



Network for Studies on Pensions, Aging and Retirement

Netspar THESES

Chiara Monticone

Financial Literacy and Financial Advice
Theory and Empirical Evidence

PhD Thesis 2011-007

Università degli Studi di Torino
Università del Piemonte Orientale

**Financial Literacy
and Financial Advice:
Theory and
Empirical Evidence**

Chiara Monticone



Scuola di Dottorato in Economia "Vilfredo Pareto"
Indirizzo Scienze Economiche

Università degli Studi di Torino
Università del Piemonte Orientale

**Financial Literacy
and Financial Advice:
Theory and
Empirical Evidence**

Chiara Monticone

Scuola di Dottorato in Economia “Vilfredo Pareto”
Indirizzo Scienze Economiche
Ciclo XXIII

Supervisore: prof. Riccardo Calcagno

Coordinatore: prof. Giuseppe Bertola / prof. Daniela Del Boca

Dipartimento di Economia “S. Cagnetti de Martiis”

Dipartimento di Scienze Economiche e Finanziarie “G. Prato”

Dipartimento di Statistica e Matematica Applicata “Diego de Castro”

Dipartimento di Politiche Pubbliche e Scelte Collettive

Dipartimento di Scienze Economiche e Metodi Quantitativi

Contents

Introduction	4
1 Financial literacy: a review on the state of research and open issues	5
1.1 Introduction	5
1.2 Definition	6
1.3 Measurement issues	7
1.4 The determinants of financial literacy	10
1.5 Financial literacy and financial behavior	13
1.5.1 Planning and saving for retirement	13
1.5.2 Pension plan participation and retirement choices	14
1.5.3 Stock market participation	15
1.5.4 Portfolio diversification	15
1.5.5 Minimizing fees	16
1.5.6 Other aspects of financial behaviour	17
1.5.7 The direction of causality	18
1.6 Discussion and open issues	20
Appendix: Financial literacy tests	21
2 The determinants of financial literacy in Italy and the role of household wealth	30
2.1 Introduction	30
2.2 Background on financial literacy determinants	32
2.3 Data and descriptive evidence	34
2.4 Empirical strategy	36
2.4.1 Accounting for endogeneity	37
2.5 Estimation results	37
2.5.1 Robustness checks	38
2.6 Concluding remarks	40
Appendix: Tables and figures	42

3	Financial literacy and financial advisors: substitutes or complements?	50
3.1	Introduction	50
3.2	The basic model	53
3.2.1	Advisor’s decision about information revelation	55
3.2.2	Investor’s decision about consulting an advisor	57
3.3	Endogenous information precision	58
3.3.1	An analytical example	60
3.4	Concluding remarks	60
	Appendix: Proofs	61
4	Financial literacy and the demand for financial advice	67
4.1	Introduction	67
4.2	Background	70
4.2.1	Financial literacy and financial advice	70
4.2.2	Other determinants of the demand for financial advisors	72
4.3	Data and descriptives	73
4.4	Empirical strategy	75
4.5	Results	77
4.5.1	Use of advisors and other sources	77
4.5.2	How much to rely on advisors	78
4.6	Robustness checks	79
4.6.1	Financial literacy indices	79
4.6.2	Financial literacy endogeneity	80
4.6.3	Relations with banks and brokers	82
4.6.4	Trust endogeneity	82
4.6.5	Effect of trust across financial literacy levels	84
4.7	Concluding remarks	84
	Appendix: Tables and figures	85
	Bibliography	111

Acknowledgements

First of all, I am deeply grateful to Riccardo Calcagno for his valuable guidance and for the careful supervision of this work. Also, a debt of thanks goes to Elsa Fornero for constant support and encouragement over the years, as well as for the continuous advice.

Special thanks go to Giuseppe Bertola, Margherita Borella, Arie Melnik, Giovanna Nicodano, and Alessandro Sembenelli who provided insightful advice that greatly improved the quality of this work. I also would like to thank all my CeRP and Ph.D. colleagues, in particular Flavia Coda Moscarola, Maela Giofr , and Serena Trucchi, for precious discussions and great patience. Facilities and technical assistance from CeRP/Collegio Carlo Alberto and its staff are gratefully acknowledged.

Chapter 2 benefited from the comments of participants to the Networks Financial Institute at Indiana State University conference “Improving Financial Literacy and Reshaping Financial Behavior” (Indianapolis, May 2009), the I SAVE Conference organized by MEA (Deidesheim, June 2009), as well as the II Italian Doctoral Workshop in Economics and Policy Analysis at Collegio Carlo Alberto (Moncalieri, July 2009).

Stimulating discussions and valuable suggestions on chapter 3 came from Andrea Buffa, Erwan Morellec, Marco Ottaviani and participants to the XVIII International Tor Vergata Conference on Money, Banking and Finance (Rome, December 2009), and the Annual International Conference on Macroeconomic Analysis and International Finance (Crete, May 2010).

Chapter 4 substantially improved thanks to the comments of participants to the II SAVE Conference (Deidesheim, June 2010), the III Italian Doctoral Workshop in Economics and Policy Analysis (Moncalieri, July 2010), the 51st Annual Conference of the Italian Economists’ Society (Catania, October 2010), and the XIX International Tor Vergata Conference on Money, Banking and Finance (Rome, December 2010). Moreover, I wish to thank Laura Marzorati at Pioneer Investments for providing access to the Unicredit Customers’ Survey; Federica Palermo at the Ministry of Interior for her help with the referendum data; and the Fondazione Rodolfo Debenedetti for making the ‘TFR Survey’ data available.

Last but not least, I thank my parents and Lorenzo for their steady encouragement during these years.

Introduction

The issue of financial literacy has recently gained relevance for several reasons. Social security reforms in the US and in many European countries are placing increasing responsibility on individuals for their financial security in old age. Workers will have to decide both how much to save for retirement and how to allocate their retirement savings. At the same time, the complexity of financial instruments is increasing and households have to deal with new and more sophisticated financial products. Various institutions raised their concerns about the low level of households' financial literacy across several countries and about the need to provide financial education (European Commission, 2007; OECD, 2005; President's Advisory Council on Financial Literacy, 2008). These developments suggest the importance of investigating the level of financial literacy, and its role in households' financial decision making.

The first chapter is devoted to a review of the research on financial literacy, discussing definition and measurement issues, summarizing evidence on the determinants of financial literacy and its relation with economic and financial behavior, and highlighting some unresolved issues that may deserve further investigation.

The second chapter, "The determinants of financial literacy in Italy and the role of household wealth", examines empirically the level of financial literacy in Italy and its determinants. It studies consumers' characteristics correlated with high levels of literacy, and investigates the relation between households' financial knowledge and financial wealth. This relation is made more complex by the fact that, from a theoretical point of view, the direction of causality is not entirely clear. Exploiting the 2006 wave of the Bank of Italy's Survey on Household Income and Wealth, the empirical analysis studies the determinants of financial literacy and uses instrumental variables estimation techniques in order to account for the endogeneity of financial wealth. The empirical results indicate that wealth has a positive effect on households' degree of financial knowledge, even after controlling for socio-demographics and removing wealth endogeneity.

Another aspect emerging from the review in chapter 1 is that the role of external advice for households' financial decisions has not yet received much attention in financial literacy research, even though knowing "where

to go for help” is recognized as a key element in achieving financial well-being (OECD, 2008). The concerns expressed by scholars and policy-makers about the lack of financial literacy would look less worrying if the individual gaps in knowledge were compensated by the advice of reliable and qualified sources. The remaining chapters start from this common motivation and investigate the issue from a theoretical and an empirical point of view, encompassing aspects related to both the demand and the supply of financial advice.

The third chapter “Financial literacy and financial advisors: substitutes or complements?” (coauthored with Prof. Riccardo Calcagno) deals from a theoretical point of view with the relation between an informed intermediary facing a conflict of interest, as at the same time he provides information to the customer and sells a risky financial product, and an investor who is less informed than the seller about the distribution of the asset payoff. Analyzing the strategic communication between the two agents, we exploit the heterogeneity of investor’s financial information in affecting the degree of information transmission in equilibrium. We find that there are cases when it is more profitable for the advisor not to reveal the information he possesses, and that this happens when he interacts with relatively less informed investors. This implies that advisors are not useful to the investors who need them the most, because they fail to be a substitute to learning by one’s self. Moreover, if fully rational investors know the structure of advisor’s selling incentives, advisors are visited only by sufficiently informed investors who anticipate that they will receive meaningful information. This result implies that only informed consumers, by consulting an advisor, pursue the most appropriate investment decision, while the least informed may make investment mistakes and incur ex-post losses. These results are confirmed when we allow investor’s degree of information to be endogenously determined by her level of financial literacy.

The fourth chapter, “Financial literacy and the demand for financial advice”, analyzes the role of financial literacy in affecting the demand for financial advice, investigating empirically which investors seek the advice of professionals, and to what extent they rely on it. Using the 2007 Unicredit Customers’ Survey, this chapter verifies whether financial advisors are consulted by more or less financially literate investors. The results indicate that, even controlling for a number of factors, such as trust towards one’s advisor, self-confidence in own financial ability, wealth and opportunity cost of time, financial literacy significantly affects the demand for advice. First, it is positively associated to a preference for financial advisors over informal sources, as as previously found in the literature (Lusardi and Mitchell, 2006; van Rooij et al., 2007). Second, financial literacy increases the probability of consulting a financial advisor, while it decreases the likelihood of either investing without consulting any professionals or delegating them. This is likely the wisest choice in a context where the supply of independent financial advice is extremely limited. These findings confirm the theoretical

prediction of chapter 3 that advisors are rarely consulted by investors who need them the most, while literate consumers “know where to go for help”.

Overall, the results of chapters 3 and 4 indicate that the presence of qualified but not completely independent advisors is not sufficient to counteract the possible effects of financial illiteracy, and suggest that policy measures reducing the private costs of acquiring knowledge and skills may be needed to ensure sound financial decision-making.

Shortcomings and directions for future research are discussed within each chapter.

Chapter 1

Financial literacy: a review on the state of research and open issues

1.1 Introduction

Financial literacy research in economics is relatively recent and has gained growing attention mostly for its relevance for policy-making. Social security reforms in the US and in many European countries are placing increasing responsibility on individuals for their financial security in old age. Workers will have to decide both how much to save for retirement and how to allocate their retirement savings. At the same time, the complexity of financial instruments is increasing and individuals have to deal with new and more sophisticated financial products. These developments suggest the importance of investigating the level of financial literacy, and its role in households' financial decision making.¹

This review aims at organizing financial literacy literature along its main directions of research. Given the relative novelty of the theme, it is important, before analyzing the main developments in the research on its determinants and effects, to start by discussing definition and measurement issues.

The chapter is organized as follows. Section 1.2 collects the most authoritative definitions of financial literacy (and related concepts) provided by scholars and institutions. Section 1.3 discusses the advantages and shortcomings of the various measurement methodologies that have been used so far. Section 1.4 describes the main driving factors associated with financial

¹For the sake of homogeneity, this chapter will not review evidence about developing countries (e.g., Cole et al. (2010) on the demand for bank savings accounts in India and Indonesia), because research questions related to developing countries are to some extent different from those about Europe and the US, and the evidence provided is not functional to the rest of the dissertation.

literacy, while Section 1.5 reviews the most important research contributions studying the effect of financial literacy on various aspects of economic-financial behaviour. Section 1.6 concludes by highlighting some open issues and possible directions for future research.

1.2 Definition

A striking aspect of the growing literature on financial literacy is the lack of a clear ‘consensus’ definition.

One of the most authoritative ones is provided by the President’s Advisory Council on Financial Literacy, defining financial literacy as “*the ability to use knowledge and skills to manage financial resources effectively for a lifetime of financial wellbeing* (President’s Advisory Council on Financial Literacy, 2008)”. This definition follows the one proposed by the Jump\$tart Coalition (a coalition of US organizations providing advocacy, research, and educational resources to improve financial literacy of school-age youth): “the ability to use knowledge and skills to manage one’s financial resources effectively for lifetime financial security” (Jump\$tart Coalition for Personal Financial Literacy, 2007).

These definitions stress knowledge and skills as key components of financial literacy, while definitions by other institutions and scholars give more emphasis to just some elements, or have a slightly different focus. Financial knowledge is the focus of Hilgert et al. (2003), and Lusardi (2008, p. 2) refers to “knowledge of basic financial concepts, such as the working of interest compounding, the difference between nominal and real values, and the basics of risk diversification”. The ability to make informed judgments is highlighted by the UK National Foundation for Educational Research and the surveys carried out by the Australia and New Zealand Banking Group, defining financial literacy as “the ability to make informed judgements and take effective decisions regarding the use and management of money (Noctor et al., 1992; Australia and New Zealand Banking Group, 2008)” .

Finally, the UK Financial Services Authority (FSA) refers to ‘financial capability’ rather than to financial literacy, where “financially capable people are able to make informed financial decisions. They are numerate and can budget and manage money effectively. They understand how to manage credit and debt. They are able to assess needs for insurance and protection. They can assess the different risks and returns involved in different saving and investment options. They have an understanding of the wider ethical, social, political and environmental dimensions of finances (Personal Finance Research Centre, 2005, p. 13)”. Starting from this premise, the conceptual framework developed for the FSA report on financial capabilities in the UK (Atkinson et al., 2006) involves other elements (such as attitudes, experience, circumstances...) in addition to knowledge and skills. On a similar

vein, HM Treasury states that “Financial capability is a broad concept, encompassing people’s knowledge and skills to understand their own financial circumstances, along with the motivation to take action. Financially capable consumers plan ahead, find and use information, know when to seek advice and can understand and act on this advice, leading greater participation in the financial service market (HM Treasury, 2007)”.

On the related issue of financial education there is more agreement across definitions. The OECD one is: “*Financial education is the process by which financial consumers/ investors improve their understanding of financial products and concepts and, through information, instruction and/or objective advice, develop the skills and confidence to become more aware of financial risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being* (OECD, 2005, 2008)”. Analogously, the President’s Advisory Council on Financial Literacy defines financial education as “the process by which people improve their understanding of financial products, services and concepts, so they are empowered to make informed choices, avoid pitfalls, know where to go for help and take other actions to improve their present and long-term financial wellbeing (President’s Advisory Council on Financial Literacy, 2008)”.

1.3 Measurement issues

Given the wide array of concepts and definitions, it is not surprising to find substantial heterogeneity also in measurement. While most research papers resort to objective test-based measures, the number, wording and content of the tests used in each paper are far from homogeneous.

Before discussing tests in detail, I will spend a few words on ‘subjective’ measurement. Self-assessment of own financial knowledge and skills is probably the easiest measure to implement in a survey and is sometimes used as a measure for financial literacy (e.g., in Perry and Morris, 2005). However, van Rooij et al. (2008) show that this may not be a reliable measure, because high (low) self-assessed knowledge does not correspond to high (low) test-based knowledge in a remarkable share of their sample. Moreover, Guiso and Jappelli (2008) suggest that self-assessment about financial knowledge is likely to be confounded with over- or under-confidence (with over-confidence being more frequent than under-confidence). They use two different measures of self-assessed financial knowledge, and find that the first one is positively (but weakly) correlated to a test-based index of financial literacy, while the second is not correlated at all.²

²Guiso and Jappelli (2008) use two measures self-assessed financial knowledge: the

Most surveys try to assess the ability to understand basic economic principles and the working of the most common financial assets by means of tests. Even though there are similarities across some questionnaires³, a large variety of questions is employed, also because some studies use *ad hoc* questionnaires. This is for instance the case of papers studying specific aspects of financial behaviour or specific assets, such as Lyons et al. (2007) on credit literacy, Lusardi and Tufano (2008) on debt literacy, Guiso and Jappelli (2008) on portfolio diversification, and Nöth and Puhan (2009) on mutual funds. In all these cases the literacy questions are related to the aspect of interest (e.g., questions on what diversification means to study the effect of literacy on portfolio diversification). For the precise wording of the questions used in the papers reviewed see the Appendix to this chapter.

A few remarks are necessary on what financial literacy tests are about (and what they are *not* about). First, since “the ability to use knowledge and skills to manage financial resources effectively for a lifetime of financial wellbeing (President’s Advisory Council on Financial Literacy, 2008)” builds (also) on numerical abilities, it is quite common to include numeracy tests in the financial literacy tests. This is, for instance, the case of van Rooij et al. (2007) and Lusardi and Mitchell (2007a,b). However, financial literacy is not exhausted by numeracy, and it is debatable whether numeracy tests alone can be used to measure financial literacy (such as the numeracy tests in the Survey of Health, Ageing and Retirement in Europe (SHARE)). Second, some surveys focus on the knowledge of “economic indicators” (e.g., what is the current inflation rate), such as Bernheim (1998) and European Commission (2008). Given that most studies try to capture knowledge of basic financial principles, rather than knowing a single parameter, I disregard this type of measures in the current review. Finally, the studies on financial capability concentrate on broader concepts than strictly on knowledge of financial principles, and include – in addition to the standard quizzes on economic-financial concepts – also measures of attitudes and behaviour (e.g., attitudes to spending money and saving, understanding consumer rights, etc.). Atkinson et al. (2006) and Australia and New Zealand Banking Group (2008) follow this approach.

Even though tests are more objective than self-assessed knowledge, they are not free from problems. I will summarize some of the most important

first is based on the responses to a series of questions about self-assessed knowledge of 10 categories of financial instruments (i.e., “How well you think you know the characteristics of corporate bonds?”), while the second asks “Think about your ability in managing your portfolio. Compared to the average do you think you have superior ability, ... etc”.

³For instance, the Italian Survey on Household Income and Wealth (SHIW) has some questions in common with the FSA questionnaire and some in common with the Health and Retirement Study (HRS – Module 8 2004); the German SAVE survey uses the the HRS tests (Module 8 – 2004); the Dutch Household Survey (DHS) uses very similar tests to the RAND American Life Panel (ALP); etc.

issues:

- Test-based measures are not absolute measures (i.e., defining what people have to know to be ‘financially literate’ is not easy and involves some degree of arbitrariness), and also when considered as relative measures they can be problematic. In particular, comparisons between different ‘indices’ or even different tests is hardly feasible.
- It is important whether a ‘don’t know’ option is offered or not. Not allowing for a ‘don’t know’ option may force respondent to select a random answer (e.g. as in the case of the early waves of the German SAVE).
- The methodology used to build a synthetic measure of financial literacy is also important. This usually depends on the nature of the questions (i.e., with right/wrong questions a count of correct answers is a reasonable way to go; with questions admitting different degrees of right/wrong questions a principal component analysis may be used, as in Kimball and Shumway (2007); Bernheim (1998) proposed an index for the kind of questions that can be answered right/wrong to varying degrees).

To (partially) address these measurement issues, several surveys that have recently added financial literacy tests for the first time in their questionnaires have opted for exactly the same set of questions in order to improve comparability across samples and countries. The questions that are establishing as the most widely used are those developed by Annamaria Lusardi and Olivia Mitchell for the Health and Retirement Study, and later added (at least some of them) to the SHIW, SAVE, the Dutch Household Survey (DHS), the New Zealand Financial Knowledge Survey, etc. The tests are:⁴

- 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. True | False | Don’t Know | Refused
- 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? More than \$102 | Exactly \$102 | Less than \$102 | Don’t Know | Refused
- 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

⁴Dataset: Health and Retirement Study 2004 – Module 8. Used for the first time in Lusardi and Mitchell (2006).

to buy more than, exactly the same as, or less than today with the money in this account? More than today | Exactly the same as today | Less than today | Don't Know | Refused

Hung et al. (2009) exploit the occurrence of different financial literacy tests in the RAND's American Life Panel (ALP) to validate financial literacy measures. This is because a few studies used the ALP (or sub-samples of it) to conduct studies on financial literacy and they used different tests to measure it. In particular, Hung and coauthors are able to use the financial literacy tests used for Lusardi and Mitchell (2007b), Kimball and Shumway (2007) and an additional financial literacy index built on purpose. They show that scores are highly correlated across sub-samples and tests, indicating stability across measurement strategy. Moreover, the questions devised for Lusardi and Mitchell (2007b) were asked again in a subsequent wave of the ALP, with responses to the same questions in different times showing very high correlation, indicating stability over time, at least for this group of tests.

Finally, it is interesting to note that some authors resorted to "induced" knowledge, rather than measuring previously acquired knowledge. For instance, in Howlett et al. (2008) "*to induce financial knowledge about the nature of 401(k) plans, half the participants were presented with a 295-word summary describing how typical 401(k) plans operate. This information was based on information presented on an investor education Web site* (p. 233)". This methodology may be useful to overcome endogeneity problems when assessing the impact of financial knowledge on financial behaviour, based on the idea that it is acquired at the time of interview and not conveyed by experience or previous financial behaviour.

1.4 The determinants of financial literacy

The main determinants of financial literacy are organized along a few major domains. Details of the questions used to measure financial literacy for the papers reviewed are contained in the Appendix to this chapter.

Socio-demographic characteristics

There are some general findings that hold across different samples, countries, times: women and ethnic minorities have less knowledge, while more educated individuals display greater financial literacy. Financial knowledge is positively correlated to wealth and/or income.

Bernheim (1998) finds that males and whites perform better on both financial and macroeconomic questions. Being male is associated with greater financial knowledge also in Italy (Guiso and Jappelli, 2008), the Netherlands

(van Rooij et al., 2007), Australia (Australia and New Zealand Banking Group, 2008), and in other US studies, such as Lusardi and Mitchell (2006, 2008) and Lusardi et al. (2010), using the National Longitudinal Survey of Youth.

Ethnic minorities perform worse on financial literacy tests (Lusardi and Mitchell, 2007a). Lyons et al. (2007) find that Hispanics are significantly less knowledgeable than whites about credit scores and reports. In Australia, individuals of aboriginal descent display lower financial literacy (Australia and New Zealand Banking Group, 2008).

There is some evidence of an inverse U-shaped age profile of financial knowledge, meaning that middle-aged adults report higher scores than both their younger and older counterparts, without controlling for cohort effects (Australia and New Zealand Banking Group, 2008). The initial rise with age might be interpreted as an increase in experience, while the subsequent decline could be the result of deteriorating cognitive functions (Agarwal et al. (2009), controlling for cohort effects). This pattern is not confirmed in Lyons et al. (2007), who find a slightly negative relation between age and credit score knowledge in a sample representative of the U.S. population aged 18 and older.

Unsurprisingly, a higher level of education is usually associated with a better understanding of credit reports and credit scores (Lyons et al., 2007) and a higher degree of financial knowledge in general (Australia and New Zealand Banking Group, 2008; Bernheim, 1998; Guiso and Jappelli, 2008; Lusardi and Mitchell, 2007a; Meier and Sprenger, 2008). In addition to formal education, individual cognitive abilities also play a role. Delavande et al. (2008) estimate a model where the financial knowledge score depends on cognitive ability and other controls. As expected, ability increases the accuracy of responses to financial tests, over and above the effect of education.

Family background

Lusardi et al. (2010) examine financial literacy among the young using data from the U.S. National Longitudinal Survey of Youth (in addition to the youth interview, the NLSY97 includes separate interviews with each youth's parent; the authors of this paper included a small set of financial literacy questions in Wave 11 of the survey, fielded in 2007-2008 when respondents were 23-28 years old). In addition to socio-demographics and cognitive ability, financial literacy is influenced also by family background, especially mother's education, and whether parents owned stocks (either in private wealth or retirement wealth). Note that "parental" variables refer to the period when the (young) respondent was 12-17.

Wealth

Delavande et al. (2008) propose a simple theoretical framework linking the acquisition of financial literacy to wealth, viewing the acquisition of financial knowledge as a sort of human capital investment. Delavande and coauthors assume that financial knowledge allows investors to obtain higher expected rates of return on their assets, for any given level of risk, up to a theoretical maximum on the mean-variance frontier. In analogy with the theory of human capital, investors decide to invest in the acquisition of financial knowledge, thereby incurring costs in terms of money, time, and effort, to benefit from higher risk-adjusted returns on their financial assets. In this framework, the benefit from investing in financial knowledge also depends on the amount of assets invested, because the higher the stock of financial knowledge possessed, the higher the rates of return obtained by the assets. Hence, according to this model, wealthier individuals should have a greater incentive to acquire financial knowledge.

Jappelli (2010) studies the link between economic resources and economic literacy from a macroeconomic point of view. The dataset used for this paper – the IMD World Competitiveness Yearbook – contains indicators of economic literacy across the world using an executive survey in 55 countries for the 1995-2008 period. The empirical analysis shows that a country’s level of economic literacy depends on educational achievement, social interactions and the level of financial development, as proxied by mandated saving in the form of social security contributions. The contribution rate is used as an (inverse) proxy for financial market development to minimize the risk of reverse causation between literacy and financial development. These findings can be rationalized by a standard human capital model, where financial knowledge depends on cognitive abilities, and the incentives to accumulate knowledge are directly related to the level of households’ resources invested in financial markets.

Time preferences

Meier and Sprenger (2008) present the results of a field study linking individual decisions to acquire personal financial information to time preferences. They offered a short, free credit counseling and information program to more than 870 individuals. About 55 percent chose to participate. Independently, the authors elicited time preferences using incentivized choice experiments both for individuals who selected into the program and those who did not. Results show that the two groups differ sharply in their measured discount factors (controlling for other individual characteristics, including prior knowledge about credit scoring). Individuals who choose to acquire personal financial information through the credit counseling program discount the future less than individuals who choose not to participate. This suggests that individual time preference may explain who will and who will not choose to become financially literate.

1.5 Financial literacy and financial behavior

The literature has shown that financial knowledge is related to a wide range of financial behaviors, including wealth accumulation, stock market participation, portfolio diversification, participation and asset allocation in 401(k) plans, indebtedness, and responsible financial behavior in general. I will consider each of these aspects in detail, concluding the section with a discussion about the direction of causality between financial literacy and behavior.

Australia and New Zealand Banking Group (2008) considers several aspects of financial behavior and shows (descriptively) that those in the top 20% of financial literacy scores are significantly more likely than those in the lowest 20% scores to engage in what can be considered to be “responsible” behaviors, such as minimizing banking fees, carrying out comparisons when looking for financial products, and borrowing from mainstream financial institutions rather than from family or friends. Moreover, they also show a significant relation between financial literacy and ownership of financial assets, from investment products to insurances.

Analogously, Hilgert et al. (2003) describe (through univariate statistics) the impact of financial knowledge on various aspects of financial behaviour such as cash-flow management (i.e., paying all bills on time, keeping records, etc.); credit management (i.e., paying credit card balances in full each month, comparing offers before applying for a credit card, etc.); saving and investment (i.e., having money spread over different types of investments, having a retirement plan, etc.); and other financial experience, such as planning and setting goals for financial future. The relationships between specific financial knowledge scores and the corresponding financial practices are statistically significant (e.g., knowing about credit issues is correlated with having higher index scores for credit management practices). The authors conclude that “*this pattern may indicate that increases in knowledge and experience can lead to improvements in financial practices, although the causality could flow in the other direction – or even both ways*” (Hilgert et al., 2003, p. 321).

1.5.1 Planning and saving for retirement

Using HRS 2004 data, Lusardi and Mitchell (2007a) show that financial literacy influences planning behavior, which, in turn, increases wealth holdings. They check for reverse causality (i.e., the possibility that wealth affects planning) and find that this is not the case.

As for retirement saving, Bernheim (1998) shows that the effect of financial literacy on a measure of accumulated retirement wealth is positive and significant. This effect is robust to instrumenting the financial literacy score with a macroeconomics test score.

Similarly, van Rooij et al. (2008) – using a module of the Dutch Household Survey (DHS) fielded in 2005 – provide evidence of an independent and positive effect of financial literacy on wealth accumulation over and above the effect of other determinants such as income, age, education, risk tolerance, patience, and basic cognitive ability. They suggest two channels through which financial literacy may facilitate wealth accumulation: financial literacy increases stock market participation, and at the same time it boosts retirement planning behavior by households. Since it is conceivable that wealth management fosters the collection of a larger financial knowledge and that the measurement of advanced financial knowledge could be surrounded with substantial error they perform an IV regression including economics education as an instrument for financial literacy, showing that financial literacy is still affecting wealth.

1.5.2 Pension plan participation and retirement choices

Howlett et al. (2008) conducted an experiment on graduating seniors at a public university in the US where participants were asked to imagine that they were starting a new job and had to decide whether or not they wanted to participate in their employer’s 401(k) plan. Their results suggest that financial knowledge and orientation toward the future can interact to influence the likelihood of 401(k) plan participation. Future orientation is defined as “the extent to which potential future consequences of an action influence current decision outcomes.” Among consumers with (induced) financial knowledge, future-oriented consumers expressed a greater likelihood to participate in a retirement plan than less future-oriented consumers. However, in the absence of knowledge, consumers’ orientation toward the future did not influence the likelihood of 401(k) plan participation.

Also Agnew et al. (2007) study pension plan participation in the US. They find that in voluntary enrollment 401(k) plans, the effect of financial literacy on saving is substantial, and is arguably more powerful than a sizeable increase in income. Under automatic enrollment, low levels of literacy are strongly linked to employees’ decision to quit their employer’s savings plan, suggesting that automatic enrollment fails to encourage savings among workers with low literacy, even as it raises plan savings rates among the more literate.

Finally, Clark et al. (2009) investigate how the retirement planning behaviour of three large US firms’ employees is related to their understanding of retirement plans and their basic financial literacy. Findings indicate that workers who believe that Social Security benefits can be accessed at earlier (later) ages than the normal retirement age expect to retire earlier (later) than workers who know the true age of eligibility.

1.5.3 Stock market participation

Christiansen et al. (2008) do not assess financial literacy in the usual way but consider the change in stockholding associated with i) completing an economics education and ii) an economist moving into the household. Having a large panel dataset representative of the Danish population, they are able to focus on the “longitudinal” change in educational status rather than on the comparison of individuals with education in different subjects. They also perform an IV estimation using the opening of a new university in a given county as an instrument for choosing an economics education. They show that economists are more likely to hold stocks than otherwise identical investors.

van Rooij et al. (2008) mention stock market participation as a channel through which financial literacy may affect higher wealth accumulation. van Rooij et al. (2007) using a module of the DHS 2005 study the effect of financial literacy on stock market participation, showing that individuals who have low financial literacy are significantly less likely to invest in stocks. The effect remains also after controlling for the endogeneity of financial literacy (instrumented in a GMM regression with the exposure to economic education in the early stages of life). They also perform some robustness checks: i) concentrate on people who went to high school before 1990 during a period when the stock market did not play any major role in the portfolios of most Dutch families; ii) control for cognition (by using questions on how difficult it was to do typical daily transactions right after the introduction of the Euro in 2002; how difficult it was to understand the new health insurance system introduced in 2006); iii) perform the empirical analysis excluding three questions for which they implemented a different wording (questions about bond pricing and the riskiness of a company stock versus a stock mutual fund).

