets and who suffered an average relative loss of 22.5%.

3.3 Measuring Financial Literacy

We measure financial sophistication using an “objective” —as opposed to a “subjective”, i.e. self-assessed—measure of financial literacy. A set of three quiz-like questions was developed by Lusardi and Mitchell (2006) for the Health and Retirement Study in 2004. The questions are designed to assess the fundamental skills that are at the core of individual saving and investment decisions. In the meantime, the same (or very similar) questions were included in several household surveys around the world, including the German SAVE survey. Two of the questions are classified as measuring basic financial concepts (van Rooji et al. (2007)). The first question concerns the understanding of interest and mainly requires the ability to calculate. The second question examines the understanding of the joint effects of interest and inflation. The third question is categorized as measuring advanced financial knowledge and deals with risk and diversification. The wording of the questions can be found in the appendix.

We use the answers to the financial quiz from the SAVE survey in 2007 because the financial crisis might have changed financial knowledge of households. The survey was conducted in the early summer of 2007 before the start of the financial crisis.

Finally, we define two measures of financial literacy. We construct an index taking values 0 to 3 according to the number of correct answers given by each respondent. The answers given by the respondents are displayed in table 2. The second variable is a dummy, which takes the value 1 if all questions were answered correctly and 0 otherwise. In our sample 53.2% of the respondents were able to answer all three financial literacy questions, whereas 46.8% had a least one incorrect answer or “do not know”.¹⁶

[Table 2 about here]

Previous analysis of financial literacy among SAVE respondents revealed that financial literacy is particularly low among women, individuals with low education, and income and individuals living in east Germany (Bucher-Koenen (2009)).

3.4 Measuring Cognitive Abilities

Cognitive abilities are measured using the cognitive reflection test (CRT) developed and tested by Frederick (2005). To our knowledge, SAVE is the first representative sample which contains this measure. The CRT consists of three quiz-like questions. All questions have an intuitive but incorrect answer and a correct answer that is a little more tricky to find. The CRT has been found to be a very efficient way to estimate cognitive abilities of individuals in questionnaires. It correlates well with more comprehensive intelligence tests. The wording of the questions can be found in the appendix.

The CRT was only introduced in the SAVE survey in 2009. However, there is no reason to assume that the crisis influenced cognitive abilities of our respondents. Thus we do not see any difficulty in using this data.

Similar to our measures of financial literacy we define a measure of cognitive abilities. We construct an index taking the values 0 to 3 corresponding to the number of correct answers given. The results can be found in table 3. 43% of our respondents gave no correct answer. Around 20% gave one and 21% two correct answers. Only 15% of the

¹⁶In the questionnaire 2007 the interest and the inflation question did not have a “do not know” option. For this reason we treat missing answers as “do not know” and do not drop them from the sample.

respondents were able to answer all three questions correctly. Moreover, we construct a dummy variable which takes the value 1 if all questions were correctly answered.

[Table 3 about here]

Our analysis of cognitive abilities and financial literacy reveals a significantly positive correlation (spearman rank correlation: 0.2899, p-value 0.000) between the two. In table 4 we show that about 4.3% of the respondents answer none of the questions correctly and 11.2% give six correct answers. Financial literacy increases with cognitive capacity: Among those with low cognitive abilities (0 correct answers) 37% give three correct answers on the financial literacy task whereas among those with high cognitive abilities (3 correct answers) the probability of correctly answering all financial literacy questions is roughly 75%.

[Table 4 about here]

4 Empirical strategies and results

4.1 Who is affected by financial losses due to the crisis?

4.1.1 Model to test hypothesis 1

In section 2.1 we argued that the probability incurring a financial loss during the crisis depends on whether the household participated in the stock market, which in turn depends on factors like participation cost, income volatility, and risk preferences. In order to test *hypothesis 1* we substitute the determinants of stock market participation into the equation to estimate the loss probability. Thus, we estimate the following reduced form probit:

$$L = \beta_0 + \beta_1 z + \beta_2 w + \beta_3 k + \beta_4 c + \epsilon. \quad (1)$$

Where L is an indicator equal to one if a household incurred a loss, z is a vector of socio-demographic variables, w is wealth, k is financial literacy, and c is cognitive abilities. ϵ is a standard normal random error.

