

# **Financial Literacy, Retirement Provisions, and Household Portfolio Behavior**

**Four Empirical Contributions**

**Maarten van Rooij**

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# **Financial Literacy, Retirement Provisions, and Household Portfolio Behavior**

## **Four empirical contributions**

Financieel Alfabetisme, Pensioenvoorzieningen  
en Beleggingsgedrag van Gezinnen

Vier empirische bijdragen  
(met een samenvatting in het Nederlands)

Proefschrift ter verkrijging van de graad van doctor  
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Marinus Cornelia Jozef van Rooij

geboren op 10 juli 1970  
te Acht (Eindhoven)

Promotoren: Prof. dr. R.J.M. Alessie  
Prof. dr. L.H. Hoogduin

To my family



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Maarten van Rooij, Amsterdam, November 2, 2008





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# INTRODUCTION



## **1. Background and motivation**

This thesis is a collection of four papers on household financial behavior. The landscape for the management of household wealth has changed dramatically in a relatively short time period. On the one hand, economic welfare is at unprecedented levels and provides many households with increased opportunities to accumulate savings, to invest their wealth portfolio and to trade off labor and leisure intertemporally. On the other hand, people are increasingly expected to take individual responsibility for their economic well-being. At the same time, the deregulation of financial markets has increased competition between financial institutions and boosted financial innovations which among others has led to a continuous stream of new financial instruments. These developments contribute to the increased interest of the economics profession in studies on household finance (see for example the Presidential Address to the American Finance Association by John Campbell (2006)), but also explain its growing relevance in policy-debates since the effectiveness of fiscal and monetary policy crucially depends on consumers' responses.

Life cycle models of consumption and savings behavior have been and still are the most important departing point for the description of household financial behavior. The simplest versions of these models predict that households accumulate wealth during their working career to finance retirement thereafter (Modigliani and Brumberg, 1954; Friedman, 1957). Life cycle models have been made much more realistic since then by incorporating for example uncertainty, liquidity constraints, and bequest motives (see Browning and Lusardi (1996) for an overview). The underlying basic assumptions however have remained unchanged in most models, i.e. consumers are considered as rational agents who collect and process all relevant information and maximize their lifetime utility. The validity of these assumptions has been questioned by for example psychologists who argue that consumers use heuristics and are prone to behavioral biases. At the same time there is evidence that households make financial mistakes violating the implicit assumption in life cycle savings models that households possess the necessary skills to behave optimally. The common theme of the papers collected in this thesis relates to retirement behavior and the role of financial skills in individual decision-making. More specifically, the papers address pension preferences of employees and their willingness to exercise investor autonomy as well as their ability to do so; the measurement of individuals' financial sophistication and ability, and its impact on portfolio choice, wealth accumulation and retirement planning; the role of financial literacy and other determinants of individual decision-making in choice situations with a default option.

The papers take a positive approach. We try to describe and explain household behavior based on information obtained from specifically designed internet surveys among the Dutch household panel of CentERdata.<sup>1</sup> Where historically economists have been skeptical towards the usefulness of household surveys and the information content of subjective questions, they are now widely used and have proven to elicit helpful information with predictive validity on household behavior.<sup>2</sup> Moreover, they are indispensable for generating information on heterogeneous household preferences and attitudes which are crucial for understanding individual decision-making.

## 2. Outline

The first paper, entitled ‘Risk-return preferences in the pension domain: Are people able to choose?’, investigates pension preferences and investor autonomy of Dutch employees. The Netherlands is an interesting case study as its pension system provides hardly any freedom of choice, while in the last three decades countries all over the world have shifted risk and responsibility from employers towards workers. The United States and the United Kingdom have for example witnessed a major shift towards Defined Contribution (DC) retirement plans at the expense of Defined Benefit (DB) plans. New international accounting standards, the stock market crisis in 2000-2003 and the structural decline in capital market interest rates have fuelled the debate on whether the prevailing DB system is still affordable or whether more investment autonomy and risks should be shifted to employees.

We find that a vast majority of Dutch employees opposes to changes that provide them with more individual responsibility for their pension provisions. These preferences are guided by their attitude towards risk and an introspection of their own financial skills. Respondents are highly risk averse, especially in the pension domain, and strongly prefer guaranteed pension benefits upon retirement. In addition, the average respondent considers himself financially unsophisticated and is reluctant to take control of retirement savings even when

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<sup>1</sup> While the surveys are answered via the internet, the access to internet is not a prerequisite in the recruitment phase. If necessary, panel members are either provided with a pc with internet connection or a set-top-box that enables them to participate through their television set. An advantage of web-based interviews is that participants do not feel rushed to provide answers and that the absence of an interviewer increases anonymity and reduces the likelihood of social desirable responses. Although, there is some concern of shortcutting or satisficing behavior (quick, inaccurate responses by less motivated respondents) in internet surveys because the computer design provides additional opportunities for multitasking and quickly skipping from one topic to the next one, laboratory and field experiments by Chang and Krosnick (2003) document evidence of less satisficing behavior in a self-administered computer-based survey mode compared to the administration of interviews over the telephone.

<sup>2</sup> See for example Hurd and McGarry (2002), Manski (2004), Donkers and Van Soest (1999), and Kapteyn and Teppa (2002).

offered the possibility to increase expertise. An experiment shows that respondents who initially choose a relatively safe investment portfolio in a hypothetical DC-system are likely to switch to the more risky median investment portfolio when confronted with the probability distribution of future income flows. This suggests that respondents indeed lack the financial skills needed for exercising investor autonomy over pension wealth. While these results might partly reflect the lack of exposure to self-directed savings plans in the past, they also raise questions and concerns about the general level of financial literacy.

The second paper, entitled ‘Financial literacy and stock market participation’, aims at measuring household financial knowledge and cognitive ability. Not only pension decisions but also many other financial decisions have become more complex due to financial innovations and an increasing supply of complex products (e.g. the loan market). At the same time, individuals are increasingly expected to take responsibility for their economic well-being. While financial skills are a necessary prerequisite to deal with increasing individual responsibility, we have little knowledge on whether individuals are capable of navigating this new financial environment. We have designed an extensive list of questions to assess basic financial literacy related to numeracy and the working of inflation and interest rates as well as questions on more advanced topics related to financial market instruments (stocks, bonds and mutual funds). Thereby, our work improves upon previous studies by considering more refined indices of financial literacy.

Our data show that the majority of households display basic financial knowledge and have some grasp of concepts such as interest compounding, inflation, and the time value of money. However, very few go beyond these basic concepts; many households do not know the difference between bonds and stocks, the relationship between bond prices and interest rates, and the basics of risk diversification. We also contribute to the methodology of measuring financial knowledge as we show that there is a lot of noise in the responses to financial literacy questions, i.e. the wording of the questions is critically important for measuring financial knowledge and minor variations in the wording of questions may cause vast changes in response patterns. The sensitivity to the wording of survey questions provides additional evidence for limited financial knowledge, but it also emphasizes the importance of testing and validating questions in e.g. pilot versions before fielding the final survey.

We evaluate the importance of financial literacy by studying whether more financially knowledgeable individuals are more likely to hold stocks. Thereby, we add to the literature which tries to understand the puzzle of limited stock market participation (Haliassos and Bertaut, 1995). Standard expected utility maximization models dictate that it is optimal for

virtually everyone to invest part of their wealth in stocks if only a tiny fraction. The motivation is that households facing no equity risk will be better in terms of expected utility when they participate for at least a small amount in the stock market provided that the equity premium is positive. Nevertheless, in practice in most countries there is a large majority who stays away from the stock market (Guiso, Haliassos and Jappelli, 2002). The basic idea that emerges from the literature is that information and processing costs, including costs to figure out how to invest and how to monitor advisors and outcomes, play an important role in explaining nonparticipation. This explanation however is inadequate for wealthy households. Other studies point to the role of trust and social interactions. A high level of financial knowledge will contribute to lower information costs and reduce the relevance of barriers to participation. Indeed, we document evidence that individuals with low financial literacy are significantly less likely to invest in stocks. We employ the variation in the extent to which people have been exposed to economics during their education, measuring financial knowledge that existed prior to investing in the stock market, in order to address the issue of reverse causality i.e. the possibility that people increase their financial sophistication as a result of their activities in the stock market.

The third paper, entitled ‘Financial literacy, retirement planning, and household wealth’, focuses on the effect of financial literacy on household net worth. Thereby, it investigates the relevance of financial sophistication for household behavior and financial outcomes from a broader perspective. There is ample empirical evidence that many households are prone to make financial mistakes and some evidence, although not undisputed, that financial education fosters savings (see Lusardi (2004) for an overview). The latter studies however do not particularly focus on whether financial education impacts savings via an increase in financial sophistication or via other mechanisms. The reported effects on savings could - at least partly - also stem from the provision of information, the offering of commitment devices, peer effects, or be due to self-selection into financial education seminars.

Our estimation results document a statistically and economically significant influence of financial sophistication on wealth holdings. This is important for public policy, especially in view of the widespread fear that many households do not save enough for retirement. Indeed, we show that financial sophistication fosters planning for retirement. Thereby, people collect and process information on (future) income and expenses, and do the necessary calculations. This process provides them with information on the required retirement savings, whereas the related activities might help households to overcome problems of self-control and



increase wealth holdings (Ameriks, Caplin and Leahy, 2003; Lusardi and Mitchell, 2007). At the same time, the fact that financial knowledge increases the likelihood of entering the stock market, thereby improving opportunities to diversify and taking advantage of the equity premium, might contribute to better portfolio management and higher wealth as well. We highlight both these channels as potential mechanisms explaining the positive effect of financial sophistication on household net worth. An additional finding is that for those who are relatively confident about their financial skills the likelihood to enter retirement planning activities is higher. Apparently the extent to which people feel uncomfortable about their financial sophistication is another element that deters people from making information intensive decisions. This suggests that, in addition to financial education, efforts to present choice problems in a clear and easily understandable way could effectively support households in making complicated decisions.

The fourth paper, entitled ‘Choice or no choice: What explains the attractiveness of default options?’, investigates the impact of financial literacy on retirement savings decisions from a different perspective. It is well documented that default options attract disproportionately many decision-makers. However, from a theoretical point of view, the framing of decisions, and in particular the choice of the default option, should not matter if preferences are clearly defined and the cost of switching between alternatives is negligible. Conventional wisdom states that more freedom of choice is always better as people may choose to ignore new options. Applying insights from psychological research to economics, it has been shown that choice stress and information overload may have an important impact on financial decisions because these factors make default choices more likely. However, there are also other reasons why decision-makers find default options more attractive such as inertia, status quo bias, the interpretation of defaults as implicit advice, and procrastination.

To the best of our knowledge however there has not been a study that compared the relative importance of these explanations empirically. We take the viewpoint that individuals who defer decisions because of their complexity in one choice situation are also more likely to display this type of behavior in other domains. Persons who procrastinate on the cancellation of their subscriptions might as well procrastinate in taking care of their retirement provisions. We consider several heterogeneous choice situations with very different characteristics and investigate whether there is a dominant factor explaining default decisions. From this we draw lessons for important financial choices in general and retirement decisions in particular.

Our results show that procrastination and financial illiteracy are important determinants of default choices in many choice situations in the Netherlands. The situations we consider include important financial decisions such as savings for old age and early retirement and having a will. Furthermore, we also consider issues like organ donation, voting participation, canceling subscriptions and no consent decisions to block commercial marketing efforts by mail or phone. In addition, the role of social interactions and social norms seems to be important in explaining deviations from the default because of the impact of third party opinions on choice behavior.

This paper also contains a comparable analysis for the US as we had the opportunity to insert a shortened version of our survey on default choices into the RAND American Life Panel. Interestingly, procrastination and financial illiteracy come forward as important explanations for default choices in the US as well, but we do not find a similar role for social norms and interactions. Moreover, in the US financial literacy seems more important than procrastination, whereas in the Netherlands procrastination seems to be somewhat more dominant. While we can only speculate about the sources of these differences - which are likely to be related to the distinct institutions, culture and traditions – they have important implications for public policy. In particular the findings suggest that in the Netherlands new policy initiatives require a relatively larger role for increasing awareness, whereas in the US emphasizing the provision of information and a clear and simple presentation of decisions might be the most effective way to proceed.

### **3. Discussion**

While the four papers address several dimensions of financial behavior and individual decision-making, the overall picture that emerges is, first, that financial skills are crucially important for household decisions and, second, that there is a wide gap between the public's actual financial knowledge and ability on the one hand and the financial skills needed for e.g. retirement savings decisions on the other hand.

This said, the empirical results also make clear that households are not completely irrational. Dutch employees for example seem to be aware of the lack of financial literacy which explains why they are not keen to exert more control and investor autonomy in the pension domain. In addition, while default options do affect individual decision-making, most variation in choices is yet explained by heterogeneity in objective personal characteristics and circumstances. At the same time, individuals are more likely to hold substantial wealth holdings, to take active decisions and to behave according to the standard models of optimal

economic behavior when they are better educated, and in particular have higher financial skills.

A direct implication is that increasing the level of financial education stimulates wise economic behavior and helps consumers taking their responsibility in important financial decisions. It is clear that in the last say thirty years, the relative importance of financial skills has increased and it is important that school curricula reflect this development. An important topic for further research is how financial education can be organized most effectively also as regards the timing of activities (both during school and thereafter; e.g. training on the job), the type of information as well as the way it is conveyed possibly dependent on the target group (oral or written information, using internet, television or other communication channels, etc.). Another important question not addressed in this thesis is the relative importance of schooling and learning by doing in accumulating knowledge and acquiring financial skills. Intuitively, both seem important and are likely to reinforce each other. Nevertheless, the size of the gap between financial literacy and the necessary skills to navigate through the current financial environment suggests that financial education alone will most likely not suffice to close the gap. Moreover, the results from studies focusing on the US, a country which historically has been characterized by much freedom of choice and individual responsibility, evoke modesty as regards to what can be accomplished by learning from experience. Against this background, the current financial crisis has shown that also highly educated experts with a huge amount of experience apparently had trouble in understanding complex financial instruments and the basics of risk management.

The implications for modeling household behavior are less straightforward. The conclusions involve a clear violation of the basic assumptions underlying standard life cycle models of utility maximization in which households collect all relevant information and are equipped with the necessary knowledge and skills to solve complex mathematical problems. Because of this lack of financial sophistication, it may not come us a surprise that these models have difficulties in accurately describing actual household behavior. Somewhat more successful are behavioral models (including models of bounded rationality or satisficing behavior in which households search for solutions which are adequately appropriate) which usually focus on specific heuristic behavior, e.g. based upon concepts such as myopia, loss aversion, mental accounting, or habit formation. While these models might be more successful in describing household behavior in specific situations, they do not offer a guide on how households should behave nor offer a comprehensive tool to explain household behavior in a multitude of situations. At the same time, our research documents widespread differences

in financial literacy and heterogeneity in individual decision-making which makes it unlikely that it is possible to find a synthesis; a comprehensive model incorporating all household characteristics which can deal with both optimal (prescriptive) and actual (descriptive) behavior in many situations.

Standard economic models do however provide an important benchmark for optimal consumer behavior from a rational, economic point of view. The necessity of interventions in the decision making process of households should be based on how far household decisions are away from optimal behavior and a careful evaluation of how this situation might be improved. Policy measures may take the form of information provision and financial education initiatives to improve financial literacy without impairing the decision autonomy of households. Interventions may occasionally also take the form of changing default options in the interest of the average consumer, in regulation and supervision of financial markets, or at the extreme in limiting the choice options for households. As regards the latter one could indeed make a case that, given the complexity of pension decisions and the potential consequences of serious financial mistakes for retirement savings, government intervention in the pension system is justified (as is done in many countries in the form of the provision of a state pension or with compulsory participation in company pension plans). Behavioral models contribute to this process because they give insight in why people show non-optimal behavior and provide information that policy-makers or regulators can use to create tools or guidelines for effective interventions. At the same time, one should be very careful with intervening in individual decision-making as interventions might entail unintended consequences.

Competition in markets where financial products are developed and sold fosters innovative solutions that are tailor-made for real household financial problems, but at the same time these markets should be organized in a way to avoid incentives that work against the interest of financially illiterate consumers. A low level of financial literacy in combination with typical behavioral traits (procrastination, myopia, inertia, etc.) make consumers sometimes easily attracted to decisions that are not in their best interest (e.g. going for short term gains, underestimating or ignoring risks that are involved, etc.). At the same time financial institutions might be faced with the temptation to exploit these behavioral traits in view of profit maximization or competitive pressures. This may take the form of the provision of information which is heavily emphasizing the advantages of products for the customer, downplaying or ignoring the disadvantages or seducing consumers with special offers to profit from those who get locked in. Ironically, well-informed consumers take advantage of the opportunities offered by these selling strategies and might in the end be subsidized by

illiterate consumers paying too high prices. Gabaix and Laibson (2006) show theoretically how this situation can persist while none of the participants (buyers and sellers) has an incentive to increase transparency and educate the illiterate consumers.

Principally, financial advisors and intermediaries play an important role in dealing with financial illiteracy. They are able to collect and process information on products and their conditions from a large amount of financial institutions efficiently and translate them into easily accessible choices households have to make. The problem however is how to create incentives to assure that advisors act in best interest of their customers. The same lack of financial expertise and behavioral traits make consumers vulnerable for financial mistakes in basing their decisions on financial advice of intermediaries (e.g. the attractiveness of seemingly free advice, a focus on low interest rates in complex mortgage products, the eye-catching figures of investment returns based on favorable assumptions). In fact, consumers need a lot of financial skills to choose independent advisors who act in their clients' interest and to be able to understand the consequences of the financial advice given.

Here is a role for regulation to promote transparency and complete and easily accessible information to ease the consumers' decision-making process as well as to safeguard that institutions who operate at the edge of an integer policy towards the consumers' interest are not driving out of the market the financial firms that do act in the best interest of the consumer for a fair price. Helpful measures that are actually gaining popularity are rules for transparency on all costs involved by financial products and advice in prescribed formats, transparency on incentive structures, or license systems for organizations and fulfill a number of condition to secure quality

The whole palette of imposing rules on transparency, information provision and incentive structures, the use of well-considered designs for decision problems (including the default option) and in exceptional situations limiting the freedom of choice might moderate the adverse consequences of limited financial skills. Naturally, the trade-off between enforcing rules, limiting freedom of choice and using default options to steer consumer decisions on the one hand and the decision autonomy of households and neutrality of government institutions on the other hand is a political decision. Nevertheless, given the empirical evidence on the wide heterogeneity in financial skills and the current lack of basic economic insights among a substantial group of most illiterate consumers, this type of measures might be necessary to supplement financial education initiatives as in the end we cannot expect each consumer to be skilled as an economics expert.

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**PAPER ONE \***

**RISK-RETURN PREFERENCES IN THE PENSION DOMAIN:  
ARE PEOPLE ABLE TO CHOOSE?**

**(Co-authors: Clemens Kool and Henriëtte Prast)**

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# **Risk-Return Preferences in the Pension Domain: Are People Able to Choose?**

Maarten van Rooij (De Nederlandsche Bank and Netspar)  
Clemens Kool (Utrecht School of Economics and Netspar)  
Henriëtte Prast (De Nederlandsche Bank, Netspar and Tilburg University)\*

August 2006

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## **Abstract**

This paper presents new evidence for the Netherlands on pension preferences and investor autonomy in the pension domain using a representative survey of about 1000 Dutch citizens. Our main conclusions are the following. Risk aversion is domain dependent and highest in the pension domain. The vast majority of respondents favors the currently dominant defined benefit pension system. If offered a combined defined benefit/defined contribution system, the majority would like to have a guaranteed pension income of at least 70% of their net labor income. Self-assessed risk tolerance and financial expertise are important individual explanatory variables of pension attitudes. The average respondent considers himself financially unsophisticated and is reluctant to take control of retirement savings investment, even when offered the possibility to increase expertise. Respondents who have chosen a relatively safe portfolio tend to switch to the riskier median portfolio when they are shown future income streams. This again suggests that many respondents currently lack the skills to have investor autonomy over investment for retirement.

**Key words:** Investor Autonomy, Pension Preferences, Risk Tolerance, Defined Contribution Schemes

**JEL Classification:** D12, D80, G11, J26

\* Maarten C.J. van Rooij, Economics & Research Division, De Nederlandsche Bank, P.O. Box 98, 1000 AB, Amsterdam ([M.C.J.van.Rooij@dnb.nl](mailto:M.C.J.van.Rooij@dnb.nl)), Clemens, J.M. Kool, professor of Finance and Financial Markets at the Utrecht School of Economics of Utrecht University ([C.Kool@econ.uu.nl](mailto:C.Kool@econ.uu.nl)), and Henriëtte M. Prast, professor of Personal Finance at Tilburg University on a Rabo/Netspar chair ([H.M.Prast@uvt.nl](mailto:H.M.Prast@uvt.nl)). The authors are grateful to two anonymous referees, to Rob Alessie, Dimitris Georgarakos, Lex Hoogduin, Kristin Kleinjans, James Poterba (editor), Fred van Raaij, Susann Rohwedder, Margreet Schuit, Paul Sengmüller, Arthur van Soest, Peter Vlaar, Peter van Els, and to participants of the 7<sup>th</sup> DNB Annual Research Conference on Household Behavior and Financial Decision Making (Amsterdam, November 2004), the 6<sup>th</sup> RTN Conference on Economics of Ageing (Frankfurt, May 2005) and seminars at DNB, Utrecht University and Netspar, for their valuable comments and suggestions. Moreover, we thank the staff of CentERdata and in particular Corrie Vis for their assistance in setting up the survey and the field work. The views expressed in this paper are those of the authors and do not necessarily reflect those of the Nederlandsche Bank.

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## 1. Introduction

In the industrialized world, risk and responsibility in retirement plans are increasingly shifted from employers towards workers. Twenty-five years ago the majority of US private pension plans was purely defined benefit (DB). This number has decreased to 1 out of 10 retirement plans and nowadays the majority is defined contribution (DC) only. The same trend has appeared in many European countries, with the United Kingdom as the most notable example. However, some countries, e.g. the Netherlands, are still dominated by DB pension plans. Nevertheless, even these countries gradually are and will be affected by the trend towards DC systems.

This paper summarizes and discusses the key findings of a survey on risk-return preferences of Dutch employees in the pension domain. The focus is on whether people are able to choose, that is whether individuals have well-defined preferences when it comes to their pension investments. DB retirement plans are convenient for participants because they delegate a number of choices on e.g. risk-return considerations of pension investments. A DC system has the advantage of creating the possibility for individually tailored pension plans. However, individuals may not benefit from autonomy because of a lack of financial sophistication (Lusardi and Mitchell, 2005), self control problems, and psychological biases (Benartzi and Thaler, 2002; Thaler and Benartzi, 2004). Many DC pension funds in the US do in fact express doubts about the quality of the investment choices made by their participants (Benartzi and Thaler, 2001; Mitchell and Zeldes, 1996). Choi, Laibson, Madrian and Metrick (2004) claim that people seem to be aware that their level of retirement saving may be too low.

Our study contributes to the existing literature on pension preferences and investor autonomy in a number of dimensions. First, we use a representative sample of the Dutch population, whereas most empirical studies are based on US higher educated and/or higher income categories. Second, the respondents in our sample are not used to DC retirement plans. Third, in the Netherlands, retirement age is not at the discretion of the individual worker. Fourth, the social security system in the Netherlands is relatively generous, with a state pension of over € 600 per month for single persons aged 65 and older. Fifth, the respondents in our panel have recently experienced a serious stock market decline, whereas those in previous studies were interviewed when the stock market was still booming.

Our main results paint a consistent picture. Dutch employees prefer the status quo of a DB scheme with a limited say, at most, about the level of pension savings and risk-taking. In case of a changeover to an individual DC system, only a minority would choose investor

autonomy. Given the prevalence of DB in the Netherlands this is likely to be partly due to a status quo bias, but it is also in line with the fact that employees (correctly) have strong doubts about their financial skills and report a high level of risk aversion in the pension domain. If respondents had to choose their retirement portfolio in a DC scheme, they would be inclined to opt for low-risk, low-return, in line with their risk attitude. When confronted with two different expected retirement income streams, they tend to choose the riskier of the two, even when the other portfolio is the one they had initially opted for. This result may be due to myopic loss aversion and/or to unrealistic asset market expectations. Either way, the results confirm the doubts expressed by respondents about their ability to take control over their pension savings. The paper is structured as follows. The next section describes current pension arrangements in the Netherlands. Section 3 explains our dataset and methodology. In Section 4, the survey results are presented and discussed. Section 5 provides a summary of the results and some policy implications.

## **2. Retirement plans in the Netherlands**

The pension system in the Netherlands consists of two pillars.<sup>1</sup> The first pillar is a pay-as-you-go state pension of about € 632 per month for every person aged 65 and over. The second pillar is capital funded and linked to employment contracts. Employees are obliged to join their employer's pension scheme and enroll automatically. Collective insurers and especially pension funds are responsible for the organization and administration of a large majority of the pension schemes. The balance total of all pension funds amounts to more than € 600 billion, exceeding the gross domestic product of the Netherlands. These assets are invested in equities (40-45%), fixed income assets (40-45%), real estate (10%) and other investment categories including commodities.

Until recent times, virtual all Dutch pension schemes in the second pillar had a DB character and were based on final pay. Recent developments such as the emergence of new international accounting standards and the ageing of the population have already caused some changes. Increasingly, defined benefit schemes are based on average career wages. Also, several corporate pension funds in the Netherlands replaced their DB systems by (collective) DC arrangements in 2005, while others have expressed their intention to do the same in the

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<sup>1</sup> In addition, individuals can make private arrangements for further retirement schemes. This facility is of marginal importance in the current system.

future.<sup>2</sup> About 85% of the 6 million pension fund participants now have DB retirement plans based on either final pay or career average wages. Roughly 200000 employees (3%) have DC pension plans. The remaining combined pension schemes typically are DB-type plans with some DC-elements.

The typical employee in the Netherlands now has a career average defined benefit pension with indexation conditional on asset-liability ratios. During the active working period accrued pension rights are in many cases indexed to negotiated wage increases (without backloading accruals for career steps) and pension benefits are often indexed to consumer price inflation. However, full indexation of pension claims to cost-of-living increases is not guaranteed. Consequently, typical Dutch DB retirement plans de facto contain a DC element. Until recently, though, indexation cuts were very rare. Cost-of-living indexation is (was) generally financed out of excess returns on pension investments. Since nominal liabilities are calculated using nominal bond rates, the more risky – equity – composition of investment portfolios makes average excess returns likely in the longer run.

DB plans in the Netherlands are relatively safe for its participants for a number of reasons. First and foremost, risk is limited through the system's funded nature. Moreover, pension fund supervision is strict and targeted on the prevention of underfunding. Funds are required to have asset portfolios of at least 105% of their nominal liabilities. In the event of underfunding, a pension fund has to submit a plan to remedy this within a year. In addition, the recovery plan should make clear how the fund will reach a capital funding ratio – including a buffer to deal with disappointing asset market developments – within 15 years. The equilibrium funding ratio for an individual pension fund depends on market interest rates and on the composition of the pension fund's investment portfolio. It currently falls between 120% and 130% for most pension funds. As a result of its emphasis on solvency, the Dutch pension system has proved to be able to withstand high losses on equity investments. For example, during the stock market decline in the period 2000-2003 the asset-liability ratio based on a fixed actuarial interest rate of 4% decreased from 150% in 1999 to 109% in 2003 and recovered thereafter. End of 2005 the funding ratio was close to 130% again.<sup>3</sup> To this end pension premiums were raised from 7.6% of the wage bill to 16.6%. Employers pay the major

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<sup>2</sup> The recently introduced collective DC retirement schemes emphasize the collective sharing of inflation, longevity and investment risks and the provision of a satisfactory pension income with a high degree of certainty.

<sup>3</sup> Since 1969 pension funds have calculated liabilities using a fixed actuarial discount rate of 4%. In recent years, market valuation of liabilities has started playing a more prominent role. As of 2007 pension funds are required to use the fair value method to calculate their funding ratio. At the end of 2005 the relevant 15-year discount rate was equal to 3.7%.

part of these pension premiums. In addition, many employees and pensioners contributed to the recovery of asset-liability ratios because their pension rights were not fully indexed to price and wage developments. Note that intergenerational risk sharing through the compulsory nature of the DB plans protects retirees partly against shocks in asset markets. The Netherlands does not have an analogue to the PBGC system (safety net).

Second, job change by participants in DB retirement plans in the Netherlands does not imply a large pension risk. The law requires pension claims to be transferable from one employer to the other, provided that the pension is adequately funded.<sup>4</sup> Third, solvency requirements make underfunding let alone default a rare phenomenon. More importantly, the consequences for pension fund participants in case of bankruptcy of their (former) employer are limited. Because companies and pension funds are separate legal identities, pension claims are not affected when the company is liquidated. Of course, the flexibility to deal with asset market developments through intergenerational risk-sharing of active participants and retirees disappears when the pension fund has to continue without a sponsor.

Summarizing, DB-plans in the Netherlands are relatively safe as far as nominal rights are concerned, with a low probability of underfunding, and with low bankruptcy or job change risks. Indexation, however, is conditional upon asset-liability ratios.

### **3. Methodology and data**

#### **3.1 Data and summary statistics**

Our data have been collected through an internet-survey among members of the CentERpanel of CentERdata, a survey research institute that is specialized in internet surveys.<sup>5</sup> The questionnaires are answered at home using an internet connection.<sup>6</sup> Thanks to the internet set-up of the survey, participants do not feel rushed to give an answer and are fully anonymous when answering the questions.<sup>7</sup> Data collected with internet surveys manifest higher validity and less social desirability response bias than those collected via telephone interviewing (Chang and Krosnick, 2003). Participants are not paid for their co-operation.

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<sup>4</sup> Retirement plans are only one of many conditions in job contracts. Some variation in plans across employers exists. Nevertheless, it is unlikely that employees choose an employer primarily to obtain a specific retirement plan or that employers compete in the labor market through retirement plan conditions.

<sup>5</sup> CentERdata forms part of the CentER Group at Tilburg University. See also <http://www.uvt.nl/centerdata/nl>.

<sup>6</sup> Households who do not have access to a pc are provided with a set-top-box for their television

<sup>7</sup> In case of attrition of panel-members, CentERdata selects new members to keep the panel representative for the Dutch population High income members are somewhat overrepresented. We have verified that this does not affect the descriptive statistics qualitatively.

Our sample consists of those panel members aged 18 and older that are employed, are looking for a job, or are students. The survey comprises two questionnaires in the period April 2004-January 2005. 1314 respondents (out of 1521) returned the first questionnaire.<sup>8</sup> 1150 respondents completed the second questionnaire. Our regression analysis of pension attitudes (Section 4.1 below) is based on the 1134 respondents who completed both questionnaires and for whom we have information on their education level and monthly income.<sup>9</sup> The average age of the 1134 respondents is 42 years, 58% is male and 91% is employed. The gross average monthly income of employees is slightly above € 2800 (about € 2300 for the median employee). We do not use the type of pension scheme as an explanatory variable in our analysis for a number of reasons. More than 1 out of 3 respondents does not know whether he has a DB or a DC plan. About 9% state that they have a pure DC retirement plan or a plan with DC-elements. However, many respondents in this group are covered by collective DC plans and while being exposed to market risk they have no or a very limited set of choice options. Further analysis (not reported here) shows that adding a background variable indicating current DC coverage does not change our results.