Contrasting results are found by Cole and Shastry (2009), using a sample from the 1980-1990-2000 Public Use US Census Data to study the determinants of financial market participation. They find that education (instrumented with exogenous variation in schooling mandates over time and states) positively affects the probability of holding investment income (and its amount), controlling for income. In investigating the determinants of this result, they show that cognitive abilities increase participation, while financial literacy education (measured by variations in state-mandated financial education in high schools, as in Bernheim et al. (2001)) does not.

1.5.4 Portfolio diversification

Using data from the University of Michigan’s monthly Survey of Consumers, Kimball and Shumway (2007) investigate the relationship between financial sophistication and three aspects of financial behaviour that can be thought of

as a lack of diversification: a “home bias” (e.g. lack of international diversification), holding employer stocks and overall portfolio under-diversification. They find that the three puzzles appear to be correlated with each other, and that sophistication is correlated with each of the puzzling behaviors, with more sophisticated people participating in the financial market, holding foreign stocks, avoiding their employers’ stocks and diversifying their portfolios.

Similarly, Guiso and Jappelli (2008) – using a survey of the customers of one of the largest Italian commercial banks (Unicredit Customers’ Survey 2007) – find a strong positive relation between financial literacy and portfolio diversification. Financial literacy is measured with questions based on understanding not only interest rates and inflation, but also riskiness of assets and the meaning of diversification.

1.5.5 Minimizing fees

Hastings and Tejeda-Ashton (2008) conduct a survey on socio-demographics, saving behaviour and financial literacy (after the HRS 2004 tests) of Mexican workers, coupled by a field experiment where respondents had to choose between several investment funds for their retirement plans based on information about fees and past returns. They find that respondents scoring high on financial literacy were more price-sensitive when ranking the investment funds. They also find that illiterate workers pay more attention to fees when these are presented in absolute value (pesos) rather than in percentage, while the financially literate do not change their behavior when fees are presented in pesos or percentage. Finally, they show that all respondents – and especially financially illiterate ones – place lower weight on fees when returns are included in the information presented.

Nöth and Puhan (2009) investigate the impact of financial literacy on the ability to minimize mutual funds’ fees. In an online survey with more than 3,000 readers of a large German weekly magazine for private investors (“Borse Online”) they ask the subjects to choose between three index funds that have the same benchmark but different fund inception dates and fee structures. Even though the sample has a positive selection bias, more than 94% of the participants fail to minimize fees. Instead, more than 60% of all participants choose the fund with the highest annualized past returns since inception, although they are irrelevant for index mutual fund decisions. The chasing of fund returns also crowds out participants’ fee sensitivity, with overconfidence being a likely driver for non-fee-minimizing decisions. They identify financial literacy as one of the variables explaining the ability to make fee-minimizing choices.

Finally, Müller and Weber (2010) analyze the relationship between financial literacy and mutual fund investment behavior. In particular, they examine how financial literacy affects the tendency to rely on actively man-

aged funds rather than on low-cost passively managed alternatives. They use data from an Internet survey conducted in cooperation with a large German newspaper in May 2007. They find that the relationship between financial expertise and the likelihood to rely on passive funds is rather weak. Even very sophisticated investors overwhelmingly select active funds, although they are very aware about less expensive ETF and index fund alternatives. The sharp difference between knowing about passive fund alternatives and investing in them accordingly cannot be explained by a “smart money” effect among smarter investors: more financially literate investors are not able to select better performing actively managed funds, and differences in fund performance are not related to differences in financial literacy. One explanation put forward by the authors is overconfidence; the authors find a positive relationship between the belief to be better than average in identifying investments that generate superior returns and the likelihood to buy an active fund, and better-than-average thinking is positively correlated with financial expertise. In addition, the study shows that more sophisticated participants pay lower front-end loads, are less biased in their past return estimates and in the risk assessment of their fund. However, financial literacy is not associated with lower annual management fees despite the fact that more sophisticated subjects are able to state very accurate fee estimates.

1.5.6 Other aspects of financial behaviour

Debt behavior

Descriptive evidence about financial literacy and debt behaviour in Australia is reported in Australia and New Zealand Banking Group (2008). Even though the use of pawn brokers, payday lenders and debt rescue companies is very low, these sources were more likely to be used by members of the bottom financial literacy quintile. Moreover, those with higher financial literacy scores were more likely to identify the correct response to questions about understanding credit rating and repayment responsibilities, than were those with relatively lower levels of financial literacy.

Lusardi and Tufano (2008) investigate debt literacy, defined as the ability to make simple decisions regarding debt contracts, in particular basic knowledge about interest and compounding, measured in the context of everyday financial choices. First, lower levels of debt literacy were found among groups including women, the elderly, certain minority groups, and people with lower income and wealth. Second, individuals who transact in ways that incur high fees (e.g., only pay minimums on their credit card bills, incur late and over-the-limit fees) and those who use high cost alternative financial services are less debt literate, even after controlling for many individual characteristics. Third, those who have the highest levels of debt

literacy are more likely to report facing no problems with debt, while those with lower levels of literacy tend to judge their debt as excessive or are unsure about their debt position.

Mortgage delinquency

Gerardi et al. (2010) investigates the effect of numerical ability (measured as in Banks and Oldfield, 2007) and financial literacy (as in Lusardi and Mitchell, 2006) on mortgage characteristics and repayment performance in a survey of sub-prime mortgage borrowers who took out mortgages in 2006 or 2007. They find a significant and negative correlation between numerical ability/ financial literacy and various measures of delinquency and default.

Annuities

Brown et al. (2008) examine individuals' self-reported willingness to exchange part of their Social Security inflation-indexed annuity benefit for an immediate lump-sum payment, using an experimental module in the 2004 Health and Retirement Study. Nearly three out of five respondents favor the lump-sum payment if it were approximately actuarially fair, and more financially literate individuals prefer the annuity.

1.5.7 The direction of causality

The evidence reviewed so far suggests a strong relation between financial literacy and various domains of financial behaviour. However, financial literacy endogeneity may bias the results (Jappelli and Padula, 2010).

There may exist several sources of endogeneity. Some of the financial practices considered (e.g., wealth management, financial market participation, etc.) may constitute occasions for learning through experience. Indeed, 2001 respondents in the Survey of Consumers report personal finance experience as their most important source of knowledge about financial issues (Hilgert et al., 2003).

Moreover, as was reported in Section 1.4, some authors consider household financial resources as determinants of financial literacy. Delavande et al. (2008) suggest that individuals may decide to invest in the acquisition of financial knowledge to benefit from higher risk-adjusted returns on their financial assets. As long as better knowledge can yield higher returns, the benefit from investing in financial knowledge depends on the amount of assets invested. Another theoretical justification to the view that wealthier individuals should have a greater incentive to acquire financial knowledge comes from Peress (2004), who studies investors' decisions to acquire information about assets payoffs, where information increases the expected

risk-adjusted returns of their portfolios. Again, the optimal amount of information depends on investors' endowment of wealth.

Finally, it is possible that an unobserved factor, such as an underlying interest in finance, simultaneously influences wealth accumulation and willingness to acquire financial knowledge.

As was seen in the preceding paragraphs, many studies chose to instrument financial literacy both to address the endogeneity problems and because financial literacy is likely to be measured with error, with the possible consequence of biasing the coefficient of financial knowledge towards zero. The use of instruments treats both the endogeneity problem and the measurement error problem.

However, finding instruments for financial literacy is very difficult. Here I will review the most notable examples:

- Bernheim (1998) estimates a retirement wealth regression where financial knowledge is instrumented by macroeconomic knowledge. Macroeconomic knowledge is measured as the ability to answer to the questions: "What is the current national unemployment rate?", "What is the national minimum wage?", "What is the annual rate of inflation?", "What is the size of the total federal debt?", "What is the size of the total federal debt per household?". The validity of the instrument rests upon the assumption that individuals with more resources have a greater incentive to acquire information about financial matters, because they may need it to manage their wealth, while they may be less interested in macroeconomic notions. The effect of financial knowledge when instrumented is greater than with OLS.
- Bernheim et al. (2001) study the effect of high school financial curriculum mandates on saving behavior of US households. They exploit the variation in requirements across states and over time (between 1957 and 1985, 29 states adopted legislation mandating some form of 'consumer' education in secondary schools) to identify the effects of interest. The evidence indicates that mandates have raised both exposure to financial curricula and subsequent asset accumulation once exposed students reached adulthood. Even though, in this study, variations in financial education mandates are used as regressors and not as instruments (as financial literacy is not measured directly), this is exactly the kind of exogenous variation that would prove an ideal instrument.
- van Rooij et al. (2007) estimate the effect of financial literacy on stock market participation and van Rooij et al. (2008) estimate the effect of financial literacy on wealth accumulation. In both papers financial literacy is instrumented with the answer to the question "how much of your education is devoted to economics?" (meaning education before

entering the labour market). The instrument is valid as long as the amount of economics education is not driven by an unobserved taste for financial issues, which might determine both schooling choices and subsequent investment decisions.

- Kimball and Shumway (2007) estimate the effect of financial literacy on a tendency to display a lack of portfolio diversification. They instrument financial sophistication with the “fraction of focal probabilities” given by respondents, i.e. the fraction of four questions that are answered with focal probabilities of 0, 50 or 100 percent. The intuition is that non-mathematically-sophisticated respondents are more likely to give focal probabilities when asked probabilistic questions. This idea is taken from Lillard and Willis (2001), who devise the following 5 probability questions: “How about the chances that Congress will change Social Security so that it becomes less generous than now?”, “And how about the chances that the U.S. economy will experience double-digit inflation sometime during the next 10 years or so?”, “(What is the percent chance) that you will live to be 75 or more?”, “What do you think are the chances that your income will keep up with inflation for the next five years?”, “What are the chances that you (and your (husband/wife/partner)) will leave an inheritance totaling \$10,000 or more?”

1.6 Discussion and open issues

In spite of the remarkable amount of research devoted to the theme, there are still several unresolved issues that could provide a starting point for new research.

- In the strand of literature assessing the effect of financial literacy on behavior, some aspects deserve more attention, such as debt behavior, including mortgages and credit cards, and retirement decisions, especially those related to the demand for annuities and to workers’ sensitivity to financial incentives to retirement.
- It is sometimes assumed that higher financial literacy can grant higher risk-adjusted returns on financial investments (Delavande et al., 2008). However, this is not been verified empirically. The returns to financial literacy deserve further attention.
- The issue of the direction of causality between financial literacy and financial behavior is far from being resolved. So far has not emerged a “mainstream” instrument that could be included in financial literacy surveys around the world. Moreover, it may not be possible to exploit

outside the US exogenous variations such as the one in high school financial education curriculum mandates (Bernheim et al., 2001).

- Even if we took the large literature about the relation between financial literacy and sound financial behaviour as evidence in favor of a causal relation (from literacy to behavior), it would be still not entirely clear to what extent financial literacy is necessary in order to achieve the best allocation of resources and investment decisions in terms of risk and return trade-offs. A challenging argument is that households could decide to rely on the guidance of experts instead of taking the time and efforts needed to acquire some financial expertise themselves. Chapters 3 and 4 of this dissertation will address this issue.
- The various definitions (and much of the research presented) implicitly consider financial literacy as sufficient to improve financial well-being. However, behavioral biases affecting investment behaviour (e.g., inertia, overconfidence, lack of self control, etc.) are likely to reduce households' ability to achieve financial well-being. An open issue is whether higher financial literacy is related to the disappearance of these biases, whether behavioral biases affect also the “financially literate”, or what level of knowledge (possibly beyond the mere “literacy”) is necessary to get rid of biases.

Appendix: Financial literacy tests

Dataset: Health and Retirement Study (US) – 2002, 2004, 2006, 2008 (05hr02d - 05hr04d - 05hr06d - 05hr08d). Section: Cognition

Paper: Lusardi and Mitchell (2007a); Lusardi (2007); Brown et al. (2008)

1. (D178) If the chance of getting a disease is 10 percent, how many people out of 1,000 would be expected to get the disease? (number of people) | DK | RF
2. (D179) If 5 people all have the winning numbers in the lottery and the prize is two million dollars, how much will each of them get? (amount) | DK | RF

For respondents who give the correct answer to either the first or the second question, the following question is then asked:

3. (D180) Let's say you have \$200 in a savings account. The account earns 10 percent interest per year. How much would you have in the account at the end of two years. (amount) | DK | RF

Dataset: Health and Retirement Study 2004 – Module 8.

Paper: Lusardi and Mitchell (2006)

1. (V363) 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. True | False | Don't Know | Refused

2. (V364) 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? More than \$102 | Exactly \$102 | Less than \$102 | Don't Know| Refused
3. (V365) 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? More than today | Exactly the same as today | Less than today | Don't Know| Refused

Dataset: Rand American Life Panel

Paper: Lusardi and Mitchell (2007b); Hung et al. (2009)

Basic Financial Literacy Questions

1. 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? (i) More than \$102; (ii) Exactly \$102; (iii) Less than \$102; (iv) Do not know (DK); (v) Refuse.
2. Compound Interest
Suppose you had \$100 in a savings account and the interest rate is 20% per year and you never withdraw money or interest payments. After 5 years, how much would you have on this account in total? (i) More than \$200; (ii) Exactly \$200; (iii) Less than \$200; (iv) DK; (v) Refuse.
3. Inflation
Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account? (i) More than today; (ii) Exactly the same; (iii) Less than today; (iv) DK; (v) Refuse.
4. Time Value of Money
Assume a friend inherits \$10,000 today and his sibling inherits \$10,000 3 years from now. Who is richer because of the inheritance? (i) My friend; (ii) His sibling; (iii) They are equally rich; (iv) DK; (v) Refuse.
5. Money Illusion
Suppose that in the year 2010, your income has doubled and prices of all goods have doubled too. In 2010, how much will you be able to buy with your income? (i) More than today; (ii) The same; (iii) Less than today; (iv) DK; (v) Refuse.

Sophisticated Financial Literacy Questions

1. Function of Stock Market
Which of the following statements describes the main function of the stock market? (i) The stock market helps to predict stock earnings; (ii) The stock market results in an increase in the price of stocks; (iii) The stock market brings people who want to buy stocks together with those who want to sell stocks; (iv) None of the above; (v) DK; (vi) Refuse.
2. Knowledge of Mutual Funds
Which of the following statements is correct? (i) Once one invests in a mutual fund, one cannot withdraw the money in the first year; (ii) Mutual funds can invest in several assets, for example invest in both stocks and bonds; (iii) Mutual funds pay a guaranteed rate of return which depends on their past performance; (iv) None of the above; (v) DK; (vi) Refuse.
3. Relation between Interest Rates and Bond Prices
If the interest rate falls, what should happen to bond prices? (i) Rise; (ii) Fall; (iii) Stay the same; (iv) None of the above; (v) DK; (vi) Refuse.
4. Safer: Company Stock or Mutual Fund
True or false? Buying a company stock usually provides a safer return than a stock mutual fund. (i) True; (ii) False; (iii) DK; (iv) Refuse.
5. Riskier: Stocks or Bonds
True or false? Stocks are normally riskier than bonds. (i) True; (ii) False; (iii) KD; (iv) Refuse.

6. Long Period Returns
Considering a long time period (for example 10 or 20 years), which asset normally gives the highest return? (i) Savings accounts; (ii) Bonds; or (iii) Stocks; (iv) DK; (v) Refuse.
7. Highest Fluctuations
Normally, which asset displays the highest fluctuations over time? (i) Savings accounts, (ii) Bonds, (iii) Stocks; (iv) DK; (v) Refuse.
8. Risk Diversification
When an investor spreads his money among different assets, does the risk of losing money: (i) Increase, (ii) Decrease (iii) Stay the same; (iv) DK; (v) Refuse.

Dataset: National Longitudinal Survey of Youth 1997 (US)

Paper: Lusardi et al. (2010)

1. 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, or less than \$102? Do not know; refuse to answer
2. 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? Do not know; refuse to answer
3. 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; refuse to answer

Dataset: own survey

Paper: Gerardi et al. (2010)

1. Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account? More than today, exactly the same as today, or less than today?
2. Suppose that in the year 2020, your income has doubled and prices of all goods have doubled too. In 2020, how much will you be able to buy with your income? More than today, exactly the same as today, or less than today?

Dataset: University of Michigan's monthly Survey of Consumers (April 2005)

Paper: Kimball and Shumway (2007)

1. A mutual fund combines the money of many investors to buy a variety of stocks or bonds. (true = 1, false = 2, DK or NA = 2)
2. Checking accounts earn a higher rate of return than other types of investments purchased from a bank. (true = 1, false = 2, DK or NA = 1)
3. I can usually tell when it is a good time to buy or sell stock. (5 point scale, DK or neither agree nor disagree = 1)
4. There is an ideal time of the year to invest. (5 point scale, DK or neither agree nor disagree = 1)
5. Only brokers make money in the stock market. (5 point scale, DK or neither agree nor disagree = 1)
6. If a stocks value is down, it will eventually come back up. (5 point scale, DK or neither agree nor disagree = 1)
7. Investments with high risk are best for younger individuals. (5 point scale, DK or neither agree nor disagree = 5)
8. Investing in only one type of stock, like tech stocks, makes sense. (5 point scale, DK or neither agree nor disagree = 1)
9. You should always put your money into the safest investment you can find. (5 point scale, DK or neither agree nor disagree = 1)
10. Choosing to invest in both small and large companies at the same time is wise. (5 point scale, DK or neither agree nor disagree = 5)

11. Investments offered by a bank are the best investments you can buy. (5 point scale, DK or neither agree nor disagree = 1)
12. The earlier in life that you invest, the better o? you will be financially. (5 point scale, DK or neither agree nor disagree = 5)
13. If you are smart, it is easy to make money in the stock market. (5 point scale, DK or neither agree nor disagree = 1)
14. To do well in the stock market, you have to buy and sell your stocks often. (5 point scale, DK or neither agree nor disagree = 1)

Dataset: University of Michigan's monthly Survey of Consumers (Nov/Dec 2001)
 Paper: Hilgert et al. (2003)

True/False questions

Credit

1. Creditors are required to tell you the APR that you will pay when you get a loan.
2. If you expect to carry a balance on your credit card, the APR is the most important thing to look at when comparing credit card offers.
3. Your credit report includes employment data, your payment history, any inquiries made by creditors, and any public record information.
4. The finance charge on your credit card statement is what you pay to use credit.
5. Using extra money in a bank savings account to pay off high interest rate credit card debt is a good idea.
6. Your credit rating is not affected by how much you charge on your credit cards.
7. If your credit card is stolen and someone uses it before you report it missing, you are only responsible for \$50, no matter how much they charge on it.
8. If you have any negative information on your credit report, a credit repair agency can help you remove that information.
9. If you are behind on debt payments and go to a credit counseling service, they can get the federal government to apply your income tax refund to pay off your debts.

Saving

10. You should have an emergency fund that covers two to six months of your expenses.
11. If you have a savings account at a bank, you may have to pay taxes on the interest you earn.
12. If you buy certificates of deposit, savings bonds, or Treasury bills, you can earn higher returns than on a savings account, with little or no added risk.
13. With compound interest, you earn interest on your interest, as well as on your principal.
14. Whole life insurance has a savings feature while term life insurance does not.

Investment

15. The earlier you start saving for retirement, the more money you will have because the effects of compounding interest increase over time.
16. A stock mutual fund combines the money of many investors to buy a variety of stocks.
17. Employers are responsible for providing the majority of funds that you will need for retirement.
18. Over the long term, stocks have the highest rate of return on money invested.
19. Mutual funds pay a guaranteed rate of return.
20. All investment products bought at your bank are covered by FDIC insurance.

Mortgages

21. When you use your home as collateral for a loan, there is no chance of losing your home.

22. You could save thousands of dollars in interest costs by choosing a 15-year rather than a 30-year mortgage.
23. If the interest rate on an adjustable-rate mortgage loan goes up, your monthly mortgage payments will also go up.
24. Repeatedly refinancing your home mortgage over a short period of time results in added fees and points that further increase your debt.

Other

25. Making payments late on your bills can make it more difficult to take out a loan.
26. Your bank will usually call to warn you if you write a check that would overdraw your account.
27. The cash value of a life insurance policy is the amount available if you surrender your life insurance policy while you're still alive.
28. After signing a contract to buy a new car, you have three days to change your mind.

Dataset: own survey (US)

Paper: Lusardi and Tufano (2008)

1. Suppose you owe \$1,000 on your credit card and the interest rate you are charged is 20% per year compounded annually. If you didn't pay anything off, at this interest rate, how many years would it take for the amount you owe to double? (i) 2 years;(ii) less than 5 years; (iii) 5 to 10 years; (iv) more than 10 years; (v) Do not know; (vi) Refuse to answer.
2. You owe \$3,000 on your credit card. You pay a minimum payment of \$30 each month. At an Annual Percentage Rate of 12% (or 1% per month), how many years would it take to eliminate your credit card debt if you made no additional new charges? (i) Less than 5 year; (ii) Between 5 and 10 years; (iii) Between 10 and 15 years; (iv) Never, you will continue to be in debt; (v) Do not know; (vi) Prefer not to answer.
3. You purchase an appliance which costs \$1,000. To pay for this appliance, you are given the following two options: a) Pay 12 monthly installments of \$100 each; b) Borrow at a 20% annual interest rate and pay back \$1,200 a year from now. Which is the more advantageous offer? (i) Option (a); (ii) Option (b); (iii) They are the same;(iv) Do not know; (v) Prefer not to answer.

Dataset: DNB Household Survey (Netherlands) – two special modules

Paper: van Rooij et al. (2007)

Basic Literacy questions

1. 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? (i) More than €102; (ii) Exactly €102; (iii) Less than €102; (iv) Do not know; (v) Refusal.
2. Interest compounding
Suppose you had €100 in a savings account and the interest rate is 20% per year and you never withdraw money or interest payments. After 5 years, how much would you have on this account in total? (i) More than €200; (ii) Exactly €200; (iii) Less than €200; (iv) Do not know; (v) Refusal.
3. Inflation
Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account? (i) More than today; (ii) Exactly the same; (iii) Less than today; (iv) Do not know; (v) Refusal.
4. Time value of money
Assume a friend inherits €10,000 today and his sibling inherits €10,000 3 years from now. Who is richer because of the inheritance? (i) My friend; (ii) His sibling; (iii) They are equally rich; (iv) Do not know; (v) Refusal.

5. Money illusion

Suppose that in the year 2010, your income has doubled and prices of all goods have doubled too. In 2010, how much will you be able to buy with your income? (i) More than today; (ii) The same; (iii) Less than today; (iv) Do not know; (v) Refusal.

Advanced Literacy questions

1. Which of the following statements describes the main function of the stock market? (i) The stock market helps to predict stock earnings; (ii) The stock market results in an increase in the price of stocks; (iii) The stock market brings people who want to buy stocks together with those who want to sell stocks; (iv) None of the above; (v) Do not know; (vi) Refusal.
2. Which of the following statements is correct? If somebody buys the stock of firm B in the stock market: (i) He owns a part of firm B; (ii) He has lent money to firm B; (iii) He is liable for firm B's debts; (iv) None of the above; (v) Do not know; (vi) Refusal.
3. Which of the following statements is correct? (i) Once one invests in a mutual fund, one cannot withdraw the money in the first year; (ii) Mutual funds can invest in several assets, for example invest in both stocks and bonds; (iii) Mutual funds pay a guaranteed rate of return which depends on their past performance; (iv) None of the above; (v) Do not know; (vi) Refusal.
4. Which of the following statements is correct? If somebody buys a bond of firm B: (i) He owns a part of firm B; (ii) He has lent money to firm B; (iii) He is liable for firm B's debts; (iv) None of the above; (v) Do not know; (vi) Refusal.
5. Considering a long time period (for example 10 or 20 years), which asset normally gives the highest return? (i) Savings accounts; (ii) Bonds; (iii) Stocks; (iv) Do not know; (v) Refusal.
6. Normally, which asset displays the highest fluctuations over time? (i) Savings accounts; (ii) Bonds; (iii) Stocks; (iv) Do not know; (v) Refusal.
7. When an investor spreads his money among different assets, does the risk of losing money: (i) Increase; (ii) Decrease; (iii) Stay the same; (iv) Do not know; (v) Refusal.
8. If you buy a 10-year bond, it means you cannot sell it after 5 years without incurring a major penalty. True or false? (i) True; (ii) False; (iii) Do not know; (iv) Refusal.
9. Stocks are normally riskier than bonds. True or false? (i) True; (ii) False; (iii) Do not know; (iv) Refusal.
10. Buying a company stock usually provides a safer return than a stock mutual fund. True or false? (i) True; (ii) False; (iii) Do not know; (iv) Refusal.
11. If the interest rate falls, what should happen to bond prices? (i) Rise; (ii) Fall; (iii) Stay the same; (iv) None of the above; (v) Do not know; (vi) Refusal.

Dataset: FSA (UK) SECTION N - MONEY QUIZ

Paper: Atkinson et al. (2006)

1. (QNquiz) SHOWCARD N1. Looking at this example of a bank statement, please can you tell me how much money was in the account at the end of February? Numeric range (PERMITTED RANGE 1 TO 9,999) | Don't know | Refused
2. (QNquiz1) SHOWCARD N2. And still looking at this statement, if a direct debit of £179 comes in on 28th February and there is an agreed overdraft limit of £100 on the account, would there be enough money in the account including the overdraft limit, to cover the direct debit? Yes | No | Don't know | Refused
3. (QNquiz2) If the inflation rate is 5% and the interest rate you get on your savings is 3%, will your savings have at least as much buying power in a year's time? Yes | No | Don't know | Refused
4. (QNquiz3) SHOWCARD N3. This chart shows how a £10,000 investment would have performed in different types of investment funds over the last seven years. Assuming that fees and charges are the same for all funds, which fund gave the best return after seven years? Fund 1 | Fund 2 | Fund 3 | Don't know | Refused

5. (QNquiz4) SHOWCARD N4. And which would have been the best fund to have chosen if you had to withdraw your money after four years? Fund 1 | Fund 2 | Fund 3 | Don't know | Refused
6. (QNquiz5) SHOWCARD N5. Suppose you saw the same television on sale at a discount in two different shops. The original purchase price of the television was £250. One shop is offering a discount of £30 off the original price, the other is offering a discount of 10% off the original price. Which is the better deal - £30 off or 10% off? £30 off | 10% off | Don't know | Refused
7. (QNquiz6) SHOWCARD N6 Can you tell me for which of these types of mortgage you would be guaranteed to pay off the full amount borrowed if you kept up the repayments? CODE ALL MENTIONED. Repayment mortgage | Low Cost Endowment mortgage | Interest-only mortgage with an associated investment in a stocks and shares ISA or PEP | Interest-only mortgage with no associated investment | Don't know | Refused
8. (QNquiz7) SHOWCARD N7. Which of these savings and investments do you think would have their cash value directly affected by stock-market performance? IF NECESSARY ADD: we are asking about typical examples of the product. CODE ALL MENTIONED. Cash ISA | Insurance/Investment bond (e.g. managed bond, with-profits bond) | Savings account with a bank or building society | Equity ISA | Endowment policy (with-profits or unit-linked) | Unit trust | Personal pension plan (with-profits or unit-linked) | Don't know | Refused | None of these

Dataset: SHIW 2006 (Italy).

Paper: Monticone (2010)

1. (QUIZ1) Suppose you receive this statement of account from your bank; can you tell me what sum of money is available at the end of May? amount in euros | don't know
2. (QUIZ2) Imagine leaving 1,000 euros in a current account that pays 1% interest and has no charges. Imagine also that inflation is running at 2%. Do you think that if you withdraw the money in a year's time you will be able to buy the same amount of goods as if you spent the 1,000 euros today? yes | no, I will be able to buy less | no, I will be able to buy more | don't know
3. (QUIZ 3) This figure shows the value of two different investment funds over the last four years. Which fund do you think produced the largest return in that period? fund 1 | fund 2 | the funds earned the same | don't know
4. (QUIZ 4) Imagine leaving 1,000 euros in a current account that pays 2% annual interest and has no charges. What sum do you think will be available at the end of 2 years? less than 1,020 euros | exactly 1,020 euros | more than 1,020 euros | don't know
5. (QUIZ 6) Imagine you have only equity funds and stock market prices fall. Are you...? better off | less well off | as well off as before | don't know
6. (QUIZ 7) Which of the following types of mortgage do you think will allow you from the very start to fix the maximum amount and number of installments to be paid before the debt is extinguished? floating-rate mortgage | fixed-rate mortgage | floating-rate mortgage with fixed installments | don't know

Dataset: 2007 Unicredit Consumer's Survey (Italy)

Paper: Guiso and Jappelli (2008)

Financial literacy:

1. Suppose that in the next 6 months interest rate will increase. Do you think it is a good idea to buy today fixed interest rate bonds?
2. Suppose that a saving account earns an interest rate of 2 percent per year (net of costs). If the annual inflation rate is 2 percent, after two years (with no withdrawals), you think you could buy more than you could buy today/less/the same/don't know

3. Do you think that financial diversification is: Hold stocks and bonds/ Don't hold too long the same asset / to invest in as many assets as possible/ To invest in assets to limit risk exposure/ to avoid high-risk assets
4. Evaluate how diversified are specific portfolios: 70 percent invested in T-bills and 30 percent in European Equity fund/70 percent invested in T-bills and 15 percent in European Equity fund and 15 percent in 2-3 stocks/70 percent invested in T-bills and 30 percent in 2-3 stocks/ 70 percent invested in T-bills and 30 percent in stock I know well
5. Ability to rank asset categories correctly according to riskiness:
 - bonds are at least as risky as transaction accounts
 - stocks are at least as risky as bonds
 - equity mutual funds are at least as risky as bond mutual funds
 - housing is riskier than transaction accounts

Perceived financial sophistication: How well you think you know the characteristics of this financial asset? Treasury bills; Repurchase agreements; corporate bonds; mutual funds; unit linked life insurance; ETF; managed investment accounts; derivatives; stocks.

Dataset: SAVE 2007-2009 (Germany)

Paper: Bucher-Koenen and Lusardi (2010)

1. Interest Calculation
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. Inflation
Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year, would you be able to buy more than, exactly the same as, or less than today with the money in this account?
3. 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" Right | wrong | don't know

Dataset: own survey (Germany)

Paper: Nöth and Puhon (2009)

1. Question 1: (Idea of compounded interest, not displayed)
Today, you deposit e 100 for five years on a savings account with an annual interest rate of 2%. Please indicate the amount (in e that you receive at the end of five years, if the entire investment amount remains in the account during these five years.
Choice Options: euro 110; euro 110.41; euro 112.40; do not know.
2. Question 2: (Money market fund knowledge, not displayed)
Today, euro 1,000 is invested in a money market fund. Is it possible that you will receive less than e 1,000 if you withdraw your money back after two years?
Choice Options: yes; no; do not know.
3. Question 3: (Mutual fund knowledge, not displayed)
Which of the following statements is correct? Please note that only one statement is correct. Choice Options: Mutual funds are riskier than investments in single stocks; mutual funds can change their investment policy over time and thus become riskier; mutual funds are tax-efficient because you do not have to pay capital gain taxes; none of the above; do not know.
4. Question 4: (Bond knowledge, not displayed)
Which of the following statements is correct? Please note that only one statement is correct. If someone buys a corporate bond of Company B:
Choice Options: She owns a part of the company; She lends money to the company; She is liable for the debt of the company B; None of the above; Do not know.