We proposed that households with high financial literacy/high cognitive abilities are more likely to hold risky assets in their portfolio and thus are more likely incur losses due

to the financial crisis. Therefore, we expect β_3 and β_4 to be positive. The awareness of individuals of their exposure to risk during the crisis and the losses related to this might depend on the knowledge of individuals about their own financial situation which might again depend on their levels of financial literacy. However, it is unclear if individuals with lower levels of financial literacy are more likely to over- or underestimate their losses. An analysis of the deviations between reported and simulated financial losses with respect to financial literacy and cognitive abilities reveals that there are no systematic over- or under-estimations of the losses depending on abilities. Furthermore, there is no relation between financial literacy and the squared difference between simulated and reported losses, i.e. financially illiterate households are not deviating more strongly. Thus, we do not think that our estimates are systematically biased.

4.1.2 Empirical results: model 1

In this analysis all 2,012 respondents are included. As proposed in hypothesis one, households with high financial literacy are more likely to incur losses due to the financial crisis. Bi-variate analysis reveals that 11% of the households with a respondent who was unable to answer all financial literacy questions report to be affected by a loss in wealth as a result of the financial crisis. In contrast, 29% of the respondents who answered all questions correctly report financial losses. Moreover, the fraction of households suffering from losses increases from 19% for low cognitive abilities (less than three correct answers) to almost 30% for high cognitive abilities (three correct answers).

To understand the effect of financial literacy and cognitive abilities on being affected by losses in wealth, we conduct a multivariate regression as specified in equation 1. The results are reported in table 5.

[Table 5 about here]

We measure financial literacy by using a dummy variable for three correct answers to the financial literacy task and cognitive abilities by using a dummy variable for three correct answers in the cognitive abilities task.¹⁷ Furthermore, we include financial wealth at the end of 2007, income and education as controls. These variables are used as proxies

¹⁷All our results maintain for alternative definitions of cognitive abilities and financial literacy. More specifically, we ran regressions using variables taking values from 0 to 3 for cognitive abilities and financial literacy, respectively.

for the ability and willingness of households to incur fixed participation cost. Moreover, Campbell and Viceira (2003) argue that the participation in risky asset markets can be influenced by income risk of households. We include two variables to proxy income risk: one measure for subjective income volatility of households in the past 5 years¹⁸ and one variable controlling for self-employment of the person answering the questionnaire. We also include a measure for risk aversion in the domain of financial matters.¹⁹ Additionally, controls for age, living in east Germany²⁰ and gender are included. We find that all of our controls show the expected signs and thus, are in line with portfolio choice theory.

Our regression reveals that financially literate individuals have a more than 13% higher chance to incur a loss during the crisis compared to financially illiterate respondents (significant at 1%). Therefore, hypothesis 1 is confirmed with respect to the effect of financial literacy. The effect of cognitive abilities is insignificant.

4.2 Who lost the most?

4.2.1 Model to test hypothesis 2

In section 2.2 we proposed that households better at managing their portfolios should incur smaller losses relative to their financial wealth. The ability to manage ones portfolio in turn depends on financial knowledge and cognitive capacity. In order to test *hypothesis 2* we estimate a model of the form:

$$l = \beta_0 + \beta_1 z + \beta_2 r + \beta_3 k + \beta_4 c + \beta_5 m + \beta_6 fa + \epsilon. \quad (2)$$

Where $l = loss/w_{07}$ is the loss relative to wealth at the end of 2007, z is a vector of socio-demographic variables, r is a proxy for the share of risky assets in the portfolio and k and c are financial literacy and cognitive abilities, respectively. m is an indicator if the

¹⁸The wording of the question is: “Over the past five years did your personal income fluctuate considerably, fluctuate somewhat, or not fluctuate at all?”

¹⁹The wording of the question is: “To what extent do the following statements apply to you? Please answer on a scale from 0 to 10, where 0 means ”does not apply at all” and 10 means ”applies very well”. I do not mind taking risks with respect to financial matters.” Dohmen et al. (2010) establish the predictive validity of this measure. We take the measure from SAVE 2008, i.e. it is measured in spring 2008.