The objective background variables that are used to explain individual behavior are defined as follows:

Age:	respondents' age measured in years
Education:	dummy for high education level (1=completed higher vocational or university education, 0 = other)
Single:	dummy for being single or having a partner (1=single, 0=married or living together)
Male:	dummy for gender (1=male, 0=female)
Income:	respondents' gross monthly salary in euro

### 3.2 The first questionnaire

The first questionnaire consists of questions focusing on self-assessment of financial knowledge, on risk attitude in various domains, on pension plan preferences, and on the investment of pension wealth in a hypothetical DC scheme. We use the first questionnaire to

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<sup>8</sup> If this first questionnaire was not completed the first time, we offered the questionnaire for a second and if necessary a third time to the group of non-respondents to improve the response rate (actually some survey weekends fell within typical vacation periods).

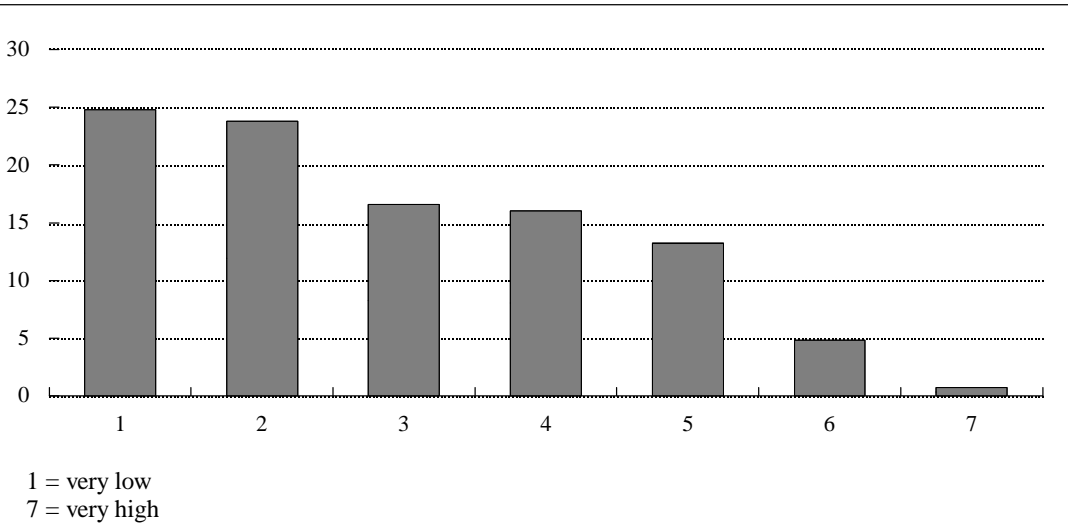
<sup>9</sup> For consistency, we do not make use of the respondents that did not respond to the second questionnaire (after three trials). Total non-response is fairly randomly distributed on important characteristics as age, income, gender, education and occupation. Selection bias does not seem to be an important problem, though small differences in composition between the sample used and the panel may exist. The descriptive statistics presented in this paper have also been calculated using weights correcting for these differences in composition. Results remain qualitatively unchanged, unless indicated otherwise. All results are available from the authors upon request.

construct the following three explanatory variables that are theoretically relevant in individual choices with respect to retirement schemes:

- FinExpert: self-assessment financial expertise (7 classes, from very low to very high)
- RiskTolSubj: self-assessment risk tolerance (7 classes, from strongly risk averse to risk tolerant)
- RiskTolObj: theoretical measured risk tolerance (6 classes from strongly risk averse to risk tolerant)

Figure 1 presents the distribution of self-assessed financial expertise and shows that almost half of the respondents rate their financial expertise as very low (categories 1 and 2). This is in line with recent literature that typically finds financial knowledge to be quite limited. Lusardi and Mitchell (2005) for instance, report similar evidence for the US. We introduce two different measures of risk attitude to account for the unsettled debate in the literature on the appropriate measurement of risk tolerance. Barsky, Juster, Kimball and Shapiro (1997) propose a ‘gambles-over-lifetime-income’ approach that is well founded in economic theory. In particular, they measure risk attitude by offering hypothetical choices between uncertain labor income streams. However, Kapteyn and Teppa (2002) compare an extended version of the Barsky et al. approach with simple ad hoc measures of risk attitude using general questions on risk attitude. Kapteyn and Teppa conclude that the latter perform better in predicting portfolio choice.<sup>10</sup> They do find a positive correlation between the two measures, though.

Figure 1 Self-assessed financial expertise  
Percentage of respondents (N=1134)



<sup>10</sup> See also Donkers and van Soest (1999).

Table 1 summarizes the evidence on self-assessed risk tolerance. In the survey, we asked for risk tolerance in general matters, in financial matters and in the pension domain, respectively. The results show that most respondents consider themselves quite risk averse, with the level of risk aversion increasing from general issues, to financial issues to pension issues. The average risk tolerance scores in these categories are 3.2, 2.8 and 2.6 respectively. Differences are statistically significant at standard levels of significance. In Figure 2, we present measured risk tolerance as extracted from a life-time income gamble.<sup>11</sup> Again, risk aversion appears high. The correlation between the measures in Table 1 and Figure 2 is positive but small (0.25). Since they apparently measure different dimensions of risk aversion, we will use them both in our empirical analysis.

**Table 1. Self-assessed risk tolerance in three different domains**  
Percentage of respondents and mean rating

Rating risk tolerance	General	Financial matters	Pension domain
1 (try to avoid risks as much as possible)	11.9	16.6	21.3
2	22.0	31.8	31.2
3	24.6	24.5	19.2
4	22.9	15.0	22.4
5	14.9	10.1	4.5
6	3.4	1.9	1.1
7 (like to take a chance)	0.4	0.2	0.3
Mean rating	3.18	2.77	2.62

Note: Total number of observations: 1134. Percentages in columns may not add up to 100 due to rounding. A t-test on the equality of the mean rating for risk tolerance in general and in financial matters is rejected strongly ( $t=14.7$ ,  $p\text{-value}=0.000$ ). The same applies to the test on the equality of mean ratings of risk tolerance in financial matters and in the pension domain ( $t=4.5$ ,  $p\text{-value}=0.000$ ).

### 3.3 The second questionnaire

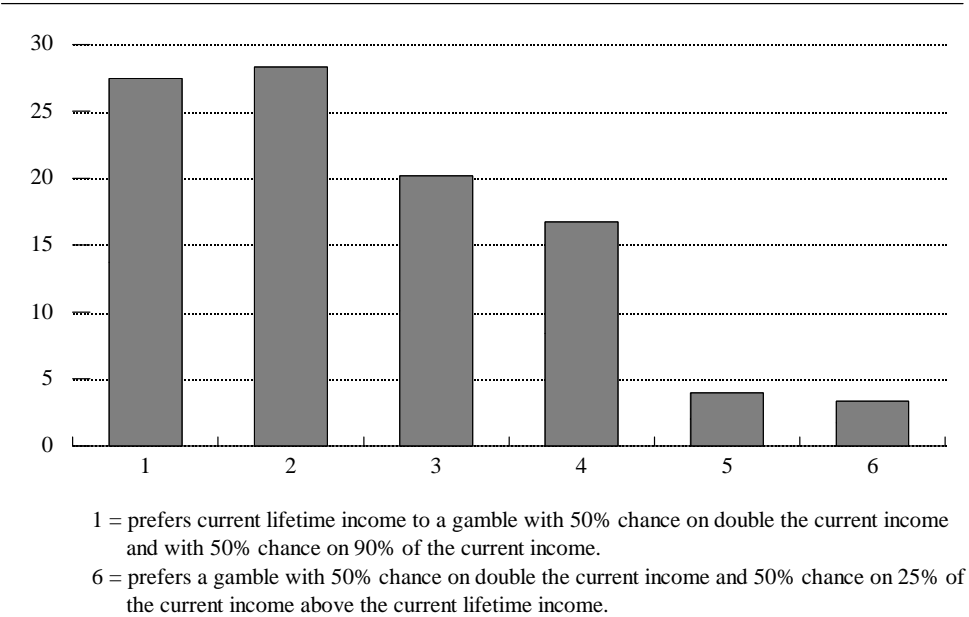
In the first questionnaire, we asked each respondent to indicate his/her preferred portfolio investment mix in a hypothetical DC scheme, expressed as the percentage of stocks and bonds respectively. Based on the given investment mix, we then constructed an individually tailored future income benefit scheme (in the form of a probability distribution of the future monthly pension allowance) for each respondent.

<sup>11</sup> Respondents are asked to make risky choices in a gamble over lifetime income. In the first round, they must choose between a certain job with fixed income  $Y$ , or a job with a 50% chance of an income of  $2Y$  and a 50% chance of an income of  $aY$  ( $a=0.7$ ). In the second round, the choice becomes more or less risky ( $a$  equals 0.5 or 0.8) depending on their first choice. Similar to Kapteyn and Teppa (2002), respondents who choose either twice the risky alternative or twice the safe alternative enter a third round ( $a$  equals 0.25 or 0.9). Based on their choices, respondents are assigned to one of six categories of different risk appetite.



In the second questionnaire, we present each respondent both the probability distribution of the pension allowance based on one’s own stated preference and the corresponding probability distribution based on the median investment portfolio. We then ask the respondent to rate the attractiveness of each portfolio without revealing that one of the two schemes reflects one’s own investment choice. Section 4.3 explains the details of this experiment.

Figure 2 Risk tolerance in a gamble on lifetime income  
Percentage of respondents (N=1134)



**4. Empirical results**

In this section, we present and analyze the survey results. First, we summarize what retirement plan participants want and analyze the relation with individual characteristics. Second, we investigate how respondents claim they would invest their pension savings in the hypothetical situation of investor autonomy. Third, we assess individual consistency in an experiment on portfolio choice.

**4.1 What do retirement plan participants want?**

In order to shed light on the respondents’ attitude towards compulsory retirement savings, we first asked whether they are happy with a compulsory pension scheme, and if so,

for what reason.<sup>12</sup> The majority of respondents (77%) is in favor of compulsory retirement saving. 12% is against compulsory retirement savings, 6% is indifferent and 5% does not know.<sup>13</sup> About 60% of the respondents in favor of a compulsory pension scheme give the cost of retirement planning (in terms of time and effort) as the most important reason. One-third states that otherwise they would not save enough for retirement, indicating awareness of a self-control problem (see also Thaler and Shefrin, 1981, and Thaler and Benartzi, 2004, for evidence in support of self-control problems)

Subsequently, we ask for respondents' preference for a DB or DC type of plan, respectively. The question explains the trade-off between a DB system with fluctuating pension premiums in order to guarantee a nominal defined benefit level, versus a DC system in which premiums are fixed but the benefit varies with investment returns. Almost two-thirds of the respondents (718 out of 1134 respondents, which is 63 percent of our sample) indicates a preference for DB over an individual DC system. Only 12 percent prefers a DC system, 10 percent is indifferent and 15 percent doesn't know. The strong preference for DB confirms earlier findings in the Netherlands (De Vos, Alessie and Fontein, 1998).

A possible explanation is a status-quo bias (see Samuelson and Zeckhauser, 1988). DB systems have dominated the Dutch pension landscape for a long time without noticeable problems. As a result, retirement plan participants are quite satisfied with the current system and may be reluctant to switch to arrangements that they are unfamiliar with.<sup>14</sup> In addition, financial (and pension-related) literacy in the Netherlands is very limited (Van Els, Van den End and Van Rooij, 2004). Intuitively, this makes sense. Due to the DB nature of most pension plans and the compulsory participation in these plans by the large majority of Dutch employees, incentives to become more financially educated have been low. Guiso, Haliassos and Jappelli (2002) provide support for the hypothesis that direct exposure to financial markets, e.g. through individual DC retirement plans, is positively correlated with financial knowledge and risk tolerance.

A possible additional reason why people might prefer the certainty of the current DB system is that for many employees in the Netherlands there is virtually no possibility to

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<sup>12</sup> Response rates differ considerably across questions. Typically the response rates for 'easy' (general) questions, such as the self assessment of risk attitudes, are higher than those for intricate questions which require more thought.

<sup>13</sup> This is related to the unsettled debate on optimality of life-time savings. See for instance Poterba, Venti and Wise (2004), Lusardi (1999), Gale (1999), Gustman and Steinmeier (1999), Hurd and Rohwedder (2005) and Scholz, Seshadri and Khitatrakun (2004). Our analysis does not provide further direct evidence on this issue.

<sup>14</sup> Actually, the wording of the corresponding question in the survey may have contributed to this effect. In the questionnaire, we described the DB system by explaining that it is largely comparable to the current system in the Netherlands. To the extent that this implicitly may have suggested to respondents that the DB systems from the past are sustainable at historical costs, we may have presented the status quo as too inexpensive.

postpone the age of retirement – as opposed to for example the US where laws against age discrimination offer more flexibility on this issue – to compensate for inadequate (DC) pensions allowances. The official retirement age in the Netherlands is 65. Labor contracts end automatically when people reach that age. At the time of the survey most collective labor agreements had even lower official retirement ages (often 60 or 62). As a result, labor participation rates of the elderly are quite low.

In Table 2, we provide the results of a more in-depth analysis of individual determinants of pension system preferences using a multinomial probit regression. In panel A we report the marginal effects of objective personal characteristics on the probability of choosing between DB and DC. The rows show how a unit change in one of the personal characteristics affects the probability of an individual choosing one of the answer categories. T-values are in parentheses. In panel B, three more explanatory variables are included that represent self-assessed financial expertise and risk tolerance. These latter three variables are not strictly exogenous as they may be affected by the explanatory variables used in panel A. A comparison of panels A and B may shed light on this. Importantly, both financial expertise and risk preferences may be influenced by actual pension plan coverage. Pension plan participation may affect preferences and thus help people become aware of the need to save (Cagan 1965; Katona 1965; Gale and Scholz 1994). To account for this, we replicated the analysis underlying Table 2 including a dummy for coverage in DB or DC plans respectively.<sup>15</sup> The dummy coefficient fails to be significant and results remain virtually unchanged. Theoretically, it is also possible that preferences affect (the choice of) pension plan coverage. However, for the Netherlands this is unlikely, given the dominance of and automatic enrolment in DB plans as well as the fact that pension plan coverage is only one of many job contract characteristics (see also footnote 4).

A few issues stand out from Table 2. Overall, the explanatory power of the regressions is limited, but we are unable to reject a test on the joint significance of all regression coefficients at standard confidence levels. From panel A, we see that respondents in higher age categories increasingly prefer DB systems over DC systems. The probability of a DB choice goes up significantly, while that of a DC choice goes down. Also, males choose significantly more often for DC systems and less often for DB systems than females. Implicitly, this suggests males are more risk-tolerant on average.<sup>16</sup> Higher income as well as

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<sup>15</sup> We thank an anonymous referee for this suggestion. Unreported results are available from the authors on request.

<sup>16</sup> See Jianakoplos and Bernasek (1998) and Schubert, Brachinger, Brown and Gysler (1999) for research on gender and risk tolerance.

**Table 2. Determinants of the preference for DB and DC**

A. Marginal effects on probability for each answer; financial expertise and risk attitude excluded

	Preferences			
	DB	DC	Indifferent	Don't know
<b>Age</b>	.005 (3.41)	-.004 (3.82)	.000 (0.22)	-.001 (1.40)
<b>Log(Income)</b>	.016 (1.69)	.014 (1.95)	-.009 (1.73)	-.021 (3.52)
<b>Education</b>	.037 (1.25)	.047 (2.34)	-.035 (1.89)	-.049 (2.33)
<b>Male</b>	-.047 (1.56)	.075 (3.95)	.006 (0.33)	-.035 (1.56)
<b>Single</b>	.044 (1.35)	-.006 (0.30)	.005 (0.22)	-.042 (1.86)

B. Marginal effects on probability for each answer; financial expertise and risk attitude included

	Preferences			
	DB	DC	Indifferent	Don't know
<b>Age</b>	.003 (2.07)	-.002 (1.91)	.001 (0.70)	-.002 (1.81)
<b>Log(Income)</b>	.019 (2.07)	.009 (1.31)	-.010 (1.74)	-.018 (3.09)
<b>Education</b>	.033 (1.11)	.023 (1.23)	-.028 (1.47)	-.028 (1.29)
<b>Male</b>	-.041 (1.74)	.039 (2.10)	.012 (0.62)	-.011 (0.47)
<b>Single</b>	.053 (0.84)	-.017 (0.91)	.001 (0.03)	-.036 (1.56)
<b>FinExpert</b>	.031 (3.06)	.020 (3.51)	-.018 (2.73)	-.033 (4.36)
<b>RiskTolSubj</b>	-.057 (4.70)	.028 (3.90)	.028 (3.64)	.002 (0.18)
<b>RiskTolObj</b>	-.028 (2.50)	.035 (5.42)	.010 (1.39)	-.017 (2.01)

Note: Number of observations: 1134. Log likelihood: -1156.95 (panel A) and -1093.71 (panel B). Marginal effects are calculated from a multinomial probit regression evaluated at the mean value of explanatory variables (discrete changes from 0 to 1 for dummy variables). Absolute values of *t*-statistic are in parentheses.

higher educated respondents are less likely to say they are indifferent or don't know. That is, they are more inclined to make a choice. This choice may go either way as both the probability of choosing DB and DC rises, but only the DC effects are (marginally) significant. With the introduction of three additional indicators in panel B, size and significance of the explanatory variables from panel A is reduced across the board, suggesting their effect mostly works indirectly through the impact on financial expertise and risk tolerance measures.<sup>17</sup> Instead, financial expertise and risk tolerance enter significantly. Self-assessed financial expertise reduces the likelihood of 'don't know' answers as well as 'indifference' while increasing the likelihood of preferring DB and DC systems approximately by an equal amount. Apparently, higher confidence in one's own financial expertise increases the likelihood of a clear-cut choice. Higher (self-perceived) risk tolerance increases the likelihood of choosing a DC system and decreases the likelihood of a DB choice. Interestingly, the risk

<sup>17</sup> A further analysis is outside the scope of this paper but will be followed up on in a companion paper. Preliminary regressions indeed show strong dependence of risk tolerance measures on individual characteristics.

tolerance indicators appear to be complements rather than substitutes. ‘Age’ remains significant after controlling for expertise and risk-tolerance. Possibly, the higher preference for DB versus DC for older people reflects their lower flexibility to compensate for disappointing pension income (in a DC system) through labor market participation and a stronger status quo bias due to their longer exposure to a well-functioning DB system.

In a related question, we asked respondents to indicate which percentage of their pre-retirement net wage income they would want to receive as a guaranteed pension allowance after retirement. We formulated the survey question in the following way: *‘Imagine a pension scheme that combines the DB and DC system. Part of the pension benefit is guaranteed through collective arrangements, but premiums may fluctuate and part of the pension benefit depends on developments on stock and bond markets but the payable premium is fixed. If you have to choose a combination of these two systems, what percentage of your net wage income would you want to be guaranteed as pension benefits? Your answer may vary from 0% to 90%’*. Out of the total of 1134 respondents, 870 gave a numerical answer to this question and 264 persons said they didn’t know. The mean preferred percentage was 69 percent, while the median equaled 70 percent. Only 11 percent of the respondents would be satisfied with a guaranteed pension income below 50 percent of their net wage income. Hence the willingness to take risks with future retirement income is very low, which supports the findings on risk tolerance in the pension domain in Section 3.2.<sup>18</sup>

In Table 3 we relate the preferred guaranteed pension income to the individual preference for DB or DC. The results show that choice for a high (low) guaranteed pension income as a percentage of pre-retirement wage income is strongly positively correlated with the preference for a DB (DC) system. Out of the 718 proponents of the DB system, 49 percent (22.0 + 27.0) wants a guaranteed pension income of over 70 percent of wage income. Only 14 percent in this group settles for 50 percent or less. On the other hand, only about 13 percent of those who prefer a DC system require a certain retirement income in excess of 70 percent, while over 45% percent in this group is satisfied with an income guarantee of 50 percent or less. An additional regression to link the preferred guaranteed income percentage to factual individual characteristics was not very successful. The explanatory power was around 1 percent and only age and gender are individually significant. The preferred guaranteed retirement income increases with age. Men require on average a 4 percentage points lower guaranteed pension income than women. Inclusion of financial expertise and risk tolerance

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<sup>18</sup> Van Els, Van den End and Van Rooij (2004) find that people are willing to pay for the security of guaranteed benefits.

indicators significantly improves the explanatory power to over 6 percent. Financial expertise is insignificant. Both higher objective and higher subjective risk tolerance lower the required percentage of guaranteed income.<sup>19</sup>

**Table 3. Preferred income guarantee versus preferred pension system**  
Percentages of respondents preferring the specified pension system

Preferred system (# respondents)	Preferred net pension income guarantee as a percentage of net final wage income					
	<= 50	>50 and <=60	>60 and <=70	>70 and <=80	>80 and <=90	DK
DB (718)	13.5	7.2	19.8	22.0	27.0	10.5
DC (136)	45.6	15.4	19.1	8.8	3.7	7.4
Indifferent (115)	27.8	5.2	13.0	17.4	7.8	28.7
DK (165)	2.4	1.2	1.2	1.8	4.9	88.5

Note: DK = 'Do not know'; Percentages in rows may not add up to 100 due to rounding.

The caveats with respect to the interpretation of the results on the DB-DC preference question apply again. A current lack of financial expertise, unfamiliarity with DC-elements and a high level of risk aversion may be partly the result of the prevailing compulsory DB schemes for most respondents that do not provide direct exposure to financial decision making and consequently do not provide many incentives to become more educated. This may contribute to the attractiveness of the status quo situation. In most Dutch retirement plans the implicit rule of thumb (status quo) is that after retirement gross income can be expected to equal about 70 percent of final gross wage, which after tax would correspond to about 90 percent of pre-retirement net income due to additional tax advantages of the retired. Nevertheless, Table 3 shows that there is a lot of heterogeneity in the stated preferences. Only a minority would opt for a full DB retirement plan. Overall, the main message is that the (un)willingness to accept uncertainty with respect to retirement benefits strongly positively correlates with a preference for a DC (DB) system. In that sense, the results are internally consistent.

To assess the desired degree of autonomy in portfolio investments, we have asked whether, in the hypothetical situation of an individual DC scheme, respondents would want to have control over individualized pension fund accounts (having the opportunity to invest their pension money according to an investment profile offered by their pension fund or according to their own investment choices) or whether they would delegate this to the pension fund.

<sup>19</sup> Detailed regression results are available from the authors upon request.

Almost half of our sample (48.4%) would leave investment decisions to the pension fund, 26.1% prefers autonomy, 10.6% is indifferent and 14.9% doesn't know. Table 4 summarizes the link with pension system preferences. The set-up is analogous to Table 3. Again, the dichotomy between supporters of DB versus DC systems is clear-cut. A large majority of the former group prefers the pension fund to decide on investments, while an equally large majority of the latter group prefers individual autonomy.

**Table 4. Preference for investor autonomy versus preferred pension system**  
Percentages of respondents preferring the specified pension system

Preferred system (# respondents)	Pension fund	Investor autonomy	Indifference	Don't know
DB (718)	60.7	24.5	9.1	5.7
DC (136)	33.8	56.6	7.4	2.2
Indifferent (115)	37.4	23.5	30.4	8.7
Don't know (165)	14.6	9.7	6.1	69.7

Note: Percentages in rows may not add up to 100 due to rounding.

The results of a multinomial probit regression of the preferred degree of investor autonomy on individual characteristics are presented in Table 5. The setup is similar to Table 2. In Panel A most coefficients are insignificant. Only the probability of respondents preferring delegation to the pension fund significantly increases with education, while men are significantly more likely to choose investor autonomy. When the indicators for financial expertise and risk tolerance are included (panel B), the education effect remains significant, while the gender effect disappears. Self-assessed higher financial expertise is shown to strongly increase the preference for individual autonomy and to marginally reduce the preference for pension fund control. The risk tolerance indicator based on the Barsky life-time income gamble has a strong positive impact on the probability of investor autonomy. This finding opposes the conclusion by Kapteyn and Teppa (2002). Typically, and in line with intuition, income, education, financial expertise and risk tolerance all reduce the likelihood that respondents answer 'don't know' in panels A and B.<sup>20</sup>

In order to see whether an increase in financial expertise would change the preference for investor autonomy we have asked respondents whether the opportunity to take a course (for free) to upgrade their financial expertise would affect their willingness to take control over their retirement savings. 42% respond that financial education would make them more

<sup>20</sup> When included the dummy on current DC coverage is insignificant and does not change the results.

inclined to take control of their retirement portfolio; another 42% believes it would not, and the remaining 16% do not know. The answers are correlated with the respondents' preference for DC over DB: six out of ten respondents who prefer a DC system believe that they would take more control over retirement savings investment when offered the possibility to upgrade their financial knowledge.

**Table 5. Determinants of the preferred degree of autonomy**

A. Marginal effects on probability for each preference excluding financial expertise and risk attitude

	Preferences			
	Pension fund	Investor autonomy	Indifferent	Don't know
<b>Age</b>	.002 (1.12)	.000 (0.32)	-.001 (0.62)	-.002 (1.44)
<b>Log(Income)</b>	.015 (1.55)	.004 (0.51)	-.005 (0.89)	-.015 (2.48)
<b>Education</b>	.064 (2.08)	.027 (0.98)	-.007 (0.39)	-.084 (4.01)
<b>Male</b>	-.038 (1.22)	.083 (3.07)	-.025 (1.27)	-.020 (0.89)
<b>Single</b>	-.033 (0.96)	.040 (1.28)	-.020 (0.99)	.013 (0.54)

B. Marginal effects on probability for each preference including financial expertise and risk attitude

	Preferences			
	Pension fund	Investor autonomy	Indifferent	Don't know
<b>Age</b>	.001 (0.56)	.002 (1.39)	-.001 (0.54)	-.002 (2.14)
<b>Log(Income)</b>	.018 (1.87)	-.003 (0.34)	-.005 (0.79)	-.011 (1.86)
<b>Education</b>	.078 (2.46)	-.016 (0.56)	.001 (0.03)	-.063 (2.95)
<b>Male</b>	-.017 (0.51)	.022 (0.78)	-.015 (0.73)	.009 (0.43)
<b>Single</b>	-.029 (0.84)	.032 (1.01)	-.023 (1.09)	.021 (0.82)
<b>FinExpert</b>	-.016 (1.51)	.067 (7.37)	-.017 (2.46)	-.034 (4.58)
<b>RiskTolSubj</b>	-.009 (0.72)	.009 (0.77)	.009 (1.17)	-.009 (0.99)
<b>RiskTolObj</b>	-.015 (1.28)	.034 (3.26)	.004 (0.52)	-.022 (2.72)

Note: Number of observations: 1134. Log likelihood: -1360.16 (panel A) and -1307.75 (panel B). Marginal effects are calculated from a multinomial probit regression evaluated at the mean value of explanatory variables (discrete changes from 0 to 1 for dummy variables). Absolute values of *t*-statistic in parentheses.

In summary, we firstly conclude that a large majority of our sample prefers a DB system over a DC system, prefers a relatively high percentage of current income to be guaranteed after retirement, and prefers a professional pension fund to decide about portfolio investment for retirement. Moreover, respondents generally make internally consistent choices on these different items. Secondly, respondents are quite risk averse on average, especially in the pension domain, and financially illiterate. We find that that self-assessed and

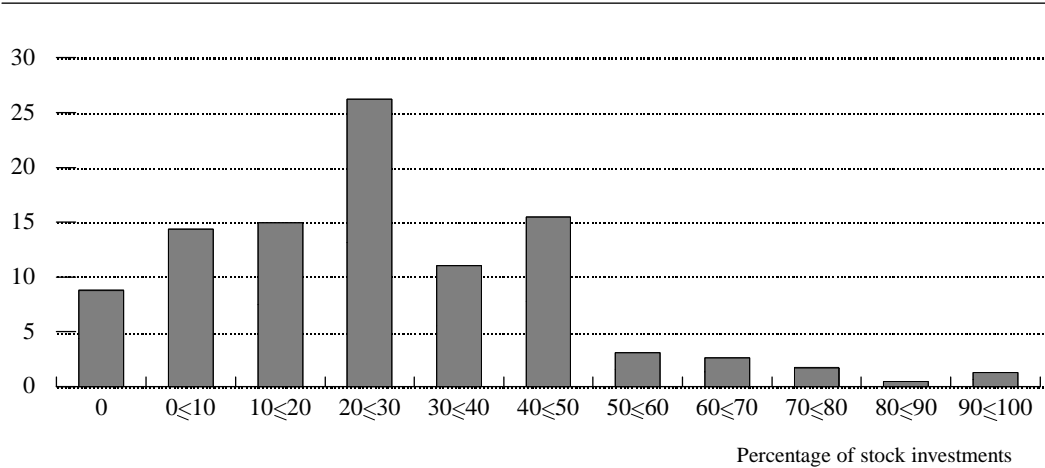


measured risk attitudes as well as self-assessed financial expertise are significant explanatory variables with respect to pension scheme preferences. Respondents who are more inclined to take risk and consider themselves to be financially sophisticated, are more likely to prefer a DC plan, are more likely to prefer a relatively low guaranteed retirement income, and are more likely to prefer investor autonomy. The effects of other explanatory variables like age, gender, income, or education on pension preferences are mostly small and insignificant once financial expertise and risk tolerance are accounted for. An important caveat in our analysis is the potential endogeneity of (self-assessed) risk tolerance and financial literacy as these themselves may be functions of exposure to a specific pension scheme.

**4.2 What would retirement plan participants do in case of investor autonomy?**

We now focus on the issue how pension plan participants (say they) would behave if they would have to make their own investment decisions.<sup>21</sup> In the hypothetical situation of individualized DC pension accounts we first ask how much of the retirement savings portfolio a respondent would invest in stocks and bonds respectively. The preferred percentage of stocks in the portfolio ranges from zero (portfolio completely in the form of bonds) to 100 (portfolio completely in stocks) percent. Figure 3 presents the results. Out of 1134 respondents, 877 give a numerical answer. Only those respondents are included in Figure 3.

Figure 3 Preferred retirement savings composition: percentage stock in individual portfolio  
Percentage of respondents (N=877)



<sup>21</sup> In this respect it is worthwhile to stress that empirical evidence indicates that individuals are highly sensitive to defaults, notably in the area of investing for retirement (Cronqvist and Thaler, 2004)

The median and mean response both equal 30 percent. Those who previously indicated to prefer a DC system (128 out of 877) on average apparently prefer to hold a larger part of their portfolio in stocks than those who prefer a defined benefit system (610 respondents). The mean response of the former group equals 39.6 percent, while that of the latter equals 28.7 percent. The preferred percentage of stock by the respondents in our sample is below that typically found in US DC schemes where participants choose the composition of their retirement savings portfolio (Benartzi and Thaler, 2002). Poterba, Venti and Wise (2003) conclude that households that do not have extremely high risk-aversion would be better off, ex ante, by holding a portfolio of stocks rather than bonds. Potential explanations for the relatively low preferred percentage of stocks are the timing of the survey in 2004 – with the stock market decline over the period 2000-2003 fresh in mind – as well as low financial expertise and/or risk tolerance.