5. Question 5: (Idea of diversification, not displayed)
Buying a company stock usually provides a safer return than a stock mutual fund.
Choice Options: true; false; do not know.
6. Question 6: (Mutual fund investment fee calculation, not displayed)
Suppose you have invested e 10,000 in a mutual fund with an additional payment of a front-end load of 5% on January 2nd, 2007. At the end of each year, you have to pay a management fee of 1.9% and an administration fee of 0.1%. In addition, the fund realized a 10% return in your first investment year. Please, indicate the amount of fees that you have to pay to the mutual fund provider until December 31st, 2007!
Choice Options: euro 200; euro 220; euro 500; euro 700 ; euro 720; do not know.

Dataset: own survey (Germany)

Paper: Müller and Weber (2010)

1. Short-selling a stock means that the stock is sold without actually owning it.
2. Assuming efficient stock markets, it is not possible to beat the market.
3. Dividends are additional payments to the management of a company.
4. The abbreviation IPO refers to a financial regulatory authority which supervises the placement of securities at a stock exchange.
5. The Japanese stock index is called Hang-Seng Index.
6. The compounded-interest-effect occurs if the lending rate is larger than the borrowing rate.
7. If one raises a mortgage or a loan, one should rather take the nominal interest rate than the effective rate of interest into account because the former indicates the actual credit costs.
8. Creditworthiness describes the ability to pay interests on a raised loan and to redeem the loan.

Possible answers: True | False | Don't Know:

Dataset: SHARE, Waves 1 and 2.

Countries Wave 1: Austria, Belgium, Denmark, France, Greece, Germany, Italy, Israel, Netherlands, Spain, Sweden, Switzerland; Countries Wave 2: Austria, Belgium, Czech Republic, Denmark, France, Greece, Germany, Italy, Netherlands, Poland, Spain, Sweden, Switzerland

Paper: Christelis et al. (2005, 2010) and mentioned also in Jappelli (2010)

- (1) CF012 NUMERACY-CHANCE DISEASE 10 PERC. OF 1000
If the chance of getting a disease is 10 per cent, how many people out of 1000 (one thousand) would be expected to get the disease? 100 | 10 | 90 | 900 | Other answer
- (2) CF013 NUMERACY-HALF PRICE
In a sale, a shop is selling all items at half price. Before the sale, a sofa costs 300 [local currency]. How much will it cost in the sale? 150 [local currency] | 600 [local currency] | Other answer
- (3) CF014 NUMERACY-6000 IS TWO-THIRDS WHAT IS TOTAL PRICE A second hand car dealer is selling a car for 6,000 [local currency]. This is two-thirds of what it costs new. How much did the car cost new? 9,000 [local currency] | 4,000 [local currency] | 8,000 [local currency] | 12,000 [local currency] | 18,000 [local currency] | Other answer
- (4) CF015 AMOUNT IN THE SAVINGS ACCOUNT Let's say you have 2000 [local currency] in a savings account. The account earns ten per cent interest each year. How much would you have in the account at the end of two years? 2420 [local currency] | 2020 [local currency] | 2040 [local currency] | 2100 [local currency] | 2200 [local currency] | 2400 [local currency] | Other answer

If a person answers (1) correctly she is then asked (3) and if she answers correctly again she is asked (4). Answering (1) correctly results in a score of 3, answering (3) correctly but not (4) results in a score of 4 while answering (4) correctly results in a score of 5. On the other hand if she answers (1) incorrectly she is directed to (2). If she answers (2) correctly she gets a score of 2 while if she answers (2) incorrectly she gets a score of 1.

Chapter 2

The determinants of financial literacy in Italy and the role of household wealth

2.1 Introduction

Italy shares several features with the United States and many European countries in terms of pension policy and increasing complexity of the financial environment. The public pension system reform, begun in the '90s and aimed at improving its long-term sustainability, brought about a need for Italian workers to learn how to actively manage their retirement savings. Before the reform, high public pension benefits ensured financial security in retirement, while the system that will emerge after the transition will be characterized by less generous public benefits. Therefore, the achievement of adequate pensions will have to rely on privately managed pension plans, which in turn require greater financial sophistication in savings and investment management. Workers will become increasingly responsible for their own financial security after retirement. Due to the encouragement toward pension plans stemming from the pension system reform, workers will have to decide both how much to save for retirement and how to allocate their pension wealth. At the same time, the complexity of financial instruments has increased and individuals have to deal with new and more sophisticated financial products.

In recent years, a growing body of literature has shown that knowledge of basic financial principles among the population should not be taken for granted, both in the US and in Europe (van Rooij et al., 2007; Lusardi and Mitchell, 2006). Moreover, it appears that financial literacy is related to a wide range of financial behaviors, including wealth accumulation, stock

⁰This chapter partly draws on Monticone (2010).

market participation, portfolio diversification, participation and asset allocation in 401(k) plans, indebtedness, and responsible financial behavior in general (Lusardi and Mitchell, 2007a; van Rooij et al., 2007; Lusardi and Tufano, 2008; Guiso and Jappelli, 2008; Howlett et al., 2008).

Since accumulating resources for one's own retirement is one of the most important reasons to save (Browning and Lusardi, 1996), wealth accumulation can be interpreted as an indicator of the ability to save adequately for old age. Lusardi and Mitchell (2007a) show that financial literacy influences planning behavior, which, in turn, increases wealth holdings. Similarly, Bernheim and Garrett (2003) find that workers tend to accumulate significantly more assets when their employer offers financial education. The finding that financial literacy matters in wealth accumulation is consistent across different countries. The net worth of Dutch households is positively and significantly affected by the degree of financial literacy, even after controlling for other factors potentially affecting saving behavior, such as risk aversion, patience, and precaution (van Rooij et al., 2008).

Alongside the previously mentioned studies showing that financial knowledge positively affects saving behavior, there is also evidence that financial behavior itself influences financial knowledge. Clearly financial experience can be a source of learning. Personal financial experience is mentioned as the single most important source of knowledge by respondents in the Survey of Consumers conducted by the University of Michigan in 2001 (Hilgert et al., 2003). In particular, respondents with more sound financial behavior (in terms of cash flow management, credit management, savings, and investments) were more likely to report experience as their most important source of learning about personal finance. As for credit literacy, Lyons et al. (2007) find that various measures of previous financial experience have a positive effect on the degree of knowledge about credit reports and credit scores. For instance, having a mortgage or past experience with credit reports influences consumers' knowledge and understanding of credit-reporting issues.

Finally, some authors have also suggested that the level of financial wealth can be one of the reasons for becoming more knowledgeable (Bernheim, 1998; Delavande et al., 2008; Peress, 2004). The rationale is that wealth management can foster the acquisition of greater financial knowledge, which can be acquired by attending seminars, through self-study, by means of books, magazines, websites, and the like.

In the context of widespread financial illiteracy and increasing need for better financial understanding, it is of interest not only to assess the current level of financial literacy among the Italian population but also to investigate its determinants, as it might help to formulate policy interventions.

Using the Bank of Italy's Survey on Household Income and Wealth (SHIW), this paper studies the link between wealth accumulation and financial knowledge. As was documented previously, financial knowledge predicts higher levels of wealth holdings. However, some authors have also suggested

that the level of financial wealth can be one of the reasons for becoming more knowledgeable. This suggests that causality might go in both directions. By analyzing the determinants of financial literacy in a representative sample of Italian households, this paper aims to assess whether financial accumulation has an exogenous impact on literacy. My findings indicate that indeed wealth is one of the factors explaining the observed degree of financial literacy.

The paper is organized as follows. Section 2.2 briefly discusses the previous literature on the topic. Section 2.3 presents data and descriptive statistics. Section 2.4 describes the empirical strategy to analyze the effect of wealth on the degree of financial literacy and discusses the issue of endogeneity. Section 2.5 presents the results and some robustness checks, while Section 2.6 concludes.

2.2 Background on financial literacy determinants

A recent strand of research provides several insights into the determinants of financial knowledge. Most of this literature focuses on U.S. consumers but it also presents evidence for a few other countries, such as Italy, the Netherlands, and Australia. A more thorough review of financial literacy determinants is in chapter 1. I will summarize here the main findings and those that are more relevant to the following empirical analysis.

Demographic characteristics, such as being male and white, are commonly associated with greater financial knowledge in several countries (see Bernheim, 1998; Lusardi and Mitchell, 2006 and Lyons et al., 2007 for the US; Guiso and Jappelli, 2008 for Italy, van Rooij et al., 2007 about the Netherlands, and Australia and New Zealand Banking Group, 2008 about Australia). There is some evidence of an inverse U-shaped age profile of financial knowledge, meaning that middle-aged adults report higher scores than both their younger and older counterparts (Australia and New Zealand Banking Group, 2008). The initial rise with age might be related to an increase in experience, while the subsequent decline could be the result of deteriorating cognitive functions (Agarwal et al., 2009).

A higher level of education is usually associated with a higher degree of financial knowledge (Australia and New Zealand Banking Group, 2008; Bernheim, 1998; Guiso and Jappelli, 2008; Lusardi and Mitchell, 2007a; Meier and Sprenger, 2008). Other factors related to financial literacy are time preferences (Meier and Sprenger, 2008), family background (Lusardi et al., 2010), and household wealth resources.

The literature exploring the role of household resources as a determinant of financial knowledge is mainly based on empirical contributions. Meier and Sprenger (2008) show that knowledge is positively associated with income level. In Italy, Guiso and Jappelli (2006, 2008) find that high income and

financial wealth are associated with greater financial knowledge scores and a greater amount of time spent every week to obtain information on investing one's savings. Bernheim (1998) finds that respondents' financial scores rise with their earnings, while their macroeconomic scores do not. According to the author, individuals with more resources have a greater incentive to acquire information about financial matters, because they may need it to manage their wealth, while they may be less interested in macroeconomic notions. The idea that resources matter is suggested also by Donkers and van Soest (1999), who show that in the Netherlands individuals with higher incomes are more interested in finance.

Other papers attempt to build a theoretical framework of the link between wealth and financial knowledge (Jappelli and Padula, 2010). Delavande et al. (2008) view the acquisition of financial knowledge as a sort of human capital investment. According to the standard theory of human capital (Ben-Porath, 1967), by devoting part of their time to education, individuals forgo current earnings but increase their stock of human capital. Since future earnings are assumed to depend on the accumulated stock of human capital, the individual decides how much education to obtain on the basis of the trade-off between forgone earnings today and increased earnings in the future. Delavande et al. (2008) assume that financial knowledge allows investors to obtain higher expected rates of return on their assets, for any given level of risk, up to a theoretical maximum on the mean-variance frontier. In analogy with the theory of human capital, investors decide to invest in the acquisition of financial knowledge, thereby incurring costs in terms of money, time, and effort, to benefit from higher risk-adjusted returns on their financial assets. In this framework, the benefit from investing in financial knowledge also depends on the amount of assets invested, because the higher the stock of financial knowledge possessed, the higher the rates of return obtained by the assets. Hence, according to this model, wealthier individuals should have a greater incentive to acquire financial knowledge.

Furthermore, a theoretical formalization of the two-way relation between financial knowledge and wealth accumulation comes from the literature on information acquisition in financial markets and its effect on asset prices. The model by Peress (2004) studies investors' decisions to acquire information about assets payoffs, where information increases the expected risk-adjusted returns of their portfolios. Again, investors face a trade-off between the cost of information acquisition and its benefit, expressed as a function of the initial endowment of wealth. The mechanism whereby wealth increases the benefit of acquiring information can be summarized as follows. Since (absolute) risk tolerance is assumed to be an increasing function of wealth, investors endowed with more wealth will be more risk tolerant and will invest a higher fraction of their wealth in risky assets. This makes information about stocks payoff more valuable to them, leading to greater investment in information acquisition. Moreover, the optimality condition

equaling marginal cost of information acquisition with marginal benefit defines a wealth threshold below which information acquisition is not worth the cost, leaving poorer individuals with no incentive to acquire information.

To sum up, from studies examining the impact of financial wealth on financial literacy from a theoretical perspective emerges the hypothesis that wealthier individuals should be more likely to acquire financial knowledge. This idea is corroborated by papers investigating this relation from an empirical perspective, showing that household income and wealth are positively associated with financial literacy. None of these contributions, however, addresses the issue of wealth endogeneity. This can be a serious concern, given the importance of financial knowledge for wealth accumulation itself. The hypothesis that the extent of financial assets can have an exogenous effect on financial knowledge will be tested in the empirical analysis that follows.

2.3 Data and descriptive evidence

Every two years, through the Survey on Household Income and Wealth (SHIW), the Bank of Italy collects detailed data on demographics, household consumption, income, and wealth in a representative sample of the Italian population. In 2006 the survey covered 7,768 households and 19,551 individuals. In that wave, in addition to the standard questionnaire, about half of the sample (3,992 households in which the head was born on an even year) was given an extra module on financial literacy to be answered by the individual identified as the head of the household.¹ Questions dealt with reading a bank account statement, understanding inflation and interest compounding, and grasping the working of the stock market and mortgages. The precise wording of the questions was as follows:

- Quiz 1: Suppose you receive this statement of account from your bank; can you tell me what sum of money is available at the end of May? (See Figure 2.1 in the Appendix) *i. Amount in euro / ii. Don't know*
- Quiz 2: Imagine leaving 1,000 euro in a current account that pays 1% interest and has no charges. Imagine also that inflation is running at 2%. Do you think that if you withdraw the money in a year's time you will be able to buy the same amount of goods as if you spent the 1,000 euro today? *i. Yes / ii. No, I will be able to buy less / iii. No, I will be able to buy more / iv. Don't know*
- Quiz 3: This figure shows the value of two different investment funds over the last four years. Which fund do you think produced the largest return in that period? (See Figure 2.2 in the Appendix) *i. Fund 1 / ii. Fund 2 / iii. The funds earned the same / iv. Don't know*

¹The household head is identified as the the person responsible for the household budget.

- Quiz 4: Imagine leaving 1,000 euro in a current account that pays 2% annual interest and has no charges. What sum do you think will be available at the end of 2 years? *i. Less than 1,020 euro / ii. Exactly 1,020 euro / iii. More than 1,020 euro / iv. Don't know*
- Quiz 5: Imagine you have only equity funds and stock market prices fall. Are you...? *i. Better off / ii. Worse off / iii. As well off as before / iv. Don't know*
- Quiz 6: Which of the following types of mortgage do you think will allow you from the very start to fix the maximum amount and number of installments to be paid before the debt is extinguished? *i. Floating-rate mortgage / ii. Fixed-rate mortgage / iii. Floating-rate mortgage with fixed installments / iv. Don't know*

Some of the questions are very similar to the ones used in Atkinson et al. (2006) to investigate financial capability in the United Kingdom, while others are taken from the Health and Retirement Study 2004 (Lusardi and Mitchell, 2006). Even though this battery is not as rich as the ones devised in other surveys (for instance van Rooij et al. (2008)), it covers a wide range of topics concerning several financial decisions and so should be able to capture financial knowledge rather than just numerical ability. Importantly, “don’t know” is always an option, so that respondents are not forced to give a random answer.

Table 2.1 presents the distribution of answers to the questions. On average 47% of respondents answers correctly to any of the questions. The most difficult appears to be quiz 3 where only 27% answers correctly, and only 8.84% can answer all 6 questions correctly (Table 2.2). However low the correct response rate may seem, it is worth noticing that if respondents were guessing they would give on average 33% correct answers (to quizzes 2-6), while the actual response rate is higher for all questions but one. Nonetheless, the share of “do not know”s is quite high (more than 30%).

Summary statistics on individuals’ responses as well as demographic and socioeconomic characteristics are reported in Table 2.3. On average, respondents answered fewer than three questions correctly. The median household had a net worth of about 158,000 euros, consisting of 150,000 euros in real wealth and 7,000 euros in (gross) financial wealth holdings.

Table 2.4 documents the heterogeneity of financial literacy across demographics and socioeconomic variables. Females answer on average worse than males.² Higher education is associated with a higher degree of financial knowledge, probably because individuals with a higher level of general education experience less difficulty in acquiring financial knowledge and therefore

²It should be remarked that all respondents to the financial literacy module are considered to be ‘household heads’. This means that women’s literacy results reported here may underestimate financial literacy among the overall female population, because many female households heads are widows (38% among female respondents are widowed, but only 5% among male respondents).

incur lower learning costs. The age profile of correct answers is concave (i.e., increases up to ages 41-60 and then declines). This might be because knowledge accumulates only up to a certain age and then depreciates or because of cohort effects, since older generations were not exposed to the current financial complexity during their youth. Given that only one cross-section is used, age and cohort effects cannot be disentangled. Respondents living in the southern regions tend to have lower competencies. Working individuals answer more questions correctly than the unemployed and those out of the labor force. Financial wealth is positively associated with financial literacy, as expected.

2.4 Empirical strategy

The dependent variable is an index of financial literacy indicating the number of correct answers given by the respondent. This measure may suffer from the shortcomings detailed in chapter 1, but has the advantage of being synthetic. Moreover, this methodology is applied also in other studies Lyons et al. (2007) and Guiso and Jappelli (2008). As shown in Table 2.2 (first row), this variable takes on integer, non-negative values and displays a high frequency of zeroes.

The wealth measure used as the independent variable is gross financial wealth, which equals the sum of deposits, government and private bonds, stocks, and other securities. The top 1% of the wealth distribution is excluded from the regressions to avoid excess sensitivity of the results to outliers.

In addition to household financial wealth, the independent variables include gender, marital status, number of household components, level of general education (expressed in number of years of schooling), a dummy variable indicating whether someone in the household is more educated than the household head, a second-order polynomial in age, dummy variables for the region of residence, occupational dummies and income from work or pensions. The dummy for the presence of a more educated household member is included because the degree of financial literacy of other household members is not elicited in the survey. This is a crude way to control for peer effects within the family.

A second specification also includes indicators of the occupation and education for both parents of the head of the household. Family background is likely to affect not only the level of financial literacy, as in Lusardi et al. (2010), but also the amount of wealth held by the family. Therefore, the inclusion of these factors is meant to ensure that the coefficient for household financial wealth does not actually capture the effect of the characteristics of the family of origin on financial knowledge.

2.4.1 Accounting for endogeneity

As was mentioned before, in estimating the effect of wealth on financial knowledge there may be a problem of endogeneity. Not only literacy is likely to affect wealth accumulation, but it is also possible that an unobserved factor, such as an underlying interest in finance, simultaneously influences wealth accumulation and willingness to acquire financial knowledge.

The endogeneity issue is addressed by resorting to instrumental variables, exploiting proxies for exogenous variations in household financial wealth. In the baseline, the relation between wealth and literacy is estimated by the generalized method of moments (GMM). The instruments adopted are a dummy variable that takes the value of one if the family is living in a house received as a bequest or gift, and zero otherwise, and the number of income earners in the household. To be valid, instruments should not be correlated with the dependent variables (literacy) but ought to be correlated with the endogenous regressor (wealth). Using an indicator of house inheritance as an instrument would not be appropriate in case richer households were systematically more likely to bequeath their dwellings than poorer households. However, the home ownership rate in Italy is high – around 71%, according to the 2001 census (Istat, 2004) – so it is not the case that only very rich and knowledgeable families bequeath their houses. Moreover, more educated parents do not seem to be more likely to leave houses to their children, at least in the SHIW sample. The number of income earners is clearly related to household wealth but there is no evident correlation with financial knowledge. A robustness check on the instruments is in Section 2.5.1.

2.5 Estimation results

The empirical estimates of column OLS(1) in Table 2.5 broadly confirm the insights of the descriptive statistics. Having higher financial wealth is associated with an increasing degree of financial literacy. Females and the widowed have lower financial literacy. The age profile of financial literacy is concave. Being more educated is associated to a greater financial literacy, suggesting that general education may decrease the cost of acquiring specific financial knowledge. The presence of a more educated household member than the household head predicts a higher level of literacy, indicating knowledge sharing within the household, rather than specialization. White-collars display a higher literacy level. Income has no significant effect.

Column OLS(2) shows a specification where some characteristics of the family of origin are included. The effect of household financial wealth is virtually unchanged.

Column GMM(1) of Table 2.6 displays the first and second stage of a GMM regression where the endogenous wealth variables are instrumented

with the number of earners in the household and whether the family is living in a house received as inheritance of gift.

The first stage regression shows that the instruments positively and significantly affect accumulation. The explanatory power and validity of instruments is confirmed by the statistics reported at the bottom of the table. The F test on excluded instruments is above 10 (the value conventionally used to exclude a weak instrument problem), and the Hansen's J test of over-identification of all the instruments supports the null hypothesis of instrument validity. The second stage regression of financial literacy shows that the effect of wealth is stronger than what measured by the OLS regression of Table 2.5: an increase in financial wealth by 100 thousand euro induces the individual to learn as much as to answer correctly to about 1.7 additional questions (0.5 in the OLS). The effect of most covariates remains unchanged. The inclusion of education and occupation of the parents reduces only slightly the explanatory power of financial wealth on financial knowledge (Column GMM(2)).

2.5.1 Robustness checks

This section discusses several robustness checks concerning the financial literacy index, the instruments, the construction of the wealth variable, and the estimation methodology.

Different difficulty of the questions

As reported in Table 2.1, some questions appear to be more difficult than others. As a robustness check, additional regressions were run using the weighted number of correct answers as the dependent variable, where each question is weighted by its difficulty (proxied by the average percentage of correct answers in the sample). Since the results are only marginally sensitive to this adjustment, the unweighted financial literacy index is adopted in all specifications.

Alternative instruments

One might argue that an indicator of house inheritance is not convincing as an instrument for financial wealth. In Table 2.7 I estimate the same equation as in Table 2.6, using as instruments two dummy variables: one takes the value one when there are two earners in the household, and the other takes value one when there are three or more income earners, controlling for the number of household members (the omitted category is less than two earners).³ The results are qualitatively the same as in Table 2.6.

³The reason for using two dummies is to allow the computation of the Hansen J test for

No financial wealth

A sizeable share of the sample (15.9%) reports having no financial wealth, and financial illiteracy may be one of the reasons why some individuals have zero financial assets. The GMM regression reported in column GMM(3) of Table 2.8 shows the effect of having positive financial wealth on the degree of financial literacy. The dummy variable for positive financial wealth is instrumented with the number of income earners in the household. As before, the effect is positive and significant.

Total household wealth

Among the papers reviewed in Section 2.2, van Rooij et al. (2008) pointed to the result that financial literacy should influence the total amount of wealth accumulation. Moreover, there is a possibility that financial literacy affects not only the decision to accumulate more or less financial assets, but also the choice to allocate wealth between financial and real assets. For these reasons, the analysis is repeated using as an independent variable the value of the total (net) household wealth, instead of its sole financial component. The GMM regression reported in column GMM(4) of Table 2.8 shows the effect of net household wealth on the degree of financial literacy. As before, the effect remains positive and significant.

Discrete choice model

Given the nature of the dependent variable – taking only integer and non-negative values, with an excess of zeroes – the model is also estimated by ordered probit⁴, instrumenting wealth by means of the control function approach.⁵

instruments validity. However, the same results hold when the number of income earners – as a single continuous variable – is used as an instrument (results not reported).

⁴A count data model, and in particular a zero-inflated poisson (ZIP) model, would also be suited. However I am not aware of an appropriate technique to deal with endogeneity in the specific case of the ZIP model. This is why I resort to an ordered probit model, to which the control function approach can be easily extended.

⁵When estimating a probit model with a continuous endogenous variable, the model can be written as

$$\begin{aligned}y_1^* &= \mathbf{z}_1\boldsymbol{\delta}_1 + \alpha_1 y_2 + u_1 \\y_2 &= \mathbf{z}_1\boldsymbol{\delta}_{21} + \mathbf{z}_2\boldsymbol{\delta}_{22} + v_2 = \mathbf{z}\boldsymbol{\delta}_2 + v_2 \\y_1 &= 1[y_1^* > 0]\end{aligned}$$

where (u_1, v_2) has a zero mean, bivariate normal distribution and is independent of \mathbf{z} . The two-step approach due to Rivers and Vuong (1988) consists in

- running an OLS regression of y_2 on \mathbf{z} and saving residuals \hat{v}_2

The use of ordered probit amounts to treating the dependent variable as if it were ordinal rather than cardinal, that is interpreting its values as “very high literacy”, “high literacy”, “medium literacy” and so on. The ordered probit model has a very good predictive power. Figure 2.3 compares observed frequencies for the outcomes of the dependent variable with (average) predicted probabilities from the estimated models, showing that the ordered probit model estimates (whether instrumented or not) can reproduce closely (and better than a count data model) the distribution of the financial literacy index.

Table 2.9 shows the results of the ordered probit estimation where the probability of answering to a given number of financial literacy questions depends on financial wealth and other regressors. Each column reports marginal effects – computed at mean values – for each of the outcomes of the dependent variable (that can take integer values from 0 to 6). Marginal effects for dummy variables are computed accounting for their discrete nature.

The first stage regression is identical to the one in Table 2.6. The significance of the coefficients relative to the first stage residuals can be interpreted as a test of the endogeneity of the instrumented variable. Even though in this case it is possible to reject the endogeneity of financial wealth, there are strong theoretical reasons that induce to instrument it anyway. Again, wealth has a positive effect on the probability of answering correctly to a higher number of questions. The effect of gender, years of schooling, age, and other covariates goes in the same direction indicated by previous estimations.

2.6 Concluding remarks

Even a basic knowledge of financial principles has proven to be important for the accumulation of retirement savings (Lusardi and Mitchell, 2007a). Yet, many households lack such competencies. Gaining insights on the factors that drive financial knowledge acquisition can have important implications on which policies are likely to be more effective in improving financial awareness and sophistication.

This paper contributes to the literature on financial literacy by investigating its determinants in Italy and by assessing the role of wealth in explaining the degree of literacy. If one assimilates the acquisition of financial

- running a probit regression of y_1 on z_1 , y_2 and \hat{v}_2 . This yields consistent estimators of coefficients scaled by $\frac{1}{(1-\rho_1^2)^{1/2}}$, with $\rho_1 = Corr(u_1, v_2)$.

Moreover, the p-value on \hat{v}_2 is a valid test of the null hypothesis that y_2 is exogenous. For a thorough explanation of this procedure see Rivers and Vuong (1988) and (Wooldridge, 2002, p. 472). This procedure can be easily extended to ordered probit response models (Wooldridge, 2007).

knowledge to a form of human capital investment, where the benefit from such investment is given by the ability to obtain higher risk-adjusted rates of return on one's own assets, then the amount of wealth held by the household may be crucial in explaining the learning effort and the widespread lack of financial knowledge (Delavande et al., 2008). The endogenous relation between wealth and literacy is taken into account by instrumenting appropriately household wealth variables.

The results show that the effect of socio-demographics is analogous to that found in the previous literature for other countries. Moreover, there is evidence that wealth matters for the acquisition of financial knowledge also controlling for its endogeneity. This suggests that the low level of literacy among Italian households may also reflect the level of their financial holdings. However, the effect of wealth is quite small, meaning that only individuals endowed with large amounts of wealth are encouraged to learn more. Therefore, active interventions – by appropriately designing defaults, by strengthening financial education among more vulnerable groups, or by devising ways to help people plan ahead – are needed to improve financial decision making and to put individuals in the condition to face adequately current and future challenges.

A final remark concerns the fact that a more recent wave of the Survey on Household Income and Wealth became available (e.g. the one for 2008) and its financial literacy module contains some of the 2006 questions. In future work, this chapter will be extended exploiting these new data. In particular, this extension will allow to monitor financial literacy developments over time (even if over a short time span), and it will improve the robustness of the results, by allowing to control for unobserved heterogeneity.