²⁰There are still substantial differences in the economic situation between the former communist and non-communist part of Germany, thus it seems appropriate to control for these structural differences.

household has a male decision maker. If households know little about financial markets they might compensate for their lack of knowledge by consulting advisors. Therefore we include an indicator fa if a household consulted a financial advisor before spring 2008.²¹ ϵ is a standard normal random error. We estimate model 2 conditional on investing in risky assets at the end of 2007.²² Our dependent variable is bounded between 0 and 1. Thus, we estimate a fractional response model à la Papke and Wooldridge (1996) and use a logistic transformation of our dependent variable $l_{trans} = \ln(l/(1-l))$.

We hypothesize that households with higher financial literacy/cognitive abilities are better diversified and therefore suffer smaller losses as a percentage of their wealth, i.e., we expect β_3 and β_4 to be negative. Moreover, we expect households with male decision makers to incur higher losses, i.e., β_5 should be positive.

4.2.2 Empirical results: model 2

The analysis of this model is restricted to stock market participation, i.e. we include 563 respondents. The descriptive analysis reveals that the fraction of wealth lost is around 10.3% for individuals with little knowledge and decreases slightly for highly literate households (9.1%). The difference between the two groups is insignificant. The analysis of relative losses over levels of cognitive abilities shows that individuals with lower cognitive abilities on average lost a higher fraction of their wealth (9.8%) than individuals with higher cognitive abilities (8.1%). Again, the difference between the two groups is insignificant.

The results of a fractional response model as specified in equation 2 to test hypothesis 2a and 2b can be found in table 6. Our dependent variable in this regression is the loss (measured in Euros) divided by financial wealth at the end of 2007. Not surprisingly, we find that the fraction of wealth lost is higher, the higher the share of financial wealth invested in stocks, bonds or other risky assets. The share invested in stocks has the largest impact on the fraction of wealth lost and is highly significant. Unfortunately we only have very broad definitions of asset classes so that not all information about

²¹The measure is taken from SAVE 2008 and thus from the same questionnaire when households report their financial situation before the crisis in December 2007.

²²We do not estimate a Heckman selection model because we actually observe the zero losses. Furthermore, we are not interested in potential losses, had the households participated in the stock market, but on actual losses of those who participated. For further arguments regarding the choice of sample-selection and conditional model see Duan et al. (1984) and Puhani (2000).

individuals' portfolio composition is captured. Therefore, we add risk preferences and find a highly significant effect on the fraction of wealth lost despite our inclusion of the share of wealth invested in risky assets. In addition to that, we find that individuals aged between 51 and 65 lost a larger fraction of their wealth compared to individuals between age 36 and 50. Net income has a small negative effect on the fraction of wealth lost.

We do not find any significant effect of cognitive abilities and financial literacy on the fraction of wealth lost. Neither do we find a significant impact of financial consultants on the fraction of wealth lost. Also, testing the joint significance of financial advice, education, cognitive abilities, and financial literacy does not add any insights. I.e., our results do not confirm hypothesis 2a: We do not find any indication that individuals with higher cognitive abilities or financial literacy were better at managing their portfolios and lost less of their wealth during the crisis.

[Table 6 about here]

We include two dummy variables to control for decision making within the household. The reference group are single female decision makers. We find no significant difference between single female or male decision makers on the size of the loss. Neither do we find a significant difference between single male or single female and joint decision makers, respectively.

To check if our results are influenced by the performance of households with very risky portfolios and accordingly very large losses, we restricted our estimation to households with a fraction invested in stocks that is smaller than 80%, i.e. we exclude the top 5% of households with the highest share of risky investments in their portfolio (specification 2 in table 6). The number of observations is reduced to 505. Overall our results compared to the previous specification do not change. However, there is one surprising result: individuals who consult financial advisors are more likely to have suffered from losses than individuals without financial advisors and the same portfolio structure. This is rather astonishing as we condition on households that invested part of their wealth in risky assets. It seems that for households with modest risky investment (between 1% and 80%) professional advice decreased the performance during the crisis.