In Table 6, we display results for two related regressions with the preferred stock percentage as the dependent variable. In the first regression, only strictly exogenous personal characteristics are used as explanatory variables. The results only show a significant gender effect. Being male (female) increases (decreases) the proportion of stock holdings by 6 percentage points on average. In the second regression, indicators of financial expertise and risk attitude are added. Overall, the explanatory power substantially increases. Financial expertise and the willingness to take risks appear the most important factors in determining

**Table 6. Determinants of preferred retirement portfolio composition**

	Preferred percentage of stocks	
	A	B
<b>Age</b>	-.075 (1.11)	.056 (0.86)
<b>Log(Income)</b>	.367 (0.87)	.057 (0.12)
<b>Education</b>	1.635 (1.15)	-.070 (0.05)
<b>Male</b>	6.051 (4.11)	2.590 (1.82)
<b>Single</b>	.304 (0.19)	-.121 (0.08)
<b>FinExpert</b>		2.290 (5.13)
<b>RiskTolSubj</b>		3.418 (6.21)
<b>RiskTolObj</b>		2.237 (4.25)
<b>Constant</b>	26.171 (6.49)	3.961 (0.92)
<b>Adj R2</b>	0.018	0.141

Note: Number of observations: 877. Regression coefficients from an ordinary least squares regression. Regression A (B) excludes (includes) financial expertise and risk attitude. Absolute values of *t*-statistic in parentheses.

the preferred portfolio mix. The gender effect is reduced in size but remains marginally significant. The finding that women are more risk averse is consistent with earlier research (Jianakoplos and Bernasek 1998), although other studies come to opposite conclusions (e.g. Schubert, Brachinger, Brown and Gysler, 1999). Our results imply that even after controlling for risk tolerance, women prefer less stock in their retirement savings portfolio.

Following the survey question on the preferred stock percentage, we first asked which factors played a role in that (initial) choice, and second which factors could play a role in the future in adjusting the preferred percentage of stocks in the total portfolio. Table 7 summarizes the outcomes. Overall, about ninety percent of the respondents states that either personal circumstances – age, family composition, personal financial position or accumulated pension claims – or general economic conditions and financial markets expectations have played a role in choosing the preferred portfolio mix and will continue to influence future adjustment decisions. About 10 percent regards none of these factors as relevant for either the initial portfolio composition or future adjustments. Apart from age, determinants of initial choice of portfolio and determinants of later changes are more or less the same. Interestingly, 44 percent of the respondents indicate age as a relevant determinant of their initial choice, whereas our regression analysis (see Table 6 above) indicates that in a multivariate analysis, age is not significant. The percentage of respondents that believes age to be an important factor for future portfolio adjustments is much lower, namely 23 as opposed to 44 for the initial composition. An explanation might be that age – unlike the other factors – is perfectly predictable. People may choose their optimal portfolio mix now given their (known) time to retirement and may not consider future changes. All other factors are subject to (unexpected) changes and as such may require portfolio adjustments from the perspective of the respondents. Not all factors are equally important, though. Especially one's personal financial situation (49 percent) and the two indicators of general economic circumstances (59 and 46 percent, respectively) apparently are strong drivers of future investment decisions. About half of our respondents would consider changing the own portfolio mix in case of (important) changes in any of these three variables. Assuming that changes in these circumstances are quite likely to happen more than once over, say, a ten-year period, this implies a relatively high (stated) degree of activism in portfolio management. Interestingly, empirical evidence in previous studies (for example Ameriks and Zeldes, 2001) typically reports a much lower degree of activism. Possibly, the respondents in our sample overestimate their activism.

**Table 7. Underlying determinants of initial choice and subsequent changes in retirement portfolio composition according to respondents**

Percentage of respondents naming the category

<b>Determinant</b>	<b>Initial composition</b>	<b>Reasons for change</b>
<b>None</b>	9.6	8.3
<b>Age</b>	44.4	23.4
<b>Family composition</b>	24.3	18.1
<b>Personal financial situation</b>	52.9	49.4
<b>Accumulated pension wealth</b>	38.8	31.9
<b>General economic condition</b>	49.8	59.3
<b>Financial market expectations</b>	39.9	45.9
<b>Other</b>	1.9	1.6

Note: Number of observations: 877. Percentages do not add up to 100 as respondents could give several answers.

Subsequently, we relate the stated degree of activism to individual characteristics using probit regressions with the dependent variable being 1 when respondents state that specific individual or general circumstances do *not* influence their choice of portfolio mix and 0 when they state that one or more of the arguments in Table 7 play a role in their decision. In Table 8, we report the results. Generally, the overall explanatory power is low and coefficients are insignificant. Only self-assessed financial expertise has a sizable and significant effect on the degree of stated activism. Apparently, higher perceived financial expertise leads individuals to stronger believe in the information in specific economic indicators and/or in their own ability to interpret such information. Thus, increased financial expertise may be an important driving force for people’s willingness to actively manage their portfolio.<sup>22</sup> Risk tolerance, on the other hand, does not play any role.

In summary, when forced to choose, respondents pick a relatively safe portfolio with only about 30 percent of stocks on average. High risk tolerance and self-assessed expertise – as well as being male – raise the chosen percentage of stocks in portfolio. Respondents also think they will be quite activist in changing their portfolio when conditions change. Especially those who think they are better experts are inclined to (say they will) change their portfolio.

<sup>22</sup> Similar regressions to those in Table 8 were performed for individual drivers of portfolio choice and portfolio adjustment respectively. That is, the dependent variable was set to one when a respondent stated that a specific determinant - say one’s personal financial position - would not be a factor in his portfolio choice or adjustment and to zero when it would. Consistently, higher financial expertise is significant with a negative sign in these regressions. The effect is strongest for financial market expectations, family composition and age, and weakest for the case of general economic conditions and one’s personal financial situation.

**Table 8. Determinants of planned activism**

	Initial composition does not depend on economic factors		Change in composition does not depend on economic factors	
<b>Age</b>	-.000 (0.08)	-.000 (0.49)	.000 (0.27)	-.000 (0.19)
<b>Log(Income)</b>	-.008 (1.27)	-.006 (1.00)	-.011 (2.05)	-.010 (1.80)
<b>Education</b>	-.027 (1.32)	-.014 (0.70)	-.030 (1.56)	-.019 (1.03)
<b>Male</b>	-.008 (0.38)	.013 (0.62)	-.002 (0.13)	.016 (0.84)
<b>Single</b>	-.018 (0.80)	-.016 (0.74)	-.018 (0.88)	-.016 (0.81)
<b>FinExpert</b>		-.027 (3.84)		-.021 (3.18)
<b>RiskTolSubj</b>		.002 (0.30)		-.002 (0.28)
<b>RiskTolObj</b>		-.006 (0.84)		-.007 (0.93)
<b>Loglikelihood</b>	-265.21	-274.32	-246.99	-239.65
<b>Pseudo R<sup>2</sup></b>	0.009	0.033	0.017	0.047

Note: Number of observations: 877. Marginal effects on probability are calculated from probit regressions evaluated at the mean value of explanatory variables (discrete changes from 0 to 1 for dummy variables). Absolute values of *t*-statistic in parentheses.

### 4.3 Are retirement plan participants able to choose?

In order to further investigate whether respondents are able to make retirement investment choices and have well-defined preferences, we carry out an experiment similar to the one by Benartzi and Thaler (2002). We asked respondents in our sample to rate the attractiveness of two benefit schemes on a 5-points scale. One scheme was based on each individual's own preferred portfolio (as answered in the first questionnaire), the other on the median portfolio choice of all respondents (consisting of 30 percent stocks and 70 percent bonds). We did not reveal that one of the two benefit schemes was based on the individually chosen portfolio.

We constructed the benefit schemes using Monte Carlo simulations. The distribution of retirement income conditional on gross salary of the respondent, the percentage of stock investment, and the mean and volatility of bond and stock returns is determined using 1000 runs with a 40 year horizon. We assume annual bonds returns to be drawn randomly from a distribution with a mean of 5 percent and a standard deviation of 4 percent, taking account of persistence in interest rates. Stock returns are randomly drawn from a distribution with a mean of 8 percent and a standard deviation of 18 percent. These distributional assumptions match historical data and are quite standard in pension funds' ALM analysis. We assume the annual premium contribution to be 13 percent of the individual's gross wage, which currently is the break-even point in a typical Dutch pension scheme (see Van Rooij, Siegmann and Vlaar, 2004). The premium contributions are invested in stocks and bonds (with an average

maturity of 5 years) according to the portfolio mix chosen by the respondent. The portfolio is rebalanced at the end of each year as to maintain the chosen mix of stock and bond investment. After each 40-year run, final wealth is invested in an annuity, the annual pension benefit of which is assumed to equal  $1/15^{\text{th}}$  of final wealth (roughly based on Dutch mortality tables). We then confront each respondent with the 5<sup>th</sup>, 50<sup>th</sup> and 95<sup>th</sup> percentile of the resulting individualized benefit scheme.

Box 1 presents an example for the case of an employee with a gross salary of € 2300 per month who indicated his preferred portfolio consisted of equal proportions stocks and bonds. Pension scheme I is the result of an investment strategy of 30% stocks and 70% bonds (the median choice) and pension scheme II is the result of the investor's own preferred portfolio. The latter one has a higher upward potential but also more risk on the downside. Note though that the pattern is asymmetric. The extra downside risk of portfolio II is relatively small compared to its extra upside potential. The numbers exemplify 1) the fact that the riskiness in term of holding stocks is relatively smaller - at least in terms of probabilities - on a long horizon than on a short one and 2) the fact that yearly contributions become relatively more (less) important when accumulated wealth is eroded (increased) by a number of years with disappointing (encouraging) returns in the stock market.

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### Box 1 Question on the rating of pension schemes

Consider two pension schemes without guaranteed pension benefit. The actual benefit depends on among others general economic and financial market developments. The table below presents the retirement benefit you may expect under each benefit scheme. The numbers present gross benefits in euro per month. The pension contributions you have to pay are equal in both arrangements. The numbers are excluding the state pension benefit (this gross benefit equals € 921 per month for singles and € 632 per person each month for married couples and people living together). Any pension plan you may have arranged on top of these arrangements, is not included. For each benefit scheme we present three possible outcomes (an unfavorable scenario, a favorable scenario and a middle variant).

Economic scenario	Pension scheme I	Pension scheme II
VERY UNFAVOURABLE	610	540
AVERAGE	920	1012
VERY FAVOURABLE	1414	1920

The interpretation of these numbers is as follows. There is a 5% probability of a retirement income above the VERY FAVOURABLE retirement income, there is a 50% probability of a retirement income above the AVERAGE retirement income and there is a 5% probability of a retirement income below the VERY UNFAVOURABLE retirement income.

QUESTION: How do you rate these two pension schemes on a scale from 1 to 5 with 5 being 'very attractive' and 1 being 'very unattractive'?

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In Table 9, we present the resulting distribution of ratings. We distinguish between three groups of respondents: those who prefer a relatively safe portfolio (334 respondents with a preferred percentage of stocks less than or equal to 20), those who prefer a relatively risky portfolio (289 respondents with a preferred percentage of stock greater than or equal to 40), and those with an average portfolio (254 respondents with a preferred stock percentage between 20 and 40 percent). The first two groups unknowingly rate their own portfolio and the median portfolio, the last one its own portfolio with the 50 percent portfolio.<sup>23</sup>

**Table 9. Attractiveness of two investment portfolios for three groups of respondents**  
Percentage of respondents and mean rating

Rating attractiveness portfolio	%stocks<=20%		20<%stocks<40		%stocks>=40	
	Median (30%)	Own	Median (30%)	50 percent	Median (30%)	Own
1 (very unattractive)	4.5	10.2	3.9	2.8	4.8	1.7
2	7.8	21.9	19.3	10.6	19.0	15.2
3 (neutral)	30.2	47.3	47.6	31.1	46.7	27.0
4	42.2	17.7	26.8	45.3	24.9	39.5
5 (very attractive)	15.3	3.0	2.4	10.2	4.5	16.6
Mean rating	3.56	2.81	3.04	3.50	3.05	3.54
T-test (H <sub>0</sub> : mean ratings are equal)	T=10.29 (p=0.000)		T=5.78 (p=0.000)		T=6.12 (p=0.000)	

Note: Total number of observations: 877 (334 respondents indicated to invest 20% stock or less, 254 respondents indicated to invest between more than 20% but less than 40% stocks and 289 indicated to invest 40% stocks or more). Percentages in columns may not add up to 100 due to rounding.

As Table 9 shows, across all groups, respondents prefer the most risky of the two portfolios presented to them, regardless of their initial choice. Consider first the group of risk averse respondents (<20% stocks). On average, they rate the pension scheme based on the median portfolio 3.56 as opposed to 2.81 for the pension scheme based on their own preferred portfolio. In fact, 61.1 percent of this group of conservative investors prefers the median to the own portfolio, while only 15.6% prefers the own portfolio and 23.3% of the group is indifferent. Put differently, ex post they regret their original choice. The group of respondents that favored a risky portfolio (>40% stocks), on the other hand rates the median portfolio as less attractive than their own (average ratings of 3.05 and 3.54 respectively) on average and typically sticks to the original choice. 59.5 percent of the respondents in this group prefer the own portfolio to the median. Finally, the middle group that chose a preferred stock percentage

<sup>23</sup> In fact, for simplicity we approximate individually chosen own portfolios with stock percentages between 20 and 40 percent with the uniform mean portfolio, which has 30 percent stocks.

close to the median (between 20 and 40 percent) rates the own portfolio on average at 3.04 and the more risky 50 percent portfolio at 3.50. 55.9 percent of this group prefers the 50 percent portfolio to their own original choice.<sup>24</sup>

Our results contrast markedly with Benartzi and Thaler (2002). Whereas in their sample respondents tend to go for the median portfolio irrespective of their initial portfolio choice, our respondents unambiguously choose the riskier portfolio of the two, regardless of their initial choice. Other empirical evidence on the consistency of preferences is mixed as well, see Benartzi and Thaler (2001) and Huberman and Jiang (2004).

One explanation for our finding – see Benartzi and Thaler (1999) – is that our respondents are subject to ‘myopic loss aversion’. Under this assumption, the probability of a short-term loss receives too much weight in long-term portfolio decisions. When confronted with the (true) distribution of long-run returns, individuals then switch to more risky portfolios. A second explanation could be that the respondents’ expectations of asset markets may differ from ours. The observed shift towards a preference for more risky portfolios then arises from the fact that respondents are more pessimistic on the stock market’s risk return profile relative to the bond market than implied by our assumptions underlying the Monte Carlo simulations.<sup>25</sup> Note that at the time of the survey in 2004, stock market returns had been disappointing for a number of years. Either way, both explanations suggest that many respondents currently lack the skills for being in charge of the investment for retirement purposes. The shift towards a more risky portfolio by a majority of the respondents suggests that either the initial preferences were fragile and not firmly grounded or that they were based on an unrealistically pessimistic – in comparison with historical averages – assessment of the distribution of stock versus bond returns.<sup>26</sup>

## 5. Summary and conclusions

In the Netherlands, the large majority of employees compulsory participates in the DB retirement plan of their employer. For a long time, the national pension system worked

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<sup>24</sup> We have also replicated the analysis in Table 9 separately for those respondents covered by DC and DB plans. The results do not show significant differences. In interpreting all these results it is important to note that the sample with DC-participants is small and heterogeneous, including those participating in collective retirement plans without choice options.

<sup>25</sup> Potentially, the results may be affected by the emergence of important new economic information in the period between the two surveys that may have changed respondents’ view on the attractiveness of the various portfolios. Given the lack of major economic developments during the period under investigation, we doubt the quantitative importance of such effect.

<sup>26</sup> One might argue that respondents are sensitive to the way the distribution of pension benefits is presented. However, Benartzi and Thaler (1999) show that individuals are not very sensitive to variations in the presentation of the retirement income distribution.



satisfactorily. The average employee typically never had much influence on pension fund policies and – possibly as a consequence – is relatively ignorant about many of his own retirement plan’s details. Although employee confidence in the system and in the safety of future pension allowances has been and still is very high, the fall in stock prices around the turn of the century, the new international accounting standards and the ageing of the population have triggered a debate on the sustainability and design of the system. Many funds have switched from a system where pension benefits are based on the final gross wage to a system that is based on career-average wages. After the 2000-2003 stock market crash, pension premiums were raised while indexation was cut by many pension funds to compensate for large investment losses. Some pension funds in the Netherlands have started to experiment with mixed DB/DC and even full (collective) DC systems.

Against this background, this paper provides evidence on pension preferences and investor autonomy with respect to retirement savings in the Netherlands. The focus is on whether employees are willing and able to deal with more retirement plan choice. We use questionnaire responses from about 1000 members of the household panel run by CentERdata, which is a representative sample of the Dutch population.

Our main conclusions are the following. Risk aversion is quite high on average. When asked about risk attitude with respect to general matters, financial matters and pension matters respectively, risk aversion is highest in the pension domain. Simultaneously, the typical employee considers himself to be financially illiterate. Lack of exposure to self-directed savings plans and investments may go some way in explaining both the low level of self-assessed financial expertise and the high level of self-assessed risk aversion. However, US evidence indicates that financial literacy has not disappeared with the widespread introduction of individual DC plans (Lusardi and Mitchell, 2005).

The vast majority of Dutch employees is in favor of compulsory saving for retirement and favors a DB pension system. This preference is, according to the employees, primarily due to their wish not to spend time on retirement savings decisions and to a perceived self-control problem, but respondents may also be affected by a status quo bias. If offered a combined DB/DC system, the majority would choose a guaranteed pension income of 70% or more of their net labor income. In case of the introduction of an individual DC scheme, most respondents would prefer to delegate decisions about the investment of their retirement portfolio to a pension fund. The possibility to enroll in a program for free to improve financial expertise would only induce a minority - 42 percent - of the employees to become more supportive of investor autonomy.

Self-assessed risk tolerance and financial expertise are important explanatory variables of pension system attitude. Respondents who are more inclined to take risk and consider themselves to be financially sophisticated, are more likely to prefer a DC plan, to prefer a relatively low guaranteed retirement income, and to prefer investor autonomy. When given investor autonomy, the typical respondent chooses a conservative portfolio with stocks making up only 30 percent of the average portfolio. Employees expect to be quite activist in managing the composition of their retirement savings portfolio if they were forced to investor autonomy in an individual DC scheme. Drivers behind a planned change in portfolio composition are changes in one's personal financial situation, general economic conditions, and expectations of financial markets. Respondents with more confidence in their financial expertise and lower risk aversion choose more risky portfolios and are more inclined to actively manage their portfolio when circumstances change.

In a final experiment we show that respondents who originally stated that they would prefer a relatively safe investment portfolio for retirement with only a small proportion of stocks tend to switch to a riskier portfolio when shown the distribution of long-run returns on their own portfolio and the mean risk portfolio (containing more stocks). The same holds for investors who originally opted for a mean risk portfolio. They too switch to a more risky portfolio. This result suggests that many Dutch pension plan participants currently lack the necessary skills to be in charge of their own investment portfolio for retirement purposes.

Our finding that most respondents are reluctant to switch from a DB to a DC system with more freedom of choice is not surprising, given their high risk aversion in the pension domain and their low self-assessed degree of financial expertise. However, risk tolerance and financial literacy are likely to be endogenous, possibly depending on individuals' exposure to self-directed savings and investment plans. The conclusions in this paper are conditional on current preferences and knowledge. Changes in the institutional design may change preferences and behavior. Be that as it may, changes in the pension scheme design will affect financial expertise and risk attitude of employees only very gradually. The policy implication therefore is, that in case of a change over to more individualized DC plans in the Netherlands, many employees would have to be guided in their retirement planning, for example by mandatory collective arrangements, made-to-measure defaults or plans offering the possibility of commitment to long-term savings strategies. Even within DC systems, there are important gains to be had from maintaining compulsory savings to avoid the pitfall of undersaving due to self-control problems and procrastination. Our results indicate that a large fraction of employees is aware of this problem. Similarly, given myopic loss aversion and lack of

financial expertise, a switch to a system with full autonomy over investment choices is far from recommendable. In any case more freedom of choice in employee retirement plans would have to be accompanied by appropriate default portfolios and/or a limited menu of investment options with differing risk characteristics. Finally, liberalization of the market for pension investment would increase the importance of supervision and regulation of the market for professional pension advice.

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## **PAPER TWO \***

### **FINANCIAL LITERACY AND STOCK MARKET PARTICIPATION**

**(Co-authors: Annamaria Lusardi and Rob Alessie)**

**\* Basically this is the October 2007 version that appeared in the NBER working paper series with the incorporation of a number of changes upon suggestions by the members of the reading committee. In the third and fourth paper of this thesis, it is referred to as Van Rooij, M., A. Lusardi, and R. Alessie, 2007, Financial literacy and stock market participation, *NBER Working Paper*, 13565.**





# Financial Literacy and Stock Market Participation

Maarten van Rooij (De Nederlandsche Bank and Netspar)

Annamaria Lusardi (Dartmouth College and NBER)

Rob Alessie (University of Groningen, Netspar and Tinbergen Institute)\*

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## Abstract

Individuals are increasingly put in charge of their financial security after retirement. Moreover, the supply of complex financial products has increased considerably over the years. However, we still have little or no information about whether individuals have the financial knowledge and skills to navigate this new financial environment. To better understand financial literacy and its relation to financial decision-making, we have devised two special modules for the DNB Household Survey. We have designed questions to measure numeracy and basic knowledge related to the working of inflation and interest rates, as well as questions to measure more advanced financial knowledge related to financial market instruments (stocks, bonds, and mutual funds). We evaluate the importance of financial literacy by studying its relation to the stock market: Are more financially knowledgeable individuals more likely to hold stocks? To assess the direction of causality, we make use of questions measuring financial knowledge before investing in the stock market. We find that, while the understanding of basic economic concepts related to inflation and interest rate compounding is far from perfect, it outperforms the limited knowledge of stocks and bonds, the concept of risk diversification, and the working of financial markets. We also find that the measurement of financial literacy is very sensitive to the wording of survey questions. This provides additional evidence for limited financial knowledge. Finally, we report evidence of an independent effect of financial literacy on stock market participation: Those who have low financial literacy are significantly less likely to invest in stocks.

**Key words:** Portfolio choice; Knowledge of Economics and Finance, Financial Sophistication.

**JEL Classification:** D91, G11, D80.

\* Maarten C.J. van Rooij, Economics & Research Division, De Nederlandsche Bank, P.O. Box 98, 1000 AB, Amsterdam ([M.C.J.van.Rooij@dnb.nl](mailto:M.C.J.van.Rooij@dnb.nl)), Annamaria Lusardi, Department of Economics, Dartmouth College, Hanover, NH 03755 ([Annamaria.Lusardi@Dartmouth.edu](mailto:Annamaria.Lusardi@Dartmouth.edu)), and Rob J.M. Alessie, School of Economics and Business, University of Groningen, P.O. Box 800, 9700 AV, Groningen ([R.J.M.Alessie@rug.nl](mailto:R.J.M.Alessie@rug.nl)). We are grateful to James Banks, Johannes Binswanger, Marcello Bofondi, Henrik Cronqvist, Dimitris Georgarakos, Michael Haliassos, Lex Hoogduin, Adriaan Kalwij, Arie Kapteyn, Clemens Kool, Mauro Mastrogiacomo, Theo Nijman, Gerard van den Berg, Peter van Els, Arthur van Soest, and participants in the Program on the Global Demography of Aging Seminar Series at the Harvard School of Public Health, the CEPR/Netspar European Pension Challenges Conference (London, September 2006), the Netspar Workshop on the Micro-economics of Ageing (Utrecht, November 2006), the Plenary Session at the Italian Congress of Econometrics and Empirical Economics (Rimini, January 2007), the Workshop on Behavioral Approaches to Consumption, Credit, and Asset Allocation (European University Institute, May 2007), the Netspar Workshop (Groningen, June 2007), and the Conference on the Luxembourg Wealth Study: Enhancing Comparative Research on Household Finance (Rome, July 2007) for suggestions and comments. We also thank the staff of CentERdata and, in particular, Corrie Vis for their assistance in setting up the survey and the field work. The views expressed in this paper are those of the authors and do not necessarily reflect the views of De Nederlandsche Bank.

## **1. Introduction**

Individuals have become increasingly active in financial markets, and market participation has been accompanied or even promoted by the advent of new financial products and services. However, some of these products are complex and difficult to grasp, especially for financially unsophisticated investors. At the same time, market liberalization and structural reforms in Social Security and pensions have caused an ongoing shift in decision power away from the government and employers toward private individuals. Thus, individuals have to assume more responsibility for their own financial well-being.

Are individuals well-equipped to make financial decisions? Do they possess adequate financial literacy and knowledge? There has been little research on this topic and the few existing studies indicate that financial illiteracy is widespread and individuals lack knowledge of even the most basic economic principles (Lusardi and Mitchell, 2006, 2007a; National Council on Economic Education (NCEE, 2005), and Hilgert, Hogarth and Beverly, 2003). At the same time, there are concerns that households are not saving enough for retirement, are accumulating excessive debt, and are not taking advantage of financial innovation (Lusardi and Mitchell, 2007b; Campbell, 2006). The existing studies have also shown that those who are not financially literate are less likely to plan for retirement and to accumulate wealth (Lusardi and Mitchell, 2006, 2007a), and are more likely to take up high-interest mortgages (Moore, 2003).

To measure financial literacy and assess its relationship with financial decision-making, we have devised two special modules for the DNB Household Survey (DHS), a panel data set covering a representative sample of the Dutch population and providing information on savings and portfolio choice. We have designed an extensive list of questions aimed at measuring and differentiating among different levels of literacy and financial sophistication. These questions can be linked to a rich set of data on demographic characteristics and wealth holdings. Our data show that the majority of households display basic financial knowledge and have some grasp of concepts such as interest compounding, inflation, and the time value of money. However, very few go beyond these basic concepts; many households do not know the difference between bonds and stocks, the relationship between bond prices and interest rates, and the basics of risk diversification. Most important, we find that financial literacy affects financial decision-making: Those with low literacy are more likely to rely on family and friends as their main source of financial advice and are less likely to invest in stocks.

This paper makes three contributions to the existing literature. First, we develop two indices of financial literacy and knowledge, which allow us to differentiate among different

levels of financial sophistication. Adding this information to existing data sets can substantially enhance the studies on saving and portfolio choice. Second, we contribute to the methodology of measuring financial knowledge. There is a lot of noise in the responses to financial literacy questions and we show that the wording of the questions is critically important for measuring financial knowledge. Third, we provide a contribution toward solving the so-called stock-holding puzzle, i.e., the fact that many households do not hold stocks (Campbell, 2006; Haliassos and Bertaut, 1995). We show that many families shy away from the stock market because they have little knowledge of stocks, the working of the stock market, and asset pricing. To address the direction of causality between literacy and stock market participation, we designed questions to measure not only current levels of literacy but also levels of literacy in the past. Moreover, we designed questions to measure cognitive ability in an attempt to disentangle the effects of knowledge from talents and skills.

Our findings have important policy implications. First, we show that financial literacy should not be taken for granted. A majority of households possesses limited financial literacy. Second, financial literacy differs substantially depending on education, age and gender. This suggests that financial education programs are likely to be more effective when targeted to specific groups of the population. Finally, any privatization programs should take into account that, when put in charge of investing for their retirement, financially unsophisticated individuals may not invest in the stock market. Thus, to work effectively, privatization programs need to be accompanied by well-designed financial education programs.

This paper is organized as follows: In Section 2, we provide a review of the current literature on financial literacy and stock market participation. In Section 3, we describe our data set. In Section 4, we introduce our measures of financial literacy and describe the problems of measuring literacy. In Section 5, we report the results of our empirical work. In Section 6, we discuss our results and provide several extensions. In Section 7, we conclude and examine areas for future research.

## **2. Literature review**

There exist very few surveys that provide information on both financial literacy and variables related to financial decision-making (for example saving, portfolio choice, and retirement planning). To remedy this lack of data, Lusardi and Mitchell (2006) devised a module on financial literacy for the 2004 US Health and Retirement Study (HRS). Their questions aimed to test basic financial knowledge related to the working of interest compounding, the effects of inflation, and risk diversification. They found that financial

illiteracy is widespread and particularly acute among specific groups of the population, such as women, the elderly, and those with low education. These results are surprising not only because the literacy questions were rather simple and basic, but also because their sample was composed of respondents who are 50 or older. Most respondents in that age group have checking accounts, credit cards, and have taken out one or two mortgages. However, similar results are found in the work by Hilgert and Hogarth (2002), which examines financial literacy in a sample covering all age groups, and on surveys by the National Council on Economic Education (NCEE), that cover financial literacy among high school students and the adult population. Findings of widespread illiteracy are also reported in studies on smaller samples or specific groups of the population (Agnew and Szykman, 2005; Bernheim, 1995, 1998; Mandell, 2004; Moore, 2003).

While these studies focus on data from the US, surveys from other countries show very similar results. A study by the OECD (2005) and work by Lusardi and Mitchell (2007b) review the evidence on financial literacy across countries and show that financial illiteracy is a common feature in many other developed countries, including European countries, Australia, and Japan. These findings are echoed in the work of Christelis, Jappelli and Padula (2007), which uses data very similar to the US HRS, and finds that most respondents in Europe score low on numeracy scales.

Financial illiteracy has implications for household behavior. Bernheim (1995, 1998) was the first to point out not only that most households cannot perform very simple calculations and lack basic financial knowledge, but also that the savings behavior of many households is dominated by crude rules of thumb. In more recent works, Bernheim, Garrett and Maki (2001) and Bernheim and Garrett (2003) show that those who were exposed to financial education in high school or in the workplace save more. Similarly, Lusardi and Mitchell (2006, 2007a) show that those who display low literacy are less likely to plan for retirement and as a result accumulate much less wealth (see also Hilgert, Hogarth and Beverly, 2003). This finding is confirmed in the work by Stango and Zinman (2007), which shows that those who are not able to correctly calculate interest rates out of a stream of payments end up borrowing more and accumulating lower amounts of wealth. Agarwal, Driscoll, Gabaix and Laibson (2007) further show that financial mistakes are prevalent among the young and elderly, who are those displaying the lowest amount of financial knowledge.