Appendix: Tables and figures

National Saving Bank
Account statement as of 31/05/200
Account No 678 987654 321

DATE	VALUE	REF.	DESCRIPTION	WITHDRAWALS	DEPOSITS
***	***	***	PREVIOUS BALANCE AS OF 05/05/2006		320
01/05/2006	30/04/2006	1007	PHONE BILL PAYMENT, PERIOD 01/03/2006 - 30/04/2006	65	
02/05/2006	01/05/2006	1008	WITHDRAWAL DEBIT CARD N. 10	100	
27/05/2006	28/05/2006	1010	PAYROLL DEPOSIT		1.100
28/05/2006	27/05/2006	1011	CHEQUE N. 3036 YOUR ORDER IN FAVOR OF MR PAOLO ROSSI	187	
29/05/2006	28/05/2006	1012	RENT PAYMENT APRIL	800	
29/05/2006	28/05/2006	1013	FEES FOR TRANSACTION No 1012	1	
31/05/2006	30/05/2006	1014	PURCHASE CARD N. 10. ON 28/05/2006 CHEMIST SHOP	88	
31/05/2006	30/05/2006	1015	REFUND NURSERY SCHOOL FEES		100
***	***	***	BALANCE AFTER THE ABOVE MENTIONED TRANSACTIONS		279

Figure 2.1: Figure for Quiz 1

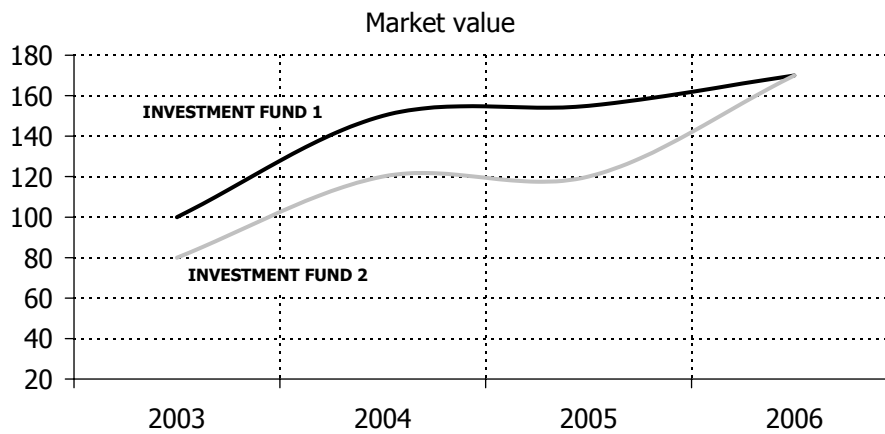


Figure 2.2: Figure for Quiz 3

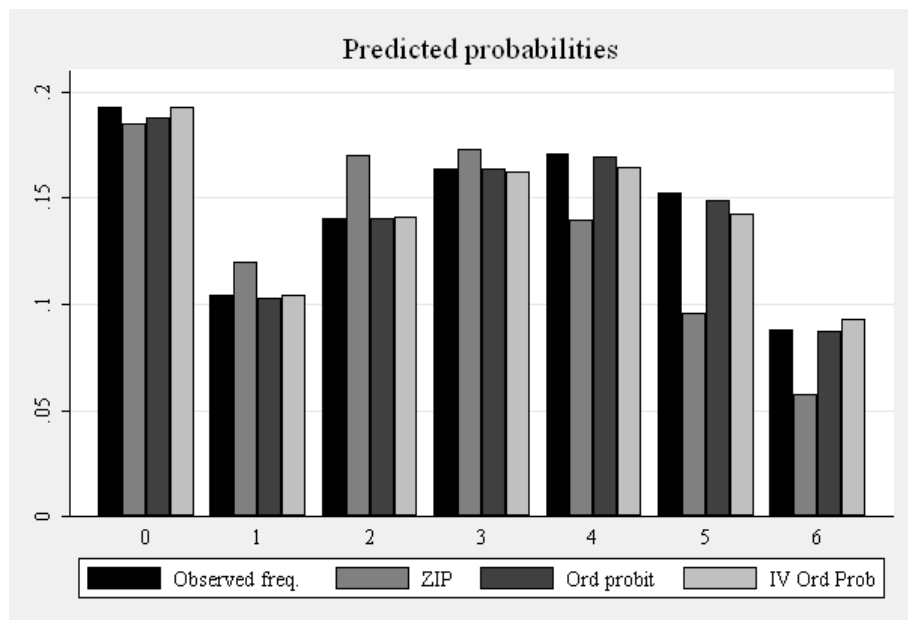


Figure 2.3: Predicted probabilities

Table 2.1: Answers to financial literacy questions (in %)

	quiz1	quiz2	quiz3	quiz4	quiz5	quiz6	Average
Correct	50.75	60.5	27.23	39.6	51.33	53.61	47.17
Incorrect	6.44	9.52	35.37	31.96	15.53	12.68	18.58
Don't Know	42.81	29.98	37.4	28.43	33.14	33.72	34.25
Total	100	100	100	100	100	100	100
N obs	3,992	3,992	3,992	3,992	3,992	3,992	3,992

Table 2.2: Distribution of correct, incorrect, and 'do not know' answers

	0	1	2	3	4	5	6	Total
Correct	18.86	10.25	13.73	16.21	16.93	15.18	8.84	100
Incorrect	38.58	29.51	18.39	9.54	3.43	0.45	0.1	100
Don't Know	36.9	18.66	9.92	7.29	6.46	5.34	15.43	100

Table 2.3: Summary Statistics

	Mean	Median	Std. Dev.
Number of correct answers (financial literacy index)	2.83	3	1.95
Number of incorrect answers	1.11	1	1.16
Number of "don't know" answers	2.05	1	2.22
Age	57.43	58	15.61
Years of schooling	9.21	8	4.66
Received house as inheritance/gift (dummy)	0.21	0	0.41
Number of earners in the household	1.68	2	0.76
Household net worth (thousands of euros)	252.74	157	516.69
Household gross financial wealth (thousands of euros)	26.12	6.93	79.17
Household real wealth (thousands of euros)	233.61	151	479.84

Table 2.4: Number of correct answers by demographic characteristics

	Frequency	Mean	Median
<i>Gender</i>			
Men	2,508	3.16	3
Women	1,484	2.27	2
<i>Education</i>			
None	226	0.91	0
Primary	1,031	1.92	2
Secondary	1,114	2.83	3
High school	1,268	3.60	4
College and over	353	3.95	4
<i>Age class</i>			
≤30	136	2.85	3
31-40	549	3.28	3
41-50	791	3.27	4
51-60	846	3.31	3
61-70	761	2.72	3
71-80	637	2.02	2
>80	272	1.34	1
<i>Area of residence</i>			
North-west	1,034	3.09	3
North-east	878	3.13	3
Center	785	3.20	4
South	833	2.06	2
Isles	462	2.42	2
<i>Occupational status</i>			
Employee	1,413	3.37	4
Self-employed	397	3.69	4
Unemployed	105	2.37	2
Retiree	1,775	2.34	2
Other out of labour force	302	2.25	2
<i>Financial wealth (gross) quintiles</i>			
1 (Poorest)	838	1.71	1
2	832	2.64	3
3	732	2.68	3
4	811	3.34	4
5 (Richest)	779	3.84	4

Note: Other out labor force include first-job seekers, students, and homemakers.

Table 2.5: Financial literacy determinants – OLS estimates

	OLS (1)	OLS (2)
Financial wealth (100k)	0.523*** (0.08)	0.499*** (0.08)
Female	-0.344*** (0.07)	-0.360*** (0.06)
Single	-0.027 (0.10)	-0.001 (0.10)
Divorced	0.141 (0.12)	0.100 (0.12)
Widow(er)	-0.380*** (0.09)	-0.374*** (0.09)
Num H components	0.005 (0.03)	-0.003 (0.03)
Age	0.061*** (0.01)	0.061*** (0.01)
Age squared	-0.001*** (0.00)	-0.001*** (0.00)
Years schooling	0.117*** (0.01)	0.099*** (0.01)
Better Edu than HH	0.393*** (0.07)	0.371*** (0.07)
Blue-collar	-0.165* (0.10)	-0.138 (0.10)
White-collar/Teacher	0.186* (0.10)	0.165* (0.10)
Manager	0.188 (0.14)	0.170 (0.14)
Entrepr/Profession	0.011 (0.16)	0.026 (0.16)
Self-employed	0.288** (0.13)	0.257** (0.12)
Inc work/pens (th.)	0.003 (0.00)	0.002 (0.00)
F of HH: Blue-collar		0.286*** (0.08)
F of HH: White-coll/Teach		0.448*** (0.12)
F of HH: Manager		0.594*** (0.17)
F of HH: Entrep/Profession		0.331* (0.19)
F of HH: Self-employed		0.502*** (0.10)
M of HH: Blue-collar		0.050 (0.09)
M of HH: White-coll/Teach		0.227 (0.17)
M of HH: Manager		-0.190 (0.41)
M of HH: Entrep/Profession		-0.072 (0.30)
M of HH: Self-employed		-0.277** (0.12)
F of HH: Primary		0.207** (0.10)
F of HH: Secondary		0.070 (0.13)
F of HH: High school+		0.088 (0.16)
M of HH: Primary		0.162* (0.09)
M of HH: Secondary		0.295** (0.13)
M of HH: High school+		0.043 (0.19)
Regional dummies	yes	yes
Constant	0.614 (0.39)	0.208 (0.39)
N obs	3953	3906
R-Squared	0.312	0.332
Adj. R-Squared	0.306	0.323

Note: Standard errors (in parentheses) are robust to heteroskedasticity. Dependent variable: number of correct answers. Model: linear model estimated by OLS. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Base categories include males, being married, being out of the labor force (i.e., retired, homemaker, etc.) and unemployed.

Table 2.6: Financial literacy determinants – GMM estimates

Dep Var :	GMM (1)		GMM (2)	
	First stage Fin W (100k)	Second stage Fin Lit	First stage Fin W (100k)	Second stage Fin Lit
Financial wealth (100k)		1.711** (0.76)		1.629** (0.80)
Female	-0.014 (0.01)	-0.330*** (0.07)	-0.015 (0.01)	-0.346*** (0.07)
Single	-0.033* (0.02)	0.002 (0.10)	-0.038* (0.02)	0.035 (0.10)
Divorced	-0.046** (0.02)	0.200 (0.13)	-0.051** (0.02)	0.161 (0.13)
Widow(er)	-0.031 (0.02)	-0.331*** (0.10)	-0.035* (0.02)	-0.325*** (0.10)
Num H components	-0.005 (0.01)	-0.007 (0.03)	-0.006 (0.01)	-0.011 (0.03)
Age	0.010*** (0.00)	0.047*** (0.01)	0.010*** (0.00)	0.048*** (0.02)
Age squared	-0.000*** (0.00)	-0.001*** (0.00)	-0.000*** (0.00)	-0.001*** (0.00)
Years schooling	0.017*** (0.00)	0.096*** (0.02)	0.016*** (0.00)	0.080*** (0.02)
Better Edu than HH	0.028* (0.01)	0.344*** (0.08)	0.030** (0.01)	0.322*** (0.08)
Blue-collar	-0.150*** (0.02)	0.011 (0.15)	-0.146*** (0.02)	0.025 (0.15)
White-collar/Teacher	-0.111*** (0.02)	0.315** (0.13)	-0.110*** (0.02)	0.287** (0.13)
Manager	-0.051 (0.05)	0.245 (0.15)	-0.039 (0.05)	0.211 (0.15)
Entrepr/Profession	-0.061 (0.04)	0.078 (0.17)	-0.085* (0.05)	0.118 (0.18)
Self-employed	-0.054* (0.03)	0.336** (0.14)	-0.063** (0.03)	0.314** (0.14)
Inc work/pens (th.)	0.008*** (0.00)	-0.006 (0.01)	0.008*** (0.00)	-0.006 (0.01)
Parent's occupation dummies			yes	yes
Parent's education dummies			yes	yes
Region dummies	yes	yes	yes	yes
<i>House as inheritance/gift</i>	<i>0.058***</i> <i>(0.01)</i>		<i>0.053***</i> <i>(0.01)</i>	
<i>Num of earners</i>	<i>0.046***</i> <i>(0.01)</i>		<i>0.044***</i> <i>(0.01)</i>	
Constant	-0.341*** (0.07)	1.049** (0.48)	-0.336*** (0.07)	0.625 (0.49)
N obs	3953	3953	3906	3906
Adj. R-Squared	0.210	0.265	0.219	0.286
Uncentered R-Squared	0.391	0.765	0.401	0.773
Weak instrument F		23.53		20.26
Hansen J (overid of all instruments)		1.931		2.354
Hansen J p-value		0.165		0.125

Note: Standard errors (in parentheses) are robust to heteroskedasticity. Dependent variable: number of correct answers. Model: linear model estimated by GMM. Significance: *** p<0.01, ** p<0.05, * p<0.1. Base categories include males, being married, being out of the labor force (i.e., retired, homemaker, etc.) and unemployed.

Table 2.7: Robustness check: Different instruments. Financial literacy determinants – GMM estimates

Dep Var :	GMM (1)		GMM (2)	
	First stage Fin W (100k)	Second stage Fin Lit	First stage Fin W (100k)	Second stage Fin Lit
Financial wealth (100k)		2.225** (1.10)		2.224* (1.17)
<i>Two earners</i>	0.029** (0.01)		0.026** (0.01)	
<i>Three+ earners</i>	0.104*** (0.03)		0.097*** (0.03)	
Parent's occupation dummies			yes	yes
Parent's education dummies			yes	yes
N obs	3953	3953	3906	3906
Adj. R-Squared	0.205	0.221	0.215	0.237
Uncentered R-Squared	0.388	0.751	0.398	0.758
Weak instrument F		11.96		10.46
Hansen J (overid of all instruments)		0.955		0.656
Hansen J p-value		0.328		0.418

Note: Standard errors (in parentheses) are robust to heteroskedasticity. Dependent variable: number of correct answers. Model: linear model estimated by GMM. Other regressors not reported: same as in Table 2.5. Significance: *** p<0.01, ** p<0.05, * p<0.1.

Table 2.8: Robustness check: alternative measures of wealth. Financial literacy determinants – GMM estimates

Dep Var :	GMM (3)		GMM (4)	
	First stage Fin W > 0	Second stage Fin Lit	First stage Total Net W (100k)	Second stage Fin Lit
Fin wealth > 0		3.303** (1.36)		
Net worth (100k)				0.401** (0.16)
<i>Num of earners</i>	0.035*** (0.01)		0.304*** (0.06)	
Parent's occupation dummies	yes	yes	yes	yes
Parent's education dummies	yes	yes	yes	yes
N obs	3906	3906	3904	3904
Adj. R-Squared	0.174	0.140	0.292	0.192
Uncentered R-Squared	0.870	0.727	0.598	0.743
Weak instrument F		15.54		27.64

Note: Standard errors (in parentheses) are robust to heteroskedasticity. Dependent variable: number of correct answers. Model: linear model estimated by GMM. Other regressors not reported: same as in Table 2.5. Significance: *** p<0.01, ** p<0.05, * p<0.1.

Table 2.9: Robustness check: discrete choice model. Financial literacy determinants – IV ordered probit estimates

	Low literacy		Medium literacy			High literacy	
	0	1	2	3	4	5	6
Fin Wealth (100k)	-0.279*	-0.129*	-0.095*	0.014	0.147*	0.216*	0.125*
	(0.15)	(0.07)	(0.05)	(0.01)	(0.08)	(0.11)	(0.07)
Female	0.054***	0.024***	0.017***	-0.004***	-0.028***	-0.040***	-0.022***
	(0.01)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)
Single	-0.007	-0.003	-0.002	0.000	0.003	0.005	0.003
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)
Divorced	-0.027*	-0.014	-0.011	-0.000	0.014*	0.023	0.014
	(0.02)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)
Widow(er)	0.050***	0.021***	0.014***	-0.005**	-0.026***	-0.035***	-0.019***
	(0.02)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
Num H components	0.002	0.001	0.001	-0.000	-0.001	-0.001	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age	-0.007***	-0.003***	-0.002***	0.000**	0.004***	0.006***	0.003***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age squared	0.000***	0.000***	0.000***	-0.000**	-0.000***	-0.000***	-0.000***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Years schooling	-0.011***	-0.005***	-0.004***	0.001**	0.006***	0.008***	0.005***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Better Edu than HH	-0.043***	-0.021***	-0.016***	0.001	0.023***	0.035***	0.021***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
Blue-collar	-0.004	-0.002	-0.001	0.000	0.002	0.003	0.002
	(0.02)	(0.01)	(0.01)	(0.00)	(0.01)	(0.02)	(0.01)
White-collar/Teacher	-0.035*	-0.018	-0.014	-0.000	0.018*	0.030	0.019
	(0.02)	(0.01)	(0.01)	(0.00)	(0.01)	(0.02)	(0.01)
Manager	-0.026	-0.013	-0.010	-0.000	0.014	0.022	0.014
	(0.02)	(0.01)	(0.01)	(0.00)	(0.01)	(0.02)	(0.01)
Entrepr/Self-empl	-0.027*	-0.013	-0.011	0.000	0.014*	0.023	0.014
	(0.02)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)
Inc work/pens (th.)	0.001	0.001	0.000	-0.000	-0.001	-0.001	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Fitted residuals	0.208	0.096	0.071	-0.010	-0.110	-0.161	-0.093
	(0.15)	(0.07)	(0.05)	(0.01)	(0.08)	(0.11)	(0.07)
Parents' occup dummies	yes						
Parents' edu dummies	yes						
Region dummies	yes						
N obs	3906						
Log-likelihood	-6699.37						
Pseudo R-Squared	0.105						

Note: Bootstrapped standard errors (100 replications) in parentheses. Dependent variable: number of correct answers. Model: Ordered Probit instrumented with Control Function. Each column reports marginal effects for a given outcome of the dependent variable. Instruments are a dummy for house inheritance and the number of income recipients in the household. First-stage regressions are displayed in Table 2.6. Base categories include males, being married, being out of the labor force (i.e., retired, homemaker, etc.) and unemployed. Other regressors not reported: same as in Table 2.5. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Chapter 3

Financial literacy and financial advisors: substitutes or complements?

with Riccardo Calcagno

3.1 Introduction

The growing literature on financial literacy suggests that consumers' knowledge of basic financial principles and products is quite scarce, and that it may not be sufficient to guarantee that households make sound financial decisions. For instance, more financially illiterate households are more prone to lack of planning for retirement, portfolio under-diversification, and over-indebtedness (Lusardi and Tufano, 2008; Lusardi and Mitchell, 2006, 2007a; Guiso and Jappelli, 2008; Kimball and Shumway, 2007). Moreover, a lack of financial knowledge is particularly worrying as long as consumer's ignorance can be exploited in retail financial markets as a source of market power by firms that increase the complexity of their financial products strategically (Carlin, 2009).

However, one may argue that a low level of households' financial literacy does not necessarily imply that they will make poor financial decisions. At least in principle, households can seek advice and guidance from qualified sources (Bernheim, 1998). As long as households can resort to the advice of experts for their financial decisions, external advice can be seen as a substitute for learning by one's self, thus avoiding the effort of acquiring financial expertise.

Indeed, common motivations for the demand for professional financial advice are that advisors are more knowledgeable about financial markets than non-professional investors (e.g., because they can exploit economies of

scale in information acquisition), and that they can mitigate households' behavioral biases (Bluethgen et al., 2008).

However, there are reasons to believe that the market for financial advice is imperfect and that the mere availability of qualified assistance will not necessarily translate into high-quality decision making. Not only advisors/brokers do not appear to fully correct investors' behavioral biases (Shapira and Venezia, 2001; Mullainathan et al., 2010), but it is apparent that conflicts of interest may affect the supply of financial advice. When financial intermediaries are at the same time acting as advisors and selling financial products, they may be tempted of "misselling", i.e., selling a product that does not match a customer's specific needs (European Commission, 2009).

Several authors studied the issue of advisors' conflicts of interests in a strategic communication setting, modeling the interaction between an uninformed investor and an informed advisor whose preferences are 'biased' towards a partisan objective (e.g. through commissions and 'kickbacks'). In the classic 'cheap-talk' communication game of Crawford and Sobel (1982), direct and costless communication does not necessarily result in full information transmission: when the preferences of the sender (advisor) and of the receiver (investor) are different due to a bias in the sender's utility, not all information is successfully communicated in equilibrium.

Other works focused on the origins of these conflicts of interest. While in most cases such bias is simply assumed, Inderst and Ottaviani (2009) allow the conflict of interest between the advisor and the investor to arise endogenously from the agency relation between the advisor and the firm, where the latter aims at setting the optimal compensation so as to induce its direct marketing agent to sell but not to missell. In modeling the conflict of interests of financial advisors, Krausz and Paroush (2002) show that the optimal level of advisor's deception is related, among the others, to the market structure represented by the level of competition. Also in Bolton et al. (2007) the bias of institutions selling financial products is related to market competitiveness, where competition both reduces the gains from lying and induces financial institutions to disclose information in order to differentiate their products. Advisor's reputational concerns do not necessarily give the right incentives to truthfully report information (Ottaviani and Sørensen, 2006).

For our purposes, a particularly relevant strand of this literature is the one focusing on investors' characteristics and on how these affect information transmission. Ottaviani (2000) allows investors to differ with respect to their degree of strategic sophistication: a perfectly rational receiver who knows the communication game is never fooled in equilibrium into taking an action which is not in her best advantage ex post, while a naive investor may take the advice literally, therefore choosing to delegate. The nature of the communication equilibrium changes drastically according to investor's

naivety. Georgarakos and Inderst (2010) allow investors' decision to hold risky assets and to rely on advisor's recommendation to depend on the perception of their own financial capability, as well as on their perceived legal protection and trust in advice. Clearly, the model predicts that probability of relying on advice is higher when perceived financial capability is lower and trust is higher. Finally, Hackethal, Inderst, and Meyer (2010) introduce investors' knowledge of financial matters and their perception of advisor's conflict of interest in a game of cheap talk, where both elements reduce the likelihood that the customer follows advisor's recommendation.

In this paper we analyze the agency relationship between an advisor / intermediary and an investor, where the latter is poorly informed about the distribution of the risky asset future returns, and the (informed) advisor earns a commission upon selling the risky product while facing a cost for mis-selling it (e.g. costs related to a loss of reputation or expected legal costs for being sued). The final utility of both advisor and investor depend upon the investment decision of the latter. With respect to the previous literature, we exploit the heterogeneity of investor's financial information and knowledge in affecting the degree of information transmission in equilibrium.¹

We show that there are cases when it is more profitable for the advisor not to reveal the information he possesses, and that this happens when investors are less knowledgeable. Moreover, we find that – if we allow investors to be fully rational and to observe the structure of advisor's selling incentives – advisors are visited only by the most knowledgeable customers. These results are confirmed when we allow investor's information precision to be endogenously determined by their (exogenous) level of financial literacy.

These findings are consistent with much of the empirical literature and with the empirical findings of chapter 4. Various authors suggested that investors with higher financial literacy are more likely to use formal sources of information and advice, including financial advisors, while 'illiterate' ones prefer informal sources, such as friends, relatives, colleagues and neighbors (Lusardi and Mitchell, 2006; van Rooij et al., 2007). Moreover, Hackethal, Haliassos, and Jappelli (2009) show that advisors are matched with wealthier and older investors, rather than with poorer and inexperienced ones, suggesting that there may be a complementarity between financial knowledge and the demand for advice. On the contrary, from an empirical point of view Hackethal, Inderst, and Meyer (2010) show that investors reporting that they keep themselves informed are less likely rely on the advice of their

¹Moreover, our work differs also from that of Hackethal, Inderst, and Meyer (2010). They assume that, upon receiving advisor's recommendations, the customer has to decide whether to follow his advice or not, and they focus on the informative equilibrium. On the contrary, in our model we focus on the different informativeness of the equilibria and the crucial decision for the investor is to visit the advisor or not, since it is always (never) optimal for her to follow the advice when this is (not) informative.

financial advisor, conditional on receiving advice.

Our results suggest that the presence of non-independent advisors, who at the same time provide advice and sell financial assets, does little to alleviate the problem of low financial literacy of some investors. Indeed, our model shows that these advisors are rarely relied upon by low financial literacy investors, who need advice the most. We conclude then that there is scope for financial literacy initiatives targeted to the population groups with the highest private costs of accessing financial knowledge.

The rest of the paper is organized as follows. Section 3.2 presents the model setup and characterizes both advisor's decision about information revelation and investor's choice about consulting or not an advisor. Section 3.3 introduces financial literacy and studies its effect both on optimal information acquisition and on the relation with the advisor. Section 3.4 concludes.

3.2 The basic model

There are two agents: an informed intermediary who at the same time sells a risky financial product and provides information to the customer, and a buyer who is less informed than the seller about the distribution of the risky asset payoff. We will refer to these agents as seller S and buyer B .

Investors can allocate their wealth between a risky and a riskless asset. The riskfree return r_f is normalized to zero. The commonly known distribution of the risky asset payoff \tilde{r} is

$$f(\tilde{r}) = \begin{cases} r_H & 1/2 \\ r_L & 1/2 \end{cases} \quad (3.1)$$

We assume that $r_H > 0$, $r_L < 0$ and $E_{f(\tilde{r})}[\tilde{r}] > 0$ in order to depict a situation where investors may incur real losses in case of an ill investment decision, but where the risky asset provides an excess return over the riskless one ex-ante.²

Before undertaking the investment, each investor can buy a private signal s_i with precision π , where $\pi = Pr(s_i = r_i | r_i) > 1/2$, i.e. the signal is correct with probability π . For instance, if the investor receives the signal $s_i = r_L$, she bases her decisions upon $E[\tilde{r} | s_i = r_L] = \pi r_L + (1 - \pi)r_H$. Given that $r_L < 0$ and $E_{f(\tilde{r})}[\tilde{r}] > 0$, when $s_i = r_L$ there is a level $\pi_0 \in [1/2, 1]$ such that $\pi_0 r_L + (1 - \pi_0)r_H = 0$. The importance of π_0 will become evident later on.

The investor/buyer B is assumed to have mean-variance utility over her final wealth W_3 . In addition to the private signal s_i , she can decide

²This means that we are restricting the analysis to those products that an uninformed agent would buy. One can think of these risky assets as being sufficiently known among the large public, or assets whose historical past returns are above the riskfree rate, such as index mutual funds.

whether to ask for further information about the future realization of \tilde{r} to an intermediary who is informed about the true state of \tilde{r} . This intermediary (henceforth the advisor) can, in turn, decide to reveal his information or not, based on the incentives and costs he faces. Given any information set I_B the investment decision of B amounts to

$$\begin{aligned} \max_{v \in [0,1]} \quad & E[U(W_3) | I_B] = E[W_3 | I_B] - \frac{\gamma}{2} Var[W_3 | I_B] \\ \text{s.t.} \quad & W_3 = W_2 + v\tilde{r} \end{aligned}$$

where v is the quota of initial wealth invested in the risky asset³ and $r_f = 0$. Given the distribution of returns in (3.1) and investor's information set I_B , the optimal investment in the risky asset is:

$$v^* = \max\left\{0, \frac{E[\tilde{r} | I_B]}{\gamma Var[\tilde{r} | I_B]}\right\} \quad (3.2)$$

and substituting for v^* in the objective function we obtain the ex-ante expected utility for investor B :

$$E[U(W_3) | I_B] = W_2 + \max\left\{0, \frac{1}{2} \frac{(E[\tilde{r} | I_B])^2}{\gamma Var[\tilde{r} | I_B]}\right\} \quad (3.3)$$

In case the optimal portfolio v^* resulting from (3.2) were negative, then we fix $v^* = 0$, due to short-selling constraints.⁴

The model has four periods. At $t = 0$ the investor chooses the precision π of her private signal s_i . Then at $t = 1$ she first receives $s_i = \{r_H, r_L\}$ and then she decides whether to invest on her own or to consult an advisor who knows the realized risky asset return. If at $t = 1$ the investor decided to consult the advisor, then at $t = 2$ investor and advisor interact in a communication game where the advisor decides whether to disclose his information or not. Then the investor chooses her portfolio on the basis of the whole information set available, including the advisor's message. Otherwise, if at $t = 1$ the investor decided not to consult the advisor, then at $t = 2$ the investor invests by herself, only on the basis of her signal s_i . At final date $t = 3$ the return \tilde{r} is realized.

In the next subsection we describe the communication game between the advisor and the investor arising at $t = 2$ in case the investor decided to demand his advice. Throughout the model we assume there are arbitrarily small advisory fees $\epsilon \geq 0$. This ensures that our results are robust to the

³It is well known that with CARA utility the optimal portfolio allocation is independent of the initial wealth, that we then normalize to one for simplicity.

⁴Notice that investors are only allowed to buy or not the risky product, but they cannot short sell it. This is reasonable for most of private investors trading standard assets as index funds, mutual funds and individual stocks.

introduction of a very competitive market for financial advice.

3.2.1 Advisor’s decision about information revelation

We start by analyzing period $t = 2$, when the advisor S and the investor B play a communication game that we denote as $(S, B) - game$. The investor enters this stage having already received a signal $s_i \in R = \{r_H, r_L\}$ with a given precision π .

Information sets. The advisor S knows the true state of \tilde{r} : using a standard terminology we say there are two types of sellers $S = \{S(r_H), S(r_L)\}$. He also knows the precision π of the buyer’s signal but not its realization.⁵ The investor B knows π , the realization of the signal s_i and the payoff function of the advisor.

Strategies. The advisor decides which signal to deliver given his type. Thus a strategy for the advisor is a mapping $\sigma_S : \{r_H, r_L\} \rightarrow \Delta R$. The investor chooses the optimal portfolio allocation as in (3.2), where $I_B = \{\pi, s_i, \sigma_S\}$.

Payoffs. Advisor’s payoff depends on the investor’s investment decision and consists in a fixed commission $F > 0$ paid upon completing a transaction (sale) with the customer, i.e. whenever $v^* > 0$.^{6 7} Moreover, he pays a penalty for misselling (as in Inderst and Ottaviani (2009)), representing “reputational costs”, expected legal costs for litigation procedures, or the monetary costs of forgone customers, among others. In particular, we assume that this cost is incurred with probability one whenever the signal σ_S does not correspond to the true state, and that the cost is proportional to the difference between the signal and the true state $[\sigma(r_i) - r_i]^2$.⁸ The seller’s payoff is then $U_S(r_i) = F_{\{v^* > 0\}} - [\sigma(r_i) - r_i]^2$. The buyer’s payoff is that in (3.3).

$$\text{Assumption 1: } (r_H - r_L)^2 < F < \frac{(r_H - r_L)^2}{(1 - \pi_0)}.$$

Assumption 1 restricts the analysis to a meaningful set of parameters in the following two ways. By imposing that advisor’s incentives are larger than the cost of lying ensures that sometimes it may be optimal for the

⁵We choose to relax the hypothesis that the seller knows the information contained in the signal s_i . However, it would not be unreasonable to assume that the advisor possesses this piece of information, because intermediaries in the European Union are supposed to collect information on risk attitudes and prior experience of their customers in order to comply with the EU Markets in Financial Instruments Directive (MiFID). We proved that the set of equilibria of the game in this case looks qualitatively as the one presented in the paper (the proof is available upon request to the authors).

⁶Note that typically intermediaries receive higher fees when the client buys one of their products than when a sale occurs.

⁷The results for period $t = 2$ are unchanged if we assume that the advisor earns a commission proportional to the amount bought by the investor $fv^*(\pi, s_i)$, instead of a fixed commission F .

⁸Results are qualitatively not dependent on this particular assumption on the cost function.

advisor not to tell the truth. The second condition in Assumption 1 ensures that advisor's incentives are not too large to always offset the cost for not telling the truth, even when the investor is relatively well informed, i.e. for $\pi \in [\pi_0, 1]$.

Equilibrium. A Perfect Bayesian Nash equilibrium in the communication game (S, B) is defined by a set of strategies (σ_S^*, v^*) and beliefs $p = \Pr(r_H)$, $p : R \rightarrow [0, 1]$ such that:

- (i) for both types $S(r_i)$, $r_i = \{r_L, r_H\}$, σ_S^* maximizes $U_S(r_i)$ given the optimal investment decision of the investor, v^* ;
- (ii) the optimal portfolio v^* is equal to (3.2), where the information set is $I_B = \{\pi, s_i, \sigma_S^*\}$;
- (iii) the belief distribution $(p, 1 - p)$ is rational and consistent with σ_S^* , i.e. $p = \Pr(r_H | \pi, s_i, \sigma_S^*)$.

We show that this equilibrium depends on the information set of the buyer, and precisely on the level of π . In particular, for $\pi \in [1/2, \pi_0)$ and in the absence of any other signals (i.e., before receiving advisor message σ_S), the investor would choose to invest a positive amount of wealth in the risky asset $v^* > 0$ regardless of the signal $s_i = \{r_H, r_L\}$ she received. On the contrary, for $\pi \in [\pi_0, 1]$ the investor's strategy (irrespective of the message σ_S) would be to invest a positive amount of wealth in the risky asset $v^* > 0$ if and only if $s_i = r_H$, while she chooses $v^* = 0$ for $s_i = r_L$. The optimal response of the advisor is different depending on the accuracy of the information owned by the investor he faces.

Lemma 1. *If Assumption 1 holds, then:*

- (i) *whenever $\pi \in [1/2, \pi_0)$ there exists a unique pooling equilibrium $(\sigma^*(r_H) = r_H; \sigma^*(r_L) = r_H)$;*
- (ii) *whenever $\pi \in [\pi_0, 1]$ there exists a unique fully revealing equilibrium $(\sigma^*(r_H) = r_H; \sigma^*(r_L) = r_L)$.*

Proofs to all lemmas are in the appendix. Lemma 1 shows that investors with relatively coarse information acquired on their own do not benefit from the opportunity to consult a professional advisor. This is because a buyer with $\pi \in [1/2, \pi_0)$ assign a low probability to the event $\tilde{r} = r_L$ and so she would choose $v^* > 0$ even if she receives signal $s_i = r_L$. As a consequence, seller $S(r_L)$ has no incentives to reveal his true type (as long as $F > (r_H - r_L)^2$), because if he did so the investor would no longer buy the asset and he would lose his commission F .