4.3 Who realizes their loss?

4.3.1 Model to test hypothesis 3

In section 2.3 it was argued that different reasons might have existed to sell ones assets during the crisis and realize a loss. To investigate our competing *hypotheses 3a and 3b* we estimate a probit of the following form:

$$s = \beta_0 + \beta_1 z + \beta_2 k + \beta_3 c + \beta_4 y + \epsilon, \quad (3)$$

where s indicates whether the household has sold assets that lost in value, and y indicates a shock to income. All other variables are defined as before.²³ As argued in section 2.3, individuals with higher financial literacy and cognitive abilities might be more or less likely to sell their assets, thus β_2 as well as β_3 can be positive or negative.

4.3.2 Empirical results: model 3

The question about the realization of losses was asked conditional on reporting a loss, i.e. only 458 households are included in the regression. Descriptive analysis reveals that the fraction of households who sold their assets that lost value is 21% for highly financially literate respondents compared to 36% on average for respondents answering less than 3 questions correctly. Similarly, the percentage of households who sold at least some of their loser stocks decreases from 26% for low cognitive abilities to 21% for high cognitive abilities.

The results of probit regressions modeled as suggested in equation 3 are shown in table 7.

[Table 7 about here]

Cognitive abilities as well as financial literacy have a negative effect on selling the loser stocks which is in line with the descriptive results. However, only the effect of financial literacy is significant at the 1% level. The ability to answer all financial literacy questions correctly decreases the probability to sell assets after a loss by 9.3%.

²³Again we do not estimate a Heckman selection model because we actually observe those who do not sell their loser stocks as well as those who do not incur losses. Furthermore, we are not interest in potential reactions, had the households incurred a loss, but on actual losses of those who participated. For further arguments regarding the choice of sample-selection and conditional model see Duan et al. (1984) and Puhani (2000).

The second interesting point to notice is that individuals older than 66 are significantly more likely to sell their assets, compared to individuals between 36 and 50. The reason is probably that they were pessimistic about medium term future stock returns and have shorter future time horizons compared to younger investors. Apart from the variables we already introduced, a variable is included to take account of shocks to income and whether individuals had to sell the assets to smooth consumption. We have information if households were affected by the crisis via the labor market. Specifically we asked respondents if they lost their job due to the crisis. We discover that job loss during the crisis had a positive effect on selling assets.

For households who sold at least some of the assets, there was a follow up question asking for the destination of the money:

What did you do with the money from selling the assets? We used most of it for consumption. / We transferred most of it to our checking account or other forms of assets.

The results from this analysis shows that most of the households who sold the assets did not aim at smoothing consumption. Only about 17% of the respondents consumed most of the money from the assets they sold. The majority (83%) transferred the money to other assets.

Summing up, we are able to reject hypothesis 3a according to which households with higher financial literacy are more likely to realize their losses. We find evidence that higher financial literacy is positively related to keeping the loser assets. Thus, individuals with lower financial literacy were more likely to realize their losses and leave the equity market during the crisis.

5 Measure of Advanced Financial Literacy

In 2009, an extended and more sophisticated financial literacy section was introduced in the SAVE questionnaire. Since it cannot be ruled out that financial literacy increased during the financial crisis, we use these questions only as a robustness test. This seems necessary because the three questions about the basic concepts of financial literacy might not capture the full range of financial knowledge required to be an active investor on the stock market. Therefore, we focus on four of the advanced literacy questions out of the 2009 financial literacy section. The exact formulation of the questions can be found

in the appendix. Again a score is constructed taking the values 0 to 4 for each correct answer and a dummy variable which takes the value 0 for less than four correct answers and 1 in case of four correct answers. The results are displayed in table 8.

[Table 8 about here]

Using the advanced financial literacy questions gives similar results to the ones previously obtained: 14.5% of the respondents who were not able to give 4 correct answers report a loss and almost 35% of households who answered all questions correctly report losses. The difference between these two groups is highly significant at 1%. In the multivariate regression we find that individuals who are able to answer all four advanced financial literacy questions correctly were on average about 9% more likely to report a loss.

Regarding the average fraction of wealth lost conditional on stock market participation our results from the previous section do not change either. There is no significant difference in the share of wealth lost between financially literate and illiterate households. Finally, using the financial literacy measure 2009 we do not detect any significant effect on selling the losers.