The measures of financial literacy used in existing studies are often crude. For example, Lusardi and Mitchell (2006, 2007a) rely on only three questions to measure financial literacy, and Stango and Zinman (2007) rely on one question. Moreover, the surveys

that provide more extensive information about financial literacy often have little or no data on wealth, saving, or other important economic outcomes (see, for example, the NCEE survey). In this paper, we overcome the problems with some of the previous studies by providing comprehensive measures of financial literacy as well as providing an evaluation of the quality of the literacy data. In addition, we link financial literacy with an important economic outcome: participation in the stock market. While extensive research on this topic exists, it is still a puzzle why so many households do not hold stocks (Campbell, 2006). Some have argued that short sale constraints, income risk, inertia, and departures from expected utility maximization may explain why so few households hold stocks (Haliassos and Bertaut, 1995), but it has proven hard to account for all these factors in available micro data sets. Others have argued that young people cannot borrow and thus do not have wealth to invest in stocks (Constantinides, Donaldson and Mehra, 2002). These life-cycle considerations and the wedge between borrowing and lending rates can provide some explanation for lack of stock ownership (Davis, Kubler and Willen, 2006), but even these reasons cannot fully explain why such a large proportion of families do not hold stocks. More recent papers have incorporated other reasons, such as trust and culture (Guiso, Sapienza and Zingales, 2005), and the influence of neighbors and peers (Hong, Kubik and Stein, 2004; Brown, Ivkovic, Smith and Weisbenner, 2007). Yet other authors have started to consider limited numeracy and cognitive ability (Christelis, Jappelli and Padula, 2007), lack of asset awareness (Guiso and Jappelli, 2005), and lack of financial sophistication (Kimball and Shumway, 2006). Our work improves substantially upon these studies by considering more refined indices of financial literacy and financial sophistication that we have explicitly designed for a survey of Dutch households. Moreover, to better understand the relationship between financial literacy and stock market participation, we have designed questions to measure economic knowledge before entering the stock market.

### **3. Data**

We use data from the 2005 DNB Household Survey (DHS). DHS is an annual household survey covering information about demographic and economic characteristics and focusing on wealth and saving data. The panel is run by CentERdata, a survey research institute at Tilburg University that specializes in internet surveys.<sup>1</sup> The data set is representative of the Dutch population, and it contains over 2000 households.

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<sup>1</sup> <http://www.uvt.nl/centerdata/en/>. See Nyhus (1996) for a detailed description of this survey and an assessment of the quality of the data.

In addition to using data from the main core of the DHS, we also use data from two modules we designed, which were added to the survey in 2005 and 2006. The first financial literacy module was in the field from September 23 until September 27, 2005 and was repeated a week later for those who did not respond during that time. A total of 1508 out of 2028 households completed the financial literacy module, implying a response rate of 74.4% (in line with the response rate from the main survey). A second module was fielded in January 2006, and 1373 out of the original 1508 respondents completed that module. The respondent to the financial literacy questions is the member of the household in charge of household finances.

Survey participants are interviewed via the internet. Although the internet connection rate in the Netherlands is one of the highest in Europe (80% of Dutch households are connected to the internet at their home), households need not have an internet connection to participate in the survey. Recruitment and selection of households is first done by phone with a randomly selected sample of households. Households without an internet connection are provided with a connection or with a set-top box for their television (for those who do not have access to a personal computer). This method of data collection presents several advantages. For example, data collected with internet surveys suffer less from reporting biases than those collected via telephone interviews (Chang and Krosnick, 2003).

The age of the respondents in our sample varies from 22 to 90 (mean age is 49.6); 51.5% of respondents are male; 34.5% have a college education (which includes vocational training in addition to university degrees). In regards to household composition, 56.8% of respondents are married or living together with a partner, and one third have children living at home. Overall, 18.4% of respondents are retired (including early retirees), 10.8 % are disabled or unemployed, and 4.4% are self-employed.<sup>2</sup>

#### **4. The measurement of literacy**

As mentioned before, we designed two modules to measure and evaluate financial literacy. The financial literacy questions are composed of two parts. The first set of questions aims to assess basic financial literacy. These questions cover topics ranging from the working of interest rates and interest compounding to the effect of inflation, discounting and nominal versus real values. The second set of questions aims to measure more advanced financial knowledge and covers topics such as the difference between stocks and bonds, the function of

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<sup>2</sup> Throughout our empirical analysis, we always use household weights to ensure that our statistics are representative of the population.

the stock market, the working of risk diversification, and the relationship between bond prices and interest rates. These questions were designed using similar modules in the HRS and a variety of other surveys on financial literacy. However, a few questions are unique to our module on literacy.<sup>3</sup> Households are instructed to answer the questions without consulting additional information or using a calculator.<sup>4</sup>

The exact wording of the questions measuring basic financial literacy is reported below in Box 1:

### **Box 1. 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 €10000 today and his sibling inherits €10000 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.

These questions measure the ability to perform simple calculations (in the first question), the understanding of how compound interest works (second question), and the effect of inflation (third question). We also designed questions to assess the knowledge of

<sup>3</sup> For an analysis of the module on financial literacy in the 2004 HRS, see Lusardi and Mitchell (2006). For a review of financial literacy surveys across countries, see Lusardi and Mitchell (2007b).

<sup>4</sup> This facilitates the comparison with other surveys, which are normally done via telephone. Moreover, this procedure better enables researchers to assess what respondents know.

time discounting (fourth question) and whether respondents suffer from money illusion (fifth question). These concepts lie at the basis of basic financial transactions, financial planning, and day-to-day financial decision-making.

Responses to these questions are reported in Table 1A. Most respondents answer the first question correctly, where the percentage of incorrect responses is only 5.2%. However, the proportion of correct answers decreases considerably, to a little more than 70%, when we consider questions on interest compounding, time discounting, and money illusion; the proportion of incorrect answers on questions measuring the time value of money or money illusion is around 24%. Note also that, while many respondents answer each individual question correctly, the proportion of respondents who answered all five questions correctly is only 40.2% (Table 1B). Thus, while many respondents display knowledge of a few financial concepts, basic financial literacy is not widespread.

**Table 1A. Basic financial literacy**

Weighted percentages of total number of respondents (N=1508)

	Numeracy	Interest compounding	Inflation	Time value of money	Money illusion
Correct	90.8	76.2	82.6	72.3	71.8
Incorrect	5.2	19.6	8.6	23.0	24.3
Do not know	3.7	3.8	8.5	4.3	3.5

Note: Correct, incorrect, and do not know responses do not sum up to 100% because of refusals.

**Table 1B. Basic literacy: Summary of responses**

Weighted percentages of total number of respondents (N=1508)

	Number of correct, incorrect and do not know answers (out of five questions)						
	None	1	2	3	4	All	Mean
Correct	2.3	2.8	6.7	15.1	32.8	40.2	3.94
Incorrect	45.2	35.7	13.6	4.4	1.1	0.0	0.81
Do not know	88.9	5.9	1.7	1.4	0.7	1.5	0.24

Note: Categories do not sum up to 100% because of rounding and means do not sum up to 5 due to refusals.



To be able to classify respondents according to different levels of financial sophistication, we added several other questions to the module. The exact wording of these questions is reported in Box 2.

### **Box 2. Advanced Literacy Questions**

6) *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.

7) *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.

8) *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.

9) *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.

10) *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; (vi) Refusal.

11) *Normally, which asset displays the highest fluctuations over time?* (i) Savings accounts; (ii) Bonds; (iii) Stocks; (iv) Do not know; (v) Refusal.

12) *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.

13) *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.

(14) *Stocks are normally riskier than bonds. True or false?* (i) True; (ii) False; (iii) Do not know; (iv) Refusal.

(15) *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.

(16) *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.

Clearly, these are much more complex questions than the previous set.<sup>5</sup> The purpose of these questions is to measure more advanced financial knowledge related to investment and portfolio choice. Specifically, these questions were devised to assess knowledge of financial assets, such as stocks, bonds and mutual funds, the returns and riskiness of different assets, as well as the working of the stock market. Moreover, we attempt to measure whether respondents understand the concept of risk diversification (which was asked in two separate questions), the working of mutual funds, and the relationship between bond prices and interest rates.

Responses to these questions are reported in Table 2A. The pattern of answers is much different than in the previous set of questions. For example, the proportion of correct answers on each question is much lower; only a quarter of respondents know about bond pricing and only 30% know how long-term bonds work. Respondents also display difficulties in grasping the concept of risk diversification: Less than 50% of respondents know that a stock mutual fund is safer than a company stock. Not only do a sizable proportion of respondents answer these questions incorrectly, but also many respondents state they do not know the answers to these questions. For example, while 30% of respondents are incorrect about which asset (among savings accounts, bonds and stocks) gives the highest return over a long time period, an additional 22% do not know the answer to this question. Similarly, more than 37% are incorrect about the relationship between bond prices and interest rates and the same high percentage (37.5%) state they do not know the answer to that question. Many respondents are incorrect or do not know the definition of stocks, bonds, and the working of mutual funds. Table 2B shows that only a tiny fraction of respondents (5%) are able to answer all the advanced literacy questions correctly, while the fraction of incorrect responses or 'do not know' answers on several questions is sizable. These are important findings; most models of portfolio choice assume that investors are knowledgeable and well-informed. Instead, the findings in Tables 1A, 1B, 2A, and 2B show that financial literacy should not be taken for granted. These findings echo the results found in US surveys, such as the HRS and the Survey of Consumers (Lusardi and Mitchell, 2006; Hilgert, Hogarth and Beverly, 2003).

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<sup>5</sup> Because we could not perform a pilot study to assess how respondents perform on these questions and how well they understood them, we use the wording of questions from other existing surveys (with some modifications to reflect the characteristics of the Dutch financial system and the behaviour of Dutch financial markets). Specifically, we took question 6 from the National Council of Economic Education Survey, questions 7 and 9 from the NASD Investor Knowledge Quiz, question 15 from the 2004 Health and Retirement Study module on financial literacy, questions 8, 10, 11, 12, 13, 14 and 16 from the Survey of Financial Literacy in Washington State, the Survey of Consumers, and the John Hancock Financial Services Defined Contribution Plan Survey. We took the questions that best reflect financial sophistication related to financial instruments and the working of the stock market. As explained later, we have also experimented with the wording of some of these questions.

**Table 2A. Advanced financial literacy**

Weighted percentages of total number of respondents (N=1508)

	Correct	Incorrect	DK
Which statement describes the main function of the stock market? <sup>1)</sup>	67.0	12.9	19.7
What happens if somebody buys the stock of firm B in the stock market? <sup>1)</sup>	62.2	25.7	11.0
Which statement about mutual funds is correct? <sup>1)</sup>	66.7	11.1	21.7
What happens if somebody buys a bond of firm B? <sup>1)</sup>	55.6	17.8	26.4
Considering a long time period (for example 10 or 20 years), which asset normally gives the highest return: savings accounts, bonds or stocks?	47.2	30.1	22.3
Normally, which asset displays the highest fluctuations over time: savings accounts, bonds, stocks?	68.5	12.7	18.4
When an investor spreads his money among different assets, does the risk of losing money increase, decrease or stay the same?	63.3	17.4	19.0
If you buy a 10-year bond, it means you cannot sell it after 5 years without incurring a major penalty. True or false?	30.0	28.3	37.9
Stocks are normally riskier than bonds. True or false? <sup>2)</sup>	60.2	15.1	24.3
Buying a company fund usually provides a safer return than a stock mutual fund. True or false? <sup>2)</sup>	48.2	24.8	26.6
If the interest rate falls, what should happen to bond prices: rise/fall/stay the same/none of the above? <sup>2)</sup>	24.6	37.1	37.5

1) See exact wording in Box 2.

2) This question has been phrased in two different ways. See also Table 3.

Note: DK = 'Do not know'; Correct, incorrect and DK responses do not sum up to 100% because of refusals.

**Table 2B. Advanced literacy: Summary of responses**

Weighted percentages of total number of respondents (N=1508)

	Number of correct, incorrect and do not know answers (out of eleven questions)											All	Mean
	None	1	2	3	4	5	6	7	8	9	10		
Correct	7.6	5.1	5.2	6.4	7.3	10.0	11.1	11.3	10.8	10.6	9.8	5.0	5.93
Incorrect	18.7	20.2	19.8	16.8	10.4	7.1	4.7	1.6	0.6	0.1	0.0	0.0	2.33
DK	44.2	11.4	8.0	6.1	5.1	3.7	4.1	4.2	2.8	3.2	3.5	3.6	2.65

Note: DK = 'Do not know'; Categories do not sum up to 100% because of rounding and means do not sum up to 11 due to refusals.

When lack of financial knowledge is so widespread, one has to worry about whether respondents even understood the meaning of the questions, and the prevalence of guessing and random answers. To assess the relevance of these problems, we used the following strategy: We inverted the wording of questions and exposed two randomly chosen groups of respondents to the same question but with a different wording. We did so for three types of questions: A simple question about the riskiness of bonds versus stocks, a more difficult question about the riskiness of a company stock versus a stock mutual fund, and an even more complex question on the effect of interest rate changes on bond prices. This allows us to assess how incorrect and perhaps random answers are connected to the difficulty of the questions. The precise wording of the questions is reported below:

(14a) *Stocks* are normally riskier than *bonds*. True or false?

(14b) *Bonds* are normally riskier than *stocks*. True or false?

(15a) Buying a *company stock* usually provides a safer return than a *stock mutual fund*. True or false?

(15b) Buying a *stock mutual fund* usually provides a safer return than a *company stock*. True or false?

(16a) If the interest rate *falls*, what should happen to bond prices? Rise/fall/stay the same/none of the above?

(16b) If the interest rate *rises*, what should happen to bond prices? Rise/fall/stay the same/none of the above?

The pattern of responses in Table 3 shows that the wording of the question matters, particularly for the difficult questions. When comparing the response to a simple question on the riskiness of stocks versus bonds, we find that respondents give rather similar answers regardless of the wording of the question (differences are not significant at the 5% level of significance). However, this is not the case for complex questions. The pattern of answers changes dramatically when the order of the wording was inverted. For example, the number of correct answers doubles when respondents are asked whether ‘buying a company stock usually provides a safer return than a stock mutual fund’ versus the same question with the inverted order: ‘buying a stock mutual fund provides a safer return than a company stock’. Note that this is not the result of following a crude rule of thumb, such as picking the first answer as the correct one. This would lead to a lower rather than higher percentage of correct answers for question (15a).<sup>6</sup> This finding provides evidence that respondents often do not

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<sup>6</sup> It is consistent, however, with another rule of thumb that was mentioned to us about the behavior of students. They tend to reply ‘false’ to a true-false question when they are not sure about the answer.

understand the question or do not know what stocks, bonds, and mutual funds are, and some correct answers are simply the result of guessing. It also shows that answers to advanced financial literacy questions should not be taken at face value and the empirical work should take into account that these measures are often noisy proxies of the true level of financial knowledge. We will address these issues in the empirical work.

**Table 3. Advanced literacy: Responses to questions with inverted wording**  
Weighted percentages

	Correct	Incorrect	DK
<i>Stocks</i> are normally riskier than <i>bonds</i> . True or false? (N=751)	60.8	17.1	21.7
<i>Bonds</i> are normally riskier than <i>stocks</i> . True or false? (N=757)	59.7	13.1	26.9
Pearson chi2(2) = 5.25 (p = 0.072)			
Buying a <i>company stock</i> usually provides a safer return than a <i>stock mutual fund</i> . True or false? (N=763)	63.4	12.1	24.1
Buying a <i>stock mutual fund</i> usually provides a safer return than a <i>company stock</i> . True or false? (N=745)	32.3	38.1	29.2
Pearson chi2(2) = 184.59 (p = 0.000)			
If the interest rate <i>falls</i> , what should happen to bond prices: rise/fall/stay the same/none of the above? (N=755)	30.5	33.8	34.8
If the interest rate <i>rises</i> , what should happen to bond prices: rise/fall/stay the same/none of the above? (N=753)	18.9	40.3	40.3
Pearson chi2(2) = 23.15 (p = 0.000)			

Note: DK = ‘Do not know’; Correct, incorrect, and do not know responses do not sum up to 100% because of refusals. In performing the test, we group together ‘do not know’ and ‘refusal’ responses.

#### 4.1 Indices of financial literacy

We summarize all of the information about financial literacy resulting from our two sets of questions into a financial literacy index. We first combine the information we have available by performing a factor analysis on the sixteen questions in the financial literacy module. Consistent with the way we have devised the financial literacy questions, the factor analysis indicates there are two main factors with different loading on two types of questions: The simple literacy questions (first 5 questions) and the more advanced literacy questions (remaining 11 questions). We decided therefore to split the set of questions into two groups and perform a factor analysis on the two sets separately. In this way, we can construct two types of literacy indices: a first literacy index potentially related to basic knowledge (note that there are no questions in this set about the stock market or about stocks and bonds) and a second index measuring more advanced financial knowledge as well as knowledge related to

stocks, the stock market and other financial instruments. In constructing the indices, we explicitly take into account the differences between ‘incorrect’ answers and ‘do not know’ answers. As already reported in Lusardi and Mitchell (2006), it is important to exploit this information to differentiate among degrees of financial knowledge. Details about the factor analysis are reported in Appendix A.

The basic literacy index runs from a minimum value of -2.9 for respondents without any correct answer to a maximum of 1.0 for the participants with only correct responses. The advanced literacy index goes from -4.7 to 0.8. Both distributions have mean zero and a standard deviation of 1.0 and 1.2 respectively. As expected the basic and advanced literacy measures are clearly correlated albeit far from perfect (correlation coefficient: 0.46).

To confirm the validity of these two indices and their features, we report the distribution of the financial literacy indices across demographic variables such as education, age, and gender in Tables 4A and 4B. As expected, basic financial literacy increases strongly with education. Those with the lowest level of basic financial literacy are concentrated on the lowest education categories: primary and preparatory intermediate vocational schools. Conversely, those with a higher vocational education (similar to a college degree in the US) or a university education locate in the highest quartiles of the basic literacy index. The profile of basic literacy has a hump-shape with regards to age, although not very pronounced. Even though in a single cross-section we cannot distinguish between age and cohort effects, this finding is similar to what is reported in Agarwal, Driscoll, Gabaix and Laibson (2007). Table 4A also shows there are large differences in basic literacy between gender: Women display much lower basic knowledge than men. These findings are similar to those reported by Lusardi and Mitchell (2006) and the findings in other literacy surveys (Lusardi and Mitchell, 2007b).

Considering more advanced financial knowledge in Table 4B, again we find a strong relationship with education. A large fraction (48.3%) of respondents with primary education is at the lowest level of literacy (first quartile). As we move to higher quartiles of level of literacy, the proportion of respondents with high levels of education increases, but even when we consider those with a university degree, only 43.4% of them are at the top quartile of advanced literacy (the proportion was 70.9% when we consider basic literacy). Thus, even respondents with high educational attainment can display a low degree of financial knowledge (more than 30% of respondents with a university degree are in the bottom two quartiles of the advanced literacy index distribution). Thus, while strongly correlated, education is only an

**Table 4A. Basic literacy across demographics**  
Weighted percentages

Basic literacy quartiles						
Education	1 (low)	2	3	4 (high)	Mean	N
Primary	35.8	31.1	17.1	15.9	2.13	67
Preparatory intermediate voc.	30.5	22.7	21.8	25.0	2.41	345
Intermediate vocational	20.9	20.8	25.2	33.2	2.71	294
Secondary pre-university	11.1	20.8	25.7	42.4	2.99	207
Higher vocational	6.4	18.1	24.0	51.5	3.21	397
University	5.9	9.7	13.5	70.9	3.49	197
Pearson chi2(15) = 147.42				(p=0.000)		

Basic literacy quartiles						
Age	1 (low)	2	3	4 (high)	Mean	N
21-30 years	21.6	19.7	19.4	39.4	2.76	179
31-40 years	18.8	18.3	21.1	41.9	2.86	306
41-50 years	13.7	18.0	23.9	44.3	2.99	333
51-60 years	16.6	19.8	21.3	42.3	2.89	311
61-70 years	18.3	22.3	23.8	35.6	2.77	217
71 years and older	18.3	24.1	24.6	33.0	2.72	162
Pearson chi2(15) = 12.23				(p=0.661)		

Basic literacy quartiles						
Gender	1 (low)	2	3	4 (high)	Mean	N
Female	22.2	25.4	21.2	31.2	2.62	674
Male	13.3	14.9	23.2	48.6	3.07	834
Pearson chi2(3) = 52.99				(p=0.000)		

Note: Percentages may not sum up to 100 due to rounding.

imperfect proxy for financial literacy and empirical studies that account for education may not fully account for the effect of financial knowledge.

Advanced literacy is low among the young, is highest among middle-age respondents (particularly 40 to 60), and declines slightly at an advanced age (61 or older). This suggests that people may be learning as they age and, perhaps, participate in financial markets. Gender differences become even sharper when considering advanced literacy. A large percentage of

**Table 4B. Advanced literacy across demographics**  
Weighted percentages

Advanced literacy quartiles						
<b>Education</b>	1 (low)	2	3	4 (high)	Mean	N
Primary	48.3	24.7	17.5	9.5	1.88	67
Preparatory intermediate voc.	35.1	29.4	23.5	12.0	2.12	345
Intermediate vocational	32.8	23.9	26.3	17.0	2.28	294
Secondary pre-university	19.0	21.8	28.4	30.9	2.71	207
Higher vocational	14.6	23.7	25.1	36.7	2.84	397
University	6.0	24.7	26.0	43.4	3.07	197
Pearson chi2(15) = 149.32				(p=0.000)		

Advanced literacy quartiles						
<b>Age</b>	1 (low)	2	3	4 (high)	Mean	N
21-30 years	24.0	33.5	25.4	17.1	2.36	179
31-40 years	34.3	21.3	23.5	20.9	2.31	306
41-50 years	23.4	26.5	20.5	29.7	2.56	333
51-60 years	18.2	24.1	30.6	27.1	2.67	311
61-70 years	25.7	22.5	22.2	29.6	2.56	217
71 years and older	23.2	24.1	28.7	24.1	2.54	162
Pearson chi2(15) = 36.70				(p=0.001)		

Advanced literacy quartiles						
<b>Gender</b>	1 (low)	2	3	4 (high)	Mean	N
Male	15.9	20.2	26.7	37.2	2.85	834
Female	34.5	30.2	23.3	12.1	2.13	674
Pearson chi2(3) = 161.53				(p=0.000)		

Note: Percentages may not sum up to 100 due to rounding.

women display low literacy: 34.5% of women are in the first and lowest quartile of the literacy distribution while only 12.1% are at the fourth quartile; the corresponding figures for men are 15.9% and 37.2% respectively.

To further show that these indices measure economic knowledge, in Table 4C we report the relationship between these measures of literacy and a subjective measure of financial knowledge. In our module we have asked respondents to report on a scale from 1 to



**Table 4C. Basic and advanced literacy versus self-assessed literacy**  
Weighted percentages

Self-assessed literacy	Basic literacy quartiles				Mean	N
	1 (low)	2	3	4 (high)		
1 (very low)	29.6	30.4	16.2	23.8	2.34	9
2	15.1	26.4	13.0	45.5	2.89	56
3	28.6	19.9	24.8	26.7	2.50	137
4	20.4	23.6	18.7	37.4	2.73	366
5	15.5	19.7	25.3	39.6	2.89	499
6	8.6	16.9	22.2	52.3	3.18	355
7 (very high)	7.4	13.4	25.5	53.7	3.25	45
Do not know	53.4	12.7	18.5	15.5	1.96	31
Refusal	52.9	0.0	35.9	11.2	2.05	10

Pearson chi2(24) = 100.38 (p=0.000)

Self-assessed literacy	Advanced literacy quartiles				Mean	N
	1 (low)	2	3	4 (high)		
1 (very low)	55.3	9.4	27.1	8.2	1.88	9
2	24.9	34.9	22.2	18.0	2.33	56
3	29.2	31.8	28.1	10.9	2.21	137
4	31.3	27.5	23.2	18.0	2.28	366
5	21.7	28.1	25.8	24.4	2.53	499
6	15.9	15.6	26.1	42.4	2.95	355
7 (very high)	3.9	10.2	34.8	51.1	3.33	45
Do not know	66.1	18.3	8.6	7.0	1.56	31
Refusal	67.5	24.9	7.6	0.0	1.40	10

Pearson chi2(24) = 189.19 (p=0.000)

Note: Percentages may not sum up to 100 due to rounding.

7 their understanding of economics.<sup>7</sup> Such a question has the advantage of being simple and direct. Moreover, it does not mention stock market participation. Note also that the question was located at the beginning of the literacy module, before any of the questions included in the basic and advanced financial literacy indices were asked. Thus, respondents had to assess their own knowledge before they answered the literacy questions. Most respondents assessed their economic knowledge as being above 3: 25.38% of respondents stated their level is 4, 32.75% that their level is 5 and 24.27% that their level is 6. However, only 2.71% reported

<sup>7</sup> See appendix B for the precise wording of this question.

their knowledge of economics as being very high (7). Most importantly, there is a very strong correlation between objective and subjective literacy. More than 50% of respondents who report knowing a lot about economics (score of 6 or 7) are located in the top quartile of the basic literacy index. The relationship becomes even stronger when we consider the advanced literacy index. More than 50% of respondents who report low levels of economic knowledge (score of 1, 2 or 3) are located in the first two quartiles of the literacy index, while the majority of those with high knowledge are located in the top two quartiles of the literacy index. Thus, while there may be noise and measurement error affecting these indices, they do provide information about economic knowledge.

An important question we aim to answer in our paper is not only whether respondents possess financial literacy, but also whether financial literacy matters in financial decision-making. We do so by first examining whether literacy influences the sources of information households consult when making financial decisions, to shed some light on why literacy affects financial behavior. We then examine whether financial literacy affects participation in the stock market.

Table 5 shows that a high proportion of respondents with low basic literacy rely on informal sources of information, such as family, friends and acquaintances. However, this proportion sharply decreases when we move to higher levels of basic literacy. Conversely, the proportion of households relying on newspapers, financial magazines, guides and books, and financial information on the Internet increases substantially as we move from low levels of literacy to high levels of basic literacy. Households with higher financial literacy are also more likely to rely on professional financial advisers. The effect is similar but stronger when we look at advanced financial literacy. Those who display high levels of advanced literacy are much less likely to rely on informal sources of information such as family and friends, and much more likely to read newspapers and magazines, consult financial advisors, and seek information on the Internet. While correlation does not imply causation, this table shows that financial literacy is strongly connected with sources of financial advice. Insofar as financial advice is an input in financial-decision making and leads to better saving and investment decisions, the findings reported in Table 5 provide a reason why financial literacy matters. In the next section, we look directly at financial behavior by examining whether financial literacy has an effect on stock market participation.

**Table 5. Most important source of advice for different levels of literacy**  
Weighted percentages (N=1135)

What is your most important source of advice when you have to make important financial decisions for the household?	<b>Basic literacy quartiles</b>			
	1 (low)	2	3	4 (high)
- Parents, friends or acquaintances	40.2	34.4	28.8	20.8
- Information from the newspapers	3.6	7.8	8.9	9.5
- Financial magazines, guides, books	3.9	7.5	9.3	12.4
- Brochures from my bank or mortgage adviser	10.6	6.8	6.0	8.1
- Advertisements on TV, in papers or other media	3.7	3.2	2.8	3.9
- Professional financial advisers	21.8	21.3	24.2	25.5
- Financial computer programs	0.0	0.3	0.9	0.7
- Financial information on the Internet	4.0	7.5	8.1	10.5
- Other	12.3	11.4	11.0	8.6

What is your most important source of advice when you have to make important financial decisions for the household?	<b>Advanced literacy quartiles</b>			
	1 (low)	2	3	4 (high)
- Parents, friends or acquaintances	40.7	37.4	19.9	17.9
- Information from the newspapers	1.1	6.0	10.6	13.7
- Financial magazines, guides, books	2.1	7.6	9.7	17.0
- Brochures from my bank or mortgage adviser	6.6	6.7	11.3	6.2
- Advertisements on TV, in papers or other media	4.0	3.6	5.0	1.4
- Professional financial advisers	19.4	23.6	27.5	24.1
- Financial computer programs	0.2	0.3	1.1	0.5
- Financial information on the Internet	6.3	6.6	7.6	12.4
- Other	19.7	8.2	7.3	6.9

Note: Percentages may not sum up to 100 due to rounding.

## 5. Financial literacy and stock market participation

As mentioned before, an important puzzle in the literature is why so few households hold stocks. In our sample, 23.8% of households own stocks or mutual funds. Thus, as in the US, many households do not participate in the stock market. This figure, however, hides major differences among demographics groups. As reported in Table 6, stock ownership increases sharply with education levels.<sup>8</sup> Only a small fraction of those with low education own stocks. However, even the large majority of those with a university degree do not participate in the stock market. Thus, impediments to stock ownership go beyond levels of schooling. Note that we found similar results when considering the index of basic and

<sup>8</sup> Note that by merging the data on stock market participation and the financial literacy module, our sample reduces to 1,189 observations. However, we do not find evidence that our sample suffers from selectivity.

**Table 6. Stock market participation across subgroups**  
Weighted percentages (N=1189)

<b>Education</b>		<b>Age</b>	
Primary	11.3	21-30 years	14.4
Preparatory intermediate voc.	16.0	31-40 years	19.4
Intermediate vocational	19.1	41-50 years	27.1
Secondary pre-university	22.5	51-60 years	26.8
Higher vocational	33.7	61-70 years	24.3
University	38.8	71 years and older	30.1
<b>Gender</b>		<b>Marital status</b>	
Female	16.7	Not-married	19.8
Male	30.3	Married	26.8
<b>Net household income quartiles</b>		<b>Non-equity net wealth quartiles</b>	
1 (low)	13.4	1 (low)	7.1
2	17.5	2	20.3
3	29.1	3	29.7
4 (high)	35.9	4 (high)	37.9
<b>Basic literacy quartiles</b>		<b>Advanced literacy quartiles</b>	
1 (low)	7.7	1 (low)	7.5
2	21.2	2	15.0
3	22.0	3	26.5
4 (high)	32.8	4 (high)	44.4

Note: Stock market participation is defined as owning individual stocks and/or mutual funds.

advanced literacy; even those with high levels of schooling did not always score high on financial knowledge. This suggests that schooling is not necessarily a good proxy for literacy and models of portfolio choice may need to incorporate both variables to explain behavior toward stocks. Stock market participation increases with age/cohorts; stock ownership is concentrated among those 40 and older. The large proportion of stock ownership for those older than 70 may simply be the result of differential mortality between richer and poorer households (Hurd, 1990). Stock market participation is much lower among women than men, a finding also reported in other studies (see also Haliassos and Bertaut, 1995) and consistent with the sharp differences in literacy between women and men (Lusardi and Mitchell, 2006). Stock market participation increases strongly with both income and wealth levels. Income refers to household net disposable income: It is simply household total income (which is the sum of labor income, unemployment and disability payments, social security and pension, other transfers and capital income, minus taxes). Wealth is the sum of checking and savings accounts, employer-sponsored savings plans, cash value of life insurance, home equity, other

real estate and other financial assets, minus total debt.<sup>9</sup> These findings are similar to those reported in many other papers on stock-ownership (see the review in Guiso, Haliassos and Jappelli (2002) and Campbell (2006)).