On the other hand, investors entering the game (S, B) with more precise information do receive extra information when they consult a professional

advisor. This is because the buyer with $\pi \in [\pi_0, 1]$ is informed enough to choose $v^* > 0$ when $s_i = r_H$ but not when $s_i = r_L$. Consequently, $S(r_L)$ has no incentive to deviate from the fully revealing equilibrium: if he did so he would still not earn F and he would have to pay the extra cost $(r_H - r_L)^2$.

Two insightful implications can be derived from Lemma 1:

- advisors are not useful to the investors who need them the most, because they fail to be a substitute to learning by one's self. Given this, we will see later that rational investors with a relative coarse information do not demand advice, even if this has a negligible cost;
- financial intermediaries/advisors have a regressive effect on the distribution of information among investors. They increase the information of the relatively more informed but do not provide any additional information to the less informed.

3.2.2 Investor's decision about consulting an advisor

At stage $t = 1$ the investor decides whether to consult a professional advisor or not, after observing the realization of the signal s_i . She picks the optimal choice comparing her utility in the two cases, correctly anticipating the advisor's behavior as outlined in Section 3.2.1 in case she decides to rely on his advice. For tractability, we let $\bar{U} = W_0 r_H$ be the maximum utility B can attain investing all her initial wealth W_0 in the risky asset when she is sure of the realization r_H .⁹ Recall that the investor pays an (arbitrarily small) advisory fee ϵ upon visiting the intermediary.

As before, investor's decision depends on the level of the precision of her acquired private signal π .

Lemma 2. *If \bar{U} is sufficiently large, then*

- (i) *whenever $\pi \in [1/2, \pi_0)$ the investor will be indifferent between consulting the advisor or not. For any arbitrarily small cost of advice ϵ she will choose to invest autonomously (not consult the advisor);*
- (ii) *whenever $\pi \in [\pi_0, 1]$ the investor will strictly prefer to consult the advisor.*

Lemma 2 shows that, since advisors would provide void advice to the least informed investors, the latter rationally do not visit them (as long as investors know the structure of advisors' incentives). As investors are able to anticipate the informativeness of the advisor's signal, advisors are

⁹This bound \bar{U} on utility is finite if the investor cannot borrow at r_f to invest in the risky asset.

consulted only by sufficiently informed investors who know they will receive meaningful information.

This result also directly implies that investors with high signal precision $\pi \geq \pi_0$, by consulting an advisor, are able to implement the “first best” investment decision, i.e. the one with complete information (because they learn the true state of \tilde{r} from the advisor). Instead, uninformed investors, by not visiting the advisor, make investment mistakes and hence suffer from ex-post losses, precisely because they are not sufficiently informed about the true state. This in turn bears further implications:

- as far as asset’s market is concerned, advisors/intermediaries do not eliminate noise trading from the market;
- as for asset prices, uninformed investors buy also in ‘bad times’, hence generating noise.¹⁰

3.3 Endogenous information precision

So far we have assumed that π was given. Let us now consider the choice of the optimal π^* at $t = 0$. For this purpose we introduce a further parameter k indicating investor’s exogenous level of financial literacy. This will allow us to verify what is the effect of financial literacy on the predictions of the model.

At $t = 0$ the investor buys a signal s_i and she can decide its optimal precision π^* . As in Peress (2004), this optimal level depends on the marginal benefit of additional signal precision in terms of future utility and on the marginal cost given by the effort of acquiring more information, where we assume that this effort depends negatively on financial literacy k .

In order to compute $\pi^*(k)$, the investor correctly anticipates the utility she will obtain at $t = 2$ under all possible scenarios regarding s_i , π , and the behaviour of the advisor (if consulted). As for the cost function $c(\pi, k)$, we assume that it is an increasing and convex function of effort and it is decreasing in financial literacy k : $\frac{\partial c(\pi, k)}{\partial \pi} > 0$, $\frac{\partial^2 c(\pi, k)}{\partial \pi^2} > 0$, $\frac{\partial c(\pi, k)}{\partial k} < 0$.

Using the results of Section 3.2.2 and equation (3.3), and recalling that ex-ante the probability of receiving either signal s_i is

$$f(s_i) = \begin{cases} s_i = r_H & 1/2 \\ s_i = r_L & 1/2 \end{cases}$$

we can write the ex-ante expected utility of investor B :¹¹

¹⁰The opposite, however, does not hold. This may be important to explain asset “bubbles”.

¹¹See Appendix for derivation of utility functions.

$$EU_B^{\pi \in [1/2, \pi_0]} = \frac{1}{2}U_B(\pi, s_i = r_H) + \frac{1}{2}U_B(\pi, s_i = r_L) - c(\pi, k) \quad (3.4)$$

$$EU_B^{\pi \in [\pi_0, 1]} = \frac{1}{2}\pi\bar{U} + \frac{1}{2}(1 - \pi)\bar{U} - c(\pi, k) = \frac{1}{2}\bar{U} - c(\pi, k) \quad (3.5)$$

and the optimal precision π^* is determined by

$$\pi^*(k) \in \arg \max_{\pi} EU_B^{\pi \in [1/2, \pi_0]}$$

The utility functions (3.4)-(3.5) together with the characterization of $\pi^*(k)$, allow us to study the effect of varying investor's financial literacy k on her choice about consulting a financial advisor.

Lemma 3. *If the following conditions are satisfied*

$$(i) \frac{\partial^2 EU_B^{\pi \in [1/2, \pi_0]}}{\partial \pi^2} < 0 \text{ with } \pi^* < \pi_0,$$

$$(ii) \frac{\partial EU_B^{\pi \in [\pi_0, 1]}}{\partial \pi} < 0 \text{ for } \pi \in [\pi_0, 1],$$

$$(iii) \frac{\partial^2 c(\pi, k)}{\partial k \partial \pi} < 0,$$

$$\text{then } \frac{\partial [EU_B^{*,adv} - EU_B^{*,self}]}{\partial k} > 0.$$

We discuss in the Appendix the relevance and appropriateness of conditions (i)-(iii) and devote Section 3.3.1 to illustrate an example of a standard cost function that satisfies these conditions.

Lemma 3 states that the difference between the maximum utility achievable by consulting an advisor and the one achievable investing autonomously is increasing in the level of financial literacy. This means that more literate investors are more likely to consult an advisor.

Investors with lower financial literacy k , coeteris paribus, choose lower levels of information precision $\pi^*(k)$ and (by Lemma 2) are not using professional advice. On the contrary, investors with greater financial literacy k become more informed and then are more likely to consult the advisor (and to receive informative signals from him). An analogous result is found empirically in (Hackethal, Haliassos, and Jappelli, 2009), who show that advisors are matched with wealthier and older investors, and not with poorer and inexperienced ones. This can be interpreted as evidence of the fact that advisors are consulted by more financially literate investors.

3.3.1 An analytical example

In this section we make an example on the functional form of $c(\pi, k)$, showing that it satisfies conditions (i)-(iii) of Lemma 3.

The candidate function is $c(\pi, k) = \frac{1}{k(1-\pi)^2}$. Let us check conditions one by one.

$$(i) \quad \frac{\partial^2 EU_B^{\pi \in [1/2, \pi_0]}}{\partial \pi^2} < 0 \text{ with } \pi^* < \pi_0.$$

$$(i.a) \quad \frac{\partial^2 EU_B^{\pi \in [1/2, \pi_0]}}{\partial \pi^2} < 0 \text{ (concavity). The condition is satisfied for}$$

$$\frac{A \pi^3 + (1 - \pi)^3}{2 \pi^3 (1 - \pi)^3} < \frac{6}{k(1 - \pi)^4}$$

that is

$$Ak < \frac{12\pi^3}{(1 - \pi)[\pi^3 + (1 - \pi)^3]}$$

$$\text{where } A = \frac{(r_L^2 + r_H^2)}{\gamma(r_H - r_L)^2}$$

$$(i.b) \quad \pi^* < \pi_0 \text{ (maximum).}$$

$$\pi^*(k) \in \arg \max_{\pi} EU_B^{\pi \in [1/2, \pi_0]}$$

$$\pi^*(k) = \frac{3kA \pm \sqrt{k^2 A^2 - 32kA}}{3kA + 16}$$

where $Ak \geq 32$ to ensure that $\pi^*(k)$ is a real number, and where the relevant solution is $\pi^*(k)_1 = \frac{3kA + \sqrt{k^2 A^2 - 32kA}}{3kA + 16}$ because $\frac{\partial \pi^*(k)_1}{\partial k} > 0$. Note that we need to impose $32 \leq Ak < \frac{12\pi^3}{(1-\pi)[\pi^3 + (1-\pi)^3]}$, which is true only for $\pi > 2/3$. In order to have that $\pi^* < \pi_0$ we also need to impose $\pi_0 > 2/3$ which is true for $r_H/r_L > -2$.

$$(ii) \quad \frac{\partial EU_B^{\pi \in [\pi_0, 1]}}{\partial \pi} < 0 \text{ for } \pi \in [\pi_0, 1] \text{ (utility decreasing in } \pi). \text{ We have that}$$

$$\frac{\partial EU_B^{\pi \in [\pi_0, 1]}}{\partial \pi} = -\frac{\partial c(\pi, k)}{\partial \pi} = -\frac{2}{k(1 - \pi)^3} < 0$$

$$(iii) \quad \frac{\partial^2 c(\pi, k)}{\partial k \partial \pi} = \frac{-2}{k^2(1-\pi)^3} < 0$$

3.4 Concluding remarks

We have analyzed the interaction between an informed intermediary who at the same time sells a risky financial product and provides information

to the customer, and a buyer who is less informed than the seller about the distribution of the risky asset payoff. Based on her prior knowledge, the investor decides whether to consult the advisor for further information. In turn, the advisor decides whether to reveal or not the information he possesses, depending on the costs and incentives he faces.

The analysis provides a number of results. First, advisors are not informative towards less informed investors, while they provide valuable information only to relatively more informed ones. This implies that advisors are not useful to the investors who need them the most, because they fail to be a substitute to learning by one's self.

Second, if investors know the structure of advisor's selling incentives, advisors are visited only by sufficiently informed individuals who know they will receive meaningful information. This result implies that only informed investors, by consulting an advisor, implement the "first best" investment decision, i.e. the one with complete information (because they learn the true state of \tilde{r} from the advisor), while uninformed investors, by not visiting the advisor, may make investment mistakes and hence suffer from ex-post losses.

Finally, higher financial literacy allows investors to obtain a higher (optimal) information precision about the distribution of asset's return, and hence to be more likely to receive reliable and informative advice.

These results provide a rationale for initiatives reducing the private costs of knowledge acquisition, because they suggest that learning about finance is necessary in order to make the right financial decisions even when financial advisors are available. Moreover, they show that the presence of advisors does little to alleviate the problem of low financial literacy, at least as long as they are at the same time selling financial assets. It appears that non completely independent financial advisors cannot be substitutes of individual financial literacy. As a specular result, these advisors are rarely relied upon by low financial literacy investors, who need advice the most.

Appendix: Proofs

Proof of Lemma 1: Let us start considering the case $\pi \in [1/2, \pi_0)$:

- (i) *Existence.* Remember that, if the investor were to base her portfolio decision on her information set without any additional information from the advisor, when $\pi \in [1/2, \pi_0)$ she would choose to invest $v^* > 0$ regardless of the realization of the signal $s_i = \{r_H, r_L\}$ received.

The candidate equilibrium is a pooling equilibrium where $\sigma(r_i)^* = r_H$ for both $r_i = \{r_H, r_L\}$ and where the equilibrium payoffs of the advisor are $U_{S(r_H)}^* = F$ and $U_{S(r_L)}^* = F - (r_H - r_L)^2$.

Consider a deviation $\sigma(r_L) = r_L$. Observing such an out of equilibrium message, the investor assigns a probability $q = Pr(r_H|\sigma = r_L)$ to the event that such message was sent by $S(r_H)$. Notice that for any belief $q \in]0, 1[$ the equilibrium payoff $S(r_H)$ obtains is larger than the one he would obtain by deviating, that is $U_{S(r_H)}^{dev} = \max\{F - (r_H - r_L)^2, -(r_H - r_L)^2\} = F - (r_H - r_L)^2 < F = U_{S(r_H)}^*$. On the contrary, the deviation may be profitable for $S(r_L)$ if q is such that the investor buys $v^* > 0$, by Assumption 1 (i.e. $F - (r_H - r_L)^2 > 0$). Hence, using the intuitive criterion (Cho and Kreps, 1987), we can restrict the out of equilibrium beliefs to $q = 0$. Under these beliefs, it is not profitable for $S(r_L)$ to deviate from the pooling equilibrium.

Finally, consider any deviation in mixed strategies, where for example $S(r_L)$ sends message $\sigma(r_L) = r_L$ with probability $\tau > 0$. An investor observing $\sigma = r_L$ even with a small probability assigns a higher belief to the event that such message was sent by $S(r_L)$ (i.e., again, it would be more profitable to deviate for $S(r_L)$ than for $S(r_H)$). But then $S(r_L)$ would reveal her type sending $\sigma(r_L) = r_L$ and obtain a payoff lower than in equilibrium.

Uniqueness. Let us show that in the region $\pi \in [1/2, \pi_0)$ the pooling equilibrium $(\sigma(r_i)^* = r_H)$ is unique.

- Rule out the perfectly revealing equilibrium $(\sigma(r_H) = r_H; \sigma(r_L) = r_L)$. Equilibrium payoffs are $U_{S(r_H)}^* = F$ and $U_{S(r_L)}^* = 0$. In this case it would be profitable for $S(r_L)$ to deviate sending $\sigma(r_L) = r_H$ and obtaining $U_{S(r_L)}^{dev} = F - (r_H - r_L)^2$ since $F - (r_H - r_L)^2 > 0$ by Assumption 1.
- Rule out the perfectly revealing equilibrium $(\sigma(r_H) = r_L; \sigma(r_L) = r_H)$. Equilibrium payoffs are $U_{S(r_H)}^* = F - (r_H - r_L)^2$ and $U_{S(r_L)}^* = 0 - (r_H - r_L)^2$. However, it is profitable for $S(r_H)$ to send $\sigma(r_H) = r_H$ (resulting in payoff $U_{S(r_H)}^{dev} = F > U_{S(r_H)}^*$), as well as it is profitable for $S(r_L)$ to send message $\sigma(r_L) = r_L$ (resulting in payoff $U_{S(r_H)}^{dev} = 0 > U_{S(r_L)}^*$).
- Rule out partially revealing equilibria, where $\sigma(r_H) = (r_H, r_L)$ with probability $(m, 1 - m)$ and $\sigma(r_L) = (r_H, r_L)$ with probability $(n, 1 - n)$, where $0 < m < 1$ and $0 < n < 1$. A necessary condition for the existence of such a mixed strategy equilibria is that, for each type of seller, the payoff obtained by playing either signal should be the same in equilibrium. This is clearly not verified, as long as $F \neq (r_H - r_L)^2$. For instance the payoff for the high-type seller $S(r_H)$ playing $\sigma = r_H$ can be either F or 0, while the payoff for the high-type seller playing $\sigma = r_L$ can be either

$$F - (r_H - r_L)^2 \text{ or } -(r_H - r_L)^2.$$

Now consider the case $\pi \in [\pi_0, 1)$.

- (ii) *Existence.* Note that if the buyer does not receive any additional information from the seller (i.e. as in a pooling equilibrium) when $\pi \in [\pi_0, 1)$ the investor chooses $v^* > 0$ when $s_i = r_H$, and $v^* = 0$ for $s_i = r_L$. Since the advisor does not observe the realization of the signal $s_i = (r_H, r_L)$, a high-type advisor will expect $v^* > 0$ with probability π and $v^* = 0$ with probability $(1 - \pi)$. On the contrary, a low-type seller expects $v^* > 0$ with probability $(1 - \pi)$ and $v^* = 0$ with probability π .

The candidate equilibrium is a fully revealing equilibrium where $\sigma(r_i)^* = r_i$ for $r_i = \{r_H, r_L\}$, and where the equilibrium payoffs of the seller are $U_{S(r_H)}^* = F$ and $U_{S(r_L)}^* = 0$.

Consider a unilateral deviation $\sigma(r_H) = r_L$ by $S(r_H)$. Given investor's prior beliefs $(\pi, 1 - \pi)$, this deviation is not profitable because the payoff would be $U_{S(r_H)}^{dev} = \pi F - (r_H - r_L)^2 < U_{S(r_H)}^*$.

Consider now a unilateral deviation $\sigma(r_L) = r_H$ by $S(r_L)$. This would give the seller the payoff $U_{S(r_L)} = (1 - \pi)F - (r_H - r_L)^2 < 0 = U_{S(r_L)}^*$ by Assumption 1 and by considering that $\pi > \pi_0$.

Finally, consider a deviation in mixed strategies, where seller $S(r_H)$ sends message $\sigma(r_H) = r_L$ with probability $\tau > 0$. This, again, is not a profitable deviation because it would result in a payoff $\pi F - (r_H - r_L)^2 < U_{S(r_H)}^*$ when $\sigma(r_H) = r_L$ realizes.

Uniqueness. Let us prove that in the region $\pi \in [\pi_0, 1)$ the fully revealing equilibrium ($\sigma(r_i)^* = r_i$) is unique by showing that all other equilibria do not exist:

- Pooling equilibrium ($\sigma(r_H) = r_H; \sigma(r_L) = r_H$). If this strategy profile was an equilibrium the payoffs would be $U_{S(r_H)}^* = \pi F$ and $U_{S(r_L)}^* = (1 - \pi)F - (r_H - r_L)^2$. But this cannot be true since then it would be profitable for $S(r_L)$ to send message $\sigma(r_L) = r_L$ obtaining $U_{S(r_L)}^{dev} = 0$ since $(1 - \pi)F - (r_H - r_L)^2 < 0$ by Assumption 1.
- Pooling equilibrium ($\sigma(r_H) = r_L; \sigma(r_L) = r_L$). If this was an equilibrium, the payoffs would be $U_{S(r_H)}^* = \pi F - (r_H - r_L)^2$ and $U_{S(r_L)}^* = (1 - \pi)F$. Again, this is not true since then it would be profitable for $S(r_H)$ to send message $\sigma(r_H) = r_H$ obtaining $U_{S(r_H)}^{dev} = F > U_{S(r_H)}^* = \pi F - (r_H - r_L)^2$.

- Partially revealing equilibria, where $\sigma(r_H) = (r_H, r_L)$ with probability $(m, 1-m)$ and $\sigma(r_L) = (r_H, r_L)$ with probability $(n, 1-n)$, where $0 < m < 1$ and $0 < n < 1$. Analogous to the proof for point (i). ■

Proof of Lemma 2: Let us compare the utility the investor would obtain by consulting the advisor and by investing autonomously. For convenience of exposition, let us consider four separate cases:

- $s_i = r_L$ and $\pi \in [1/2, \pi_0)$: the investor anticipates an uninformative signal from the advisor by Lemma 1, so the utility she would obtain by consulting an advisor is the same she would obtain investing by herself. Given that $\pi \in [1/2, \pi_0)$ she would choose $v^* > 0$ even when receiving $s_i = r_L$. Therefore her utility in this case is $U_B^{adv} = U_B^{self} = \frac{1}{2} \frac{(E[\tilde{r}|s_i=r_L, \pi])^2}{\gamma \text{Var}[\tilde{r}|s_i=r_L, \pi]}$. In this case, for any small cost of advice ϵ the investor prefers not to visit the intermediary.
- $s_i = r_L$ and $\pi \in [\pi_0, 1]$: the investor anticipates an informative signal from the advisor by Lemma 1. The utility she would obtain by consulting an advisor is $U_B^{adv} = (1 - \pi)\bar{U}$. This is because when $s_i = r_L$ the investor's expected probability that the true state is r_H is $(1 - \pi) = Pr(s_i = r_L|r_H)$. Moreover, if the advisor's signal is $\sigma^*(r_H) = r_H$ the variance of her portfolio goes to zero. We put an (arbitrarily large) bound to \bar{U} to avoid enjoying then an infinite utility. The utility she would obtain investing by herself is $U_B^{self} = 0$, because, when $\pi \in [\pi_0, 1]$, $E[\tilde{r}|s_i = r_L] = \pi r_L + (1 - \pi)r_H < 0$ and she would rather not invest in the risky asset. Since $U_B^{adv} = (1 - \pi)\bar{U} > 0$ visiting the advisor is strictly preferred by the investor.
- $s_i = r_H$ and $\pi \in [1/2, \pi_0)$: as before, by Lemma 1, the investor anticipates an uninformative signal from the advisor: she chooses $v^* > 0 \forall s_i$ and her utility is $U_B^{adv} = U_B^{self} = U(\pi, s_i = r_H)$. In this case, for any small cost of advice $\epsilon > 0$ the investor prefers not to visit the intermediary.
- $s_i = r_H$ and $\pi \in [\pi_0, 1]$: by Lemma 1, the investor anticipates an informative signal from the advisor so that the utility she would obtain by consulting an advisor is $U_B^{adv} = \pi\bar{U}$. This is because when $s_i = r_H$ the investor's expected probability that the true state is r_H is $\pi = Pr(s_i = r_H|r_H)$. Since the advisor is perfectly informed, the variance of the portfolio goes to zero. The utility she would obtain by herself is $U_B^{self} = U(\pi, s_i = r_H) = \frac{1}{2} \frac{(E[\tilde{r}|s_i=r_H, \pi])^2}{\gamma \text{Var}[\tilde{r}|s_i=r_H, \pi]}$. Given that \bar{U} is arbitrarily large, we can safely assume that $\pi\bar{U} > U(\pi, s_i = r_H) \quad \forall \quad \pi \in [\pi_0, 1]$,

and so visiting the advisor is preferred by the investor. ■

Derivation of utility functions in Section 3.3. For the case $s_i = r_H$, the expected value and variance of \tilde{r} are:

$$\begin{aligned}
E[\tilde{r}|\pi, s_i = r_H] &= r_H Pr[r_H|s_i = r_H] + r_L Pr[r_L|s_i = r_H] \\
&= r_H \frac{Pr[r_H]Pr[s_i = r_H|r_H]}{Pr[s_i = r_H]} + r_L \frac{Pr[r_L]Pr[s_i = r_H|r_L]}{Pr[s_i = r_H]} \\
&= r_H \frac{1/2\pi}{1/2\pi + 1/2(1-\pi)} + r_L \frac{1/2(1-\pi)}{1/2\pi + 1/2(1-\pi)} \\
&= \pi r_H + (1-\pi)r_L
\end{aligned}$$

and

$$\begin{aligned}
Var[\tilde{r}|\pi, s_i = r_H] &= \sum_i [r_i - E(\tilde{r}|s_i = r_H)]^2 Pr(r_i|s_i = r_H) \\
&= [r_H - E(\tilde{r}|s_i = r_H)]^2 Pr(r_H|s_i = r_H) + \\
&\quad + [r_L - E(\tilde{r}|s_i = r_H)]^2 Pr(r_L|s_i = r_H) \\
&= \pi(1-\pi)(r_H - r_L)^2
\end{aligned}$$

The case $s_i = r_L$ is analogous. We therefore have

$$\begin{aligned}
EU_B^{\pi \in [1/2, \pi_0]} &= \frac{1}{2}U_B(\pi, s_i = r_H) + \frac{1}{2}U_B(\pi, s_i = r_L) - c(\pi, k) \\
&\quad + \frac{[\pi r_H + (1-\pi)r_L]^2}{4\gamma\pi(1-\pi)(r_H - r_L)^2} + \frac{[\pi r_L + (1-\pi)r_H]^2}{4\gamma\pi(1-\pi)(r_H - r_L)^2} - c(\pi, k)
\end{aligned}$$

Proof of Lemma 3: let us first check conditions (i)-(iii):

- (i) This is verified for $\frac{(r_L^2 + r_H^2)}{2\gamma(r_H - r_L)^2} \frac{\pi^3 + (1-\pi)^3}{\pi^3(1-\pi)^3} < \frac{\partial^2 c(\pi, k)}{\partial \pi^2}$;
- (ii) $\frac{\partial EU_B^{\pi \in [\pi_0, 1]}}{\partial \pi} = -\frac{\partial c(\pi, k)}{\partial \pi} < 0$ whenever $\frac{\partial c(\pi, k)}{\partial \pi} > 0$ as we assumed before;
- (iii) condition $\frac{\partial^2 c(\pi, k)}{\partial k \partial \pi} < 0$ means that for increasing k the marginal cost of effort is decreasing.

We can write $EU_B^{*,adv} - EU_B^{*,self}$ by recalling from Section 3.2.2 that for $\pi \in [1/2, \pi_0)$ the investor chooses to invest autonomously and for $\pi \in [\pi_0, 1]$ she will consult the advisor. We therefore compute the maximum value of the two ‘portions’ of the utility function by substituting π^* in $EU_B^{\pi \in [1/2, \pi_0)}$, and π_0 in $EU_B^{\pi \in [\pi_0, 1]}$. We then compute:

$$\begin{aligned}
EU_B^{*,adv} - EU_B^{*,self} &= \frac{1}{2}\bar{U} - c(\pi_0, k) + \\
&\quad - \left\{ \frac{[\pi^* r_H + (1 - \pi^*) r_L]^2}{4\gamma\pi^*(1 - \pi^*)(r_H - r_L)^2} + \right. \\
&\quad \left. + \frac{[\pi^* r_L + (1 - \pi^*) r_H]^2}{4\gamma\pi^*(1 - \pi^*)(r_H - r_L)^2} - c(\pi^*, k) \right\}
\end{aligned}$$

from which we can show that

$$\begin{aligned}
\frac{\partial[EU_B^{*,adv} - EU_B^{*,self}]}{\partial k} &= \frac{\partial c(\pi^*, k)}{\partial k} - \frac{\partial c(\pi_0, k)}{\partial k} \\
&= -\frac{\partial[c(\pi_0, k) - c(\pi^*, k)]}{\partial k} > 0
\end{aligned}$$

for $\frac{\partial c(\pi, k)}{\partial \pi} > 0$, $\pi_0 > \pi^*$, and $\frac{\partial^2 c(\pi, k)}{\partial k \partial \pi} < 0$. ■

Chapter 4

Financial literacy and the demand for financial advice

4.1 Introduction

The growing research on financial literacy suggests that consumers' knowledge of basic financial principles and products is quite scarce, and that it may not be sufficient to guarantee that households make sound financial decisions. For instance, more financially illiterate households are more prone to high-cost borrowing (Lusardi and Tufano, 2008), lack of planning and saving for retirement (Lusardi and Mitchell, 2006, 2007a), portfolio underdiversification (Guiso and Jappelli, 2008; Kimball and Shumway, 2007), and so on.

However, one may argue that a low level of households' financial literacy does not necessarily imply that they will make poor financial decisions. In principle, households could seek advice and guidance from qualified sources, such as independent financial advisors, bankers, brokers, and other professionals. As long as households can resort to the advice of experts for their financial decisions, the lack of financial literacy may look less worrisome, as external advice could act as a substitute for learning by one's self.

In practice, a number of factors may limit consumers' willingness to consult professionals and rely on their recommendations. Financial decisions are not only difficult because of the skills and technical knowledge required, but also because potential sources of information and advice may not be completely fair and may not act in the consumers' interest. For instance, in markets for technically complex products, such as financial ones, consumers often rely on the advice provided by representatives of the seller, who perform the conflicting tasks of advising customers and selling financial products (European Commission, 2009).

Conflicts of interest and misselling practices, i.e. selling a product that may not match a customer's needs, have been the focus of some theoretical

research. Conflicts of interest typically arise from the structure of advisor's incentives and from market imperfections (Bolton et al., 2007; Daniel et al., 2002; Inderst and Ottaviani, 2009; Krausz and Paroush, 2002), and may affect consumers' demand for advice through different channels. For instance, investor's may be less willing to seek and follow advice if they are more aware of advisors' conflict of interest (Hackethal, Inderst, and Meyer, 2010), or if they know they will receive more or less 'informative' advice according to their own financial literacy (see results of chapter 3).

The previous literature on the use of external sources of advice suggests that the use of 'experts' is not uniformly distributed in the population. Some papers report evidence of the preferred sources of information and advice among US and European consumers (Lusardi, 2003; Lusardi and Mitchell, 2006; EBRI, 2007; van Rooij et al., 2007). In general, they find that higher financial literacy investors are more likely to use 'formal' sources of information and advice (e.g., newspapers, internet and financial advisors), as opposed to 'informal' ones, such as friends, relatives, colleagues and neighbors. This is consistent with the findings of Hackethal, Haliassos, and Jappelli (2009), who devote part of their analysis to the demand for financial advice and argue that advisors are consulted by those who need them relatively less, since they are matched with wealthier and older investors, rather than with poorer and inexperienced ones.

This paper contributes to the literature by investigating the role of financial literacy on the demand for financial advice. In particular, I will study which investors seek advice, from whom, and to what extent they rely on advice.

This is relevant for consumers, scholars and policy-makers. Consumers are affected by (whether and) which advice they demand because investment performance and households' wealth accumulation depend on who ultimately takes portfolio management decisions. Moreover, the concerns expressed by scholars and policy-makers about the lack of financial literacy would look less worrying if individual gaps were compensated by external advice coming from reliable and qualified sources.

The analysis explores empirically the choice among sources of financial information and advice, and the extent to which customers rely on the advice provided by their bank (or their financial advisor), using the 2007 Unicredit Customers' Survey (UCS). Even though not representative of the Italian population as a whole, the survey is a representative sample of the customers of one of the largest Italian banks and contains detailed information on socio-demographic characteristics, wealth holdings, and portfolio composition. The 2007 survey also contains additional information on financial literacy, trust and investment attitudes.

The rationale for concentrating on relations with intermediaries has to do with the fact that they represent the main source of financial information in Italy. Figure 4.1 reports evidence from a survey of Italian investors'

behavior (Beltratti, 2007), showing that banks are the main source of financial information and advice, both with respect to professional sources of advice and overall. The same is true in Figure 4.2 from the UCS, showing that banks are the sources of advice visited most often. This preference for intermediaries among professional sources of advice is in part explained by the fact that the supply of independent financial advice (fee-based) is very limited in Italy.

This paper improves upon the existing literature in several ways. Some of the previous papers (Lusardi, 2003; Lusardi and Mitchell, 2006; EBRI, 2007; van Rooij et al., 2007) provide only descriptive evidence based on univariate statistics, while I am able to investigate the issue in a multivariate framework. Moreover, this paper extends the analysis beyond the choice of preferred sources of advice, by focusing on the relationship between investors and professional financial advisors and by studying how much individuals rely on the advice of experts. In doing this, I extend the analysis of Hackethal, Haliassos, and Jappelli (2009) by including other important factors, such as financial literacy and trust, which are missing in their analysis (due to the use of administrative data). Finally, the paper addresses potential endogeneity issues regarding financial literacy and trust.