6 Conclusions

Our analysis of the effects of the financial crisis on households' portfolios and their reactions reveals the following results:

- On average, households in Germany do not seem to have suffered substantially from the financial crisis. Little more than 20% of households in Germany report financial losses. Mean losses are about 2,560 Euros or 3.6% of financial assets.
- Households with lower financial literacy and cognitive abilities are less likely to participate in risky asset markets and thus less frequently report financial losses due to the crisis. The effect of financial literacy is significant even if we control for socio-demographic differences, risk preferences and income risk. Thus, our results are consistent with the results of Calvet et al. (2007). The authors argue that financially unsophisticated households are skeptical about financial markets and thus stay out of risky assets to avoid investment mistakes.

- Contrary to the predictions derived from existing theory, households with lower financial literacy and cognitive abilities did not lose larger fractions of their wealth if they participated in the stock market. Moreover, our indicator of overconfidence does not reveal any significant effects on the size of the loss.
- Financially illiterate households were more likely to sell the assets which lost in value during the crisis. Calvet et al. (2009) observe that financially unsophisticated households in Sweden are more likely to exit risky assets markets when incurring a loss. We confirm these findings using German household data.

However, one should not jump to conclusions too fast. Even though the effects of the financial crisis in Germany appear to be limited in the short run they can have substantial consequences in the long run. In Germany, participation in risky assets has been traditionally low but has increased slightly in recent years. Malmendier and Nagel (2010) find that past returns matter for households' participation in stock and bond markets. If the shock to financial market returns has a negative impact on financial market participation, the rising trend in stock market participation might slow down or even be reversed (we observe households leaving the stock market due to the crisis). Consequentially, there might be substantial losses in future welfare for households who leave or stay out. This might impact households financial well-being particularly in the light of demographic transition and declining pension benefits. Mankiw and Zeldes (1991) estimate that consumption patterns of stockholders and nonstockholders differ substantially: stock holding households have overall larger volatility of consumption, but at the same time they have higher average levels of consumption. Cocco et al. (2005) estimate a welfare loss of 1.5 to 2% of annual consumption due to lack of stock market participation. We found stock market participation decisions to be related to financial literacy. Investors who avoided financial losses during the crisis by staying out might feel confirmed in their investment strategy due to the downturn. They might be even less likely to invest than before the crisis. Additionally, financially illiterate investors were more likely to leave the equity market. Thus, due to different investment strategies of financially literate and illiterate investors income inequality at old-age might increase. Therefore an active policy is necessary to reestablish "trust" in financial markets and get illiterate households to participate and improve the management of their portfolios.

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Figure 1: Density Function Financial Losses

This figure shows the distribution of losses conditional on reporting a loss. The function is smoothed using a univariate kernel density estimation (Epanechnikov kernel function).