One explanation about lack of stock ownership that has not yet been well-explored in the literature is that stocks are complex assets, and many households may not know or understand stocks and the working of the stock market. At the bottom of Table 6, we report stock ownership across different levels of financial literacy. Stock ownership increases sharply with literacy. Even when considering basic literacy that measures simple knowledge and ability to do calculations, we find that those who score high on basic literacy are disproportionately more likely to participate in the stock market. The relationship becomes much stronger when we consider the index of advanced literacy. Participation in the stock market is concentrated among those with high literacy (fourth quartile), while only 8% and 15% of respondents in the first and second quartile of literacy participate in the stock market. Given that literacy is highly correlated with the demographic variables mentioned above, we now turn to examine whether this relationship holds true even after accounting for many of the determinants of stock market participation, such as age, education, gender, income and wealth. Most important, we will address the direction of causality between stock ownership and financial literacy.

Our empirical specification recognizes there are many determinants of stock ownership, and we consider a wide set of variables that are available in our survey. As in the previous studies, we consider demographics such as age, education, gender, marital status, and number of children (Haliassos and Bertaut, 1995; Guiso, Haliassos and Jappelli, 2002; Campbell, 2006). We added a dummy for respondents who are retired to account for the fact that some households may be in the decumulation phase of their life-cycle. We also added a dummy for self-employment, to account for those who are already exposed to high risk in the labor market and may therefore be less likely to hold stocks (Heaton and Lucas, 2000). Additionally, we added income (in logs) and dummies for quartiles of wealth.<sup>10</sup> Most important, we added measures of financial literacy. One of the main hypotheses of this paper is that respondents who are not financially knowledgeable—do not know about stocks and

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<sup>9</sup> Because the dependent variable in our empirical work is stock market participation (including participation in mutual funds), in our definition of wealth we do not include stocks and mutual funds (which are clearly correlated with stock market participation). We also do not include business equity because it is a very noisy measure of business wealth. For an analysis of wealth and wealth components in the DHS, see Alessie, Hochguertel and van Soest (2002).

<sup>10</sup> Wealth measures are rather noisy in the DHS. The use of dummies allows us to overcome this problem and also to measure how much stock-ownership increases over the wealth distribution.

bonds and are not familiar with the working of financial markets—stay away from the stock market. We use the index for advanced literacy to account for financial knowledge. However, we also add the index of basic knowledge to account for different levels of literacy as well as to control for cognitive ability.<sup>11</sup>

Table 7 reports the results for several stock market participation regressions using both OLS and GMM estimation techniques. We start by discussing the OLS results. As a benchmark, the first column shows the empirical estimates for a traditional specification without including direct measures of literacy. The estimates are in line with the results that commonly found in the literature (Guiso, Haliassos and Jappelli, 2002). In particular, education, gender, income and wealth explain the variation in stock ownership.

The second and third column of Table 7 show that financial literacy matters for stock ownership, even after controlling for a large set of demographic characteristics and income and wealth. Those who display higher literacy are more likely to participate in the stock market. The estimates are also sizable: A one-standard deviation increase in advanced literacy raises stock market participation by more than 8 percentage points. Note that the effect is as large as the effect of formal education and wealth. For example, having a university degree increases stock market participation by more than 9 percentage points. Compared to the first quartile of wealth (values up to €2300), having wealth in the second quartile (up to €45000) increases stock market participation by more than 7 percentage points. Note also that when we account for basic literacy the estimate of advanced literacy does not change (column (3) of Table 7). These estimates indicate that financial literacy affects stock market participation above and beyond the effect of the traditional determinants of stock ownership. Compared to the traditional specification, a larger part of the variation in stock ownership can be explained and in particular the importance of education for stock ownership is reduced considerably (the education dummies even become jointly insignificant) which suggests that this variable serves as a proxy for financial literacy when excluding direct measures for financial ability and knowledge.

There are several potential problems in relying on OLS estimates.<sup>12</sup> First, the index of literacy may be measured with substantial error. As we have argued before, many responses

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<sup>11</sup> By merging together the data on literacy, income, wealth and all the demographics needed for the empirical work, we end up with a final sample of 1,115 observations.

<sup>12</sup> Note that we estimate a simple linear probability model. It is well-known that the error term of a linear probability model is heteroskedastic. Therefore, we correct the standard errors of the OLS estimates for the presence of heteroskedasticity. For the same reason, we use Generalized Method of Moments (GMM) estimation when we perform Instrumental Variables (IV) estimation.

**Table 7. Multivariate analysis of stock market participation**

	(1) OLS	(2) OLS	(3) OLS	(4) GMM	(5) GMM
Advanced literacy index		0.0839*** (0.012)	0.0892*** (0.012)	0.163** (0.069)	0.155*** (0.057)
Basic literacy index		0.0112 (0.010)		-0.0138 (0.023)	
Dummy (30<age<=40)	-0.0250 (0.046)	-0.0101 (0.045)	-0.00850 (0.045)	0.00600 (0.048)	0.00384 (0.047)
Dummy (40<age<=50)	0.0261 (0.047)	0.0326 (0.047)	0.0353 (0.047)	0.0474 (0.049)	0.0438 (0.048)
Dummy (50<age<=60)	0.0133 (0.048)	0.0150 (0.047)	0.0165 (0.047)	0.0213 (0.048)	0.0195 (0.048)
Dummy (age>60)	0.0604 (0.062)	0.0743 (0.060)	0.0734 (0.060)	0.0832 (0.059)	0.0841 (0.059)
Intermediate vocational	0.0760* (0.041)	0.0233 (0.036)	0.0247 (0.036)	0.0163 (0.037)	0.0148 (0.038)
Secondary pre-university	0.0352 (0.037)	0.0249 (0.042)	0.0298 (0.041)	-0.0006 (0.048)	-0.0059 (0.051)
Higher vocational	0.110*** (0.037)	0.0676* (0.037)	0.0717* (0.037)	0.0471 (0.041)	0.0429 (0.044)
University	0.153*** (0.047)	0.0977** (0.048)	0.102** (0.047)	0.0691 (0.054)	0.0642 (0.057)
Male	0.109*** (0.028)	0.0715*** (0.027)	0.0715*** (0.027)	0.0428 (0.036)	0.0433 (0.035)
Married	-0.0367 (0.032)	-0.0280 (0.031)	-0.0267 (0.031)	-0.0167 (0.032)	-0.0184 (0.032)
Number of children	-0.00159 (0.015)	0.00371 (0.015)	0.00290 (0.015)	0.00538 (0.015)	0.00628 (0.015)
Retired	-0.0252 (0.055)	-0.0315 (0.053)	-0.0311 (0.053)	-0.0353 (0.052)	-0.0356 (0.052)
Self-employed	0.0458 (0.056)	0.0315 (0.058)	0.0319 (0.057)	0.0232 (0.059)	0.0227 (0.059)
Ln(household income)	0.0916*** (0.027)	0.0845*** (0.026)	0.0848*** (0.026)	0.0790*** (0.027)	0.0787*** (0.027)
Second wealth quartile (€2300<wealth<=€45500)	0.100*** (0.035)	0.0743** (0.035)	0.0749** (0.035)	0.0570 (0.039)	0.0568 (0.039)
Third wealth quartile (€45500<wealth<=€197300)	0.155*** (0.037)	0.117*** (0.037)	0.117*** (0.037)	0.0894** (0.044)	0.0897** (0.044)
Fourth wealth quartile (wealth>€197300)	0.212*** (0.042)	0.159*** (0.042)	0.160*** (0.042)	0.122** (0.054)	0.122** (0.054)
Constant	-0.886*** (0.26)	-0.752*** (0.25)	-0.760*** (0.25)	-0.664** (0.26)	-0.657** (0.26)
Observations	1115	1115	1115	1115	1115
R-squared	0.10	0.14	0.14	0.11	0.12
Hansen J test p-value				0.673	0.672
F-statistic first stage regression				19.71	22.15
p-value exogeneity test				0.236	0.227

Note: Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. This table reports OLS and GMM estimates of the effect of literacy on stock market participation. In the last two columns (GMM estimates), the advanced literacy index has been instrumented using three dummy variables indicating how much the respondent's education was devoted to economics. The reference group consists of those respondents whose education was devoted a lot to economics.

are imprecise and may result from simple guessing; this is particularly true for questions measuring high levels of financial knowledge. Thus, OLS estimates may be biased downward. On the other hand, there may also be learning and improvement in knowledge (and familiarity with the questions asked in the module) via participation in the stock market. This alternative argument leads to OLS estimates that are biased upward. In either case we cannot simply rely on the estimates reported in the second and third column of Table 7 to assess the effect of literacy.<sup>13</sup>

When we devised the module on financial literacy, we took into account the fact that financial literacy is not an exogenous characteristic; in fact, literacy can itself be affected by financial behavior (for example, if individuals learn via experience). To remedy this problem, we have collected additional information (beyond current levels of economic knowledge) that can serve as instruments for advanced financial literacy. To be able to rely on measures of literacy that are exogenous with respect to stock market participation, we asked respondents about their exposure to financial knowledge before entering the job market. Specifically, we asked how much of their education was devoted to economics.<sup>14</sup> Note that economics is part of the high school curriculum at the majority of schools in the Netherlands and it is possible to specialize in economics/business at the high school level (economics degrees can be pursued in college as well, of course).<sup>15</sup> Our strategy is to rely on exposure to economic education in the early stages of life. This measure should be correlated with current advanced knowledge while it should be uncorrelated with stock market participation. As mentioned before, advanced knowledge may be a crude proxy of actual knowledge. Moreover, it may simply reflect how much respondents have learned from their personal experiences and from their success in the stock market. For example, if financially knowledgeable respondents are more likely to invest successfully and stay in the market, while low knowledge respondents are more likely to lose money and exit the market, the relationship between literacy and market participations may simply reflect the higher knowledge of those who stay in the market.

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<sup>13</sup> The OLS estimates may also suffer from the omitted variables bias. For example, the error term may include 'ability' which is also correlated with financial literacy. As long as our measure of basic literacy index is a good proxy for '(financial) ability,' we should not suffer from this problem. However, we address omitted variables bias later in the text.

<sup>14</sup> For the precise wording of this question, see Appendix B.

<sup>15</sup> In contrast to the US, there are no initiatives at the employer-level to improve financial literacy and economic knowledge of workers in the Netherlands. There are no retirement seminars, as the vast majority of Dutch employees participate in Defined Benefit retirement plans and have no say in their pension savings or the way their pension wealth is invested (see van Rooij, Kool and Prast (2007)). Thus, the supply of economic education is restricted to the school system in the Netherlands. Bernheim, Garrett and Maki (2001) show that those who were exposed to financial education in high school in the US were more likely to save later in life.



**Table 8. First stage regressions**

	(I)	(II)
Basic literacy index	0.290*** (0.027)	
Dummy (30<age<=40)	-0.185* (0.10)	-0.166 (0.12)
Dummy (40<age<=50)	-0.121 (0.099)	-0.0577 (0.11)
Dummy (50<age<=60)	-0.0241 (0.10)	0.0155 (0.12)
Dummy (age>60)	-0.0189 (0.13)	-0.0457 (0.14)
Intermediate vocational	0.0481 (0.086)	0.0943 (0.095)
Secondary pre-university	0.229*** (0.086)	0.412*** (0.090)
Higher vocational	0.210*** (0.073)	0.365*** (0.077)
University	0.357*** (0.080)	0.555*** (0.086)
Male	0.299*** (0.058)	0.345*** (0.062)
Married	-0.119* (0.064)	-0.0988 (0.068)
Number of children	-0.0247 (0.029)	-0.0534 (0.033)
Retired	0.0476 (0.11)	0.0656 (0.11)
Self-employed	0.119 (0.087)	0.151 (0.10)
Ln(household income)	0.0512 (0.054)	0.0703 (0.057)
Second wealth quartile (€2300<wealth<=€45500)	0.217** (0.093)	0.269*** (0.100)
Third wealth quartile (€45500<wealth<=€197300)	0.342*** (0.090)	0.409*** (0.097)
Fourth wealth quartile (wealth>€197300)	0.439*** (0.097)	0.547*** (0.10)
Economics education: some	-0.207*** (0.057)	-0.255*** (0.064)
Economics education: little	-0.300*** (0.067)	-0.352*** (0.073)
Economics education: hardly at all or 'don't know'	-0.597*** (0.081)	-0.723*** (0.092)
Constant	-0.642 (0.53)	-0.979* (0.56)
Observations	1115	1115
R-squared	0.33	0.22
p-value test age coefficients = 0	0.282	0.434
p-value test education coefficients = 0	0.000	0.000
p-value test wealth coefficients = 0	0.000	0.000
F statistic first stage regression	19.71	22.15
p-value test instruments =0	0.000	0.000

Note: Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The advanced literacy index has been instrumented using three dummy variables indicating how much the respondent's education was devoted to economics. The reference group consists of those respondents whose education was devoted a lot to economics.

The first stage regressions are reported in Table 8. Responses to how much of education was devoted to economics range from ‘hardly at all’ to ‘a lot’ and we construct dummies for different levels of economics education while in school. These instruments have a strong predictive power: Those who have had less exposure to economics education in school are less likely to display advanced knowledge, and this holds true even when we account for basic literacy, which we consider a measure of cognition and ability. The F-statistic in the first stage regressions is high (with values close to 20) and beyond the values recommended to avoid the weak instruments problem (Staiger and Stock, 1997; Bound, Jaeger and Baker, 1995). The first stage results also continue to confirm the correlation between literacy and demographic characteristics, such as education and gender, reported in Table 4B.

The estimates in the second stage reported in the last two columns of Table 7 show that the relationship between literacy and stock market participation remains positive, statistically significant, and is even larger in the Generalized Method of Moments (GMM) estimates. Moreover, the exogeneity test is not rejected. Thus, the OLS estimates do not differ significantly from the GMM estimates. The results of the Hansen J-test show that the overidentifying restrictions are not rejected. Overall, our estimates indicate that financial literacy is an important determinant of stock market participation: Those who have low financial knowledge are less likely to hold stocks.

## **6. Discussion and extensions**

### **6.1 Exploiting stock market participation in the past**

One of the potential objections concerning our instruments is that the exposure to economics in school could be a choice variable, depending for example on tastes toward risk, or perhaps simply reflecting ‘interest in the stock market’, i.e., how much respondents were interested in becoming knowledgeable in economics to invest in the stock market. While this may be the case for young generations, it can hardly be the case for middle-aged and older respondents. Investing in the stock market is a recent phenomenon for many Dutch families and it would be hard if not impossible for these families to have anticipated the current changes in financial markets and the increase in individual responsibility.

To better understand and document household participation in the stock market, we have examined other surveys that provide information about stock holdings in the 1980s. The first wave of the Dutch Socio-Economic Panel, which covers a representative sample of the

population, shows that in 1987 only approximately 6% of families owned stocks (see also Alessie, Lusardi and Aldershof (1997)), and that stock-ownership grew to only approximately 8% by 1990. Stock-ownership began to take off during the 1990s and it increased to more than 20% by the end of the 1990s (Guiso, Haliassos and Jappelli, 2002). We exploit the behavior of the stock market and the very recent increase in the fraction of families who own stocks to further sharpen our understanding of the relationship between literacy and stock market participation.

In Table 9A, we report the OLS and GMM estimates for respondents who are older than 35. In this case, we 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. Both the OLS and (most importantly) the GMM estimates remain positive and statistically significant. Note that these estimates do not depend on the age split. We get estimates of similar size when we split the sample at age 40 or at 45.

**Table 9A. Stock market participation among respondents older than 35**

	OLS	OLS	GMM	GMM
Advanced literacy index	0.0908*** (0.015)	0.0964*** (0.014)	0.146* (0.066)	0.145** (0.069)
Basic literacy index	0.0136 (0.012)		-0.0015 (0.025)	
Demographics (see table 7)	yes	yes	yes	yes
Observations	884	884	884	884
R-squared	0.12	0.12	0.11	0.11
Hansen J test p-value			0.951	0.951
F-statistic first stage regression			18.97	20.11
p-value exogeneity test			0.476	0.466

Note: Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The advanced literacy index has been instrumented using three dummy variables indicating how much the respondent's education was devoted to economics. The reference group in the instrument set consists of those respondents whose education was devoted a lot to economics.

While it is admittedly hard to find good instruments for financial literacy, the historical experience of the Netherlands provides us with a unique opportunity to rely on information about financial literacy *before* the stock market became important and *before* individuals took an active interest in the stock market. Since estimates of financial literacy do not change significantly in size when considering respondents older than 35, in the next sections we perform our estimates in the total sample.<sup>16</sup>

<sup>16</sup> To further account for the fact that current or past literacy can proxy for 'interest in economics' we use answers to the question 'How much understanding of economics do you need during daily activities (job,

To pursue this argument further and also investigate other instrument sets, we have considered the information in the survey about advice from parents during childhood on how to budget and save money in lieu of exposure to economics in school. However, we found no relationship between this variable and advanced literacy. This provides further evidence that the behavior of the stock market is a new experience and that current generations may be unable to learn about investing in the stock market from previous generations. We turn next to other potential sources of learning.

## **6.2 Stock market participation and peer effects**

Another potential issue with the instruments we use is that respondents who were exposed to economics during their schooling may be more likely to have friends (perhaps their classmates) that invest in the stock market. Because of ‘peer effects’ in investing respondents exposed to these friends may themselves be more likely to invest in the stock market. Although we have previously documented that more financially knowledgeable individuals are more likely to rely on formal sources of financial advice rather than relying on family and friends, it is important to disentangle how much our variable measures ‘financial knowledge’ versus ‘peer effects’. Several studies have documented that peer effects can be pretty powerful determinants of portfolio choice (Hong, Kubik and Stein, 2004; Brown, Ivkovic, Smith and Weisbenner, 2007) and those peer effects can start early in the life-cycle. We have information in the data set on the level of education that most of the respondents’ acquaintances have. While this does not necessarily reflect knowledge of economics, education is very strongly correlated with financial literacy as shown in Tables 4A and 4B.

In Table 9B, we report OLS and GMM estimates in a new empirical specification where, in addition to the education of the respondents, we add the education of their peers (for simplicity we only report the estimates of these new controls and the estimates for financial literacy). The education level of peers does matter for stock-ownership. Those who have friends that have a college degree are 12 to 14 percentage points more likely to own stocks. Thus, there may be information-provision and learning via social interaction. Note, however, that both the OLS and GMM estimates of literacy are barely affected by the addition of this variable. Thus, financial literacy has an effect on stock ownership above and beyond the effects of peers.

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hobbies etc.)?’, available in the survey. Those who are not interested in economics are unlikely to choose a job that requires a lot of economics knowledge. Our measure of literacy continues to remain statistically significant at conventional levels even after the addition of dummies for the levels of ‘understanding of economics during daily activities’. For brevity, estimates are not reported but are available upon request.

**Table 9B. Stock market participation and the importance of peer effects**

	OLS	OLS	GMM	GMM
Advanced literacy index	0.0874*** (0.012)	0.0930*** (0.012)	0.158* (0.086)	0.155** (0.074)
Basic literacy index	0.0145 (0.011)		-0.0039 (0.024)	
Education of peers: intermediate vocational, secondary pre-university	0.0748 (0.046)	0.0748 (0.046)	0.0539 (0.054)	0.0545 (0.054)
Education of peers: higher vocational, university	0.143*** (0.055)	0.144*** (0.055)	0.119* (0.064)	0.120* (0.063)
Demographics (see table 7)	yes	yes	yes	yes
Observations	1054	1054	1054	1054
R-squared	0.16	0.16	0.14	0.14
p-value test education coefficients = 0	0.861	0.847	0.842	0.842
p-value test education peers coefficients = 0	0.030	0.029	0.102	0.101
Hansen J test p-value			0.842	0.840
F-statistic first stage regression			13.15	13.96
p-value exogeneity test			0.399	0.391

Note: Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The advanced literacy index has been instrumented using three dummy variables indicating how much the respondent's education was devoted to economics. The reference group in the instrument set consists of those respondents whose education was devoted a lot to economics.

### 6.3 Self-assessed literacy versus objective literacy

Measuring literacy is clearly a difficult task. For example, we do not know how many questions one should use to get a proper measure of literacy. Moreover, our questions are focused on stocks and the stock market rather than financial knowledge in general. In this section, rather than relying on our constructed indices, we use the simple measure of financial literacy based on self-assessed economics knowledge. As mentioned before, we have asked respondents to rate their understanding of economics on a scale from 1 to 7. This question is easy to understand and to answer. Moreover, from a theoretical point of view, self-assessed economics knowledge is what should influence household financial decision-making, even though we show there is a strong correlation between subjective and objective measures of knowledge. Finally, there is no mentioning of the stock market or financial market instruments in this question and reverse causality may be less of a problem. On the other hand, since the question refers to current economics knowledge, households may be influenced in their judgment by their experience and success in the stock market. As before, we first perform OLS regressions of stock market participation on financial literacy, this time using self-assessed literacy in lieu of the literacy index. We then instrument self-assessed knowledge, again using as instruments how much of the respondent education was devoted to economics.

The estimates are reported in Table 9C.<sup>17</sup> For brevity, we only report the estimates of the variables of interest. Even when using this simple measure, the estimates of financial literacy are positive and statistically significant. The GMM estimates are higher than the OLS estimate and again the exogeneity test is not rejected. In both OLS and GMM regressions, we account for the basic financial literacy index, which becomes statistically significant. Thus, according to these alternative measures, both basic and self-assessed financial knowledge are important determinants of stock market participation.

**Table 9C. Stock market participation and self-assessed literacy**

	OLS	GMM
Self-assessed literacy	0.0629*** (0.012)	0.0914** (0.038)
Basic literacy index	0.0332*** (0.011)	0.0288** (0.012)
Demographics (see table 7)	yes	yes
Observations	1083	1083
R-squared	0.13	0.13
Hansen J test p-value		0.624
F-statistic first stage regression		37.99
p-value exogeneity test		0.424

Note: Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The self-assessed literacy question is reported in appendix B. The self-assessed literacy index has been instrumented using three dummy variables indicating how much the respondent's education was devoted to economics. The reference group consists of those respondents whose education was devoted a lot to economics.

## 6.4 Knowledge or cognition?

One of the issues about financial literacy is whether it measures knowledge or simply ability and cognition (see Benjamin, Brown and Shapiro (2006) and Stango and Zinman (2007)). This distinction has important implications for public policy and, for example, for the effectiveness of financial education programs. In our work, we try to account for cognition by grouping together questions measuring the ability to perform simple calculations, the understanding of changes in prices, and the time value of money (our basic literacy index). We added this variable separately in the regressions in addition to the advanced knowledge index. However, this is perhaps only a crude proxy of ability. To better account for cognition and ability with calculations, we exploited two important economic changes in the Netherlands. First, like most of the members of the European Union, the Netherlands shifted

<sup>17</sup> In the regression analysis, we deleted the respondents who did not know the answer to this question or refused to answer.

from their national currency (the Dutch guilder) to the Euro. As of 2002, the Euro replaced the guilder as a legal mean of payment. We exploited this fact in the second module that was added to the DNB survey in January 2006. We asked respondents how difficult it was to do shopping, read bank statements, and do typical daily transactions right after the introduction of the Euro in 2002 (answers range from ‘very difficult’ to ‘not difficult at all’).<sup>18</sup> More than 13% of respondents found the conversion to the Euro to be ‘very difficult’ or ‘difficult’, 21.9% found it ‘somewhat difficult’ and the rest (63%) found it ‘not very difficult’ or ‘not difficult at all’. We constructed dummies for the responses to this question and added them to the regression to account for cognitive ability (these dummies replaced the basic financial literacy index). When we account for these dummies in our regressions, both the OLS and the GMM estimates of the advanced literacy index remain positive, statistically significant and of similar magnitude. Thus, financial literacy affects stock ownership above and beyond the effect of cognition and the ability to perform calculations.

We also considered another important change in the Netherlands, this time concerning the health system. A new law was passed in 2005 that introduced more freedom of choice in the health insurance system. Households were required to make decisions about their health providers, their contributions, and the deductible in their health policy. Decisions had to be made before March 1, 2006 (the ultimate deadline to make changes to previous decisions at no cost). In the new module we added in January 2006, we ask respondents how difficult it was to understand the new health insurance system (again, answers can range from ‘very difficult’ to ‘not difficult at all’).<sup>19</sup> However, contrary to the conversion to the Euro - where respondents were confronted with a currency exchange and had to make simple calculations - there are several reasons why the new health system is difficult to comprehend.<sup>20</sup> We further asked respondents the reasons for their answer, in order to differentiate between those who did not know how to make this kind of decision (low cognitive ability respondents), and those who considered the decision difficult because they had to spend time reading and collecting information and had to figure out what was best for them to do (high cognitive ability respondents).

Overall, 43% of respondents found the health decisions ‘not very difficult’ or ‘not difficult at all’. Of the remaining group who found the decision ‘very difficult’, ‘difficult’ or ‘somewhat difficult’, more than half reported that it was because they had to spend time to

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<sup>18</sup> For the precise wording of this question, see Appendix B.

<sup>19</sup> For the precise wording of these questions, see Appendix B.

<sup>20</sup> People had to choose from a large number of health insurers and had to compare the coverage and price of supplementary health packages, which offered different deductibles.

make comparisons and reading and collecting information. As before, we constructed dummies for different types of respondents and added these dummies to our regression. Even after controlling for this alternative measure of cognitive ability, we find that both the OLS and GMM estimates of the advanced literacy index remain positive and statistically significant (Table 9D).

**Table 9D. Stock market participation and alternative measures of basic literacy**

	Euro Introduction		Change Health Insurance System	
	OLS	GMM	OLS	GMM
Advanced literacy index	0.0848*** (0.012)	0.141** (0.061)	0.0880*** (0.012)	0.156** (0.065)
Dealing with Euro: somewhat difficult	-0.0469 (0.045)	-0.0521 (0.046)		
Dealing with Euro: not very difficult	-0.0138 (0.042)	-0.0240 (0.044)		
Dealing with Euro: not difficult at all	0.0450 (0.048)	0.0289 (0.052)		
Difficulty health system: making comparisons and collecting info			-0.0105 (0.030)	-0.00622 (0.031)
Difficulty health system: figuring out what the best for me to do			-0.0257 (0.036)	-0.00807 (0.040)
Difficulty health system: I don't know how to make these decisions & DK			0.0755 (0.075)	0.131 (0.088)
Demographics (see table 7)	yes	yes	yes	yes
Observations	1053	1053	1053	1053
R-squared	0.14	0.13	0.14	0.12
p-value test Euro coefficients = 0	0.156	0.236		
p-value test health insurance coefficients = 0			0.590	0.398
Hansen J test p-value		0.960		0.970
F-statistic first stage regression		18.37		17.26
p-value exogeneity test		0.343		0.280

Note: Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. In the first two columns, the reference group consists of those respondents who found dealing with the Euro transition 'very difficult' or who answered the question with 'do not know'. In the last two columns, the reference group consists of those respondents who have no difficulty understanding the health care system change (see question H1 in appendix B). The three dummy variables are based on question H2 in appendix B. The advanced literacy index has been instrumented using three dummy variables indicating how much the respondent's education was devoted to economics. The reference group consists of those respondents whose education was devoted a lot to economics.

## 6.5 A different financial literacy index

As mentioned before, to assess the quality of the answers to literacy questions, we changed the wording of three questions and exposed two randomly selected groups of respondents to the same question with different wording. From this methodology we inferred that respondents had considerable difficulty understanding the questions about bond pricing



and the riskiness of a company stock versus a stock mutual fund. In performing the factor analysis, respondents were divided into different subgroups according to the wording of the question they were exposed to. Since there may be a lot of noise in the answers to these questions, in this section we perform the empirical analysis excluding the three questions for which we implemented a different wording.<sup>21</sup> In this way, we can show how sensitive our estimates are not only to our methodology, but also to different measures of literacy. By excluding these questions, we exclude concepts that were rather difficult for respondents to grasp, and we can therefore check whether indices that have a stronger focus on basic economic concepts are still related to stock ownership.

As in the previous tables, we report both OLS and GMM estimates. Since we exclude questions explicitly related to stocks and the pricing of bonds, the problem of reverse causality may be less prevalent. At the same time, we may have decreased the amount of noise in the index, since it is hard to infer a lot from answers related to topics that respondents do not know well. The OLS estimates in Table 9E shows that literacy is still related to stock market participation, even when we focus on an index that excludes several advanced economic concepts. The GMM estimates are also positive and statistically significant and of similar magnitude than the previous estimates.

**Table 9E. Stock market participation and an alternative advanced literacy index**

	OLS	OLS	GMM	GMM
Advanced literacy index (alternative)	0.0767*** (0.012)	0.0823*** (0.012)	0.182** (0.078)	0.166*** (0.062)
Basic literacy index	0.0113 (0.010)		-0.0243 (0.028)	
Demographics (see table 7)	yes	yes	yes	yes
Observations	1115	1115	1115	1115
R-squared	0.13	0.13	0.09	0.10
Hansen J test p-value			0.684	0.682
F-statistic first stage regression			16.15	19.07
p-value exogeneity test			0.163	0.156

Note: Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The (alternative) advanced literacy index has been instrumented using three dummy variables indicating how much the respondent's education was devoted to economics. The reference group consists of those respondents whose education was devoted a lot to economics.

We have also experimented with excluding questions 12 and 13 from the set of advanced literacy questions since the latter has a very low correct response rate and there is

<sup>21</sup> See Appendix A for the calculation of the financial literacy index.

already one question in the set about risk diversification. In addition, we experimented with excluding questions 7 and 9, which simply refer to the definition of stocks and bonds. Estimates for financial literacy remain positive and statistically significant. For example, the GMM estimates are 0.159 (s.e. 0.067) and 0.174 (s.e. 0.074) in the first and second case respectively. Thus, results do not depend on the inclusion or exclusion of a particular question in the literacy index.

## 6.6 Including measures of risk aversion

Notably, one of the variables which is missing from our empirical specification is a measure of risk aversion. Clearly, preferences for risk are an important determinant of stock ownership and may explain some of the differences among households.<sup>22</sup> Some researchers have further argued that knowledge and cognitive ability may have an effect on preferences, such as risk aversion and the rate of time preference (Benjamin, Brown and Shapiro, 2006; Dohmen, Falk, Huffman and Sunde, 2007) and, through this channel, affect financial decision-making. We do not investigate this relationship in our paper, but will account for preferences in a new empirical specification. In this way, our indices can better measure the effects of knowledge and information costs rather than the effect of preferences. In a separate module on preferences in the DHS, there are questions that aim to measure attitudes toward risk. These questions are similar to those in the HRS.<sup>23</sup> Barsky, Juster, Kimball and Shapiro (1997) show that, while imperfect, the measure of risk aversion derived from these types of questions is related to financial behavior and correlates with stock ownership. However, one of the disadvantages of using the risk aversion data is that we lose a lot of observations from merging together separate sections of DHS.

From the information provided in the survey, we can distinguish among four types of households, from those unwilling to take any risk (reject any gamble that offers higher but uncertain payoff) to those willing to take substantial risk (willing to take both gambles presented in the questions that offer high but uncertain payoffs). When we examine a simple correlation between stock market participation and our risk aversion dummies, we find that risk is correlated to ownership of stocks: Those who are not willing to take risk are less likely to participate in the stock market. Thus, while a crude measure, the risk aversion dummies seem to be able to proxy for attitudes toward risk.

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<sup>22</sup> However, as reviewed in Haliassos and Bertaut (1995), risk aversion alone cannot explain why so many households do not hold stocks. One has to appeal to different preferences than the general class of HARA preferences to explain lack of stockownership.