The results indicate that, even controlling for a number of important factors such as trust towards one's advisor, self-confidence in own financial ability, wealth and opportunity cost of time, financial literacy is an important factor in the demand for financial advice. First, the positive association between financial literacy and the use of formal sources of advice previously found in the literature is confirmed. Second, financial literacy increases the probability of consulting the bank/financial advisor, while at the same time it reduces that of delegating. In a context where the supply of independent financial advice is extremely limited, this may be the wisest choice. These findings confirm the theoretical results of chapter 3 that advisors are less used by investors who need them the most. This implies that the presence of qualified sources of advice may not be enough to counteract the effects of the low level of financial literacy and that further policy measures may be needed to ensure sound financial decision-making.

The rest of the paper is organized as follows. Section 4.2 discusses the previous literature, highlighting the potential determinants of the demand for financial advice and the role of financial literacy. Section 4.3 presents the dataset and the construction of the main variables used in the analysis. Section 4.4 describes the empirical strategy for estimation, while section 4.5 presents the results for the use of financial advisors in comparison to informal sources, and for the extent of reliance on financial advisors. Section 4.7 concludes.

4.2 Background

4.2.1 Financial literacy and financial advice

Deciding how to allocate one's savings in risky investments is not an easy task for households and financial literacy is likely to have a role in this decision. However, the literature studying specifically financial literacy has explored the demand for financial advice only incidentally, even though the ability "to know where to go for help" is recognized as an important element for financial well-being (OECD, 2008; President's Advisory Council on Financial Literacy, 2008).¹

As financially literate investors have a better understanding of financial products and concepts, one might expect them to have an easier access to financial markets, suggesting that they may have a lower need for financial advisors. Financial knowledge can be interpreted as a way to reduce participation costs, since it has to do with "understanding basic investment principles as well as acquiring enough information about risks and returns to determine the household's optimal mix between stocks and riskless assets" (Vissing-Jorgensen, 2004, p. 179), which is typically identified as one of the main costs to stock market participation.² van Rooij et al. (2007) show that financial literacy is related to higher stock market participation among Dutch households. If financial literacy increases stock market participation, then it may also increase the probability of investing autonomously and having less of a need for external support.

However, much of the existing literature suggests the opposite, i.e. that advice is demanded by knowledgeable investors and not by financially illiterate ones.

The theoretical predictions of chapter 3 are that more informed and knowledgeable investors are more likely to receive 'informative' and valuable advice from an intermediary/advisor and (in anticipation of this) they are more likely to consult them and follow their advice with respect to less informed and knowledgeable consumers.³

¹"Financial education is the process by which financial consumers/ investors improve their understanding of financial products and concepts and, through information, instruction and/or objective advice, develop the skills and confidence to become more aware of financial risks and opportunities, to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being (OECD, 2005, 2008)".

²Clearly, information barriers to stock market participation have to do also with cognitive abilities (Christelis et al., 2010).

³This is not in contradiction with the findings of Hackethal, Inderst, and Meyer (2010), who argue that conditional on receiving advice from a professional advisor, more knowledgeable investors are less likely to follow his recommendations, because they are able to scrutinize his advice. From an empirical point of view they also show that investors reporting that they have a great interest in financial matters and that they keep themselves informed are less likely to agree with the statement "with respect to financial issues, I

This is broadly consistent with the existing empirical evidence. Earlier works provide some descriptive evidence about the demand for financial advice. Lusardi (2003) shows that according to the 1995 Survey of Consumer Finances financial planners/brokers are among the sources of information used most often by 50-61 years-olders to make decisions about saving and investments (together with relatives/ friends and magazines/ newspapers). However, respondents in the 2007 Retirement Confidence Survey show some reluctance in the use of formal sources of advice for retirement planning (EBRI, 2007).

Further empirical (but mainly descriptive) evidence on financial literacy suggests that it may affect the choice of financial advisors and information sources (Bernheim, 1998). Lusardi and Mitchell (2006) show that individuals who are correct about three financial literacy questions tend to use formal tools for retirement planning (attend retirement seminar; use calculator/worksheet; consult a financial planner) rather than informal ones (talk to family, friends, coworkers). At the same time, those who used more sophisticated tools were always more likely to get the literacy questions right, as compared to those who relied on personal communications. Similar evidence is found in the Netherlands, where those who display high levels of basic and advanced financial literacy are less likely to rely on informal sources of information (family, friends) and are more likely to rely on formal sources (read newspapers, consult financial advisors, and seek information on the internet) (van Rooij et al., 2007).⁴ Moreover, Hackethal, Haliassos, and Jappelli (2009) show that advisors are matched with wealthier and older investors, rather than with poorer and inexperienced ones, suggesting that the demand for advice might be a complement rather than a substitute to financial literacy.

Finally, the idea that advice is demanded by more knowledgeable investors is shared also by the psychological research. This literature points to the fact that individuals who do not know much about (any) subject tend not to recognize their ignorance, and so fail to seek better information. Relatively less knowledgeable people are more likely to overestimate their abilities, and as a consequence of their incompetence they also lack the metacognitive ability to realize it (Kruger and Dunning, 1999). This effect appears to be there also in the financial domain (Forbes and Kara, 2010).

constantly rely on the advice of my financial advisor”.

⁴One may argue that also ‘formal’ sources may act misleadingly, and that not necessarily resorting to them is a guarantee of sound financial decisions. For instance, investors may follow unscrupulous financial ‘gurus’, or use unreliable internet advisory websites and financial press. However, these sources are still more likely to provide valuable information than non-professional sources, such as friends, neighbors and relatives. This can be the case especially if individuals pair with similar people in terms of education and financial literacy (i.e, if low financial literacy investors have low financial literacy friends), and if investment knowledge is shared through social interaction with peers (Hong et al., 2004; Duflo and Saez, 2002).

Overall, this evidence suggests that a further investigation of the effect of financial literacy on the demand for advice – especially in the relation with professional sources of advice, such as banks, brokers and financial advisors – is needed.

4.2.2 Other determinants of the demand for financial advisors

Even though self-assessed financial knowledge is often correlated with more objective measures (Guiso and Jappelli, 2008; van Rooij et al., 2007), it is likely to drive the demand for financial advice independently from the latter. Georgarakos and Inderst (2010) study from a theoretical point of view the effect of investors' (perceived) financial capability on their decision to participate to the stock market and whether to do so by relying on a professional advisor or on their own judgment. As expected, when perceived financial capability is higher the investor is more likely to hold risky assets and to rely on her own knowledge instead of an advisor.

Moreover, it is important to disentangle self-assessed and test-based financial literacy also because financial education initiatives aiming at improving financial literacy may have the side-effect of raising self-confidence without improving ability, leading to worse decisions (Willis, 2008).

Another potentially important factors is trust in advisors. As was argued before, there are reasons to believe that the market for financial advice is imperfect. Not only advisors do not appear to correct investors' behavioral biases (Mullainathan et al., 2010; Shapira and Venezia, 2001), but it is apparent that conflicts of interest may affect the supply of financial advice (European Commission, 2009). As a matter of fact, cheating does happen in financial markets. Data from the European Social Survey 2004 show that, when asked how many times they had been cheated by a bank or insurance company in the last 5 years, non-negligible shares of the population reported of having experienced cheating more than once. Figure 4.3 shows the distribution to this answer for some European countries.

In all the situations where investors may be afraid of being treated unfairly by their advisor or broker, trust becomes important for the investment to take place. Gambetta (1998) defines trust as “the subjective probability with which an agent assesses that another agent or group of agents will perform a particular action (p. 217)”. Recent research has shown that lack of trust in the financial system and financial intermediaries reduces the probability of investing in the stock market. Guiso et al. (2008) show that individuals who think that most people can be trusted are more likely to buy stocks, and conditional on participation to the stock market they hold more. Moreover, they show that personalized trust (i.e. trust in one's own bank or financial advisor) has a positive role in stockholding. Similarly,

Pasini and Georgarakos (2009) report evidence of a positive effect of trust in financial institutions on stock market participation across countries. This is because when the investor perceives a high probability of being cheated she reduces her expected return from a financial investment, and if this is not high enough she will be better off staying out of the stock market. Trust in financial institutions appears to matter also for participation in 401(k) plans. Agnew et al. (2007) find that (lack of) trust is related to the decision to quit the plan in the presence of automatic enrollment.

Last but not least, wealth and the opportunity cost of time are also important. Hackethal, Haliassos, and Jappelli (2009) study the investment behaviour of the customers of a large German brokerage firm and investigate the probability that investors have their accounts run by an independent financial advisor. They show that advisors tend to be matched with wealthier and older investors, who presumably delegate their investment decisions (also) because of a high opportunity cost of time.

4.3 Data and descriptives

The Unicredit Customers' Survey is a representative sample of the customers of one of the largest Italian banks (Unicredit group). Eligible interviewees are account holders with at least 10,000 euro in the bank at the end of 2006. The 2007 UCS survey samples 1,686 individuals. Even though sample selection is based on individual Unicredit customers, the survey has detailed information on demographic characteristics of all components of account holders' households, including their labour market position, income, and household wealth (financial wealth, real assets, insurance policies and pensions).⁵ Additionally, the account holder is asked about her relations with the bank, her attitudes towards investments, and her level of financial literacy. The only information available based on the bank's administrative records is related to financial wealth holdings, while other (potential) pieces of administrative information – for instance about portfolio allocation, risk profile, advisors fixed effects, etc. – are not available.

Table 4.1 describes the construction of the main UCS variables used in the analysis, and contains description and data sources for the variables not contained in the Unicredit dataset.

⁵Analyzing respondents who are customers of the same bank has advantages and shortcoming. One drawback is that the choice of the bank is certainly not random and it might be driven by the same factors that affect the extent of reliance on the bank as a source of advice. This selection, however, cannot be controlled for. Moreover, cross-bank heterogeneity cannot be used to explore, for instance, cost effects. On the positive side, analyzing customers of the same bank reduces unobserved heterogeneity (for instance in terms the cost and type of advice provided, etc.).

Summary statistics for the variables used in the analysis are reported in Table 4.2. Bank customers are on average 55 years of age and about one third are females; 32% are employees, 28% are self-employed and 33% are retired; they earn an average (total) individual income of 50,000 euro per year and 45% of the sample has been a customer of Unicredit for at least 20 years.

In addition, Table 4.3 shows a comparison between the UCS and the Bank of Italy's Survey on Household Income and Wealth (SHIW), which is a nationally representative sample. To improve comparability, I selected three sub-samples from the SHIW: the sample of household heads (because in the SHIW financial literacy tests are asked only to household heads), the sample of those who hold an account at a bank or at a post office (because the UCS only samples account holders), and finally the sub-sample of household heads who hold a bank/post account. In general, the Unicredit sample is older, more educated, more likely to live in the North, and with higher family income. Given that financial literacy is correlated with education, income and is usually higher in northern regions, it is reasonable to expect the UCS sample to display higher financial literacy than the SHIW one. However, it is hard to make financial literacy comparisons. First, it is not possible to compare single items since tests are different.⁶ Second, it is not easy to make comparisons even by looking at the overall performance. On average UCS respondents report more correct answers, display a considerably lower number of "do not know"s and a lower fraction of individuals gave zero correct answers. Nevertheless, in the UCS there is a higher share of incorrect answers than in the SHIW.

Let us now describe in more detail the main variables used in the analysis. The dependent variables refer to the use of various sources of advice, and of professional advisors in particular. Descriptives about the use of different sources are reported in Table 4.4. Banks and brokers (*promotori finanziari*) are those visited most often, while friends/ relatives/ colleagues and internet are rarely used.⁷ As for the extent of reliance on advice from a professional about financial investments decisions, respondents' choice between investing autonomously or delegating is reported in Table 4.5. About 12% of the respondents with risky assets decide completely by themselves, 68% ask for their banks's / advisors' advice before forming their own decisions, while almost 20% rely mostly or completely on advisors' indications.

Other variables of interest are financial literacy and trust. The financial

⁶The questions about inflation is similar, even though with a slightly different wording. On this questions the share of correct answers is much higher in the nationally representative SHIW sample than in the Unicredit one.

⁷In Italy trade unions too can be considered as a source of financial advice, especially in relation to occupational pension funds. However, I will not consider their role in the present study, both because the focus here is not on retirement savings and, above all, because no information about workers' relations with trade unions is present in the data.

literacy measure is constructed as in Guiso and Jappelli (2008) and equals the number of correct answers to eight questions on interest, inflation, understanding risk diversification and understanding the riskiness of various financial products. The wording of the tests is reported in Table 4.1 and the answers are displayed in Table 4.6. The average index corresponds to 4.7 correct questions out of 8 and less than 1% of the sample can answer all of them correctly; the overall distribution of correct answers is displayed in Figure 4.4.

The measure of personalized trust is based on how much trust the respondent has in his advisor concerning his financial investments. The average answer is 3.8 on a scale from 1 to 5, where higher values indicate higher trust.

4.4 Empirical strategy

To assess the impact of financial literacy on the demand for financial advice, I conduct two sets of analyses. In the first one, I analyze in a multivariate model investors' use of different sources of financial information and advice and their preferences for professional sources over informal ones, such as friends, relatives and colleagues. This allows to verify whether the positive relation between financial literacy and use of formal sources, shown in the US (Lusardi and Mitchell, 2006) and the Netherlands (van Rooij et al., 2007), holds also in the Italian data. In the second part, I concentrate on the relation between investors and professional financial advisors, and I analyze the extent of reliance on financial advisors. As about 6% of the sample reports that Unicredit is not their main bank, these observations are dropped from the analysis, and only observations where Unicredit is the main or only bank are used.

Descriptives about the use of various sources of advice are reported in Table 4.4. Banks and brokers are those visited most often, while friends/relatives/colleagues and internet are seldom used.

The empirical specification used to assess the preference among different sources of advice is the following probit model with selection

$$P_{jk} = 1[X_1\beta_1 + u_1 > 0]$$

$$S = 1[X\delta_2 + v_2 > 0]$$

where P_{jk} is a dummy taking value one when source j is used very often or when source j is preferred to source k , depending on specifications. I define a source j to be preferred to source k when source j is used more often than source k . Informal sources include family, friends, and colleagues. Explanatory variables in X_1 include gender, age, years of education, occupa-

tional status, (macro) regions of residence, log individual income, financial wealth categories,⁸ experience, whether the respondent works in the financial sector, length of bank relationship, financial literacy, self-confidence and trust, and X includes X_1 plus some variables serving as exclusion restrictions. (u_1, v_2) is assumed to be distributed as a bivariate normal. Source use/preference is observed only when investors hold risky assets and devote a positive amount of time to becoming informed about financial issues (this defines the sample selection, i.e. $S = 1$). The exclusion restrictions used are risk preferences and zero saving rate, because they affect the propensity to hold risky assets while they are not related to the frequency of use of any source of advice. It is more difficult to find credible exclusion restrictions affecting the propensity to spend at least some time to gather financial information. The selection turns out to be not significant (i.e., not statistically different from random) in most specifications.

In the second part of the analysis I analyze the effect of financial literacy on the extent of investors reliance on their financial advisor. Descriptive statistics about the choice between investing autonomously or delegating are reported in Table 4.5.

Table 4.7 reports the financial literacy distribution across modes of investment, showing that investors choosing an intermediate level of delegation (i.e., those who ask for the bank/advisor's opinion before investing) have higher financial literacy than those on the two extremes (i.e., those either investing by themselves, or fully delegating). To see whether this is confirmed in a more thorough analysis, I estimate an ordinal response model of the probability of choosing one of the five possible values.

Since the question about the extent of reliance on financial advice is asked only to a sub-sample of the survey (i.e., those who hold risky assets), the relation is first estimated by ordered probit controlling for the selection bias, and using the same exclusion restrictions as before (i.e., risk preferences and zero saving rate). As the selection is not significant,⁹ I proceed with the econometric analysis disregarding the selection issue.

⁸Financial wealth (dummies) are based on the bank's administrative records (indicating the amount of financial wealth held by the customer at the end of the year 2006) and are 'augmented' with self-reported financial wealth when the self-report exceeds the administrative information. This is to allow for the possibility that respondents hold additional financial assets outside their Unicredit account. Basing this variable on administrative data corrects the heavy item non-response and under-reporting of the 'subjective' financial wealth measure, where about 54% of the sample refuses to indicate in which range their wealth is included and the remaining respondents who provide an answer often under-report their holdings (i.e., indicate a lower bracket with respect to the administrative data).

⁹Results for the estimation by ordered probit controlling for the selection bias are in Table 4.9. Future research will be devoted at estimating the same generalized ordered probit regression controlling for the selectivity bias.

I then estimate the following generalized ordered probit model of chosen delegation level¹⁰

$$\begin{aligned}
P(D_i = 1) &= F(-X\beta_1) \\
P(D_i = j) &= F(\kappa_j - X\beta_j) - F(\kappa_{j-1} - X\beta_{j-1}), \quad j = 2, \dots, J - 1 \\
P(D_i = J) &= 1 - F(\kappa_J - X\beta_J)
\end{aligned} \tag{4.1}$$

where $J = 5$, $F(\cdot)$ is the cumulative normal distribution, X is the vector of independent variables (which includes gender, age, years of education, occupational status, (macro) regions of residence, log individual income, financial wealth, experience, whether the respondent works in the financial sector, length of bank relationship, financial literacy, self-confidence and trust), and D_i is the delegation level chosen by individual i , where:

$D_i = 1$: investor i decides completely by herself, the bank simply executes her decisions

$D_i = 2$: investor i tells the bank/advisor how she intends to invest and asks their opinion before deciding

$D_i = 3$: investor i considers bank/advisor's proposals before deciding

$D_i = 4$: investor i relies mainly on bank/advisor for her investment decision

$D_i = 5$: investor i lets the bank/advisor decide everything

In the generalized ordered probit model, the parameters β_j are allowed to vary across alternatives by generalizing the threshold parameters and making them dependent on covariates

$$\kappa_j = \tilde{\kappa}_j + X\gamma_j$$

Hence, the parameters β_j in (4.1) are defined as $\beta_j = \beta - \gamma_j$. In practice, equality of coefficients $\beta_1 = \dots = \beta_J$ is not imposed when statistical tests reject the null of equality at the 5% level, implying that for these variables the parallel-lines assumption is violated; otherwise equality is imposed. In the present case, the parallel-lines assumption is violated for financial literacy and trust in advisors.

4.5 Results

4.5.1 Use of advisors and other sources

A common results found in the previous literature is that high financial literacy is usually associated with a preference for formal sources of information and advice rather than for informal ones (Bernheim, 1998; Lusardi

¹⁰See Greene and Hensher (2010); Boes and Winkelmann (2006); Terza (1985).

and Mitchell, 2006; van Rooij et al., 2007). However, so far these results have been reported in univariate analyses.

Table 4.8 reports the marginal effects of financial literacy on the probability of using the bank often or very often as source of advice (Column I); on the probability of using the bank or a broker often or very often (Column II); on the probability of using informal sources often or very often (Column III); on the probability of using the bank more often than informal sources (Column IV); on the probability of using the bank or a broker more often than informal sources (Column V). The results in the fourth and fifth columns show that financial literacy increases the probability of preferring professional advisors to informal sources (i.e., friends/relatives/colleagues) by about 4-5 percentage points. As the first three columns show, however, this effect is determined by a tendency of more literate customers to avoid informal sources, rather than preferring formal ones. It appears that financial literacy is not associated with the use of professional financial advisors, while it is related with a more infrequent use of friends/family/colleagues.

4.5.2 How much to rely on advisors

This section investigates the effect of financial literacy on the extent of reliance on advice from a professional financial advisor.

Table 4.10 reports the marginal effects from a generalized ordered probit regression on the probability of choosing one the five options about autonomous investment/delegation. The most interesting result is that the effect of financial literacy is non-monotonic across delegation levels, thus confirming the descriptive evidence found in Table 4.7.¹¹ Higher financial literacy reduces the probability of choosing to invest autonomously and it also reduces the probability of delegating financial decisions mostly or completely to the advisor. On the contrary, financial literacy increases the probability of choosing the intermediate option, i.e. consulting the advisor, while at the same time maintaining the final decision over investments. This is consistent with the general finding that financial literacy is associated with a tendency to consult professionals, and lends support to the results of Hackethal, Haliassos, and Jappelli (2009) showing that advice is demanded by older and wealthier investors, rather than by poorer and inexperienced ones. The fact that more knowledgeable investors are *more* likely to consult an advisor but *less* likely to delegate is also consistent with the finding of Hackethal, Inderst, and Meyer (2010) that investors more interested in financial matters (and presumably more knowledgeable) are less likely to follow advisor's recommendations, conditional on receiving advice.

Other interesting results emerge from Table 4.10. More educated investors and those working in the financial sector are less likely to delegate

¹¹The same result about financial literacy, also quantitatively, is found estimating a non-ordinal model, such as a multinomial logistic regression (not reported here).

and more likely to invest by themselves. The same is true for investors who have higher perception of their own financial knowledge. This supports the theoretical predictions of Georgarakos and Inderst (2010), who argue that investors with higher perceived financial capability should be more likely not only to hold risky assets, but also to invest relying on their own judgment instead of an advisor.

The fact that women are more likely to delegate is not easy to interpret. It may be seen as an indirect effect of self-confidence: as women are typically found to be less overconfident than men (Barber and Odean, 2001), they might be less prone to invest by themselves. Other explanations, however, may be equally valid (e.g., they are less used than men to manage household's finances). As expected, trust towards one's own advisor increases the likelihood of delegation and reduces that of autonomous investment. On the other hand, the length of the relationship with the bank does not have a clear effect on the delegation choice.

Some variables that might be considered to proxy for investors' opportunity cost of time – such as their occupational status, or their individual income – do not affect the probability of delegating or investing autonomously. This is in contrast with the previous findings of Hackethal, Haliassos, and Jappelli (2009), maybe because the Unicredit sample is richer than the national average. This may reduce the heterogeneity across the variables that are related to the opportunity cost. Finally, financial wealth appears to be related to a tendency to delegate (even if not all wealth categories are significant), consistently with Hackethal, Haliassos, and Jappelli (2009).

4.6 Robustness checks

4.6.1 Financial literacy indices

As discussed in section 4.3, the financial literacy index is constructed as in Guiso and Jappelli (2008). This equals the number of correct answers to four questions about interest, inflation and risk diversification, plus four questions based on understanding the riskiness of various financial products. This index may be problematic not only because it involves some degree of arbitrariness, but also because it may be overly dependent on some specific question(s).

In this section I estimate again model (4.1) with alternative financial literacy indices, showing that results remain qualitatively the same. For ease of exposition let us define the following variables, corresponding to the single 'items' constituting the indices (detailed wording is in Table 4.1):

- *Inflation*: correct on quiz about inflation
- *Interest*: correct on quiz about interest

- *Diversif1*: correct on first quiz about risk diversification (definition of diversification)
- *Diversif2*: correct on second quiz about risk diversification (choose better diversified portfolio)
- *Risk1*: correct on first quiz about risk (Private bonds are at least as risky as deposits)
- *Risk2*: correct on second quiz about risk (Stocks at least are as risky as government bonds)
- *Risk3*: correct on third quiz about risk (Stocks mutual funds are at least as risky as bonds mutual funds)
- *Risk4*: correct on fourth quiz about risk (Housing is at least as risky as deposits)

The following indices will be employed (all of them are re-scaled so as to range between 0 and 10):

- Financial literacy 1. It is the same the main index (Guiso and Jappelli, 2008), rescaled: $10 \times (Inflation + Interest + Diversif1 + Diversif2 + Risk1 + Risk2 + Risk3 + Risk4) / 8$
- Financial literacy 2. Since quizzes *Risk1* – *Risk4* are highly correlated among themselves, this index gives them a lower weight: $10 \times [Inflation + Interest + Diversif1 + Diversif2 + (Risk1 + Risk2 + Risk3 + Risk4) / 4] / 5$
- Financial literacy 3. It is the same as the previous one with the difference that the inflation question is eliminated, because it shows a very low correct response rate (34%) – much lower than a similar question in the SHIW (60%) – which might be related to a misinterpretation of the question rather than to financial illiteracy. The index is: $10 \times [Interest + Diversif1 + Diversif2 + (Risk1 + Risk2 + Risk3 + Risk4) / 4] / 4$
- Financial literacy 4: $10 \times [Interest + Diversif1 + Diversif2] / 3$

Table 4.11 reports estimation results, showing that the effect of financial literacy is qualitatively the same across indices 1 to 3, while results for ‘Financial literacy 4’ are insignificant on almost all values of the dependent variable.

4.6.2 Financial literacy endogeneity

The fact that financial literacy is associated with the preference for formal sources of advice and with the tendency to consult rather than delegate to professional advisors does not necessarily provide indications on the direction of causality. Financial literacy may be positively correlated with a

preference for advisors because individuals *learn* from formal sources, rather than because financially literate individuals *choose* formal sources of advice. Similarly, investors who consult professional advisors are more likely to learn from them than those who delegate or invest by themselves.

To address this issue, I concentrate on potential learning from the bank and I consider various sub-samples of respondents who should be more likely to learn from the bank (i.e. those who use the bank often or prefer the bank to friends, and those who report $D_i = 3$). Then I check whether financial literacy increases with the length of bank relationship, under the assumption that if there is learning from the bank, it should be related to the length of relationship. Table 4.12 shows that financial literacy is not related to being a long-time customer of Unicredit in any of the sub-samples considered.

As it is arguable that financial literacy may still be endogenous in spite of this evidence, the same relation of model (4.1) is estimated controlling for endogeneity via the control function approach (Rivers and Vuong, 1988).¹² The instruments for financial literacy are the average financial literacy at regional level (taken from the Bank of Italy's Survey on Household Income and Wealth, SHIW) and experience with financial products (from UCS). Financial literacy at regional level is likely to increase individual knowledge through social interaction. The measure of previous experience is based on a question asking at what age the individual first traded a given financial product (either government bonds, stocks or mutual funds). This is strongly related to financial literacy, while it is not related to the extent of delegation (controlling for age and length of bank relationship, see Table 4.10). Estimates from a first stage regression are reported in Table 4.13, together with statistics about instruments validity. Both experience and regional financial literacy positively and significantly affect the financial knowledge of Unicredit customers, and taken together produce an F statistic of over 18, indicating that the instruments have sufficient explanatory power. Moreover, the Hansen's J test does not reject the null of instruments validity (p-value 0.169).

Results from Table 4.14 show that the positive relation between financial literacy and the propensity to consult an advisor is robust to controlling for endogeneity and is even stronger than in Table 4.10. The effect of financial literacy on investing autonomously and on delegating turns insignificant, even though it carries the same (negative) sign as before.

¹²When estimating a probit model with a continuous endogenous variable, the two-step approach due to Rivers and Vuong (1988) consists in saving the residuals from the first stage regression and then plugging them into the structural probit equation. This procedure can be easily extended to ordered probit response models (Wooldridge, 2007), and can analogously be extended to a generalized ordered probit model, since the generalization does not affect the error term of the discrete choice equation.

4.6.3 Relations with banks and brokers

As was previously mentioned, the estimation sample includes only observations where Unicredit is the main or only bank (excluding about 6% of the total sample). A further check uses alternative sample selections, showing that results are robust to a more stringent selection of the sample. Table 4.15 reports estimates of model (4.1) based on the following sub-samples:

- Unicredit is the main or only bank (i.e., the baseline), with $N = 1,116$
- Unicredit is the only bank, with $N = 802$
- Unicredit is the main or only bank and the respondents uses brokers for advice never, seldom or sometimes, with $N = 847$
- Unicredit is the main or only bank and the respondent never or seldom uses brokers for advice, with $N = 705$

Estimates from Table 4.15 show that results in all rows are quantitatively very similar, even though in the third and fourth rows the effect of literacy on investing autonomously becomes insignificant (potentially also because of a reduction in sample size).

4.6.4 Trust endogeneity

Trust towards financial advisors can be endogenous with respect to the choice of delegating if an investor increases her trust because she delegated in the past and was satisfied with the advice received, or if respondents try to rationalize ex-post their delegation behavior when answering to the trust question.

To verify the robustness of the results of Table 4.10 with respect to the potential endogeneity of trust, its effect on delegation is estimated using instrumental variables. Table 4.16 provides evidence about potential candidates to be used as instrumental variables.¹³

¹³Table 4.16 provides evidence about instruments, based on previous literature. First, Column I reports the effect of generalized trust expressed by UCS respondents, showing that generalized and specific trust are positively correlated. Then, Column II reports the effect of trust in banks at the regional level, which is positively related to trust in advisors in the UCS.

Further instruments are sought in the social capital literature. Guiso et al. (2004) argue that participation in referenda is related to social capital and trust. Column III shows that the turnout (at provincial level) at the 2006 referendum significantly affects trust towards advisors. Other attempts to include among the instruments other variables drawn from the social capital literature were not successful. These variables included blood donations at the provincial level (Guiso et al., 2004), income inequality at regional level (Zak and Knack, 2001; Knack and Keefer, 1997), and the regional participation rate to associations (Putnam, 1993). Finally, since previous research showed the existence of a link between cross-country generalized trust and economic growth, the GDP growth rate at the province

Table 4.17 reports the estimates from the first stage regression (Column I) and from various second stages regressions: a probit model for delegation (with control function, Column II), a linear probability model for a dichotomous indicator of delegation (estimated by GMM, Column III), and a linear model for for the continuous indicator of delegation (estimated by GMM, Column IV). Trust towards advisors is instrumented with average trust towards banks at the regional level and turnout at the 2006 referendum at the provincial level (controlling for provincial GDP growth), which should not have any relation with financial delegation.¹⁴ Even if referendum turnout significantly affects trust towards advisors, the F test on excluded instruments reported at the bottom of the table is very low, suggesting a weak instrument problem. The Hansen’s J test supports the null hypothesis of instruments validity. Unfortunately, once trust is instrumented its effect on delegation becomes insignificant, probably due to instruments weakness. This does not change when the second stage follows a binary response model or a linear one (and when the dependent variable is the probability of delegating mostly or completely, $D_i \geq 4$, and the extent of delegation, D_i). For most of the other covariates the sign and significance remain the same as without instrumenting.

To partially overcome the problem of instruments weakness, I estimate separate regressions for newer and older customers, based on the idea that newer clients have had less time to update their trust priors.¹⁵ Table 4.18 reports the marginal effects on the probability of delegation ($D_i \geq 4$) from two generalized ordered probit regressions run on the two sub-samples of relatively more recent (at most five years) and relatively older customers of the bank (more than five years). As Table 4.18 shows, trust is an important factor in explaining delegation also for customers who have had less time to learn about their bank trustworthiness (the effect is almost the same for the two groups). This suggests that the endogeneity of trust should not be too serious a problem.

level is added as a control (Dincer and Uslaner, 2010; Knack and Keefer, 1997; Zak and Knack, 2001).

¹⁴As one may argue, in Italy the decision to participate or not to a referendum has a strategic component, since the referendum is valid only if at least the majority of electors goes to the polling station. However, the 2006 one was a ‘constitutional referendum’, which does not require a minimum turnout to be valid. Moreover, the analysis was repeated using the provincial participation rates to political elections – in particular, participation to the 2006 elections for the Senate – as an alternative to referendum participation (not reported). Results are almost the same, as the two participation rates are highly correlated.