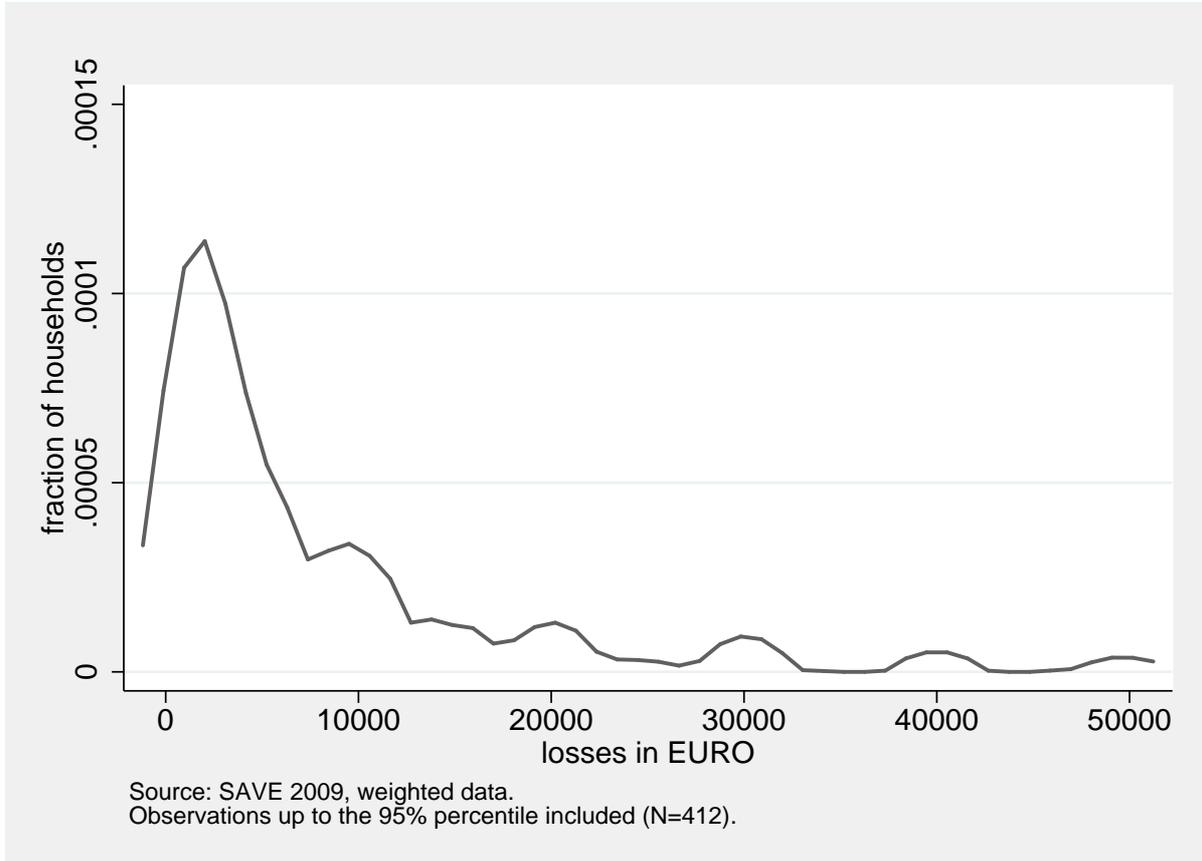


Table 1: Households' Reaction to Financial Losses

This table contains the frequency and the proportion of respondents who gave the respective answers to the question "What did you do with the assets that lost in value?" Additionally the average loss and the average fraction of wealth lost are reported.

	Freq.	Percent	Mean Loss	Fraction of Wealth Lost
I/we kept the assets	344	75.2	12196	17.4%
I/we sold some of the assets	53	11.6	23518	22.5%
I/we sold all of them	61	13.2	9187	22.5%
Total	458	100.0	13153	18.7%

Source: SAVE 2009, data is weighted.

Table 2: Financial Literacy 2007

This table contains the frequency and the proportion of respondents who were able to answer zero to three questions on the financial literacy task.

no. of correct answers	Freq.	Percent	Cum.
0	138	6.9	6.9
1	178	8.8	15.7
2	626	31.1	46.8
3	1070	53.2	100.0

Source: SAVE 2007, data is weighted according to sample weights 2009, N= 2012.

Table 3: Cognitive Reflection Test

This table contains the frequency and the proportion of respondents who were able to answer zero to three questions on the cognitive abilities task.

no. of correct answers	Freq.	Percent	Cum.
0	871	43.3	43.3
1	434	21.6	64.9
2	403	20.0	84.9
3	303	15.1	100.0

Source: SAVE 2009, data is weighted, N= 2012.

Table 4: Financial Literacy 2007 and Cognitive Reflection Test

This table contains the relative frequency of respondents who were able to give the respective number of correct answers on the financial literacy and the cognitive abilities task.

Cognitive Abilities	Financial Literacy 2007				
	0	1	2	3	Total
0	4.5	5.6	17.0	16.2	43.3
1	1.1	1.7	6.9	11.9	21.6
2	0.9	1.1	4.2	13.8	20.0
3	0.4	0.5	3.0	11.2	15.1
Total	6.9	8.8	31.1	53.2	100.0

Source: SAVE 2007 and 2009, data is weighted, N= 2,012.