<sup>23</sup> For the precise wording of these questions, see appendix B.

When including risk aversion in our empirical specification in Table 9F, we find that the estimates of our variables of interest do not change. Both the OLS and GMM estimates of financial literacy remain positive, statistically significant, and do not change appreciably in magnitude. Thus, the exclusion of risk aversion does not take away from the importance of financial literacy in explaining participation in the stock market.

**Table 9F. Stock market participation, literacy, and risk aversion**

	OLS	GMM
Advanced literacy index	0.0974*** (0.014)	0.151* (0.080)
Basic literacy index	0.00477 (0.012)	-0.0112 (0.026)
Risk aversion: low	-0.0431 (0.084)	-0.0627 (0.094)
Risk aversion: medium	0.0172 (0.055)	-0.00714 (0.066)
Risk aversion: high	0.0558 (0.045)	0.0451 (0.047)
Risk aversion: don't know	0.0185 (0.063)	0.0344 (0.068)
Demographics (see table 7)	yes	yes
Observations	888	888
R-squared	0.13	0.12
Hansen J test p-value		0.480
F-statistic first stage regression		15.48
p-value exogeneity test		0.493

Note: Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The advanced literacy index has been instrumented using three dummy variables indicating how much the respondent's education was devoted to economics. The reference group consists of those respondents whose education was devoted a lot to economics. In this regression the reference group consist of those respondents who exhibit the highest degree of risk aversion according to the questions reported in appendix B.

## 6.7 Other extensions

We have pursued another robustness check to show that financial literacy is an important determinant of stock-ownership and captures information and search costs related to a complex asset such as stocks. In addition to stocks, we have examined the relationship between financial literacy and savings accounts. A much lower degree of financial sophistication and information costs is required to deal with these assets and we would not expect to find a strong relationship with financial literacy. Indeed, in our empirical work, we do not find any relationship between our measures of literacy and ownership of savings accounts. The OLS and GMM estimates of advanced literacy are 0.0167 (s.e. 0.014) and

0.0142 (s.e. 0.059) respectively. This confirms the results of Christelis, Jappelli and Padula (2007), who also found no relationship between cognitive ability and savings accounts.

Our results are robust to a variety of other specifications. For example, we have excluded from our sample respondents who are older than 70, which should be in the decumulation phase of their life-cycle. This increases the power of our instruments, since the effect of schooling declines with age. The OLS and GMM estimates of advanced literacy are 0.082 (s.e. 0.013) and 0.167 (s.e. 0.071) respectively. Moreover, rather than simply accounting for self-employment in our specification, we have excluded the self-employed from our sample. Hurst and Lusardi (2007) show that the self-employed/business owners display many differences with respect to other households and we do not have a lot of information in our data set to account for all these differences. However, our OLS estimate of financial literacy is 0.088 (s.e. 0.012) and the GMM estimate is 0.138 (s.e. 0.068). Thus, estimates continue to remain positive and statistically significant

## **7. Concluding remarks**

In this paper, we show that lack of understanding of economics and finance is a significant deterrent to stock ownership. The different measures of financial knowledge we have employed in our work all show that lack of literacy prevents households from participating in the stock market. Cocco, Gomez and Maenhout (2005) show that the welfare loss from non-participation in the stock market can be sizable. Thus, the role of financial literacy should not be under-estimated. As more workers transition to a system where they have to decide how much to save for retirement and how to invest their retirement wealth, it is important to consider ways to enhance their level of financial knowledge or to guide them in their financial decisions.

We plan to expand this work in several directions. First, we will examine the relationship between financial literacy and retirement planning and explore whether difficulties in performing calculations and low financial sophistication affect also the ability to plan for retirement. Moreover, we will assess whether financial literacy has an effect not only on portfolio choice but also on savings behavior and whether those who display low literacy are less likely to accumulate wealth.

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## Appendix A. Constructing indices for basic and advanced financial literacy

The index for basic literacy is based on the first 5 questions reported in Section 4. For each basic literacy question we have constructed a dummy variable for respondents who answered correctly to the question. We have performed a factor analysis on those binary variables using the iterated principal factor method. We were able to retain one factor with a meaningful interpretation; this factor describes basic literacy. The factor loadings are presented in Table A1. Given these factor loadings, we obtained factor scores using the Bartlett method (Bartlett, 1937).

**Table A1. Factor loadings corresponding to the five basic literacy questions**

Basic literacy questions	Factor loadings
Numeracy	0.6667
Interest compounding	0.5188
Inflation	0.5513
Time value of Money	0.4267
Money illusion	0.2432

The advanced financial literacy index has been constructed using the next 11 questions presented in Section 4. As we state in the main text, three questions were ‘randomized’ (see Table 3). The following two items presented in Table 3 are very sensitive to the way the question is formulated.

- (15a) Buying a *company stock* usually provides a safer return than a *stock mutual fund*?
- (15b) Buying a *stock mutual fund* usually provides a safer return than a *company stock*?
  
- (16a) If the interest rate *falls*, what should happen to bond prices: rise/fall/stay the same/none of the above?
- (16b) If the interest rate *rises*, what should happen to bond prices: rise/fall/stay the same/none of the above?

Therefore, we decided to split the sample into four groups and to perform the factor analysis on each of those four groups separately. The first group had to answer questions 15a and 16a, the second group 15b and 16a, the third group 15a and 16b and the fourth group 15b and 16b. Since the assignment to those groups occurred randomly with equal probability (25%), the sub-samples are about of equal size. Contrary to the answers to the basic literacy questions, the responses to the advanced literacy questions include many ‘do not know’ answers. To take this response behavior into account, we constructed 2 dummy variables for each of the 11 questions. The first dummy variable indicates whether the question was answered correctly, while the other one refers to the ‘do not know’ answers. In other words, we performed a factor analysis on 22 variables. We were able to retain one factor with a meaningful interpretation: it basically describes advanced literacy. The factor loadings are presented in Table A2.



**Table A2. Factor loadings for the advanced literacy questions (four subsamples)**

Advanced literacy questions		Factor loadings			
		15a,16a	15b,16a	15a,16b	15b,16b
If the interest rate falls, what should happen to bond prices: rise/fall/stay the same/none of the above?	Correct	0,3602	0,3903	0,3548	0,3819
	DK	-0,6607	-0,7346	-0,6863	-0,7072
Buying a company stock usually provides a safer return than a stock mutual fund?	Correct	0,6787	0,441	0,6512	0,4177
	DK	-0,7688	-0,8016	-0,7554	-0,7158
Stocks are normally riskier than bonds?	Correct	0,5883	0,6798	0,6036	0,6196
	DK	-0,7257	-0,819	-0,7194	-0,7786
Considering a long time period, which asset described below normally gives the highest return: Savings accounts, Bonds or Stocks?	Correct	0,4684	0,5099	0,5549	0,5293
	DK	-0,6964	-0,7655	-0,7993	-0,7245
Normally, which asset described below display the highest fluctuations over time: Savings accounts, Bonds or Stocks?	Correct	0,6459	0,6731	0,6532	0,6655
	DK	-0,7548	-0,7904	-0,7954	-0,7516
When an investor spreads his money among different assets, does the risk of losing money increase, decrease or stay the same?	Correct	0,4980	0,5804	0,5578	0,6159
	DK	-0,7410	-0,7685	-0,7441	-0,7532
If you buy a 10-year bond, it means you cannot sell it after 5 years without incurring a major penalty. True or false?	Correct	0,4798	0,4658	0,4669	0,5176
	DK	-0,6373	-0,6398	-0,6414	-0,6652
Which of the following statements describes the main function of the stock market? <sup>1)</sup>	Correct	0,5646	0,6848	0,5584	0,6003
	DK	-0,7178	-0,7457	-0,6948	-0,7190
What happens if somebody buys the stock of firm B in the stock market? <sup>1)</sup>	Correct	0,4489	0,4619	0,3862	0,4452
	DK	-0,6619	-0,6764	-0,6227	-0,5875
Which statement about mutual funds is correct? <sup>1)</sup>	Correct	0,5931	0,6754	0,6331	0,6479
	DK	-0,7507	-0,7925	-0,7816	-0,7253
What happens if somebody buys a bond of firm B? <sup>1)</sup>	Correct	0,5829	0,6365	0,5852	0,6436
	DK	-0,7178	-0,8032	-0,7434	-0,7402

1) See the exact wording of the question in the Box 2.

We have also constructed an alternative index for advanced financial literacy where we do not use the questions that were randomized (see Table 3). The results of the factor analysis (factor loadings) are shown in Table A3. This alternative index has been used in the sensitivity analysis presented in Table 9E.

**Table A3. Factor loadings for the advanced literacy questions excluding the randomized questions**

Advanced literacy questions (excluding the three randomized questions)		Factor loadings
Considering a long time period, which asset described below normally gives the highest return: Savings accounts, Bonds or Stocks?	Correct	0,5166
	DK	-0,7527
Normally, which asset described below display the highest fluctuations over time: Savings accounts, Bonds or Stocks?	Correct	0,6522
	DK	-0,7874
When an investor spreads his money among different assets, does the risk of losing money increase, decrease or stay the same?	Correct	0,5820
	DK	-0,7682
If you buy a 10-year bond, it means you cannot sell it after 5 years without incurring a major penalty. True or false?	Correct	0,4545
	DK	-0,6175
Which of the following statements describes the main function of the stock market? <sup>1)</sup>	Correct	0,6292
	DK	-0,7443
What happens if somebody buys the stock of firm B in the stock market? <sup>1)</sup>	Correct	0,4408
	DK	-0,6615
Which statement about mutual funds is correct? <sup>1)</sup>	Correct	0,6521
	DK	-0,7704
What happens if somebody buys a bond of firm B? <sup>1)</sup>	Correct	0,5975
	DK	-0,7372

1) See the exact wording of the question in Box 2.

## Appendix B. Exact wording of the questions in the questionnaire and construction of variables used in the empirical work.

### Self-assessed literacy

How would you assess your understanding of economics (on a 7-point scale; 1 means very low and 7 means very high)?

- Very low Very high
- 1    2    3    4    5    6    7
- Do not know
- Refusal

The index of *self-assessed literacy* used in the regression analysis is constructed by grouping together the two lowest categories (very few respondents have chosen the lowest level), recoding the remaining six levels of self-assessed literacy from 1 to 6 and excluding ‘do not know’ answers and ‘refusals.’

### Economics education

How much of your education was devoted to economics?

- A lot
- Some
- Little
- Hardly at all
- Do not know
- Refusal

The instrument variable *economics education in the past* is used in the regression analysis by including three dummy variables for the response categories ‘some’, ‘little’ and ‘hardly at all,’ respectively. The reference group consists of those respondents whose education was devoted ‘a lot’ to economics. The ‘do not knows’ and ‘refusals’ are grouped together with the ‘hardly at all’ answers.

### Conversion to Euro

In 2002 we went from the guilder to the Euro. How difficult was it for you back then to go shopping, read your bank statements and do your usual daily transactions using the Euro?

- Very difficult
- Difficult
- Somewhat difficult
- Not very difficult
- Not difficult at all
- Do not know
- Refusal

The variable *conversion to Euro* is used in the regression analysis by including three dummy variables for the response categories ‘somewhat difficult’, ‘not very difficult’ and ‘not difficult at all,’ respectively. The reference group consists of those respondents who found the transition from the guilder to the Euro ‘very difficult’ or ‘difficult’. ‘Do not knows’ and ‘refusals’ are grouped together with these latter two categories.

### Health care system change

H1) This year, the Dutch system of health insurance has changed. How difficult is it for you to understand the new Health Insurance system?

- Very difficult
- Difficult

- Somewhat difficult
- Not very difficult
- Not difficult at all
- Do not know
- Refusal

[If the response to question H1 is not equal to 'not very difficult' or 'not difficult at all' then the following question (H2) is asked]

H2) Could you please indicate which of the following statements best describes what makes the decisions you have to make difficult?

- I have to make comparison and spend time reading and collecting information
- I have to find a way to figure out what is best for me to do
- I do not know how to make this kind of decisions
- Do not know
- Refusal

The variable *health care system change* is used in the regression analysis by including three dummy variables for the first three response categories in question H2. The 'do not know' and 'refusal' answers are grouped together with the group which indicated 'I do not know how to make this kind of decisions'. The reference group consists of those respondents who reported they find the change in the system of health insurance either 'not very difficult' or 'not difficult at all.'

### **Risk aversion**

R1) Suppose that you are the only income earner in the family, and you have a good job guaranteed to give you your current (family) income every year for life. You are given the opportunity to take a new, equally good job, with a 50% chance it will double your (family) income and a 50% chance that it will cut your (family) income by a third. Would you take the new job?

- Yes
- No
- Do not know

[If R1 = 'yes' then R2]

R2) Suppose the chances were 50% that it would double your (family) income, and 50% that it would cut it in half. Would you take the new job?

- Yes
- No
- Do not know

[If R1 = 'no' or 'do not know' then R3]

R3) Suppose the chances were 50% that it would double your (family) income and 50% that it would cut it by 20 percent. Would you then take the new job?

- Yes
- No
- Do not know

The variable *risk aversion* is used in the regression analysis by including four dummy variables: One for those who choose the most risky option twice (least risk averse), one for those who choose the most risky option the first question but not in the second question (medium risk averse), one for those who choose the safe option in the first question but not in the second question (risk averse) and one for those who do not make a choice in the first question (do not know), respectively. The reference group consists of those respondents who choose the safe option twice (most risk averse).

**PAPER THREE**

**FINANCIAL LITERACY, RETIREMENT PLANNING,  
AND HOUSEHOLD WEALTH**

**(Co-authors: Annamaria Lusardi and Rob Alessie)**



# Financial Literacy, Retirement Planning, and Household Wealth

Maarten van Rooij (De Nederlandsche Bank and Netspar)

Annamaria Lusardi (Dartmouth College and NBER)

Rob Alessie (University of Groningen, Netspar and Tinbergen Institute)\*

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## Abstract

There is ample empirical evidence documenting widespread financial illiteracy and limited pension knowledge. At the same time, the wealth distribution is heavily dispersed and many workers arrive on the verge of retirement with little or no personal assets. This paper is the first to investigate the relation between financial sophistication and household net worth relying on specific measures of financial knowledge and skills rather than crude proxies. For this purpose, we have designed a new module for the Dutch DNB Household Survey. Our findings provide evidence of a statistically and economically significant positive effect of financial sophistication on net worth. Moreover, we highlight empirical evidence of two channels by which financial sophistication facilitates wealth accumulation. First, financial skills increase the likelihood to invest in the stock market thereby opening the possibility to benefit from the equity premium and improving the opportunities for risk diversification. Second, financial sophistication boosts retirement planning behavior by households, thereby providing an important channel for the development of savings plans and creating instruments for self-control. In addition, our results suggest that respondents who are relatively confident on their own financial skills have a higher propensity to plan. To take into account that wealth, portfolio management and planning activities might exert an independent effect on financial literacy, we employ instrumental variable regression techniques using information on economics education.

**Key words:** Financial Education, Savings and Wealth Accumulation, Retirement Planning, Knowledge of Finance and Economics, Overconfidence, Stock Market Participation

**JEL Classification:** D91, D12, J26

\* Maarten C.J. van Rooij, Economics & Research Division, De Nederlandsche Bank, P.O. Box 98, 1000 AB, Amsterdam ([M.C.J.van.Rooij@dnb.nl](mailto:M.C.J.van.Rooij@dnb.nl)), Annamaria Lusardi, Department of Economics, Dartmouth College, Hanover, NH 03755 ([Annamaria.Lusardi@Dartmouth.edu](mailto:Annamaria.Lusardi@Dartmouth.edu)), and Rob J.M. Alessie, School of Economics and Business, University of Groningen, P.O. Box 800, 9700 AV, Groningen ([R.J.M.Alessie@rug.nl](mailto:R.J.M.Alessie@rug.nl)). We gratefully acknowledge valuable comments and suggestions by Carol Bertaut, Johannes Binswanger, Lex Hoogduin, Clemens Kool, Peter Schotman, Federica Teppa, Peter van Els, and participants in the Netspar pension conference (The Hague, June 2008), and the ECB-CFS conference on Household Finances and Consumption (Frankfurt, September 2008). We thank the staff of CentERdata and, in particular, Corrie Vis for their assistance in setting up the survey and the field work. The views expressed in this paper are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

## 1. Introduction

Households hold very different amounts of savings. Heterogeneity in lifetime earnings, the willingness to leave bequests, motives for precautionary or other savings, and cross sectional variability in time preferences, expectations, health, longevity, inheritances and other income shocks contribute to the dispersion in wealth holdings and have been researched extensively.<sup>1</sup> The relation between wealth accumulation and financial capabilities has received much less attention, mainly because information on the level of financial sophistication is usually unavailable. Recently, however, there has been a boost in research on the measurement of financial literacy and its effects on household behavior (e.g. Van Rooij, Lusardi and Alessie, 2007; Lusardi and Mitchell, 2007a, 2007b, 2008; Agnew, Szykman, Utkus and Young, 2007; Kimball and Shumway, 2006). In this paper, we report the results of a new survey with an extensive set of questions designed to measure basic and more advanced financial skills and to the best of our knowledge it is the first study of its impact on net worth.

The relation between financial sophistication and savings behavior is important as individuals are increasingly asked to take private responsibility for their financial well-being. Given the evidence on widespread financial illiteracy and limited pension knowledge, there is an obvious policy interest in the question whether financial education affects savings behavior and what type of education programs is most effective. The empirical evidence on the effect of financial education and the provision of information on savings behavior is mixed (Lusardi, 2004). Moreover, even if studies find a significant impact of financial education on savings, the outcomes generally do not provide much information on the channel underlying this effect. Studies on the impact of retirement seminars for example are typically not able to disentangle the consequences of an increase in financial skills, if any, from behavioral effects due to the provision of information, retirement seminars being an integral part of a more comprehensive initiative to increase financial awareness, or the importance of peer and community effects in raising savings (Duflo and Saez, 2003). We isolate the effect of financial skills, investigate whether financial sophistication as such has an impact on wealth accumulation and ask ourselves what underlying channels are at work here.

The main contributions of this paper are the following. We provide evidence of an independent and positive effect of financial sophistication on wealth accumulation over and above the effect of other determinants such as income, age, education, family composition, risk tolerance, patience, the attitude towards saving, and basic cognitive ability. We identify and highlight two channels by which financial literacy facilitates wealth accumulation. First, a

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<sup>1</sup> See the references in the next section.



high level of financial skills lowers the costs of gathering and processing information and reduces barriers to invest in the stock market (Haliassos and Bertaut, 1995; Vissing-Jorgenson, 2004). We show that financial sophistication indeed fosters stock market participation and thereby provides households with the opportunity to benefit from the equity premium on stock investments. Second, we find that financial sophistication boosts retirement planning behavior by households, thereby providing an important mechanism for wealth accumulation (Ameriks, Caplin and Leahy, 2003; Lusardi and Mitchell, 2007a). In addition, our empirical results suggest that respondents who are relatively confident about their own financial skills have a higher propensity to plan. The intuition behind the retirement planning channel is that a high level of financial knowledge and skills reduces planning costs, i.e. the economic and psychological barriers to acquire information, to do the calculations and to develop a plan. Our data show that once households start doing calculations on their savings needs for retirement, they often follow through setting up a retirement plan and are in general also successful in sticking to their plan.

Our findings have important policy implications. Financial skills cannot be taken for granted. We show that financial illiteracy is widespread and that the lack of financial sophistication has important consequences for wealth holdings. This suggests that the skills to take financial decisions often fall short of what is necessary for the kind of choices that individuals nowadays are expected to make in a financial world with a vast and growing supply of complicated products which have become accessible to a large public by now. The implication is that there is an important role for financial education as by effectively boosting financial sophistication households become better equipped to manage their own savings. One reason why this is important is that many households enter retirement with very little wealth (Venti and Wise, 1998, 2000; Lusardi, 1999, 2003). This has profound implications not only for personal welfare but also for public policy, as low savings households lack a buffer to deal with negative shocks and are more likely to become dependent on state benefits. In addition, financial education initiatives might help reducing the dispersion in wealth; a dispersion that is much higher than the often debated inequality in income (Cagetti and De Nardi, 2006).

This paper is organized as follows. In Section 2, we review the current literature on wealth accumulation in relation to financial sophistication. In Section 3, we present data and descriptive statistics, and explain how the measures of financial ability and sophistication are constructed. In Section 4, we report the results of wealth regressions including measures of financial ability and sophistication. In Section 5, we present several extensions and discuss the robustness of the results. In Section 6, we consider two channels by which financial skills

exert an effect on wealth accumulation: stock market participation and retirement planning activities. In addition, we examine the economic relevance of being financially sophisticated. In Section 7, we conclude with some remarks on implications for policy and areas for future research.

## 2. Literature

The simplest version of the life cycle consumption model without bequests and uncertainty predicts that households accumulate savings during their working career to finance retirement and decumulate wealth thereafter (Modigliani and Brumberg, 1954). This type of savings behavior enables households to smooth their marginal utility of consumption over the life cycle. However, there are many reasons why household consumption and wealth follow different patterns and the standard model can quite easily be adjusted to cope with many of them (Browning and Lusardi, 1996; Cagetti and De Nardi, 2006).

A large variety of empirical research sheds light on the observed patterns in wealth dispersion and portfolio choice. Studies have highlighted among others the role of precautionary savings motives (Hubbard, Skinner and Zeldes, 1995), longevity and bequests (Hurd, 1989), different economic opportunities across cohorts (Kapteyn, Alessie and Lusardi, 2005), self-control (Laibson, 1997; Benartzi and Thaler, 2004; Ameriks, Caplin, Leahy and Tyler, 2007), unexpected events (Venti and Wise, 2000; Lusardi, 2003), background income risk (Heaton and Lucas, 2000; Guiso, Jappelli, Terlizzese, 1996), and health (Rosen and Wu, 2004). To the best of our knowledge, none of these studies focus on the role of financial capabilities in accumulating savings, while more financially sophisticated individuals are likely to perceive lower barriers for gathering and processing information and are thus better equipped to manage their savings portfolio. Somewhat related to the subject of our study is the work by Chan and Stevens (2008) who document that households base pension and retirement savings decisions upon the limited and sometimes incorrect pension knowledge they have.<sup>2</sup>

Bernheim (1995, 1998) was among the first to stress that policymakers and researchers might have overlooked the importance of financial literacy for savings. Since then many studies emphasize the role of financial sophistication but, in absence of specific literacy measures, resort to crude proxies for financial skills, such as income, wealth or education

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<sup>2</sup> Many authors have documented that households are rather ill-informed about their Social Security benefits and company pensions. See Gustman and Steinmeier (2004) and Van Els, Van den End and Van Rooij (2004) for evidence for the US and the Netherlands, respectively.

(Calvet, Campbell and Sodini, 2007; Vissing-Jorgenson, 2004). The disadvantage of these proxies is that there is no way to disentangle the effect of financial ability from the effect of the proxy variable. By using education as a measure of financial sophistication one is not able to separate the independent effect of financial skills from the impact of the education level as such, which in many regression specifications also serves as a proxy for lifetime income. Christiansen, Joensen and Rangvid (2008) use information on formal economics education as an alternative proxy for individual financial sophistication to study portfolio decisions.

Since a few years researchers have increased effort in developing specific measures of financial ability and knowledge and have started investigating its relation to economic decisions and portfolio choice. Hilgert, Hogarth and Beverly (2003) explore the relation between literacy and money management, while Lusardi and Mitchell (2006) consider the associations with retirement planning. More recently Van Rooij, Lusardi and Alessie (2007) and Christelis, Jappelli and Padula (2007) have studied the link between the decision to invest in stocks and specific measures of financial sophistication and basic cognitive ability.

Several authors have stressed that the welfare costs of financial mistakes are not negligible (Campbell, 2006; Calvet, Campbell and Sodini, 2007; Cocco, Gomes and Maenhout, 2005). Nevertheless, an increasing amount of studies documents the prevalence of financial mistakes. Agarwal, Driscoll, Gabaix and Laibson (2007) provide evidence of financial mistakes in the loan market with many households paying too much fees or too high interest rates on credit card debt, home equity loans and mortgages (see also Moore, 2003). Calvet, Campbell and Sodini (2007) show that in Sweden – a country that is claimed to have efficient investors – many households hold underdiversified portfolios or do not participate in financial markets at all.

The amount of financial mistakes might not come as a surprise given the body of evidence on limited financial literacy among households. This evidence is robust in different settings and across different countries of which many have reacted by setting up financial education programs (OECD, 2005). While the large variation in the initiatives to enhance awareness and financial sophistication creates new possibilities to learn how to effectively design and implement education programs in the near future, these evaluations have been limited so far (Smith and Stewart, 2008).

The impact of financial education on savings behavior has been investigated almost exclusively in the context of retirement seminars offered by US firms. An important exception is the work by Bernheim, Garrett and Maki (2001) who document positive effects of financial education during high school on long term savings employing the variability in state mandates

on the teaching of topics related to household financial decisions. Bernheim and Garrett (2003), Lusardi (2004) and Clark and D'Ambrosio (2008) have documented positive effects of retirement seminars in the workplace, especially when it regards the intentions to change savings behavior. Overall, however, the evidence is mixed as other studies were not able to come up with significant, lasting effects (Duflo and Saez, 2003, 2004).

Moreover, as the attendance in retirement seminar is voluntary it is not to be excluded that participants form a selected group that is already more intrinsically motivated to remedy insufficient pension savings. In addition, any beneficial effect of retirement seminars could also be the direct result of the provision of information on the need for retirement savings rather than of an increase in financial sophistication. This is especially likely as retirement seminars typically take a few hours at most. Interestingly, Mandell (2008) does not find a literacy enhancing effect of more intensive courses at high school devoted to teaching personal finance and money management on test scores for financial literacy. This suggests that the effect of financial education in high school or at retirement seminars on savings could also work via other channels than raising financial knowledge and ability. The impact of financial education on savings in these studies might for example work more indirectly through an effect on individual characteristics and the appetite for saving. In this paper, we do not evaluate financial education programs but focus directly on the role of actual financial knowledge and capabilities in wealth accumulation and disentangle its effects from other personal traits including risk tolerance, patience, and other preferences related to the propensity to save.

### **3. Data**

We have devised a special module for the annual DNB Household Survey (DHS) including an elaborate set of questions on financial ability and knowledge as well as a section on retirement planning activities. The questions have been answered by the household panel run by CentERdata; a survey agency at Tilburg University specialized in internet surveys.<sup>3</sup> It is important to note that - even though the Netherlands has an internet penetration of about 80% - the selection of panel members is not dependent on the use and availability of internet. Households without a computer or an internet connection are provided with the necessary equipment (e.g. a set-top box to participate through their television connection). Attrition is dealt with by biannual refreshment samples that are drawn in view of keeping the panel

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<sup>3</sup> For more information, we refer to <http://www.uvt.nl/centerdata/en>.

representative of the Dutch population of 16 years and older (persons staying in hospitals, specialized care institutions or prisons are not included).<sup>4</sup>

The questionnaire was held among those persons within the household who are in charge of household finances. It was fielded in 2005 from September 23 until September 27 and repeated a week thereafter for those households that had not responded yet. The response rate equaled 74.4% (1508 out of 2028 households). The DHS contains a lot of information on income and work, health, household debt and assets, and an extensive set of psychological questions on attitudes with respect to saving and portfolio investments.<sup>5</sup> We merge our module on financial literacy with the data in the 2005 wave of DHS on net worth for those households for who we have information on all of their assets and debts. Since wealth regressions might be sensitive to outliers we trim the net worth variable by excluding the top and bottom 1% of observations which are most suspicious to measurement error.

After these steps, our reduced sample consists of 1091 households. The average age of the respondents equals 50.8 (ranging from 22 to 90 years); 53.1% of the respondents are male; 56.7% are married or living together with a partner, about one third have children living at home and 20.4% of the respondents are retired. Comparison of these characteristics with the full sample shows that especially elderly respondents report their asset and debt position more frequently, but overall the composition of the sample remains fairly unchanged. Table 1 reports the median, mean and standard deviation of household net worth. This wealth concept includes all kind of private savings and investments accounts, housing wealth, other real estate, and durable goods, net of mortgages and other financial debt. It is clear that its distribution is skewed and that there is a lot of dispersion in net worth also after the substantial reduction due to the trimming process.

This paper aims at exploring a new potential explanation contributing to the heterogeneity in wealth holdings, i.e. the role of the apparent widespread differences in financial literacy. First, we look at the bivariate relationship between wealth holdings and two financial literacy indices which have been derived from our financial literacy module (Table 2). The basic literacy index is a measure for very basic financial ability and knowledge and follows from a factor analysis based on the correct answers to five simple questions on the understanding of inflation, interest rates and interest compounding. The advanced literacy index is based on a factor analysis using the information content of correct, incorrect and do

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<sup>4</sup> In addition, we use household weights to calculate descriptive statistics to ensure representativeness of the population.

<sup>5</sup> Direct information on consumption and annual saving out of income is not available.

not know answers to eleven questions on financial knowledge about the understanding of stocks, bonds and mutual funds, their trade off between risk and return and the benefits of risk diversification. The exact wording of these questions, the response patterns, an explanation of the construction of these indices and the relation to demographics is documented in detail in a previous paper (Van Rooij, Lusardi and Alessie, 2007) which is also included as the second paper in this thesis.

**Table 1. Total net worth statistics**

Thousands of euro

<b>Total net worth</b>	<b>Total net worth</b>		
	Median	Mean	Standard deviation
before trimming (N=1116)	119.7	184.3	279.3
after trimming (N=1091)	119.7	167.1	189.0

**Table 2. Total net worth versus basic and advanced literacy**

Thousands of euro (N=1091)

<b>Basic literacy quartiles</b>	<b>Total net worth</b>		
	Median	Mean	Standard deviation
1 (low)	43.9	117.2	162.3
2	98.8	150.2	164.7
3	111.2	156.5	173.6
4 (high)	142.8	195.7	209.3

<b>Advanced literacy quartiles</b>	<b>Total net worth</b>		
	Median	Mean	Standard deviation
1 (low)	46.7	100.1	121.2
2	82.0	129.3	151.0
3	112.4	167.5	181.4
4 (high)	185.9	236.3	228.4

Table 2 documents a strong increase in median net worth with basic and advanced literacy. The median net worth position of the top quartile of financially sophisticated individuals amounts to €185900 which is the quadruple of the median net worth position in the bottom advanced literacy quartile (€46700). Also the differences in wealth position across

basic literacy quartiles are large - although somewhat smaller than for advanced literacy. These simple correlations suggest a strong, non-linear gradient between literacy and net worth.

Table 3 shows a similar pattern for several asset categories. Home ownership and investments in stocks, mutual funds and bonds are much more common among those who score high on the literacy scales. Nevertheless there are obvious differences between asset classes. While home ownership is also not uncommon among the most illiterate households, investments in individual stocks or bonds are almost absent within this subgroup. This evidence suggests that more literate households hold more diversified portfolios or at least spread their wealth over a richer class of assets.