¹⁵Clearly, it would make more sense to restrict this sub-sample to much more recent customers (e.g. less than one year), because five years might be a long enough span to revise one’s priors. However, the number of such respondents is too low (< 20) to allow this estimation.

4.6.5 Effect of trust across financial literacy levels

Finally, it is interesting to note whether (and how) financial literacy and trust interact in affecting the demand for advisors. Guiso et al. (2004, 2008) find that the effect of trust on financial development (use of checks, percent of portfolio non in cash, etc.) and on stock market participation is higher for respondents with education below the median.

It is quite natural to expect trust to have a different impact across financial knowledge also on the use and reliance on advisors. Indeed Georgarakos and Inderst (2010) argue that trust in advice should affect the decision to participate in risky assets (through the use of an advisor) only when investor's perceived own capability is low, and this is consistent with their empirical findings, where trust increases participation only for investors with less than college education.

In this case, however, as Table 4.19 shows, the effect of trust is almost the same across the two sub-samples of investors with above average and below average financial literacy, and analogous results are obtained splitting the sample by education level (not reported).

4.7 Concluding remarks

I investigate the role of financial literacy on the demand for financial advice, looking at both the use of financial advisors in comparison to informal sources, and at the extent of reliance on financial advisors for portfolio management. Given the lack of nationally representative datasets about this issues, the empirical analysis exploits the 2007 Unicredit Customer's Survey, which is representative of the customers of one of the largest Italian commercial banks.

The results indicate that, controlling for a number of factors including trust towards one's own advisor, self-confidence in own financial ability, wealth and opportunity cost of time, financial literacy is important in explaining the demand for financial advice, and the relationship between private investors and financial intermediaries providing advice. First, the positive association between financial literacy and a preference for financial advisors over informal sources previously found in the literature is confirmed. Second, financial literacy increases the probability of consulting the bank/financial advisor, as opposed to investing without consulting any professional or delegating. In a context where the supply of independent (fee-based) financial advice is extremely limited, consulting one's bank without delegating may be the wisest choice. These findings suggest that advisors are used less often by investors who need them the most. This implies that the presence of qualified sources of advice may not be enough to counteract the effects of the low level of financial literacy, and that further policy measures may be need to ensure sound financial decision-making.

Appendix: Tables and figures

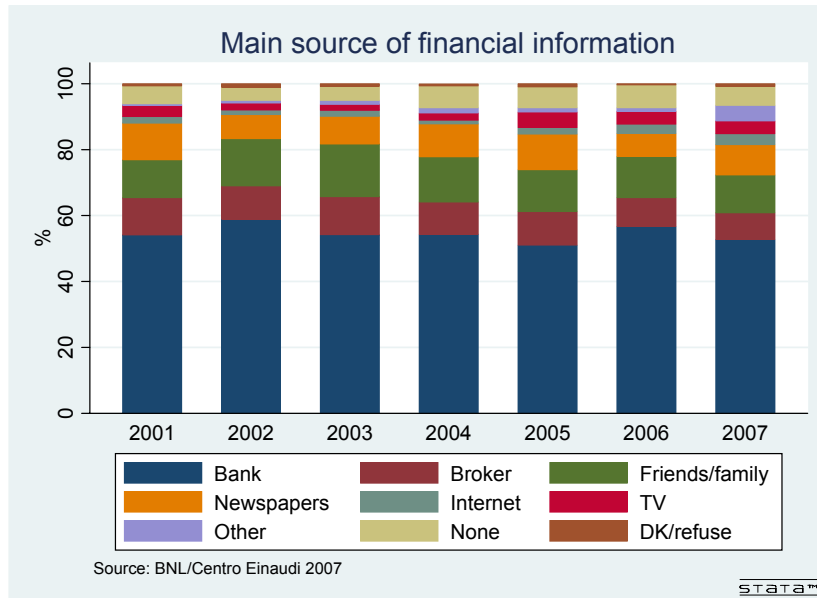


Figure 4.1: Main source of financial information

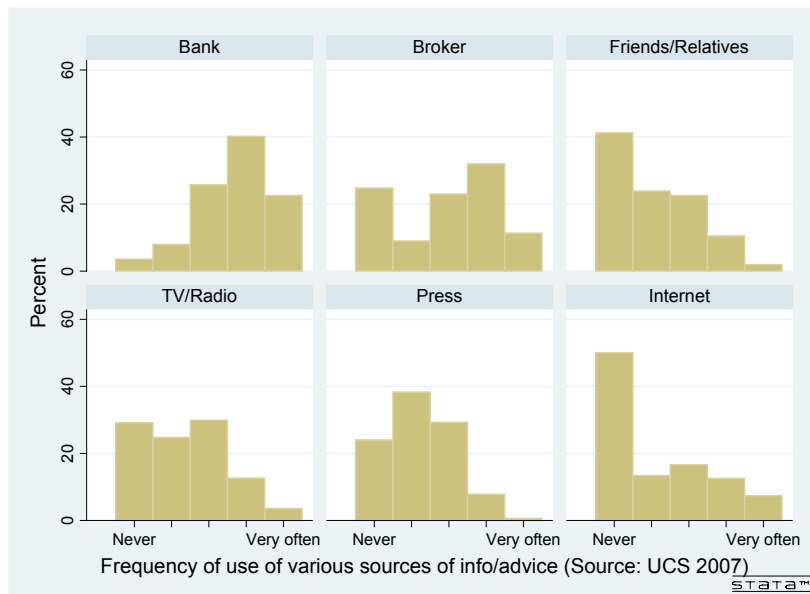


Figure 4.2: Frequency of use of sources of information/advise



Figure 4.3: Frequency of cheating by bank/insurance company

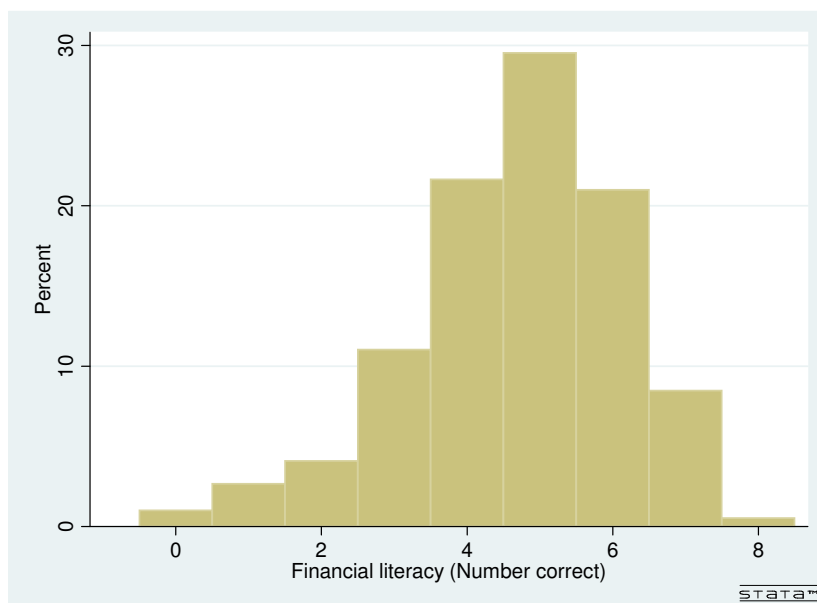


Figure 4.4: Financial literacy distribution (baseline definition)

Table 4.1: Variable Description and Data Sources

Variable	Description	Source
Financial Literacy	<p>The financial literacy measure is constructed as in Guiso and Jappelli (2008). One point is given if the respondent can answer correctly to each of the following questions:</p> <ul style="list-style-type: none"> - <i>Inflation</i>: Imagine an account yields 2% yearly (net of costs and taxes). With inflation at 2% per year, how much do you think you will be able to buy after two years (without moving funds in the account)? More than what I could buy today Less The same Do not know; - <i>Interest</i>: Imagine you know with certainty that in six months interest rates will rise. Do you think you should buy fixed rate bonds today? Yes No Do not know - <i>Diversif1</i>: What do you think having correctly diversified investments means? Having in one's own portfolio both bonds and stocks Do not invest for too long in the same financial product Invest in as many assets as possible Invest in several assets at the same time, in order to limit exposure to risks linked to single assets Do not invest in very risky products Do not know - <i>Diversif2</i>: Which of these portfolios is better diversified? 70% T-bills, 15% European equity fund, 15% in 2-3 Italian stocks 70% T-bills, 30% European equity fund 70% T-bills, 30% in 2-3 Italian stocks 70% T-bills, 30% in stocks of companies I know well Do not know <p>Four other indicators are based on the question "How risky do you think these products are?" The answers can be from 1 (Not risky at all) to 5 (Very risky) and 'Do not know' is always an option. One point is given if the respondent can correctly state that</p> <ul style="list-style-type: none"> - <i>Risk1</i>: Private bonds are at least as risky as deposits - <i>Risk2</i>: Stocks at least are as risky as government bonds - <i>Risk3</i>: Stocks mutual funds are at least as risky as bonds mutual funds - <i>Risk4</i>: Housing is at least as risky as deposits 	UCS
Self-confidence (Self-assessed financial knowledge)	<p>It is based on the question: "For each of these ten assets I would like you to tell me how much you think you know it", where the answer can be in the range 1 (I do not know it at all) to 5 (I know it very well). The assets are: government bonds, repurchase agreements, private bonds, mutual funds, derivatives, unit-linked or index-linked life insurance, ETFs, managed portfolios, structured products. The self-confidence index used in the analysis is the average of these ten measures, and ranges from 1 to 5.</p>	UCS

Continues

Table 4.1: (continued)

Variable	Description	Source
Experience	Three questions are used in measuring experience in assets trading. If the respondent has ever invested in either bonds, stocks or mutual funds, then the UCS asks at which age the respondent first invested in each of bonds, stocks and mutual funds. Experience in each asset is computed as the difference between current age and age of first investment. Overall experience is computed as the maximum of these three numbers. If the respondent has never invested in any of the three assets, experience is set to zero.	UCS
Finance sector	A dummy variable taking value of one if the respondent works in the sector related to “monetary and financial intermediation, and insurances”	UCS
Financial wealth categories	Given the categorical variable $fpatrim$ based on administrative data and indicating in which class the financial holdings (at the bank) of each respondent fall, and given the categorical variable $selfw$ indicating the self reported category in which the (total) financial holdings of each respondent fall, I build a categorical variable $finw$ that is $finw = \begin{cases} fpatrim & \text{if } selfw \leq fpatrim \\ selfw & \text{if } selfw > fpatrim \end{cases}$	UCS
Zero saving rate	Since about 54% of the observations in $selfw$ are missing, it is likely that $finw$ is still under-reported with respect to the true financial wealth. It is captured by a question asking “On average, in the year 2006 which percentage of your income did you save? More then 50% of your annual income 30-50% 20-30% 10-20% 5-10% 1-5% 0%, I did not save anything”. The variable used in the analysis is a dummy variable taking the value of one if the answer is “0%, I did not save anything”	UCS
Risk preferences	It is based on the question “In managing your financial investments which of these attitudes do you usually have? When I invest I usually look for: Very high returns, even with a high risk of losing part of your principal High returns with a fair degree of principal safety Fair returns with high safety of your principal Low returns without risk of losing your principal”	UCS
Trust towards own financial advisors	It is based on the question “Overall, how much trust do you have in your bank advisor or financial advisor concerning your financial investments?” with the answers ranging from 1 (No trust at all) to 5 (I trust a lot).	UCS
Generalized trust	It is a dummy based on the World Values Survey question “Generally speaking, do you think that most people can be trusted or that you have to be very careful in dealing with people?”. The dummy takes the value of 1 if the respondent answers “I think that most people can be trusted”	UCS
Trust in banks	This variable is based on the Fondazione Rodolfo Debenedetti’s ‘TFR Survey’. This is an <i>ad hoc</i> survey of private sector employees conducted in 2007 to investigate the effects of a pension reform. The survey asks “Do you trust banks? Fully A lot Little Not at all”. The variable is the share of respondents answering ‘Fully’ within each region, weighted with the weights provided with the survey	FRDB TFR Survey
GDP growth	GDP growth rate in 2006 at provincial level	Eurostat
Referendum 2006	Voter turnout at the provincial level for the 2006 constitutional referendum	Ministry of Interior

Table 4.2: Summary statistics

	Mean	Median	Std. Dev.	Min	Max
Female	0.30	0	0.46	0	1
Age	54.81	57	12.27	25	89
Years schooling	12.47	13	4.04	0	20
Employee	0.32	0	0.47	0	1
Self-employed	0.28	0	0.45	0	1
Unemployed	0.01	0	0.07	0	1
Retired	0.33	0	0.47	0	1
Other out of the labor force	0.07	0	0.25	0	1
Total individual income (th.)	50.72	31	67.85	0.2	822
Fin Wealth 10 – 50,000 euro	0.15	0	0.36	0	1
Fin Wealth 50 – 100,000 euro	0.22	0	0.41	0	1
Fin Wealth 100 – 150,000 euro	0.19	0	0.39	0	1
Fin Wealth 150 – 250,000 euro	0.18	0	0.38	0	1
Fin Wealth 250 – 500,000 euro	0.19	0	0.39	0	1
Fin Wealth 500,000+ euro	0.07	0	0.25	0	1
Experience	13.37	12	12.82	0	53
Years at Unicredit: < 1	0.01	0	0.11	0	1
Years at Unicredit: 1 – 5	0.10	0	0.31	0	1
Years at Unicredit: 6 – 10	0.19	0	0.39	0	1
Years at Unicredit: 11 – 20	0.24	0	0.43	0	1
Years at Unicredit: 20+	0.45	0	0.50	0	1
Trust towards advisor	3.78	4	0.91	1	5
Financial literacy	4.68	5	1.48	0	8
Self-assessed fin knowledge	2.90	2.9	0.85	1	5
Very risk tolerant	0.02	0	0.13	0	1
Risk tolerant	0.28	0	0.45	0	1
Risk averse	0.52	1	0.50	0	1
Very risk averse	0.19	0	0.39	0	1
Saving: > 50%	0.03	0	0.17	0	1
Saving: 30 – 50%	0.09	0	0.28	0	1
Saving: 20 – 30%	0.16	0	0.37	0	1
Saving: 10 – 20%	0.20	0	0.40	0	1
Saving: 5 – 10%	0.17	0	0.38	0	1
Saving: 1 – 5%	0.13	0	0.34	0	1
Saving: 0%	0.22	0	0.42	0	1

Data: Unicredit 2007. N = 1,686

Table 4.3: Comparison between UCS and SHIW datasets

	UCS 2007	SHIW 2006		
	Account holder	Household head (answering FL tests)	Account holder at bank or post office	Household head and account holder
Male	69.9	62.8	49.1	65.0
Age: ≤ 30	2.5	3.4	29.7	3.3
31 – 40	12.9	13.8	13.0	14.3
41 – 50	21.6	19.8	15.4	20.4
51 – 65	38.3	28.4	22.0	29.4
66+	24.6	34.6	20.0	32.6
No education	0.4	5.7	11.0	4.0
Primary	8.7	25.8	20.0	23.7
Secondary	20.9	27.9	28.9	28.2
High school	43.7	31.8	31.1	34.3
University degree or more	26.4	8.8	9.0	9.8
North-west	22.8	25.9	25.5	28.2
North-east	28.5	22.0	22.8	23.5
Center	24.3	19.7	21.0	20.5
South	16.9	20.9	19.9	17.7
Isles	7.5	11.6	10.9	10.1
Household income (avg.)	71,324.6	31,659.5	37,850.9	33,653.1
< 20,000	7.4	32.5	19.9	27.2
20 – 50,000	44.5	53.3	60.0	57.1
50 – 100,000	31.7	12.5	17.9	14.0
100,000+	16.4	1.6	2.2	1.8
<i>Financial Literacy</i>				
Inflation	34.2			
Interest	52.0			
Diversification 1	39.9			
Diversification 2	13.0			
Risk 1 (Private bond vs. deposit)	83.8			
Risk 2 (Stocks vs. gov bonds)	89.1			
Risk 3 (Equity fund vs. bond fund)	81.0			
Risk 4 (Housing vs. deposits)	75.0			
Account statement		50.8		54.7
Inflation		60.5		64.1
Compare returns		27.2		29.5
Interest compounding		39.6		42.5
Equity fund		51.3		54.3
Mortgage		53.6		56.9
N correct (%)	58.5	47.2		50.3
N don't know (%)	11.9	34.2		30.4
N incorrect (%)	29.6	18.6		19.2
Zero correct	1.0	18.9		15.2
N	1,686	3,992	17,688	3,574

Data: Unicredit 2007 and SHIW 2006

Table 4.4: How much do you use each of these sources to have information about your financial investments?

	Bank	Broker	Friends, relatives, colleagues	Econ TV/radio programs	Econ pages in non-econ newspapers
Never	3.5	24.7	41.2	29.2	26.1
Seldom	8.0	9.0	23.9	24.7	20.6
Sometimes	25.8	23.0	22.5	29.9	29.8
Often	40.2	32.0	10.5	12.7	19.3
Very often	22.5	11.3	1.9	3.5	4.3
	Econ inserts in non-econ newspapers	Econ newspapers	Non-econ magazines	Econ magazines	Econ websites
Never	36.8	30.8	45.8	50.4	50.1
Seldom	21.7	19.6	21.8	20.3	13.4
Sometimes	24.6	25.9	21.8	17.7	16.6
Often	14.0	15.6	8.5	9.6	12.5
Very often	3.0	8.1	2.1	2.1	7.4
Total	100	100	100	100	100

Unicredit 2007. N = 679. Conditional on spending at least some time to gather information about how to manage savings and investments.

Table 4.5: Which of these statements best describes your behaviour in deciding how to invest your savings?

	Unconditional	Conditional on having risky assets
I decide completely autonomously, the bank executes my decisions	8.60	12.03
I tell bank/advisor how I intend to invest and ask for their opinion	21.59	30.21
I consider bank/advisor proposals before deciding	27.16	38.01
I mostly rely on bank/advisor for my investment decisions	11.51	16.10
I let bank/advisor decide everything	2.61	3.65
Non-participation	28.53	
Total	100	100
N	1,686	1,205

Unicredit 2007.

Table 4.6: Answers to financial literacy tests (N = 1,686)

	Freq.	Percent
<i>Inflation:</i>		
More than today	39	2.3
Less than today	881	52.3
Same as today (correct)	577	34.2
Do not know	189	11.2
<i>Interest:</i>		
Yes	388	23.0
No (correct)	876	52.0
Do not know	422	25.0
<i>Diversification 1:</i>		
To have both bonds and stocks	282	16.7
Do not hold same asset for too long	111	6.6
Invest in as many assets as possible	144	8.5
Invest in more assets to limit risk exposure of single ones (correct)	672	39.9
Do not invest in very risky assets	292	17.3
Do not know	185	11.0
<i>Diversification 2:</i>		
70% T-bills, 15% European equity fund, 15% in 2-3 Italian stocks	688	40.8
70% T-bills, 30% European equity fund (correct)	219	13.0
70% T-bills, 30% in 2-3 Italian stocks	117	6.9
70% T-bills, 30% in stocks of companies I know well	149	8.8
Do not know	328	19.5
Correct on risk 1	1,413	83.8
Correct on risk 2	1,502	89.1
Correct on risk 3	1,365	81.0
Correct on risk 4	1,264	75.0

Unicredit 2007.

Table 4.7: Financial literacy by degree of reliance on advice

	Freq	Mean	Std. Dev.
I decide completely autonomously, the bank executes my decisions	145	4.97	1.33
I tell bank/advisor how I intend to invest and ask for their opinion	364	4.98	1.25
I consider bank/advisor proposals before deciding	458	5.09	1.32
I mostly rely on bank/advisor for my investment decisions	194	4.63	1.48
I let bank/advisor decide everything	44	4.30	1.19
Total	1205	4.94	1.34

Unicredit 2007.

Table 4.8: The determinants of preference among sources of information and advice

	Dep Var: Pr use bank (very) often (I)	Dep Var: Pr use bank/broker (very) often (II)	Dep Var: Pr use informal (very) often (III)	Dep Var: Pr use bank more often than informal (IV)	Dep Var: Pr use bank/broker more often than informal (V)
Female	0.079 (0.06)	0.109** (0.05)	0.055 (0.03)	-0.024 (0.05)	-0.018 (0.05)
Age	-0.021 (0.02)	-0.026 (0.02)	0.000 (0.01)	-0.023 (0.01)	-0.008 (0.02)
Age squared	0.000 (0.00)	0.000* (0.00)	-0.000 (0.00)	0.000* (0.00)	0.000 (0.00)
Years school	-0.014** (0.01)	-0.014** (0.01)	0.001 (0.00)	-0.004 (0.01)	-0.003 (0.01)
FinW 100-150 th	0.016 (0.06)	0.035 (0.06)	-0.060** (0.03)	0.153*** (0.04)	0.155*** (0.05)
FinW 150-250 th	-0.017 (0.06)	-0.025 (0.06)	-0.037 (0.03)	0.067 (0.05)	0.070 (0.05)
FinW 250-500 th	-0.018 (0.06)	0.012 (0.06)	-0.038 (0.03)	0.034 (0.05)	0.035 (0.05)
FinW 500+ th	0.144* (0.08)	0.106 (0.08)	-0.073*** (0.02)	0.148*** (0.05)	0.128** (0.06)
Financial literacy	0.020 (0.02)	0.020 (0.02)	-0.028*** (0.01)	0.044*** (0.02)	0.047*** (0.02)
Self-confidence	0.125*** (0.04)	0.187*** (0.04)	0.047** (0.02)	-0.015 (0.03)	0.008 (0.03)
Finance sector	-0.198* (0.12)	-0.175 (0.11)	-0.023 (0.05)	-0.185 (0.12)	-0.191 (0.12)
Trust advisor	0.186*** (0.03)	0.200*** (0.03)	-0.010 (0.01)	0.082*** (0.02)	0.097*** (0.02)
Years at UC: 6-10	-0.192* (0.10)	-0.180* (0.11)	0.029 (0.07)	-0.128 (0.11)	-0.080 (0.11)
Years at UC: 11-20	-0.109 (0.10)	-0.083 (0.10)	0.058 (0.07)	-0.102 (0.10)	-0.060 (0.10)
Years at UC: > 20	-0.154 (0.10)	-0.138 (0.10)	0.035 (0.06)	-0.088 (0.09)	-0.085 (0.10)
Dep Var: Pr(Selection=1)					
Very risk tolerant	0.384*** (0.11)	0.387*** (0.11)	0.401*** (0.10)	0.409*** (0.10)	0.408*** (0.10)
Risk tolerant	0.131** (0.05)	0.142*** (0.05)	0.147*** (0.04)	0.141*** (0.05)	0.138*** (0.05)
Risk averse	0.103** (0.05)	0.110** (0.04)	0.109*** (0.04)	0.107** (0.04)	0.107** (0.04)
Saving: 0%	-0.126*** (0.03)	-0.125*** (0.03)	-0.117*** (0.03)	-0.127*** (0.03)	-0.123*** (0.03)
N obs	1540	1540	1540	1540	1540
Wald test ($\rho=0$)	1.95	1.58	4.39	1.98	1.99
Wald test p-value	0.163	0.209	0.036	0.160	0.159

Unicredit 2007. Dep Var: Column I, probability of using the bank often or very often as a sources of financial information; Column II, probability of using the bank or a broker often or very often as a sources of financial information; Column III, probability of using informal sources (i.e. friends, relatives and colleagues) often or very often as a sources of financial information; Column IV, probability of using the bank more often than informal sources; Column V, probability of using the bank or a broker more often than informal sources. Model: heckman probit (Marginal effects reported). Exclusion restrictions reported in bottom part of the table) are risk preferences; zero saving rate. Standard errors are robust to heteroskedasticity. Other regressors not reported: macro-regions, individual income, occupational status, experience. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4.9: Investing autonomously or delegating financial decisions

	$D_i = 1$	$D_i = 2$	$D_i = 3$	$D_i = 4$	$D_i = 5$	Selection
Female	-0.035*** (0.01)	-0.047*** (0.02)	0.028*** (0.01)	0.042*** (0.02)	0.012** (0.01)	-0.002 (0.03)
Age	-0.001 (0.00)	-0.001 (0.01)	0.000 (0.00)	0.001 (0.00)	0.000 (0.00)	0.007 (0.01)
Age squared	-0.000 (0.00)	-0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	-0.000 (0.00)
Years school	0.005*** (0.00)	0.006*** (0.00)	-0.004*** (0.00)	-0.005*** (0.00)	-0.001** (0.00)	0.008** (0.00)
Self-employed	-0.000 (0.01)	-0.000 (0.02)	0.000 (0.01)	0.000 (0.02)	0.000 (0.00)	0.018 (0.03)
Retired	0.008 (0.02)	0.010 (0.02)	-0.007 (0.02)	-0.009 (0.02)	-0.002 (0.01)	-0.034 (0.04)
North	0.022* (0.01)	0.027* (0.02)	-0.018* (0.01)	-0.024* (0.01)	-0.006* (0.00)	0.019 (0.03)
Log tot ind income	-0.008 (0.01)	-0.010 (0.01)	0.007 (0.01)	0.009 (0.01)	0.002 (0.00)	-0.002 (0.01)
FinW 50-100 th	-0.050** (0.02)	-0.071** (0.03)	0.037** (0.02)	0.064** (0.03)	0.019** (0.01)	0.105*** (0.03)
FinW 100-150 th	-0.032 (0.02)	-0.043 (0.03)	0.025 (0.02)	0.039 (0.03)	0.011 (0.01)	0.131*** (0.03)
FinW 150-250 th	-0.053** (0.02)	-0.078*** (0.03)	0.038** (0.01)	0.071** (0.03)	0.022** (0.01)	0.149*** (0.03)
FinW 250-500 th	-0.048** (0.02)	-0.069** (0.03)	0.035** (0.02)	0.063** (0.03)	0.019* (0.01)	0.162*** (0.03)
FinW 500+ th	-0.026 (0.03)	-0.036 (0.04)	0.020 (0.02)	0.032 (0.03)	0.009 (0.01)	0.173*** (0.04)
Financial literacy	-0.000 (0.00)	-0.001 (0.01)	0.000 (0.00)	0.000 (0.01)	0.000 (0.00)	0.046*** (0.01)
Self-confidence	0.026*** (0.01)	0.032*** (0.01)	-0.022*** (0.01)	-0.029*** (0.01)	-0.007** (0.00)	0.028* (0.02)
Experience	-0.000 (0.00)	-0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.008*** (0.00)
Finance sector	0.111** (0.05)	0.079*** (0.02)	-0.097** (0.04)	-0.077*** (0.02)	-0.016*** (0.00)	0.054 (0.06)
Trust advisor	-0.076*** (0.01)	-0.093*** (0.01)	0.063*** (0.01)	0.084*** (0.01)	0.022*** (0.00)	0.046*** (0.01)
Years at UC: 6-10	0.019 (0.03)	0.021 (0.03)	-0.016 (0.02)	-0.019 (0.03)	-0.005 (0.01)	0.089** (0.04)
Years at UC: 11-20	0.031 (0.03)	0.035 (0.03)	-0.027 (0.02)	-0.031 (0.03)	-0.008 (0.01)	0.208*** (0.03)
Years at UC: > 20	0.018 (0.02)	0.022 (0.03)	-0.015 (0.02)	-0.020 (0.03)	-0.005 (0.01)	0.218*** (0.04)
Very risk tolerant						0.225*** (0.02)
Risk tolerant						0.127*** (0.03)
Risk averse						0.138*** (0.03)
Saving: 0%						-0.138*** (0.03)
N						1581
Log-Lik						-2173.711
ρ						0.188
ρ std. err.						(0.168)

Data: Unicredit 2007. Dependent variable: columns I-V, probability of delegating financial decisions ($D_i = 1, \dots, 5$); Column VI, probability of holding risky assets. Model: Ordered Probit with selection. Exclusion restrictions (Column VI) are risk preferences; zero saving rate. Standard errors are robust to heteroskedasticity. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4.10: Investing autonomously or delegating financial decisions

	$D_i = 1$	$D_i = 2$	$D_i = 3$	$D_i = 4$	$D_i = 5$
Female	-0.030*** (0.01)	-0.056*** (0.02)	0.026*** (0.01)	0.049*** (0.02)	0.011** (0.00)
Age	0.000 (0.00)	0.000 (0.01)	-0.000 (0.00)	-0.000 (0.01)	-0.000 (0.00)
Age squared	-0.000 (0.00)	-0.000 (0.00)	0.000 (0.00)	0.000 (0.00)	0.000 (0.00)
Years school	0.004*** (0.00)	0.008*** (0.00)	-0.004*** (0.00)	-0.007*** (0.00)	-0.001*** (0.00)
Self-employed	0.000 (0.01)	0.000 (0.02)	-0.000 (0.01)	-0.000 (0.02)	-0.000 (0.00)
Retired	0.005 (0.01)	0.008 (0.02)	-0.004 (0.01)	-0.007 (0.02)	-0.001 (0.00)
North	0.016 (0.01)	0.029 (0.02)	-0.015 (0.01)	-0.025 (0.02)	-0.005 (0.00)
Center	-0.006 (0.01)	-0.011 (0.02)	0.006 (0.01)	0.010 (0.02)	0.002 (0.00)
Log tot ind income	-0.007 (0.01)	-0.012 (0.01)	0.007 (0.01)	0.011 (0.01)	0.002 (0.00)
FinW 50-100 th	-0.035** (0.01)	-0.070** (0.03)	0.029*** (0.01)	0.062** (0.03)	0.014* (0.01)
FinW 100-150 th	-0.021 (0.02)	-0.039 (0.03)	0.018 (0.01)	0.034 (0.03)	0.008 (0.01)
FinW 150-250 th	-0.038*** (0.01)	-0.078** (0.03)	0.031*** (0.01)	0.069** (0.03)	0.017* (0.01)
FinW 250-500 th	-0.033** (0.01)	-0.065** (0.03)	0.028*** (0.01)	0.058** (0.03)	0.013* (0.01)
FinW 500+ th	-0.015 (0.02)	-0.028 (0.04)	0.013 (0.02)	0.024 (0.04)	0.005 (0.01)
Financial literacy	-0.012** (0.01)	-0.003 (0.01)	0.037*** (0.01)	-0.017** (0.01)	-0.005** (0.00)
Self-confidence	0.022*** (0.01)	0.039*** (0.01)	-0.021*** (0.01)	-0.033*** (0.01)	-0.007*** (0.00)
Experience	0.000 (0.00)	0.001 (0.00)	-0.000 (0.00)	-0.000 (0.00)	-0.000 (0.00)
Finance sector	0.104** (0.05)	0.105*** (0.02)	-0.104** (0.04)	-0.091*** (0.02)	-0.014*** (0.00)
Trust advisor	-0.085*** (0.01)	-0.018 (0.02)	-0.009 (0.02)	0.086*** (0.01)	0.026*** (0.00)
Years at UC: 6-10	0.024 (0.02)	0.038 (0.03)	-0.024 (0.02)	-0.032 (0.03)	-0.006 (0.00)
Years at UC: 11-20	0.037* (0.02)	0.057** (0.03)	-0.036* (0.02)	-0.048** (0.02)	-0.009** (0.00)
Years at UC: > 20	0.024 (0.02)	0.042 (0.03)	-0.023 (0.02)	-0.036 (0.03)	-0.007 (0.01)
N obs	1116				
Log-Lik	-1419.615				

Unicredit 2007. Dep Var: probability of delegating financial decisions ($D_i = 1, \dots, 5$), where $D_i=1$: I decide completely autonomously, the bank executes my decisions; $D_i=2$: I tell bank/advisor how I intend to invest and ask for their opinion; $D_i=3$: I consider bank/advisor proposals before deciding; $D_i=4$: I mostly rely on bank/advisor for my investment decisions; $D_i=5$: I let bank/advisor decide everything. Model: Generalized Ordered Probit (marginal effects reported). 961b-sample of investors holding risky assets. Standard errors reported in parentheses are robust to heteroskedasticity. Significance: *** p<0.01, ** p<0.05, * p<0.1.