Table 5: Probit “Financial Loss”

This table reports the effect of cognitive abilities, financial literacy, and various covariates on reporting a loss due to the financial crisis. The dependent variable is a dummy that indicates if a household incurred a loss in wealth due to the financial crisis. We report marginal effects after estimating a probit evaluated at the median of all variables and the respective standard errors. Marginal effects and standard errors are calculated using 5 imputed data sets and combined according to Rubin’s Rule (Rubin (1987, 1996)). Cognitive abilities and financial literacy each are measured by a dummy equal to one if all questions of the respective tasks were correctly answered. (d) indicates the change of a dummy variable from 0 to 1. Ref. indicates the reference category if various dummies are used.

	marginal effect	standard error
Cognitive Abilities 3 (d)	0.033	0.028
Financial Literacy 3 (d)	0.134***	0.028
Age: 35 and younger (d)	-0.019	0.036
Age: 36-50 (d)	Ref.	Ref.
Age: 51-65 (d)	0.065**	0.024
Age: 66 and older (d)	0.070**	0.026
Log financial wealth 2007	0.036***	0.007
Men (d)	-0.043**	0.023
Living in East Germany (d)	-0.001	0.024
Low level of schooling (d)	Ref.	Ref.
Intermediate schooling (d)	-0.010	0.027
High schooling (d)	0.027	0.027
Log monthly net income	0.067**	0.023
High Income Volatility (d)	0.010	0.026
Self-employed (d)	0.059	0.037
Risk Preference	0.027***	0.004
Observations	2012	
R2	0.177	

Source: SAVE 2007 to 2009, own calculation. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6: Fractional Response Model “Loss/Wealth 2007”

This table reports odds ratios and standard errors calculated after estimating a fractional response model. The dependent variable is defined as loss in Euro relative to financial wealth at the end of 2007 in Euro. Odds ratios and standard errors are calculated using 5 imputed data sets and combined according to Rubin’s Rule (Rubin (1987, 1996)). Cognitive abilities and financial literacy each are measured by a dummy equal to one if all questions of the respective tasks were correctly answered. (d) indicates the change of a dummy variable from 0 to 1. Ref. indicates the omitted category if various dummies are used. The first specification includes all households who own stocks at the end of 2007 (N=563). The second specification includes all households who own stocks and invest less than 80% of their financial wealth in stocks (N=505).

	Model 1		Model 2	
	odds ratio	standard error	odds ratio	standard error
Share invested in bonds	1.52	1.15	1.53	1.12
Share invested in stocks	15.45***	5.10	10.96***	5.20
Share invested in other risky assets	3.00	3.45	3.13	3.55
Cognitive abilities 3 (d)	0.86	0.15	0.82	0.15
Financial literacy 3 (d)	1.20	0.26	1.15	0.26
Low level of schooling (d)	Ref.	Ref.	Ref.	Ref.
Intermediate level of schooling (d)	1.09	0.27	1.03	0.27
High level of schooling (d)	1.06	0.25	0.94	0.25
Financial advisor (d)	1.29	0.22	1.57**	0.28
Age: younger than 36 (d)	0.85	0.29	0.88	0.29
Age: 36-50 (d)	Ref.	Ref.	Ref.	Ref.
Age: 51-65 (d)	1.61**	0.37	1.24	0.29
Age: older than 66 (d)	0.89	0.23	0.79	0.21
Female decision maker (d)	Ref.	Ref.	Ref.	Ref.
Male decision maker (d)	0.77	0.22	0.83	0.26
Joint decision making (d)	0.86	0.22	0.88	0.25
Living in east Germany (d)	0.97	0.19	1.21	0.26
Log monthly net income	0.74*	0.12	0.83	0.16
Risk Preference	1.15***	0.04	1.17***	0.05
Observations	563		505	

Source: SAVE 2007 to 2009, own calculation. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 7: Probit “Realized Loss”

This table reports the effect of cognitive abilities, financial literacy, and various covariates on selling assets during the financial crisis. The dependent variable is a dummy that indicates if households sold some or all of their assets which lost in value during the crisis. We report marginal effects after estimating a probit evaluated at the median of all variables and the respective standard errors. Marginal effects and standard errors are calculated using 5 imputed data sets and combined according to Rubin’s Rule (Rubin (1987, 1996)). Cognitive abilities and financial literacy each are measured by a dummy equal to one if all questions of the respective tasks were correctly answered. (d) indicates the change of a dummy variable from 0 to 1. Ref. indicates the reference category if various dummies are used.