**Table 3. Asset ownership versus basic and advanced literacy**  
Weighted percentages (N=1116)

Basic literacy quartiles	% of households owning			
	Stocks	Mutual funds	Bonds	Home
1 (low)	2.4	5.6	1.9	40.5
2	9.7	17.6	3.8	53.4
3	10.2	16.5	3.0	54.4
4 (high)	18.1	23.9	6.1	60.8

Advanced literacy quartiles	% of households owning			
	Stocks	Mutual funds	Bonds	Home
1 (low)	2.0	6.5	1.4	44.6
2	5.0	11.8	1.2	44.8
3	14.2	18.5	5.0	56.0
4 (high)	25.2	33.1	8.8	70.9

Note: Percentages may not sum up to 100 due to rounding.

#### 4. Wealth regressions

To further investigate the relation between wealth accumulation and financial sophistication, we start with a basic multivariate regression for total net worth and extend this specification by successively including additional information. Tables 4A and 4B report the results. First, we run an OLS regression of total net worth on our measure for basic financial skills and cognitive ability. Other control variables include gender, age and education level of

the respondent, household composition (marital status and the number of children within the household), household net disposable income, and a dummy for whether the respondent is retired. We have also included a dummy for being self-employed as entrepreneurs differ in many aspects from others and might behave accordingly (Hurst and Lusardi, 2004).

**Table 4A. Total net worth and financial literacy: multivariate regressions**

	(1) OLS		(2) OLS		(3) OLS	
Basic financial literacy index	12328***	(3.42)	15804***	(3.37)	15712***	(3.08)
Age dummy (30<age<=40)	26904**	(2.25)	24581**	(2.02)	22398*	(1.69)
Age dummy (40<age<=50)	72269***	(5.42)	72359***	(5.34)	74986***	(5.20)
Age dummy (50<age<=60)	131181***	(8.71)	130456***	(8.49)	136511***	(8.33)
Age dummy (60<age<=70)	143929***	(7.01)	144246***	(6.94)	152902***	(7.25)
Age dummy (age>70)	166320***	(6.31)	161898***	(5.88)	168605***	(6.15)
Intermediate vocational education	18230	(1.37)	12666	(0.93)	12961	(0.92)
Secondary pre-university education	10709	(0.65)	2851	(0.18)	4714	(0.28)
Higher vocational education	25853*	(1.85)	22434	(1.59)	18835	(1.30)
University education	37059**	(1.98)	35853*	(1.88)	26112	(1.32)
Male	-7952	(0.81)	-10204	(1.02)	-20710**	(1.97)
Married	30905***	(2.72)	26639**	(2.29)	24494**	(2.08)
Number of children	10285*	(1.70)	11166*	(1.80)	10199	(1.59)
Retired	45437**	(2.16)	45454**	(2.11)	42855**	(2.03)
Self-employed	26205	(1.17)	25016	(1.12)	25300	(1.04)
Ln(household income)	-3277982***	(3.76)	-3261105***	(3.72)	-3062710***	(3.69)
Ln <sup>2</sup> (household income)	315864***	(3.71)	314721***	(3.67)	297871***	(3.67)
Ln <sup>3</sup> (household income)	-9676***	(3.51)	-9648***	(3.45)	-9179***	(3.48)
High confidence in financial skills			-10738	(0.79)	-9253	(0.66)
Low confidence in financial skills			-26368**	(2.15)	-21614*	(1.70)
Risk aversion dummy 2 (low)					-1181	(0.043)
Risk aversion dummy 3					-16204	(0.65)
Risk aversion dummy 4					-30789	(1.24)
Risk aversion dummy 5					-13917	(0.53)
Risk aversion dummy 6					-55402**	(2.41)
Risk aversion dummy 7 (very high)					-64013***	(2.85)
Constant	10880396***	(3.67)	10818615***	(3.65)	10088240***	(3.58)
Observations	1091		1060		1013	
R-squared	0.32		0.32		0.34	
p-value test age=0	0.00		0.00		0.00	
p-value test education=0	0.26		0.27		0.61	
p-value test income=0	0.00		0.00		0.00	
p-value test confidence=0			0.10		0.24	
p-value test risk aversion=0					0.00	

Note: Absolute value of robust t-statistics in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The dependent variable is net worth in thousands of euro. The most risk tolerant, none smoking and moderately drinking (4 alcoholic drinks or less a day) respondents are in the reference group.

Age and income appear to be strongly significant (Table 4A, column 1). Total net worth is increasing in age, but using cross-section data we cannot disentangle whether this is



attributable to age or cohort effects. Nevertheless, it is consistent with panel data evidence suggesting that Dutch households hardly decumulate private wealth after retirement (Kapteyn, Alessie and Lusardi, 2005; Alessie, Lusardi and Kapteyn, 1999).<sup>6</sup> To capture complex, possibly non-linear effects of income on wealth accumulation, we have included a polynomial for the natural logarithm of net disposable household income with a linear, quadratic and cubic term. A one percent increase in household income – measured at mean levels of the control variables – is associated with an increase in total net worth by somewhat more than €1400.

Most interesting is the positive and significant effect of basic cognitive financial ability on total net worth. A unit increase in basic literacy goes together with about €12000 more wealth (the basic literacy measure itself has a zero mean and a standard deviation of one). Individuals with higher cognitive ability seem to be more likely to accumulate savings. Nevertheless, it is not immediately clear whether this is the result of better financial decisions because of the ability to collect and process information at low cost and effort or runs through its association to personal characteristics like risk aversion, time preference or overconfidence (see for example Christelis, Jappelli and Padula (2007) for a discussion).

To further investigate these issues, we first examine the role of confidence in financial skills in relation to actual financial knowledge. In addition to actual financial ability, perceptions of one's own ability might assert an independent effect on financial outcomes albeit the direction of the effect is not clear-cut a priori. Persons who are overly modest about their skills might refrain from financial innovations and forego potential financial benefits. Insofar high confidence in one's personal skills leads to less conservative portfolio management it could have a positive impact on net worth. On the other hand, these people might buy complex products that they do not fully understand and could end up making financial mistakes with serious money at stake. In addition, in the literature on overconfidence it is argued that individuals with too much trust in their own skills could be inclined to interpret and filter information in accordance with their beliefs and might trade excessively (ending up with high trading costs and lower net investment returns). Barber and Odean (2000, 2001) for instance provide evidence of overconfident investors trading excessively and ending up with lower returns.

At the start of our survey, we ask respondents *'How would you assess your understanding of economics (on a 7-points scale; 1 means very low and 7 means very high)?'*

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<sup>6</sup> The increase in the 70 plus age group could also be partly related to different mortality rates depending upon the wealth position (Hurd, 1990).

Based upon this self-assessment of economic literacy, we construct a relative measure of overconfidence. The self-reported literacy question and our basic ability index are not directly comparable due to the use of different scales, but do provide information on the relative position of respondents within the distribution of actual basic literacy and self-assessed literacy, respectively. We start with grouping both variables into four categories and rank the respondents accordingly from the top category to the lowest group. Thereafter, we create a dummy for overconfidence that equals unity if the respondents' self-assessed literacy ranking is higher than our classification for basic financial skills. In addition, we construct a dummy for relatively low confidence or underconfidence measuring whether the ranking on self-assessed literacy is more modest than warranted. Thereafter, we rerun the first wealth regression now including both dummies (the reference group being the respondents with a proper assessment of their skills). Append A provides more details on the construction of the confidence measures. Our main interest is whether the effect of basic financial ability on wealth accumulation is affected by the inclusion of the confidence measures. The coefficient of basic financial capabilities remains significant and increases somewhat (Table 4A, column 2).<sup>7</sup> The coefficient of overconfidence is negative but insignificant. Underconfidence however has a significant negative impact on net worth. Compared to persons with proper knowledge of their financial skills, these people do not seem to take full advantage of their capabilities.

Experimental evidence reveals that individuals with lower cognitive ability are likely to be less risk tolerant and more impatient (Benjamin, Brown and Shapiro, 2006; Dohmen, Falk, Huffman and Sunde, 2007). To test whether the effect of cognitive ability runs through an association with risk attitude, we include a measure of risk aversion. In the annual DHS respondents are asked to indicate to what extent they agree with the following statement '*Investing in stocks is something I don't do, since it is too risky*'. The response scale runs from 1 to 7, where 1 corresponds to complete disagreement and 7 to complete agreement. Kapteyn and Teppa (2002) use this measure and show that it has more explanatory power in models of portfolio choice than measures of risk tolerance based on a series of hypothetical choices between uncertain streams of lifetime income as introduced by Barsky, Juster, Kimball and Shapiro (1997). The regression results in Table 4A (column 3)<sup>8</sup> show that there is indeed an

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<sup>7</sup> The number of observations has now decreased from 1091 to 1060 as, in constructing the measures for under and overconfidence, we ignore respondents answering 'do not know' when asked to assess their financial skills.

<sup>8</sup> The information on risk aversion and time preferences is available in the DHS modules on savings attitudes, income and health. Due to the merging process the total number of observations in our regression is reduced by 57 (even though we were able to retain some households by using information on time preferences and risk tolerance from adjacent years).

important role for risk aversion in explaining wealth heterogeneity, but the coefficient of basic financial skills is virtually unaffected.<sup>9</sup>

We subsequently test whether financial ability serves as a proxy for patience. We do not have direct information on time preferences, but we include information on smoking and drinking behavior as a proxy for myopic behavior as it is done in many other studies since the work by Fuchs (1980) on the relation between different types of health decisions and patience. We use information on whether people smoke and how often, and on whether they are heavy drinkers (more than four alcoholic drinks on average per day). We do not find any relation between net worth and these proxies for time preference and the coefficient of the basic financial literacy index changes only marginally (Table 4B, column 1)

In the next step, we investigate whether basic financial ability could be a proxy for more advanced financial skills (as suggested by the results in Van Rooij, Lusardi and Alessie, 2007) and include the measure of advanced financial sophistication. Indeed the effect of advanced literacy is strongly significant, reduces the coefficient on basic financial capacity and wipes out its significance (Table 4B, column 2). The coefficient of advanced literacy is higher than the original effect of the basic ability index and a unit increase in financial sophistication raises the household net worth position by €24000 on average. However, we need to be cautious with the interpretation of the OLS coefficient for financial sophistication. While the financial ability index touches upon very basic cognitive skills that people more or less need on a daily basis, the advanced literacy index includes questions on the working of stocks, bonds and mutual funds and addresses skills which are not a necessity in daily transactions. It is conceivable that wealth management fosters the collection of financial knowledge and the OLS coefficient could be biased upwards (simultaneity bias). On the other advanced literacy index might be a noisy measure of actual financial skills and the coefficient of financial sophistication could be biased to zero (attenuation bias). Indeed Van Rooij, Lusardi and Alessie (2007) provide evidence of the importance of slight variations in the wording of questions for response patterns, which suggests that there is some guessing going on for questions that appear hard to grasp.

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<sup>9</sup> As a robustness check we have included the Barsky et al. (1997) measure of risk tolerance as it has proved to be a valuable measure in other papers (e.g. Van Rooij, Prast and Kool, 2007), but it turned out to be insignificant confirming the results of Kapteyn and Teppa (2002).

**Table 4B. Total net worth and financial literacy: multivariate regressions**

	(1) OLS	(2) OLS	(3) IV
Advanced financial literacy index		23514*** (4.86)	67122** (2.28)
Basic financial literacy index	16694*** (3.17)	9050 (1.64)	-5129 (0.45)
Age dummy (30<age<=40)	20743 (1.55)	24756* (1.81)	32198** (2.12)
Age dummy (40<age<=50)	76027*** (5.24)	77806*** (5.31)	81106*** (5.24)
Age dummy (50<age<=60)	136072*** (8.17)	134470*** (8.05)	131499*** (7.49)
Age dummy (60<age<=70)	151976*** (7.18)	150595*** (7.11)	148034*** (6.71)
Age dummy (age>70)	169144*** (6.16)	169701*** (6.17)	170733*** (6.08)
Intermediate vocational education	16282 (1.14)	12459 (0.87)	5368 (0.35)
Secondary pre-university education	5994 (0.35)	-1197 (0.07)	-14533 (0.76)
Higher vocational education	17733 (1.21)	11324 (0.77)	-563 (0.03)
University education	25821 (1.30)	16848 (0.84)	208 (0.01)
Male	-19907* (1.84)	-26884** (2.49)	-39823*** (3.01)
Married	22754* (1.89)	24778** (2.07)	28533** (2.28)
Number of children	10687* (1.66)	11424* (1.79)	12790** (1.99)
Retired	43503** (2.06)	41651** (1.98)	38215* (1.78)
Self-employed	26025 (1.07)	24797 (1.03)	22520 (0.93)
Ln(household income)	-3066220*** (3.68)	-3011077*** (3.57)	-2908803*** (3.28)
Ln <sup>2</sup> (household income)	299340*** (3.66)	293782*** (3.57)	283474*** (3.30)
Ln <sup>3</sup> (household income)	-9261*** (3.48)	-9084*** (3.40)	-8754*** (3.17)
High confidence in financial skills	-8685 (0.61)	-9829 (0.70)	-11951 (0.84)
Low confidence in financial skills	-23286* (1.83)	-19605 (1.55)	-12778 (0.94)
Risk aversion dummy 2 (low)	-3888 (0.14)	-8001 (0.29)	-15629 (0.57)
Risk aversion dummy 3	-21340 (0.86)	-23968 (0.97)	-28841 (1.17)
Risk aversion dummy 4	-35329 (1.41)	-33869 (1.36)	-31162 (1.23)
Risk aversion dummy 5	-16025 (0.60)	-19345 (0.74)	-25502 (0.99)
Risk aversion dummy 6	-57751** (2.51)	-54037** (2.37)	-47149** (1.98)
Risk aversion dummy 7 (very high)	-66105*** (2.93)	-60545*** (2.71)	-50234** (2.07)
Smoking: every now and then	-20230 (1.22)	-18589 (1.15)	-15544 (0.95)
Smoking: daily (< 20 cigarettes)	-6861 (0.39)	-5978 (0.34)	-4339 (0.25)
Smoking: daily (>= 20 cigarettes)	-20227 (0.73)	-21097 (0.76)	-22711 (0.82)
Drinking: daily (> 4 drinks)	-966 (0.04)	-1802 (0.08)	-3353 (0.15)
Constant	10066777*** (3.56)	9897789*** (3.45)	9584366*** (3.15)
Observations	1003	1003	1003
R-squared	0.34	0.35	0.32
p-value test age=0	0.00	0.00	0.00
p-value test education=0	0.64	0.81	0.84
p-value test income=0	0.00	0.00	0.00
p-value test confidence=0	0.18	0.30	0.56
p-value test risk aversion=0	0.00	0.01	0.48
p-value test smoking, drinking=0	0.74	0.77	0.83
p-value Hansen J test			0.30
F-statistic first stage regression			13.0
p-value exogeneity test			0.18

Note: Absolute value of robust t-statistics in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The dependent variable is net worth in thousands of euro. The most risk tolerant, none smoking and moderately drinking (4 alcoholic drinks or less a day) respondents are in the reference group. The advanced literacy index has been instrumented using dummy variables indicating how much the respondent's education was devoted to economics. The reference group consists of those respondents whose education was devoted a lot to economics.

Therefore, we perform an instrumental variables (IV) regression including economics education as an instrument for advanced financial literacy. This variable measures the

exposure to education before entering the job market. It is based upon the answers to the question ‘*How much of your education was devoted to economics?*’ where response categories include the options ‘a lot’, ‘some’, ‘little’, and ‘hardly at all’.<sup>10</sup> We assume that this information is unrelated to wealth. It has strong predictive power for financial literacy as shown by the test on instrument relevance in the first stage regression (Table 4B, column 3). The F-value equals 13, clearly above 10 the value that is often recommended as a rule of thumb to be sure that problems due to weak instruments are avoided (Staiger and Stock, 1997). The estimation results show that the IV coefficient remains significant at the 5% level and increases substantially to €67000 suggesting that financial literacy is indeed measured with imprecision. The Hansen J-test on the validity of the overidentifying restrictions is not rejected. Overall, our estimates are in line with the hypothesis that financial sophistication is an important determinant of wealth accumulation also after accounting for attitudes and preferences which might be associated with the level of financial sophistication.

## 5. Extensions

One potential concern with our instrument is that accumulating wealth, and becoming literate or being exposed to economics education are choice variables depending on a common unobserved factor or another omitted variable. One possible candidate for a variable that drives literacy, education and wealth but is usually unavailable in wealth regressions is ability as some people are intrinsically more gifted by nature with talent and basic cognitive skills than others. For this reason precisely we maintain the basic literacy variable in the wealth regressions as to control for cognitive ability.

Carefulness is an example of an important common factor that is perhaps not sufficiently taken into account yet. Careful persons taking many precautions to prevent bad things happening to them could be more likely to hold additional savings buffers and to invest in financial education as well to lower the chance to enter a debt situation or end up with financial problems. To explore this possibility we run two additional specifications including information from two separate questions on whether respondents consider themselves a ‘*careful person*’, and whether they ‘*take many precautions*’. The response scales run from 1 (completely disagree) to 7 (completely agree). Appendix B reports the precise wording of these questions, which are available in a separate DHS module. By merging this information with our data we lose close to 300 observations. Due to the lower number of observations, the F-value of the joint significance of economics education in the first stage regression decreases

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<sup>10</sup> See appendix B for the precise wording.

to 6 but remains strongly significant. More importantly, Table 5A shows that the inclusion of how careful the respondents are does not take away anything from the effect of financial sophistication on net worth. The advanced literacy coefficient remains significant at the 5% confidence level and even increases in value.

**Table 5A. Total net worth regressions: including carefulness and precaution**

	(1) OLS	(2) IV	(3) OLS	(4) IV
Advanced financial literacy index	24139*** (4.03)	92061** (2.19)	25390*** (4.26)	96858** (2.33)
Basic financial literacy index	10023 (1.60)	-12794 (0.82)	10813* (1.68)	-13227 (0.85)
Carefulness dummy 2 (low)	-43822 (1.18)	-40941 (1.13)		
Carefulness dummy 3	-50935 (1.48)	-33725 (0.97)		
Carefulness dummy 4	-10235 (0.30)	3741 (0.11)		
Carefulness dummy 5	6059 (0.17)	10025 (0.29)		
Carefulness dummy 6 (very high)	-6969 (0.19)	-8211 (0.23)		
Precaution dummy 2 (low)			24382 (0.64)	1035 (0.024)
Precaution dummy 3			7903 (0.24)	5677 (0.16)
Precaution dummy 4			25802 (0.80)	16869 (0.48)
Precaution dummy 5			19022 (0.59)	5463 (0.15)
Precaution dummy 6 (very high)			29969 (0.88)	29647 (0.82)
Demographics (see table 4B)	yes	yes	yes	yes
Observations	721	721	721	721
R-squared	0.38	0.31	0.37	0.29
p-value test carefulness=0	0.00	0.03		
p-value test precaution=0			0.80	0.78
p-value Hansen J test		0.14		0.15
F-statistic first stage regression		6.24		6.12
p-value exogeneity test		0.12		0.10

Note: Absolute value of robust t-statistics in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The dependent variable is net worth in thousands of euro. The reference group in the first two columns contains those respondents who strongly disagree with the statement that they consider themselves as a careful person. The reference group in the last two columns contains those respondents who strongly disagree with the statement that they take many precautions. Other control variables, not reported for brevity, are the same as in Table 4B. The advanced literacy index has been instrumented using dummy variables indicating how much the respondent's education was devoted to economics. The reference group consists of those respondents whose education was devoted a lot to economics.

Another potential concern with respect to our result that financial sophistication leads to higher net wealth holdings is that net worth is a very heterogeneous concept. Although we have included controls for the impact of demographics, risk aversion, time preferences and confidence measures many other potential drivers of wealth heterogeneity could be related to financial sophistication - possibly in an unexpected way - and might influence the relation between financial literacy and the accumulation of savings. In this section we further exploit the richness of the DHS dataset to investigate whether the importance of the effect of financial sophistication is taken away once we control for alternative explanations of wealth dispersion.

One potential explanation for wealth heterogeneity is simply that households have a different appetite for saving. Venti and Wise (1998, 2000) for example conclude that unobserved heterogeneity in the taste for saving must be a major driving factor for wealth inequality after having eliminated successively lifetime earnings, chance events and investment choices as sufficient explanations. Our dataset does contain a direct proxy for the appetite for saving; we include the responses to the question on what respondents '*do with money that is left over after having paid for food, rent, and other necessities*'. The response scale runs from 1 to 7, where 1 means '*I like to spend all my money immediately*' and 7 means '*I want to save as much as possible*'. Exact wording and responses are reported in appendix B. Table 5B (columns 1 and 2) indeed shows that across the board a higher taste for saving translates into more accumulated savings. Being a crude proxy that perhaps could also serve as a measure of patience, the most important result from the table is that the magnitude and significance of the coefficient of financial sophistication is unaffected.

Another alternative measure for time preference can be obtained from the question whether people use a short or a long forward looking horizon in their spending decisions. Being a direct measure of patience and saving compared to the commonly used smoking and drinking proxies for time preference, the disadvantage is that responses to this question could be related to a number of other personal characteristics and background information. That said the estimates show that the responses have clear predictive value for wealth accumulation (Table 5B, columns 3 and 4). Nevertheless, the inclusion of this measure does not take away the effect of financial sophistication on net worth.

Self-control is indisputably an important factor in savings outcomes (Thaler, 1994). No matter how much importance people attach to savings, if they have difficulties to withstand the short term temptations of consumption and cannot find ways to constrain their consumption behavior, they will hold savings below their target level. The question to respondents whether they '*find it difficult to control their expenditures*' (on a scale from 1 to 7

where 1 means ‘*very easy*’ and 7 means ‘*very difficult*’) appeals directly to problems of self-control. As expected self-control is a major determinant for wealth accumulation (Table 5C, columns 1 and 2). The difference in net worth between those who have little or no problems in controlling their expenses and those who recognize that this is a major challenge is as much as nearly €90000. The inclusion of self-control, however, does not fundamentally affect the relation between financial literacy and wealth accumulation.

**Table 5B. Total net worth: including taste for saving and alternative time preferences**

	(1) OLS	(2) IV	(3) OLS	(4) IV
Advanced financial literacy index	20951*** (4.40)	63127** (2.15)	23189*** (4.85)	64954** (2.21)
Basic financial literacy index	6763 (1.21)	-6445 (0.58)	10022* (1.81)	-3589 (0.31)
Taste for saving dummy 2 (low)	41138** (2.20)	31847 (1.61)		
Taste for saving dummy 3	52947*** (3.18)	47649*** (2.76)		
Taste for saving dummy 4	68209*** (4.37)	61623*** (3.79)		
Taste for saving dummy 5	100078*** (5.94)	86603*** (4.53)		
Taste for saving dummy 6 (very high)	68491*** (3.42)	57392*** (2.62)		
Time preference: horizon 3-12 months			663 (0.053)	-939 (0.074)
Time preference: horizon 1-5 years			32813** (2.56)	33408*** (2.59)
Time preference: horizon 5-10 years			55025*** (2.67)	52812*** (2.59)
Time preference: horizon > 10 years			60375** (2.32)	55111** (2.08)
Demographics (see table 4B)	yes	yes	yes	yes
Observations	1003	1003	1003	1003
R-squared	0.37	0.34	0.37	0.34
p-value taste for saving=0	0.00	0.00		
p-value test time preference=0			0.00	0.00
p-value Hansen J test		0.33		0.26
F-statistic first stage regression		12.6		13.0
p-value exogeneity test		0.20		0.22

Note: Absolute value of robust t-statistics in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The dependent variable is net worth in thousands of euro. The reference group in the first two columns contains those respondents with a very low taste for saving. The reference group in the last two columns contains those respondents with a very short time horizon (a couple of months). Other control variables, not reported for brevity, are the same as in Table 4B. The advanced literacy index has been instrumented using dummy variables indicating how much the respondent’s education was devoted to economics. The reference group consists of those respondents whose education was devoted a lot to economics.



**Table 5C. Total net worth regressions: including self-control and bequest motives**

	(1)	(2)	(3)	(4)
	OLS	IV	OLS	IV
Advanced financial literacy index	21539*** (4.47)	63363** (2.18)	18918*** (4.04)	71014** (2.45)
Basic financial literacy index	5950 (1.06)	-7420 (0.66)	8797 (1.63)	-7154 (0.66)
Self-control dummy 2 (quite easy)	-13081 (0.79)	-9695 (0.58)		
Self-control dummy 3	-43830** (2.45)	-35643* (1.84)		
Self-control dummy 4	-47582** (2.46)	-39237* (1.95)		
Self-control dummy 5	-68355*** (3.86)	-58363*** (2.99)		
Self-control dummy 6 (quite difficult)	-88070*** (4.48)	-86862*** (4.41)		
Dummy bequest motive: yes			106732*** (4.81)	103244*** (4.66)
Dummy bequest motive: no			-12838 (0.88)	-10935 (0.73)
Dummy bequest motive: other			-57490*** (2.87)	-32600 (1.26)
Demographics (see table 4B)	yes	yes	yes	yes
Observations	1003	1003	1003	1003
R-squared	0.37	0.34	0.40	0.36
p-value taste self-control=0	0.00	0.00		
p-value test bequest motive=0			0.00	0.00
p-value Hansen J test		0.21		0.29
F-statistic first stage regression		13.4		12.8
p-value exogeneity test		0.23		0.08

Note: Absolute value of robust t-statistics in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The dependent variable is net worth in thousands of euro. The reference group in the first two columns contains those respondents who find it very easy to control their expenditures. The reference group in the last two columns contains those respondents who do not have children. Other control variables, not reported for brevity, are the same as in Table 4B. The advanced literacy index has been instrumented using dummy variables indicating how much the respondent's education was devoted to economics. The reference group consists of those respondents whose education was devoted a lot to economics.

The same is true if we take into account that bequest motives might be associated with vast differences in wealth accumulations. Although there is no a priori reason to believe that financial sophistication is related to the intention to leave bequests, the bequest motive might be an omitted variable explaining a large part of the variation in wealth accumulation. Indeed the empirical results suggest that some households hold substantial amounts of their wealth for intentional bequests (Table 5C, columns 3 and 4). The positive impact of financial sophistication on net worth survives upon inclusion of the bequest motive: its magnitude and significance even increase somewhat.

In addition to these extensions we have incorporated a large number of variables which based upon the theoretical and empirical literature could principally account for part of the variation in net worth among households. To this end, we have utilized the rich dataset we have available by merging our survey data with information from other DHS-modules which inevitably sometimes leads to a loss of observations. At the same time the variables employed are sometimes simple, crude proxies but may serve at least as a first test for the underlying hypotheses. We have included several alternative health measures, the self-assessed probability of the respondent for survival until certain age levels to account for heterogeneity with respect to perceived longevity, income uncertainty, expectations regarding house price developments, the perceived likelihood of a future reduction in the generosity of the state pension, and the expected replacement rate (based upon state pension eligibility and mandatory employer company savings). The latter proxies annuitized pension wealth which is not part of the private net worth position. All these variables appear insignificant and do not take away the effect of financial sophistication. Finally, we have tested the robustness of our results to other specifications of the wealth regression. Using net worth over permanent income as a dependent variable, where permanent income is calculated from an auxiliary regression of income on a number of demographics, gives estimation results which corroborate the evidence of a positive and significant impact of financial sophistication on wealth.

## **6. Discussion**

### **6.1 Financial sophistication and stock market participation**

Given that financial sophistication increases household wealth holdings, it might be attractive from a public policy point of view to invest in financial education initiatives. To learn about what type of education programs might be most successful it is important to understand the mechanisms at work behind the relation between financial sophistication and net worth. We explore two possible explanations related to the well documented limited stock market participation puzzle and to another puzzling fact in household finance, i.e. the lack of retirement planning.

Economic theory dictates that possibly except for a small proportion of households it is optimal to hold at least part of their wealth in the form of stocks (Haliassos and Bertaut, 1995). Investments in the stock market provide the opportunity to exploit the equity premium and to benefit from risk diversification. International evidence on the composition of

household portfolios shows that many households have no stocks at all in their wealth portfolio (Guiso, Haliassos and Jappelli, 2002). In our sample about a quarter of the households invest in stocks either direct or indirect via mutual funds. The limited participation in stock markets is mostly explained by transaction costs and the costs of processing information which create a threshold for entering the stock market (Haliassos and Bertaut, 1995; Vissing-Jorgenson, 2004). In addition, it has been argued that households are either simply unaware of the opportunities to invest in stock markets or refrain from doing so due to a lack of trust (Guiso and Jappelli, 2005; Guiso, Sapienza and Zingales, 2008).

An increase in financial sophistication lowers information costs as well as impediments to participating due to a lack of knowledge or trust in the working of financial markets. Indeed, the regression results reported in Van Rooij, Lusardi and Alessie (see the second paper of this thesis) show that the probability to own stocks or mutual funds increases by about 8 percentage points upon a one-standard deviation increase in the level of financial sophistication, and about 16 percentage points when we use economics education as an instrument for financial literacy. The latter corrects for measurement error in the index for advanced financial literacy and takes into account that one might accumulate financial knowledge in the process of investing in stocks. The effect of financial sophistication on stock market participation is confirmed in a large number of alternative specifications and remains unaffected when we employ a variety of robustness checks (see Van Rooij, Alessie and Lusardi, 2007).

The fact that financial knowledge boosts stock ownership provides an opportunity to exploit the risk premium on equity investments and might contribute to the positive effect of financial literacy on net worth. This is true regardless of the fact that some households may in fact be better off by not investing in the stock market due to excessive trading or a bad timing of transactions as the evidence in the finance literature shows that the vast majority of households investing in the stock market follow very passive investment strategies (see e.g. Ameriks and Zeldes, 2004).

## **6.2 Financial sophistication and retirement planning**

A second potentially important channel for wealth accumulation is that financial sophistication is related to planning behavior. As an example, the model by Reis (2006) distinguishes inattentive consumers who do not plan and do not accumulate wealth from those who do plan and thereby accumulate savings. Empirical evidence supports the assertion that planning affects wealth accumulation (Ameriks, Caplin and Leahy, 2003; Lusardi and

Mitchell, 2007a). Planning is an inherently complex task requiring advanced cognitive skills and financial understanding. One needs to collect and process information from different sources on current and future income and expenditures and calculate savings needs based upon alternative scenarios. Thus, it is obvious that the effect of financial literacy on total net worth might be related to planning capabilities.<sup>11</sup> Indeed, Lusardi and Mitchell (2007b) report convincing evidence of financial sophistication fostering thinking about retirement. In another study, Lusardi and Mitchell (2008) document a positive relation between simple measures of financial knowledge and more specific measures of retirement planning related to the calculation of savings needs. In the following, we take these two approaches a step forward by relating the more concrete definition of retirement planning to well-developed measures of financial sophistication.