Table 4.11: Investing autonomously or delegating – Robustness on financial literacy index

	$D_i = 1$	$D_i = 2$	$D_i = 3$	$D_i = 4$	$D_i = 5$
Financial literacy 1	-0.0100** (0.005)	-0.0023 (0.009)	0.0298*** (0.008)	-0.0137** (0.006)	-0.0039** (0.002)
Financial literacy 2	-0.0070* (0.004)	-0.0019 (0.007)	0.0208*** (0.008)	-0.0084 (0.006)	-0.0035** (0.002)
Financial literacy 3	-0.0033 (0.004)	0.0027 (0.007)	0.0141** (0.007)	-0.0096* (0.005)	-0.0040*** (0.002)
Financial literacy 4	-0.0016 (0.003)	0.0023 (0.005)	0.0078 (0.005)	-0.0054 (0.004)	-0.0031** (0.001)

Unicredit 2007. Dep Var: probability of delegating financial decisions ($D_i = 1, \dots, 5$), where $D_i=1$: I decide completely autonomously, the bank executes my decisions; $D_i=2$: I tell bank/advisor how I intend to invest and ask for their opinion; $D_i=3$: I consider bank/advisor proposals before deciding; $D_i=4$: I mostly rely on bank/advisor for my investment decisions; $D_i=5$: I let bank/advisor decide everything. Model: Generalized Ordered Probit (marginal effects reported). Definition of financial literacy indices: Financial literacy 1: the baseline (Guiso and Jappelli, 2008), re-scaled $(10 \times (Inflation + Interest + Diversif1 + Diversif2 + Risk1 + Risk2 + Risk3 + Risk4)/8)$; Financial literacy 2: $10 \times [Inflation + Interest + Diversif1 + Diversif2 + (Risk1 + Risk2 + Risk3 + Risk4)/4]/5$; Financial literacy 3: $10 \times [Interest + Diversif1 + Diversif2 + (Risk1 + Risk2 + Risk3 + Risk4)/4]/4$; Financial literacy 4: $10 \times [Interest + Diversif1 + Diversif2]/3$. Sub-sample of investors holding risky assets. Regressors not reported: same covariates as in Table 4.10. Standard errors reported in parentheses are robust to heteroskedasticity. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4.12: Financial literacy and length of bank relationship

	Whole sample	Use bank often or very often	Use bank more often than friends	($D_i = 3$)	($D_i = 3$) and do not use brokers
Years at UC: 6-10	-0.243 (0.15)	-0.295 (0.27)	-0.412* (0.25)	-0.102 (0.25)	0.144 (0.28)
Years at UC: 11-20	-0.102 (0.15)	0.019 (0.27)	-0.035 (0.24)	-0.036 (0.23)	0.090 (0.26)
Years at UC: > 20	-0.018 (0.15)	0.006 (0.26)	0.070 (0.23)	-0.036 (0.21)	0.010 (0.26)
N obs	1116	393	475	429	320
Adj. R ²	0.121	0.089	0.127	0.129	0.149

Unicredit 2007. Dep Var: Financial literacy (baseline). Model: linear regression model estimated by OLS. Standard errors are robust to heteroskedasticity. Regressors not reported: gender, age, education, occupational status, macro-regions, log income, financial wealth categories, trust, self-confidence, experience, working in the financial sector. Significance: *** p<0.01, ** p<0.05, * p<0.1.

Table 4.13: First stage for financial literacy endogeneity

	Dep var: Fin Lit (UCS)
Experience	0.018*** (0.00)
Regional Fin Lit (SHIW)	0.426** (0.15)
N obs	1116
F excl instr	18.71
Hansen J	1.893
Hansen J p-val	0.169
Endog test	0.200
Endog test p-val	0.655

Unicredit 2007. Dep Var: Financial Literacy (baseline). Model: linear model estimated by GMM (only the first stage is reported). Standard errors reported in parentheses are robust to heteroskedasticity and clustering on regions. Regressors not reported: gender, age, education, occupational status, macro-regions, financial wealth categories, log individual income, self-confidence, financial sector dummy, trust, length of bank relationship. Significance: *** p<0.01, ** p<0.05, * p<0.1.

Table 4.14: Investing autonomously or delegating (controlling for financial literacy endogeneity)

	$D_i = 1$	$D_i = 2$	$D_i = 3$	$D_i = 4$	$D_i = 5$
Financial literacy	-0.018 (0.03)	-0.026 (0.05)	0.085** (0.04)	-0.028 (0.04)	-0.013 (0.01)
Fitted residuals	0.007 (0.03)	0.028 (0.05)	-0.057 (0.04)	0.012 (0.04)	0.010 (0.01)
N obs	1116				
Log-Lik	-1417.376				

Unicredit 2007. Dep Var: probability of delegating financial decisions ($D_i = 1, \dots, 5$), where $D_i=1$: I decide completely autonomously, the bank executes my decisions; $D_i=2$: I tell bank/advisor how I intend to invest and ask for their opinion; $D_i=3$: I consider bank/advisor proposals before deciding; $D_i=4$: I mostly rely on bank/advisor for my investment decisions; $D_i=5$: I let bank/advisor decide everything. Model: Generalized Ordered Probit, controlling for financial literacy endogeneity via control function approach (marginal effects reported). Instruments for financial literacy: average financial literacy at regional level (SHIW) and experience with financial products (UCS). Bootstrapped standard errors (200 repetitions) are robust to heteroskedasticity and clustering at regional level. Regressors not reported: same covariates as in Table 4.10. Sub-sample of investors holding risky assets. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4.15: Investing autonomously or delegating – Robustness on bank/broker relationships

	$D_i = 1$	$D_i = 2$	$D_i = 3$	$D_i = 4$	$D_i = 5$
Sample: Unicredit main or only bank (baseline) (N = 1,116)					
Financial literacy	-0.012** (0.01)	-0.003 (0.01)	0.037*** (0.01)	-0.017** (0.01)	-0.005** (0.00)
Sample: Unicredit only bank (N = 802)					
Financial literacy	-0.016** (0.01)	0.005 (0.01)	0.032*** (0.01)	-0.017* (0.01)	-0.005 (0.00)
Sample: Unicredit main/only bank and use broker never/seldom/sometimes (N = 847)					
Financial literacy	-0.012 (0.01)	0.002 (0.01)	0.032*** (0.01)	-0.016* (0.01)	-0.005** (0.00)
Sample: Unicredit main/only bank and use broker never/seldom (N = 705)					
Financial literacy	-0.012 (0.01)	0.001 (0.01)	0.037*** (0.01)	-0.019* (0.01)	-0.007** (0.00)

Unicredit 2007. Dep Var: probability of delegating financial decisions ($D_i = 1, \dots, 5$), where $D_i=1$: I decide completely autonomously, the bank executes my decisions; $D_i=2$: I tell bank/advisor how I intend to invest and ask for their opinion; $D_i=3$: I consider bank/advisor proposals before deciding; $D_i=4$: I mostly rely on bank/advisor for my investment decisions; $D_i=5$: I let bank/advisor decide everything. Model: Generalized Ordered Probit. Regressors not reported: same covariates as in Table 4.10. Standard errors are robust to heteroskedasticity. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4.16: Trust in own financial advisor/bank advisor

	(I)	(II)	(III)	(IV)	(V)	(VI)
Female	0.185*** (0.05)	0.182*** (0.05)	0.183*** (0.05)	0.178*** (0.05)	0.181*** (0.05)	0.178*** (0.05)
Age	0.007 (0.02)	0.007 (0.02)	0.005 (0.02)	0.004 (0.02)	0.004 (0.02)	0.004 (0.02)
Age squared	-0.000 (0.00)	-0.000 (0.00)	-0.000 (0.00)	-0.000 (0.00)	-0.000 (0.00)	-0.000 (0.00)
Years school	0.003 (0.01)	0.003 (0.01)	0.006 (0.01)	0.006 (0.01)	0.004 (0.01)	0.005 (0.01)
Log tot ind income	-0.066** (0.03)	-0.063** (0.03)	-0.058** (0.03)	-0.058** (0.03)	-0.060** (0.03)	-0.060** (0.03)
FinW 50-100 th	0.043 (0.09)	0.030 (0.09)	0.050 (0.09)	0.042 (0.09)	0.042 (0.09)	0.038 (0.09)
FinW 100-150 th	0.118 (0.08)	0.112 (0.08)	0.123 (0.08)	0.122 (0.08)	0.122 (0.08)	0.122 (0.08)
FinW 150-250 th	0.149* (0.08)	0.129 (0.09)	0.139 (0.09)	0.135 (0.09)	0.132 (0.09)	0.130 (0.09)
FinW 250-500 th	0.286*** (0.08)	0.267*** (0.08)	0.273*** (0.08)	0.276*** (0.08)	0.267*** (0.08)	0.270*** (0.08)
FinW 500+ th	0.543*** (0.11)	0.501*** (0.11)	0.508*** (0.11)	0.505*** (0.11)	0.494*** (0.11)	0.495*** (0.11)
Financial literacy	-0.013 (0.02)	-0.009 (0.02)	-0.013 (0.02)	-0.008 (0.02)	-0.009 (0.02)	-0.006 (0.02)
Self-confidence	0.053 (0.03)	0.053 (0.03)	0.050 (0.03)	0.042 (0.03)	0.050 (0.03)	0.043 (0.03)
Experience	0.003 (0.00)	0.003 (0.00)	0.003 (0.00)	0.002 (0.00)	0.002 (0.00)	0.002 (0.00)
Finance sector	-0.332* (0.17)	-0.309* (0.17)	-0.293* (0.17)	-0.278 (0.17)	-0.291* (0.17)	-0.279 (0.17)
Years at UC: 6-10	-0.126* (0.07)	-0.121 (0.07)	-0.136* (0.08)	-0.137* (0.07)	-0.130* (0.08)	-0.132* (0.07)
Years at UC: 11-20	-0.124* (0.07)	-0.126* (0.07)	-0.128* (0.07)	-0.120* (0.07)	-0.128* (0.07)	-0.121* (0.07)
Years at UC: > 20	-0.146** (0.07)	-0.134** (0.07)	-0.140** (0.07)	-0.129* (0.07)	-0.126* (0.07)	-0.120* (0.07)
Generalized trust	0.181*** (0.06)					
Trust in banks		2.287** (1.00)			1.767* (1.01)	1.409 (1.04)
GDP growth			0.016 (0.01)	0.012 (0.01)	0.016 (0.01)	0.012 (0.01)
Referendum 2006			0.022*** (0.01)		0.017** (0.01)	
Senate 2006				0.041*** (0.01)		0.035*** (0.01)
Constant	3.838*** (0.52)	3.811*** (0.51)	2.795*** (0.63)	0.567 (0.91)	3.036*** (0.59)	1.078 (0.92)
N obs	1581	1581	1581	1581	1581	1581
Adj. R-Squared	0.051	0.051	0.052	0.058	0.056	0.060

Data: Unicredit 2007. Dep Var: Trust in own financial advisor/bank official. Model: linear model estimated by OLS. Standard errors reported in parentheses are robust to heteroskedasticity and clustering on provinces. Regressors not reported: occupational status, macro region, Significance: *** p<0.01, ** p<0.05, * p<0.1.

Table 4.17: Delegating financial decisions (controlling for trust endogeneity)

Dep Var:	First Stage	Second Stage		
	Trust	$Pr(D_i \geq 4)$		D_i
Model:	(I)	Probit (II)	LPM (III)	(IV)
Trust in banks	1.784* (0.99)			
Referendum 2006	0.019*** (0.01)			
Trust advisor		0.089 (0.16)	-0.024 (0.21)	0.096 (0.45)
Fitted residuals		0.025 (0.16)		
N obs	1581	1116	1116	1116
F excl instr			4.629	4.629
Hansen J			0.516	0.342
Hansen J p-value			0.472	0.559
Endog test			0.307	0.298
Endog test p-val			0.580	0.585

Unicredit 2007. First column: first stage regression, where the dependent variable is trust towards advisor and the model is estimated by OLS. Second column: second stage regression, where the dependent variable is the probability of delegating ($D_i \geq 4$) and a probit model is estimated, instrumenting trust with a control function (Bootstrapped standard errors with 200 repetitions). Third column: second stage regression, where the dependent variable is the probability of delegating ($Pr(D_i \geq 4)$) and a linear probability model is estimated by GMM. Fourth column: second stage regression, where the dependent variable is delegation (D_i) and the model is estimated by GMM. Regressors not reported: gender, age, education, occupational status, macro-regions, log individual income, financial wealth categories, financial literacy, self-confidence, experience, financial sector dummy, length of bank relationship. Standard errors reported in parentheses are robust to heteroskedasticity and clustering on provinces. Significance: *** p<0.01, ** p<0.05, * p<0.1.

Table 4.18: Delegating financial decisions (effect of trust across length of relationship)

	Unicredit customers for ≤ 5 years (Dep Var: $Pr(D_i \geq 4)$)	Unicredit customers for > 5 years (Dep Var: $Pr(D_i \geq 4)$)
Trust advisor	0.102*** (0.04)	0.114*** (0.02)
N obs	82	1034
Log-Lik	-82.135	-1218.851

Unicredit 2007. Dep Var: Probability of Delegating Financial Decisions ($Pr(D_i \geq 4)$). Model: Generalized Ordered Probit. Regressors not reported: gender, age, education, occupational status, macro-regions, log individual income, financial wealth categories, financial literacy, self-confidence, experience, financial sector dummy. Standard errors reported in parentheses are robust to heteroskedasticity. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4.19: Delegating financial decisions (effect of trust across financial literacy levels)

	Financial Literacy Below average (≤ 4) (Dep Var: $Pr(D_i \geq 4)$)	Financial Literacy Above average (> 4) (Dep Var: $Pr(D_i \geq 4)$)
Trust advisor	0.109*** (0.03)	0.109*** (0.02)
N obs	384	732
Log-Lik	-467.370	-841.552

Unicredit 2007. Dep Var: Probability of Delegating Financial Decisions ($Pr(D_i \geq 4)$). Model: Generalized Ordered Probit. Regressors not reported: gender, age, education, occupational status, macro-regions, log individual income, financial wealth categories, self-confidence, experience, financial sector dummy, length of bank relationship. Standard errors reported in parentheses are robust to heteroskedasticity. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Bibliography

- Agarwal, S., J. C. Driscoll, X. Gabaix, and D. Laibson (2009). The age of reason: Financial decisions over the lifecycle. *Brookings Papers on Economic Activity* 2009(2), 51–117.
- Agnew, J. R., L. Szykman, S. P. Utkus, and J. A. Young (2007). Literacy, trust and 401(k) savings behavior. Working paper CRR WP 2007-10, Center for Retirement Research at Boston College.
- Atkinson, A., S. McKay, E. Kempson, and S. Collard (2006). Levels of financial capability in the UK: Results of a baseline survey. Consumer Research 47, Financial Services Authority.
- Australia and New Zealand Banking Group (2008). *ANZ Survey of Adult Financial Literacy in Australia*. Melbourne, Australia: Australia and New Zealand Banking Group.
- Banks, J. and Z. Oldfield (2007). Understanding pensions: Cognitive function, numerical ability and retirement saving. *Fiscal Studies* 28(2), 143–170.
- Barber, B. M. and T. Odean (2001). Boys will be boys: Gender, overconfidence, and common stock investment. *The Quarterly Journal of Economics* 116(1), 262–292.
- Beltratti, A. (2007). Gli impieghi del risparmio. In A. Beltratti (Ed.), *Finanza Globale, Risparmiatore Locale – XXV Rapporto BNL/Centro Einaudi sul risparmio e sui risparmiatori in Italia*. BNL Edizioni, Guerini e Associati.
- Ben-Porath, Y. (1967). The production of human capital and the life cycle of earnings. *The Journal of Political Economy* 75(4), 352–365.
- Bernheim, B. D. and D. M. Garrett (2003). The effects of financial education in the workplace: evidence from a survey of households. *Journal of Public Economics* 87(7-8), 1487–1519.

- Bernheim, B. D., D. M. Garrett, and D. M. Maki (2001). Education and saving: The long-term effects of high school financial curriculum mandates. *Journal of Public Economics* 80(3), 435 – 465.
- Bernheim, D. D. (1998). Financial illiteracy, education, and retirement saving. In O. S. Mitchell and S. J. Schieber (Eds.), *Living with Defined Contribution Pensions*, pp. 38–68. The Pension Research Council, Wharton School Pension Research Council, University of Pennsylvania.
- Bluethgen, R., A. Gintschel, A. Hackethal, and A. Müller (2008). Financial advice and individual investors' portfolios. mimeo.
- Boes, S. and R. Winkelmann (2006). Ordered response models. *Allgemeines Statistisches Archiv* 90(1), 165–179.
- Bolton, P., X. Freixas, and J. Shapiro (2007). Conflicts of interest, information provision, and competition in the financial services industry. *Journal of Financial Economics* 85(2), 297 – 330.
- Brown, J. R., M. D. Casey, and O. S. Mitchell (2008). Who values the social security annuity? New evidence on the annuity puzzle. NBER Working Paper No. 13800, National Bureau of Economic Research.
- Browning, M. and A. Lusardi (1996). Household saving: Micro theories and micro facts. *Journal of Economic Literature* 34(4), 1797–1855.
- Bucher-Koenen, T. and A. Lusardi (2010). Financial literacy and retirement planning in Germany. Paper presented at the Netspar International Pension Workshop, Zurich, 10-11 June 2010.
- Carlin, B. I. (2009). Strategic price complexity in retail financial markets. *Journal of Financial Economics* 91(3), 278 – 287.
- Cho, I.-K. and D. M. Kreps (1987). Signaling games and stable equilibria. *The Quarterly Journal of Economics* 102(2), 179–222.
- Christelis, D., T. Jappelli, and M. Padula (2005). Health risk, financial information and social interactions: the portfolio choice of European elderly households. mimeo.
- Christelis, D., T. Jappelli, and M. Padula (2010). Cognitive abilities and portfolio choice. *European Economic Review* 54(1), 18 – 38.
- Christiansen, C., J. S. Joensen, and J. Rangvid (2008). Are economists more likely to hold stocks? *Review of Finance* 12, 465–496.
- Clark, R. L., M. S. Morrill, and S. G. Allen (2009). The role of financial literacy and knowledge in determining retirement plans. Working paper, College of Management, North Carolina State University.

- Cole, S., T. Sampson, and B. Zia (2010). Prices or knowledge? What drives demand for financial services in emerging markets? mimeo.
- Cole, S. and G. K. Shastri (2009). Smart money: The effect of education, cognitive ability, and financial literacy on financial market participation. mimeo, Harvard Business School.
- Crawford, V. P. and J. Sobel (1982). Strategic information transmission. *Econometrica* 50(6), 1431–1451.
- Daniel, K., D. Hirshleifer, and S. H. Teoh (2002). Investor psychology in capital markets: evidence and policy implications. *Journal of Monetary Economics* 49(1), 139 – 209.
- Delavande, A., S. Rohwedder, and R. J. Willis (2008). Preparation for retirement, financial literacy and cognitive resources. Michigan Retirement Research Center Working Paper No. 2008-190.
- Dincer, O. C. and E. M. Uslaner (2010). Trust and growth. *Public Choice* 142(1-2), 59–67.
- Donkers, B. and A. van Soest (1999). Subjective measures of household preferences and financial decisions. *Journal of Economic Psychology* 20(6), 613–642.
- Duflo, E. and E. Saez (2002). Participation and investment decisions in a retirement plan: The influence of colleagues’ choices. *Journal of Public Economics* 85(1), 121 – 148.
- EBRI (2007). The retirement system in transition: The 2007 retirement confidence survey. Issue Brief No. 304, Employee Benefit Research Institute.
- European Commission (2007). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – A single market for 21st century Europe*. COM(2007) 724 final. Brussels: Commission of the European Communities.
- European Commission (2008). *Europeans’ Knowledge of Economic Indicators*. Special Eurobarometer Wave 67.2. European Commission.
- European Commission (2009). *Commission Staff Working Document on the Follow up in Retail Financial Services to the Consumer Markets Scoreboard*. SEC(2009) 1251 final. Brussels: Commission of the European Communities.

- Forbes, J. and S. M. Kara (2010). Confidence mediates how investment knowledge influences investing self-efficacy. *Journal of Economic Psychology* 31(3), 435 – 443.
- Gambetta, D. (1998). Can we trust trust? In D. Gambetta (Ed.), *Trust: Making and Breaking Cooperative Relations*, pp. 213–237. Oxford: University of Oxford.
- Georgarakos, D. and R. Inderst (2010). Financial advice and stock market participation. mimeo.
- Gerardi, K., L. Goette, and S. Meier (2010). Financial literacy and subprime mortgage delinquency: Evidence from a survey matched to administrative data. Working Paper No. 2010-10, Federal Reserve Bank of Atlanta.
- Greene, W. H. and D. A. Hensher (2010). *Modeling Ordered Choices: A Primer*. Cambridge: Cambridge University Press.
- Guiso, L. and T. Jappelli (2006). Information acquisition and portfolio performance. *CEPR Discussion Paper* (No. 5901).
- Guiso, L. and T. Jappelli (2008). Financial literacy and portfolio diversification. EUI Working Paper ECO 2008/31.
- Guiso, L., P. Sapienza, and L. Zingales (2004). The role of social capital in financial development. *The American Economic Review* 94(3), 526–556.
- Guiso, L., P. Sapienza, and L. Zingales (2008). Trusting the stock market. *Journal of Finance* 53(6), 2557–2600.
- Hackethal, A., M. Haliassos, and T. Jappelli (2009). Financial advisors: A case of babysitters? *CEPR Discussion Paper* (No. 7235).
- Hackethal, A., R. Inderst, and S. Meyer (2010). Trading on advice. mimeo.
- Hastings, J. S. and L. Tejeda-Ashton (2008). Financial literacy, information, and demand elasticity: Survey and experimental evidence from Mexico. NBER Working Paper 14538, National Bureau of Economic Research.
- Hilgert, M. A., J. M. Hogarth, and S. Beverly (2003). Household financial management: The connection between knowledge and behavior. *Federal Reserve Bulletin* 89(7), 309–322.
- HM Treasury (2007). *Financial Capability: the Government's long term approach*. HM Treasury.
- Hong, H., J. D. Kubik, and J. C. Stein (2004). Social interaction and stock-market participation. *The Journal of Finance* 59(1), 137–163.

- Howlett, E., J. Kees, and E. Kemp (2008). The role of self-regulation, future orientation, and financial knowledge in long-term financial decisions. *Journal of Consumer Affairs* 42(2), 223–242.
- Hung, A. A., A. M. Parker, and J. K. Yoong (2009). Defining and measuring financial literacy. Working Paper WR-708, RAND Working Paper.
- Inderst, R. and M. Ottaviani (2009). Misselling through agents. *The American Economic Review* 99(3), 883 – 908.
- Istat (2004). *Edifici ed abitazioni. Censimento 2001, Dati definitivi*. Rome: Istat.
- Jappelli, T. (2010). Economic literacy: An international comparison. *The Economic Journal* 120(548), F429–F451.
- Jappelli, T. and M. Padula (2010). Financial literacy accumulation and portfolio decisions. Paper presented at the XIX International Tor Vergata Conference on Money, Banking and Finance, Rome, December 13-17, 2010.
- JumpStart Coalition for Personal Financial Literacy (2007). *National Standards in K-12 Personal Finance Education*. JumpStart Coalition for Personal Financial Literacy.
- Kimball, M. S. and T. Shumway (2007). Investor sophistication and the home bias, diversification, and employer stock puzzles. mimeo, University of Michigan.
- Knack, S. and P. Keefer (1997). Does social capital have an economic payoff? A cross-country investigation. *The Quarterly Journal of Economics* 112(4), 1251–1288.
- Krausz, M. and J. Paroush (2002). Financial advising in the presence of conflict of interests. *Journal of Economics and Business* 54, 55 – 71.
- Kruger, J. and D. Dunning (1999). Unskilled and unaware of it: How difficulties in recognizing one’s own incompetence lead to inflated self-assessments. *Journal of Personality and Social Psychology* 77(6), 1121–1134.
- Lillard, L. and R. J. Willis (2001). Cognition and wealth: The importance of probabilistic thinking. Michigan Retirement Research Center Working Paper No. 2001-007.
- Lusardi, A. (2003). Planning and saving for retirement. mimeo.

- Lusardi, A. (2007). Household saving behavior: The role of literacy, information and financial education programs. Paper written for the conference “Implications of Behavioral Economics for Economic Policy” held at the Federal Reserve Bank of Boston on September 27-28, 2007.
- Lusardi, A. (2008). Household saving behavior: The role of financial literacy, information, and financial education programs. NBER Working Paper 13824, National Bureau of Economic Research.
- Lusardi, A. and O. Mitchell (2006). Financial literacy and planning: Implications for retirement wellbeing. PRC Working Paper No. 1/2006.
- Lusardi, A. and O. S. Mitchell (2007a). Baby boomer retirement security: The roles of planning, financial literacy, and housing wealth. *Journal of Monetary Economics* 54(1), 205–224.
- Lusardi, A. and O. S. Mitchell (2007b). Financial literacy and retirement planning: New evidence from the Rand American Life Panel. Working Paper 2007-157, University of Michigan Retirement Research Center.
- Lusardi, A. and O. S. Mitchell (2008). Planning and financial literacy: How do women fare? *American Economic Review* 98(2), 413–17.
- Lusardi, A., O. S. Mitchell, and V. Curto (2010). Financial literacy among the young. *Journal of Consumer Affairs* 44(2), 358–380.
- Lusardi, A. and P. Tufano (2008). Debt literacy, financial experience and overindebtedness. NBER Working Paper No. W14808, National Bureau of Economic Research.
- Lyons, A. C., M. Rachlis, and E. Scherpf (2007). What’s in a score? Differences in consumers’ credit knowledge using OLS and quantile regressions. *Journal of Consumer Affairs* 41(2), 223–249.
- Meier, S. and C. Sprenger (2008). Discounting financial literacy: Time preferences and participation in financial education programs. *IZA Discussion Paper* (No. 3507).
- Monticone, C. (2010). How much does wealth matter in the acquisition of financial literacy? *Journal of Consumer Affairs* 44(2), 403–422.
- Mullainathan, S., M. Nöth, and A. Schoar (2010). The market for financial advice: An audit study. Paper presented at the II SAVE Conference ‘to SAVE or not to SAVE: Old-age provision in times of crisis’, 16-17 june 2010, Deidesheim, Germany.
- Müller, S. and M. Weber (2010). Financial literacy and mutual fund investments: Who buys actively managed funds? *Schmalenbach Business Review* (forthcoming).

- Noctor, M., S. Stoney, and S. Stradling (1992). Financial literacy: a discussion of concepts and competences of financial literacy and opportunities for its introduction into young people's learning. Technical report, National Foundation for Educational Research.
- Nöth, M. and T. Puhan (2009). How to hide mutual fund fees - experimental evidence. Working paper, University of Hamburg.
- OECD (2005). *Improving Financial Literacy: Analysis of Issues and Policies*. Paris: OECD.
- OECD (2008). *Improving Financial Education and Awareness on Insurance and Private Pensions*. Paris: OECD.
- Ottaviani, M. (2000). The economics of advice. mimeo.
- Ottaviani, M. and P. N. Sørensen (2006). Professional advice. *Journal of Economic Theory* 126(1), 120–142.
- Pasini, G. and D. Georgarakos (2009). Trust, sociability and stock market participation. Netspar Discussion Paper No. 04/2009-015, Netspar.
- Peress, J. (2004). Wealth, information acquisition, and portfolio choice. *The Review of Financial Studies* 17(3), 879–914.
- Perry, V. G. and M. Morris (2005). Who is in control? The role of self-perception, knowledge, and income in explaining consumer financial behavior. *Journal of Consumer Affairs* 39(2), 299–313.
- Personal Finance Research Centre (2005). Measuring financial capability: an exploratory study. Consumer Research 37, Financial Services Authority.
- President's Advisory Council on Financial Literacy (2008). *2008 Annual Report to the President*. The Department of the Treasury.
- Putnam, R. (1993). *Making Democracy Work*. Princeton, NJ: Princeton University Press.
- Rivers, D. and Q. H. Vuong (1988). Limited information estimators and exogeneity tests for simultaneous probit models. *Journal of Econometrics* 39(3), 347–366.
- Shapira, Z. and I. Venezia (2001). Patterns of behavior of professionally managed and independent investors. *Journal of Banking and Finance* 25(8), 1573–1587.
- Terza, J. V. (1985). Ordered probit: A generalization. *Communications in Statistics - A. Theory and Methods* 14(1), 1–11.

- van Rooij, M., A. Lusardi, and R. Alessie (2007). Financial literacy and stock market participation. NBER Working Paper No. W13565, National Bureau of Economic Research.
- van Rooij, M., A. Lusardi, and R. Alessie (2008). Financial literacy, retirement planning, and household wealth. Paper presented at the ECB-CFS Conference on Household Finances and Consumption, Frankfurt am Main, Germany, September 4-5, 2008.
- Vissing-Jorgensen, A. (2004). Perspectives on behavioral finance: Does “irrationality” disappear with wealth? Evidence from expectations and actions. In *NBER Macroeconomics Annual 2003*, Volume 18, pp. 139–208. National Bureau of Economic Research.
- Willis, L. E. (2008). Against financial-literacy education. *Iowa Law Review* 94, 197–285.
- Wooldridge, J. M. (2002). *Econometric Analysis of Cross Section and Panel Data*. Cambridge, Massachusetts; London, England: The MIT Press.
- Wooldridge, J. M. (2007). *Control Functions and Related Methods – What’s New in Econometrics? Lecture 6*. NBER Summer Institute 2007.
- Zak, P. J. and S. Knack (2001). Trust and growth. *The Economic Journal* 111(470), 295–321.