	marginal effects	standard errors
Cognitive Abilities 3 (d)	-0.029	0.043
Financial Literacy 3 (d)	-0.091**	0.038
Age: 35 and younger (d)	0.048	0.061
Age: 36-50 (d)	ref.	ref.
Age: 51-65 (d)	0.045	0.040
Age: 66 and older (d)	0.106***	0.040
Log financial wealth 2007	-0.007	0.007
Men (d)	0.043	0.039
East (d)	0.049	0.041
Low level of schooling (d)	ref.	ref.
Intermediate schooling (d)	0.038	0.039
High schooling (d)	-0.020	0.046
Log monthly net income	0.029	0.037
Risk preferences	-0.004	0.007
Budget limit	0.008	0.047
Unemployment due to crisis	0.060*	0.039
Observations	458	
Pseudo R2	0.048	

Source: SAVE 2007 to 2009, own calculation. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 8: Advanced Financial Literacy 2009

This table contains the frequency and the proportion of respondents who were able to answer zero to four questions on the advanced financial literacy task.

No. of correct answers	Freq.	Percent	Cum.
0	317	15.8	15.8
1	262	13.0	28.8
2	295	14.7	43.5
3	450	22.4	65.8
4	602	29.9	95.8
missing	85	4.2	100.0

Source: SAVE 2009, data is weighted.

A Appendix A: Summary Statistics

Table A1: Summary Statistics

This table contains summary statistics for 2,012 respondents in SAVE 2009.

Variable	Mean	Std. Dev.	Min	Max
Age	50.8	15.9	21	90
Men	0.47	0.50	0	1
East	0.28	0.45	0	1
Rural	0.15	0.36	0	1
Married	0.57	0.50	0	1
Single	0.21	0.40	0	1
Divorced	0.13	0.33	0	1
Widowed	0.08	0.26	0	1
Separated	0.03	0.16	0	1
Partner	0.65	0.48	0	1
Employed	0.55	0.50	0	1
Fulltime	0.34	0.47	0	1
Parttime	0.20	0.40	0	1
Unemployed	0.08	0.28	0	1
Homemaker	0.19	0.40	0	1
Retired	0.28	0.45	0	1
Household size	2.43	1.22	1	9
Households with children	0.37	0.48	0	1
Number of children	1.67	1.38	0	8
Lower secondary education	0.08	0.27	0	1
Upper secondary education	0.60	0.49	0	1
Post secondary, non tert. education	0.12	0.33	0	1
First stage tertiary education	0.17	0.38	0	1
Other education	0.03	0.17	0	1
Household income (Euro/month)	2,127	1,389	22	22,500
Gross wealth - end of 2007 (Euro)	187,281	384,198	0	7,720,000
Gross financial wealth - end of 2007 (Euro)	38,855	114,128	0	2,870,000

Source: SAVE 2008 and 2009, data is weighted and imputed.

B Appendix B: Measures of Financial Literacy and Cognitive Abilities

1. *Understanding of Interest Rate (Numeracy)*

“Suppose you had €100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow: more than €102, exactly €102, less than €102?”

2. *Understanding of Inflation*

“Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy more than, exactly the same as, or less than today with the money in this account?”

3. *Understanding of Risk and Diversification*

“Do you think that the following statement is true or false? Buying a single company stock usually provides a safer return than a stock mutual fund.” do not know

Cognitive Reflection Test

1. “A bat and a ball cost 110 cents in total. The bat costs 100 cents more than the ball. How much does the ball cost?”
2. “If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?”
3. “In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?”

Advanced Financial Literacy 2009

1. *Understanding Average Asset Fluctuations*

“Normally, which asset displays the highest fluctuations over time: Savings accounts, bonds, stocks?” Do not know / refuse to answer

2. *Understanding of the Main Function of the Stock Market*

“Which of the following statements describes the main function of the stock market?” The stock market helps to predict stock earnings. / The stock market results in an increase in the price of stocks. / The stock market brings people who want to buy stocks together with those who want to sell stocks. / None of the above. / Do not know / refuse to answer

3. *Understanding of Risk and Diversification*

“Do you think that the following statement is true or false? Buying a single company stock usually provides a safer return than a stock mutual fund.” do not know

4. *Understanding of Mutual Funds*

“Which of the following statements is correct?” Once one invests in a mutual fund, one cannot withdraw the money in the first year. / Mutual funds can invest in several assets, for example invest in both stocks and bonds. / Mutual funds pay a guaranteed rate of return which depends on their past performance. / None of the above. / Do not know / refuse to answer