Our survey module contains a series of questions on retirement planning developed by Lusardi and Mitchell (2006) and inserted in the 2004 wave of HRS. The precise wording of the questions and variation therein depending on marital status and employment status are reported in appendix B. The first question relates to the very first step in setting up a retirement plan: *'Have you ever tried to figure out how much your household would need to save for retirement?'*. Out of 1508 respondents 564 answered affirmatively and are labeled as 'simple' planners. The proportion of simple planners is comparable to the one found for US households in HRS 2004, although the latter figure is based on a sample of older households. Those respondents who answered 'yes' were given the next follow-up question: *'Have you developed a plan for retirement saving?'* The majority seems to have developed some sort of a retirement savings plan as 161 plus 299 respondents answered 'yes' or 'more or less', respectively. Out of this group of 'serious' planners, the large majority claims to have been successful in the sense that 169 plus 250 respond 'always' or 'mostly' to the third question *'How often have you been able to stick to this plan'*. The proportion of simple, serious and successful planners is roughly comparable to, albeit somewhat higher than, the findings for US households in HRS 2004, although the latter is based on a sample of elderly households (Lusardi and Mitchell, 2006). The weighted percentage of simple, serious and successful planners in our sample equals 34.6, 27.6, and 25.1 respectively.

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<sup>11</sup> Even if people outsource much of the work to financial planners, they have to come up with a lot of information some of which is complex to retrieve and communicate (e.g. subjective information on their preferences and the uncertainty around the main scenario they foresee). At the same time, they have to be financially smart enough to understand the implications of their advice to judge whether these plans indeed fit their needs. Interestingly, a multivariate regression analysis reveals that financial sophistication does not exert an independent effect on the probability of consulting a financial intermediary. Illiterate households do however rely significantly more often on the advice of friends and acquaintances when making important financial decisions (results are available upon request).

**Table 6. Retirement planning across demographics**  
Weighted household percentages

<b>Education</b>	Percentage of planners			N
	Simple	Serious	Successful	
Primary	20.6	16.9	15.9	67
Preparatory intermediate voc.	37.3	27.6	25.1	345
Intermediate vocational	33.0	26.2	22.7	295
Secondary pre-university	33.1	26.6	23.1	207
Higher vocational	35.5	30.8	29.1	397
University	39.8	29.9	28.9	197
Pearson chi2(5)	9.50	3.37	4.75	
p-value	0.09	0.64	0.45	

<b>Age</b>	Simple	Serious	Successful	N
21-30 years	24.8	18.5	14.9	179
31-40 years	30.0	23.0	21.8	306
41-50 years	34.6	27.1	24.8	333
51-60 years	45.4	36.7	34.0	311
61-70 years	34.8	28.4	25.3	217
71 years and older	34.4	28.9	27.0	162
Pearson chi2(5)	23.4	19.7	19.8	
p-value	0.00	0.00	0.00	

<b>Gender</b>	Simple	Serious	Successful	N
Female	32.6	26.5	24.4	674
Male	36.6	28.4	25.7	834
Pearson chi2(1)	0.42	0.03	0.02	
p-value	0.52	0.86	0.88	

<b>Marital status</b>	Simple	Serious	Successful	N
Single/divorced/widow	0.323	0.237	0.213	
Married/living together	0.364	0.304	0.279	476
				1032
Pearson chi2(1)	1.59	3.35	4.04	
p-value	0.21	0.07	0.04	

Note: Percentages may not sum up to 100 due to rounding.

Descriptive statistics on retirement planning and demographics are reported in Tables 6 and 7. As expected, there is a strong correlation with age. The closer people get to retirement the more likely they are to start considering their retirement needs. No differences in planning activities between men and women come forward, while couples are more likely to be successful in executing their plans. While there is not much evidence that planning is related to education or basic literacy, there is a strong correlation with advanced financial literacy. The proportion of planners in the most literate group is almost double the number for households with the lowest level of financial understanding.

The relation between financial sophistication and simple retirement planning is confirmed in a multivariate regression analysis including the same explanatory variables as before (Table 8). We report OLS and IV regressions, as we are cautious of possible simultaneity bias because one could become more financially educated in the process of calculating savings needs, and developing and executing a retirement plan. The IV-coefficients however suggest that the downward bias in the OLS coefficient due to imprecise measurement of financial sophistication is more important than the effect of planning on financial sophistication. A one standard deviation increase in financial sophistication increases the probability to plan for retirement with more than 20 percentage points. Another interesting result is the role of confidence. Those people who are very confident in their financial capabilities are more likely to start making calculations on how much they need to save for retirement purposes. This suggests that worries about their own financial skills and capacity to handle complex retirement savings decisions withhold people from attempting to calculate retirement savings needs and setting up plans.

Critics might argue that, in particular in the Netherlands, it is not clear that sophisticated persons decide to save more for retirement when they compare the expected retirement income with their spending needs.<sup>12</sup> Informed people could as well come to the conclusion that they are currently holding more wealth than necessary and adjust their savings downward, since the Dutch pension system is known to be relatively generous and the vast majority of employees save via mandatory defined benefit retirement plans with compulsory contributions (Van Rooij, Kool and Prast, 2007). Research into these issues however shows that the replacement rates provided in Dutch mandatory pension system are in many cases below the expectations from employees and insufficient to provide in the desired old age standard of living (Van Duijn, Lindeboom, Lundborg and Mastrogiacomo, 2008; Binswanger

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<sup>12</sup> Also for the US the conclusion - drawn in many studies - that retirement savings are insufficient is not undisputed (Scholz, Seshadri, and Khitatrakun, 2006).

and Schunk, 2008). This suggests that also in the Dutch system doing retirement calculations, and subsequently developing targets for spending and savings might help people to overcome problems of self-control and to improve their wealth position.

**Table 7. Retirement planning and literacy**  
Weighted household percentages

<b>Basic literacy</b>	Percentage of planners			N
	Simple	Serious	Successful	
1 (low)	31.9	23.8	21.7	217
2	33.7	27.9	22.9	284
3	31.4	26.4	24.0	350
4 (high)	38.1	29.5	28.2	657
Pearson chi2(3)	1.95	0.94	3.62	
p-value	0.58	0.82	0.31	
<b>Advanced literacy</b>	Simple	Serious	Successful	N
1 (low)	24.5	19.9	18.6	330
2	31.8	22.9	20.9	354
3	38.2	31.7	28.3	371
4 (high)	44.1	35.5	32.5	453
Pearson chi2(3)	32.6	22.9	20.6	
p-value	0.00	0.00	0.00	
<b>Self-assessed literacy</b>	Simple	Serious	Successful	N
1 (very low)	53.4	44.1	44.1	9
2	33.3	17.8	15.0	56
3	21.2	17.3	16.2	137
4	26.7	20.3	16.1	366
5	37.0	30.7	28.2	499
6	45.7	37.7	36.1	355
7 (very high)	51.4	42.7	41.5	45
Do not know	17.6	10.2	10.2	31
Refusal	27.2	13.9	13.9	10
Pearson chi2(8)	48.6	43.6	49.9	
p-value	0.00	0.00	0.00	

Note: Percentages may not sum up to 100 due to rounding.

**Table 8. Retirement planning and financial sophistication**

	OLS		IV	
Advanced financial literacy index	0.072***	(4.13)	0.25***	(2.66)
Basic financial literacy index	0.031*	(1.79)	-0.026	(0.71)
Age dummy (30<age<=40)	0.026	(0.43)	0.056	(0.89)
Age dummy (40<age<=50)	0.084	(1.39)	0.097	(1.62)
Age dummy (50<age<=60)	0.18***	(2.99)	0.17***	(2.77)
Age dummy (60<age<=70)	0.16**	(2.16)	0.15**	(2.04)
Age dummy (age>70)	0.052	(0.62)	0.056	(0.69)
Intermediate vocational education	0.0029	(0.06)	-0.026	(0.49)
Secondary pre-university education	-0.0081	(0.15)	-0.062	(1.02)
Higher vocational education	-0.033	(0.74)	-0.080	(1.57)
University education	0.073	(1.31)	0.0064	(0.10)
Male	-0.061*	(1.79)	-0.11**	(2.55)
Married	-0.032	(0.87)	-0.017	(0.44)
Number of children	0.017	(0.92)	0.022	(1.20)
Retired	0.034	(0.54)	0.020	(0.32)
Self-employed	0.0090	(0.13)	-0.000095	(0.00)
Ln(household income)	-0.13	(0.05)	0.28	(0.09)
Ln <sup>2</sup> (household income)	0.029	(0.12)	-0.012	(0.04)
Ln <sup>3</sup> (household income)	-0.0013	(0.16)	0.000004	(0.00)
High confidence in financial skills	0.14***	(3.35)	0.13***	(2.98)
Low confidence in financial skills	-0.048	(1.30)	-0.021	(0.51)
Risk aversion dummy 2 (low)	0.0085	(0.13)	-0.022	(0.32)
Risk aversion dummy 3	0.023	(0.34)	0.0034	(0.05)
Risk aversion dummy 4	0.017	(0.27)	0.028	(0.43)
Risk aversion dummy 5	0.017	(0.24)	-0.0078	(0.11)
Risk aversion dummy 6	-0.052	(0.85)	-0.025	(0.38)
Risk aversion dummy 7 (very high)	-0.010	(0.17)	0.031	(0.48)
Smoking: now and then	-0.046	(0.69)	-0.034	(0.48)
Smoking: daily (1-20 cigarettes)	0.0100	(0.20)	0.017	(0.33)
Smoking: daily (> 20cigarettes)	-0.096	(1.30)	-0.10	(1.28)
Drinking: daily (> 4 glasses)	-0.024	(0.37)	-0.030	(0.46)
Constant	0.061	(0.01)	-1.20	(0.11)
Observations	1003		1003	
R-squared	0.07		-0.01	
p-value test age=0	0.01		0.06	
p-value test education=0	0.38		0.32	
p-value test income=0	0.46		0.78	
p-value test confidence=0	0.00		0.00	
p-value test risk aversion=0	0.84		0.93	
p-value test smoking, drinking=0	0.68		0.71	
p-value Hansen J test			0.25	
F-statistic first stage regression			13.0	
p-value exogeneity test			0.06	

Note: Absolute value of robust t-statistics in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The dependent variable is a 0-1 dummy indicating whether respondents have tried to calculate savings needs for retirement. The most risk tolerant, none smoking and moderately drinking (4 alcoholic drinks or less a day) respondents are in the reference group. The advanced literacy index has been instrumented using dummy variables indicating how much the respondent's education was devoted to economics. The reference group consists of those respondents whose education was devoted a lot to economics.



### 6.3 Cost of ignorance

A question of major relevance for public policy decisions is whether the impact of financial sophistication on net wealth positions is not only statistically significant but also quantitatively meaningful, in other words whether financial literacy really matters in economic terms. From the household's point of view it is important as well to know whether it is worthwhile to invest time, effort and financial resources in building up a high level of financial sophistication. The regression results that document a positive and statistically significant effect of financial literacy on wealth accumulation provide also a basis for some simple calculations on the difference in net worth associated with different levels of financial sophistication.

Table 9 reports the difference in net worth for individuals with lower and higher levels of financial sophistication based upon our estimate for the advanced literacy coefficient.<sup>13</sup> The table shows that a small increase in financial sophistication from just below the level of an average consumer to somewhat above the average, i.e. from the 45<sup>th</sup> to the 55<sup>th</sup> percentile of its empirical distribution, increases net worth in expected terms by €11500. This certainly constitutes a non-negligible number as about 20 percent of the households in our sample hold lower levels of total net worth. Wealth effects for larger improvements along the literacy distribution are even more substantial: the net worth difference associated with the 75<sup>th</sup> percentile of the financial literacy distribution up from the 25<sup>th</sup> percentile equals over €81000. Comparison with the median net worth level of about €120000 and the mean household net worth of less than two hundred thousand euro makes clear that this type of wealth differences are associated with big jumps in the relative wealth position. The 95%-confidence interval surrounding the last estimate ranges from €11500 to €150600 reflecting that the estimate for the financial literacy coefficient is surrounded by substantial uncertainty. The net worth difference associated with an increase from the bottom to the top tail of the empirical financial literacy distribution is estimated at over €200000. Note that while these calculations provide crude proxies to have an idea of the relevance of literacy in economic terms, they do not take into account possible wealth effects of changes in risk attitude or other personal characteristics associated with higher levels of financial literacy.

Summarizing, while recognizing that our calculations provide crude approximations, it is clear that from a public policy point of view the wealth effects of financial sophistication are likely to be substantial. Also for households it seems attractive in terms of wealth holdings

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<sup>13</sup> In the calculations we use the coefficient and confidence interval for the effect of financial sophistication on wealth from the preferred IV-specification among the regressions in Table 4B (see column 3).

to invest in financial education insofar as these efforts boost financial skills. For the ultimate impact on personal welfare though it makes a difference whether higher wealth holdings come from improved wealth management leading to the avoidance of financial mistakes and to higher portfolio returns or alternatively are the result of households being in a better position to control their expenses. The two channels that we have highlighted (stock market participation and retirement planning) suggest that both mechanisms are at work here. That said it is important to realize that any effect of financial education on household wealth is not instantaneous but needs time to materialize.

**Table 9. Net worth differences associated with different levels of financial sophistication**

Improvement within financial literacy distribution (percentiles)		Simulated net worth difference (thousands of euro)	
From	To	Expected	95%-confidence interval
45	55	11,5	(1,6 - 21,4)
40	60	24,1	(3,4 - 44,8)
25	75	81,1	(11,5-150,6)
10	90	181,6	(25,8-337,5)
5	95	220,9	(31,3-410,5)
1	99	251,1	(35,6-466,5)

Note: the expected net worth difference and its 95%-interval are derived from the estimate and its 95%-confidence interval for the coefficient on advanced financial literacy in the IV specification from Table 4B, keeping the values of all other variables unchanged.

## 7. Concluding remarks

Household financial skills, their effect on economic decisions and the prevalence of financial mistakes have become an important topic in policy debates. It obvious that the management of a wealth portfolio nowadays requires more sophisticated knowledge and skills than say two or three decades ago. Not only have households become more and more responsible for their individual welfare, but at the same time the landscape of financial markets and products has dramatically changed; changes that have been characterized by a vast increase in complexity and possibilities. To the best of our knowledge, this is the first study on the relation between financial sophistication and wealth accumulation. Using explicit measures for the level of basic cognitive financial ability and more advanced measures of financial sophistication, we have documented empirical evidence of an independent positive effect from financial sophistication on wealth accumulation. This effect of financial

sophistication on accumulated savings is robust across different specifications and continues to hold if we control for many other wealth determinants.

We have highlighted evidence of two important channels that are likely to contribute to this relation which is the fact that financially literate persons are more likely to invest in stocks and have a higher propensity to plan for retirement. We argue that this is the result of financial sophistication lowering the costs of collecting and processing information, and reducing planning costs. Thereby it facilitates the execution of financial decisions and brings down economic and psychological thresholds for participating in the stock market or calculating retirement savings needs and developing retirement plans subsequently. In addition, we have illustrated that the economic effects of changes in financial sophistication are likely to be substantial. Our estimates suggest that even small difference in financial sophistication are likely to be responsible for substantial differences in wealth holdings, but this figure easily extends to over €80000 for larger differences in financial sophistication (comparing the expected net worth difference associated with the 75<sup>th</sup> and 25<sup>th</sup> percentile of the empirical financial literacy distribution).

Our study is complementary to the studies by Bernheim, Garret and Maki (2001), and Bernheim and Garrett (2003) who have shown that financial education in the US (either at high school or via seminars at the work place) exert a positive impact on savings, but could not identify whether this effect runs via its influence on tastes for saving, via the provision of information and the supply of commitment devices, through a broad improvement in financial literacy and reduction of financial mistakes or works mainly via peer effects. The latter might be the case if at least some participants of financial education programs have increased their financial sophistication and neighbors, relatives, colleagues or others benefit via word-of-mouth information or community effects. Our work shows that financial sophistication does directly boost wealth accumulation, but we cannot infer from this result that the effect of financial education programs indeed runs through an increase in financial literacy.<sup>14</sup> For this we need to separate the impact of several financial educating programs on financial ability and knowledge from other channels.

An alternative to financial education could be to consider and stimulate initiatives aiming to simplify complex decisions or to increase the transparency of markets and products. Ironically, firms have less of an incentive to come up with more transparent and simple

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<sup>14</sup> Interestingly, a further analysis shows that peer effects might indeed play an important role in financial behavior especially for those with less financial sophistication as they are more likely to consult friends and relatives as their most important source of information for advice on financial decisions.

products the larger the part of the population with low financial sophistication (Gabaix and Laibson, 2006). The idea is that firms might employ strategies to profit from less sophisticated individuals even if this means that part of these gains are used to subsidize financial sophisticated individuals who make optimal use of selling strategies to attract less sophisticated, more inattentive consumers.

From a policy perspective, the benefits of higher financial sophistication are clear. Our results show that financial sophistication leads to higher net worth levels, boosts the participation in the stock market and increases the propensity to plan for retirement. These effects are very welcome as they all contribute to consumers being well equipped to take individual responsibility for their financial well being over the life cycle. An important issue that is beyond the scope of this paper but certainly warrants more study is how and to what extent financial sophistication can be stimulated and enhanced effectively.

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## **Appendix A. Measuring literacy and confidence**

### *Basic and advanced financial literacy*

The construction of the basic and advanced literacy index is explained in detail in a previous paper (Van Rooij, Lusardi and Alessie, 2007). In short, the basic literacy index follows from a factor analysis based on five simple questions. For each question, we create a binary dummy equal to unity if the respondent provides the correct answer. The five questions measure numeracy and the understanding of economic concepts (related to the working of inflation and interest rates) that are more or less necessary in day-to-day transactions. The index of advanced literacy is based on eleven questions about more advanced concept like the understanding of stocks and bonds, the relation between risk and return and the benefits of diversification. To do justice to the important role of do-not-know answers, we have created two binary dummies for each question, measuring whether the question is answered correctly, and whether the respondent indicated that he did not know the answer, respectively. A factor analysis on these 22 dummies clearly points to one factor that adequately describes the variation in responses. The procedure employed takes into account the fact that we have used minor variations in wording for three out of eleven questions to test the sensitivity of responses to these variations.

### *Overconfidence and underconfidence*

At the beginning of our survey, we ask respondents to assess their own literacy. Table A1 reports the exact wording of the question and the distribution of the responses. We have grouped the bottom three categories and the top two categories from the 7-points response scale to retrieve four categories with about equal size. We also divide the basic literacy index based on five simple economic questions over four different groups and thereby try to mimic the size of the groups of the self-reported literacy groups. This provides us with a relative ranking of self-reported literacy and one for measured basic literacy. Those respondents that rank themselves higher than the rank we obtain for the basic literacy score are labeled overconfident and those who are modest about their financial skills compared to the actual measure of basic literacy are labeled underconfident. Both variables are binary dummies taking the value unity if the respondent is overconfident or underconfident, respectively, and zero otherwise. This way, we end up with 404 overconfident respondents, 599 underconfident respondents, 464 respondents with an equal ranking for actual and self-reported literacy, and 41 respondents with missing information because they did not answer the self-assessed literacy question. The fact that we obtain more relatively underconfident than overconfident persons is related to the fact that we are not able to match the group sizes exactly, since the top category for basic literacy is relatively large, containing the 677 respondents (out of 1508) who answer all five questions correctly.

**Table A1 Self-assessed literacy**  
 Number and percentage of respondents

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How would you assess your understanding of economics (on a 7-points scale; 1 means very low and 7 means very high)?

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	N	%
1 (very low)	9	0.60
2	56	3.71
3	137	9.08
4	366	24.27
5	499	33.09
6	355	23.54
7 (very high)	45	2.98
Do not know	31	2.06
Refusal	10	0.66
<b>Total</b>	<b>1508</b>	<b>100.00</b>

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## Appendix B. Wording of questions and construction of variables used in empirical work

This appendix provides information on important variables used in the regression analysis. The squared brackets in the retirement planning questions indicate the different wording used depending on the marital status of the respondent and depending on whether the respondent is retired or not.

### Risk aversion

To what extent do you agree or disagree with the statement ‘*Investing in stocks is something I don’t do, since it is too risky*’ (on a scale from 1 to 7, where 1 means ‘completely disagree’ and 7 means ‘completely agree’)?

<i>Completely disagree</i>						<i>Completely agree</i>
<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7

This provides us with a measure of risk aversion. The reference group in the empirical work consists of those respondents who disagree completely (category 1).

### Economics education

How much of your education was devoted to economics?

- A lot
- Some
- Little
- Hardly at all
- Do not know
- Refusal

The instrument variable *economics education in the past* is used in the regression analysis by including four dummy variables for the response categories ‘some’, ‘little’, ‘hardly at all,’ and ‘do not know/refusal’ respectively. The reference group consists of those respondents whose education was devoted ‘a lot’ to economics.

### Taste for saving

Some people spend all their income immediately. Others save some money in order to have something to fall back on. Please indicate what you do with money that is left over after having paid for food, rent, and other necessities (on a scale from 1 to 7, where 1 means ‘I like to spend all my money immediately’ and 7 means ‘I want to save as much as possible’)?

<i>I like to spend all my money immediately</i>							<i>I want to save as much as possible</i>
<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	

The measure of *taste for saving* used in the regression analysis is constructed by grouping together the two lowest categories (very few respondents have chosen the lowest level), recoding the remaining six levels of *taste for saving* from 1 (quite low) to 6 (very high). The reference group in the empirical work consists of those respondents who like to spend all their money immediately (category 1).

### **Time preference**

People use different time horizons when they decide about what part of the income to spend, and what part to save. Which of the time horizons mentioned below is in your household MOST important with regard to planning expenditures and savings?

- The next couple of months
- The next year
- The next couple of years
- The next 5 to 10 years
- More than 10 years from now

The reference group in the empirical work consists of those respondents who state that the most important time horizon is shortest, i.e. the next couple of months (category 1).

### **Self-control**

Do you find it difficult to control your expenditures? Please indicate how difficult you find this (on a scale from 1 to 7, where 1 means 'very easy' and 7 means 'very difficult')?

- |                            |                            |                            |                            |                            |                            |                            |                       |
|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|-----------------------|
| <i>Very easy</i>           |                            |                            |                            |                            |                            |                            | <i>Very difficult</i> |
| <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 | <input type="checkbox"/> 6 | <input type="checkbox"/> 7 |                       |

The measure of *self-control* used in the regression analysis is constructed by grouping together the two highest categories (very few respondents have chosen the highest level), recoding the remaining six levels of self-control from 1 (very easy) to 6 (quite difficult). The reference group in the empirical work consists of those respondents who find it very easy to control their expenditures (category 1).

### **Bequest motive**

Please indicate which of the following four statements about parents leaving a bequest to their children would be closest to your own opinion about this?

- If our children would take good care of us when we get old, we would like to leave them a considerable bequest
- We would like to leave our children a considerable bequest, irrespective of the way they will take care of us when we are old
- We have no preconceived plans about leaving a bequest to our children
- We don't intend to leave a bequest to our children
- None of the above-mentioned statements

### Carefulness

To what extent do you agree or disagree with the statement '*I would describe myself as a careful person*' (on a scale from 1 to 7, where 1 means 'completely disagree' and 7 means 'completely agree')?

- Completely disagree* *Completely agree*  
 1    2    3    4    5    6    7  
 Do not know  
 Refusal

The measure of *carefulness* used in the regression analysis is constructed by grouping together the two lowest categories (very few respondents have chosen the lowest category), recoding the remaining six levels of carefulness from 1 (quite low) to 6 (very high). The few respondents that have chosen 'do not know' are added to the last category. The reference group in the empirical work consists of those respondents who strongly disagree with the statement that they are careful person (category 1).

### Precaution

To what extent do you agree or disagree with the statement 'When there is possible danger, I take many precautions' (on a scale from 1 to 7, where 1 means 'completely disagree' and 7 means 'completely agree')?

- Completely disagree* *Completely agree*  
 1    2    3    4    5    6    7  
 Do not know  
 Refusal

The measure of *precaution* used in the regression analysis is constructed by grouping together the two lowest categories (very few respondents have chosen the lowest category), recoding the remaining six levels of precaution from 1 (quite low) to 6 (very high). The few respondents that have chosen 'do not know' are added to the last category. The reference group in the empirical work consists of those respondents who strongly disagree with the statement that they take many precautions (category 1).

### Thinking about retirement

How much have you thought about retirement?

- A lot  
 Some  
 Little  
 Hardly at all  
 Do not know  
 Refusal

In the regression analysis, we use a dummy which takes the value 1 if respondents have thought 'a lot' or 'some' about retirement, and 0 otherwise.

### **Simple planning**

[Have you [or your husband/wife/partner] ever tried\Did you [or your husband/wife/partner] try] to figure out how much your household would need to save yourself for [retirement?/ before you retired?]

- Yes
- No
- Do not know
- Refusal

In the regression analysis, we use a dummy which takes the value 1 if respondents answered affirmatively and 0 otherwise.

### **Serious planning**

[Have you\Did you] [or your husband/wife/partner] develop(ed) a plan for retirement saving?

- Yes
- More or Less
- No
- Do not know
- Refusal

In the regression analysis, we use a dummy which takes the value 1 if respondents answered affirmatively and 0 otherwise.

### **Successful planning**

How often [have you [and your husband/wife/partner] been\were you [and your husband/wife/partner]] able to stick to this plan: would you say always, mostly, rarely, or never?

- Always
- Mostly
- Rarely
- Never
- Do not know
- Refusal

In the regression analysis, we use a dummy which takes the value 1 if respondents answered affirmatively and 0 otherwise

### **Self-assessed literacy**

How would you assess your understanding of economics (on a 7-points scale; 1 means very low and 7 means very high)?

- Very low* *Very high*
- 1    2    3    4    5    6    7
- Do not know
- Refusal

The index of *self-assessed literacy* used in the regression analysis is constructed by grouping together the two lowest categories (very few respondents have chosen the lowest level), recoding the remaining six levels of self-assessed literacy from 1 to 6 and excluding 'do not know' answers and 'refusals.'





**PAPER FOUR**

**CHOICE OR NO CHOICE:  
WHAT EXPLAINS THE ATTRACTIVENESS OF DEFAULT OPTIONS?**

**(Co-author: Federica Teppa)**



## **Choice or No Choice: What Explains the Attractiveness of Default Options?**

Maarten van Rooij (De Nederlandsche Bank and Netspar)  
Federica Teppa (De Nederlandsche Bank and Netspar)\*

November 2008

### **Abstract**

The default option in individual decision making has proved to be a major attractor in a large number of situations. Yet, direct empirical evidence on the reasons for the importance of the default is still lacking. We have devised a new module for the Dutch DNB Household Survey and the US RAND American Life Panel to identify potential explanations for default choices and to provide empirical evidence on their relative importance for retirement savings, organ donation, voting, having a will, and no-consent decisions in marketing. The use of survey data allows us to study the behavior of the entire population and to control for a rich set of personal characteristics, as well as for labor market status, income, and wealth. Our findings confirm that the default option plays a pivotal role in individual decision making in the Netherlands as well as in the US. Moreover, choice behavior seems to be driven by different reasons across different situations in both countries, with a particularly strong role for procrastination and financial illiteracy. In addition, we find an important role for social norms and peer effects explaining the deviation from default options in the Dutch data.

**Key words:** Default Choices, Individual Decision Making, Procrastination, Inertia, Financial Literacy, Endorsement, Trust, Conformity, Status Quo Bias

**JEL Classification:** D12, D80, C90

\* Maarten C.J. van Rooij, Economics & Research Division, De Nederlandsche Bank, P.O. Box 98, 1000 AB, Amsterdam ([M.C.J.van.Rooij@dnb.nl](mailto:M.C.J.van.Rooij@dnb.nl)), and Federica Teppa, Economics & Research Division, De Nederlandsche Bank, P.O. Box 98, 1000 AB, Amsterdam ([F.Teppa@dnb.nl](mailto:F.Teppa@dnb.nl)). We are grateful to Rob Alessie, Marcello Bofondi, Lans Bovenberg, Stefan Hochguertel, Lex Hoogduin, Clemens Kool, Peter Kooreman, David Laibson, Theo Nijman, Peter Schotman, Paul Sengmüller, Robert Slonim, Peter van Els, Raymond van Es, Nathanaël Vellekoop, Peter Vlaar and participants in the Netspar Conference on the Micro-economics of Ageing (Utrecht, November 2006), the French Economic Association Conference on Behavioral Economics and Experiments (Lyon, May 2007), the CEPR/Netspar European Challenges Conference (Zurich, October 2007), the Netspar Pension Day (Tilburg, October 2007), the 10<sup>th</sup> Annual DNB Research Conference on Behavioral Economics: Challenges to Policy Makers and Financial Institutions (Amsterdam, November 2007) and the Netspar Pension Workshop 'Aging Insured' (Utrecht, January 2008) for helpful suggestions and comments. A special thank goes to Arie Kapteyn and Arthur van Soest, for their comments and suggestions to improve upon the questionnaire and their help in using the RAND American Life Panel to collect US data. We thank Jeffrey Dominitz, Sandy Chien and Bas Weerman for their work in implementing the questionnaire in the US. We are also grateful to the staff of CentERdata, and in particular, Corrie Vis for their assistance in setting up the survey and the Dutch field work. The views expressed in this paper are those of the authors and do not necessarily reflect those of the institutions they belong to. Any remaining errors are our own responsibility.

## 1. Introduction

The role of default options in individual decision making is well documented in the empirical and experimental literature. The polarization at the default is a persistent finding not only in economics (e.g. pension savings, insurance), but also in other domains like organ donation, phone marketing, and Internet privacy policies. These findings contradict the predictions of neoclassical economics, as standard choice theory dictates that the framing of choice problems, in particular the selection of one of the alternatives as the default, should be irrelevant. As long as transaction or switching costs are small and preferences are well-defined, the consumer will pick the option that maximizes her utility, irrespective of the design of the choice problem.

The literature is less clear-cut on the reasons behind the attractiveness of default options. Why is it that individuals are so much attracted to the default? Is there one obvious reason or do different motivations play a role in different situations? Many potential explanations have been suggested including inertia, procrastination, the interpretation of defaults as endorsements, as well as choice overload and the complexity of choice problems. Despite the great deal of attention devoted to the topic, a comparative study on the role of the default in different settings seems to be missing. Nevertheless, these are important questions. As an example, from a public policy perspective, it is relevant to know whether nonparticipation in retirement plans or donor registration is a deliberate choice, and - if not - whether it is the consequence of a lack of knowledge rather than of procrastination.

To answer these questions, we have designed a specific module for both the DNB Household Survey in the Netherlands and the RAND American Life Panel in the US to elicit information on personal traits and choices made in several situations with a default option. The default is defined as the situation that occurs if an individual does not take any action. In our empirical analysis, we take into account that this situation can be either the outcome of an active decision process or a deferral choice, i.e. the result of not choosing or not taking any action. We consider several choice domains including retirement savings, organ donation, having a will, voting participation and no-consent decisions about phone and leaflet commercial marketing. We provide empirical evidence on the relation between individual choices and personal traits and background characteristics. To what extent respondents are exposed to behavioral attitudes is identified by factors extracted from a principal component analysis on a set of statements about individual behavior.

This paper contributes to the literature in a number of ways. First, it compares the role of the default option across several domains. Second, it provides empirical evidence on the

relative importance of potential explanations for default choices. Third, the analysis is based on survey data. Existing studies use either administrative data or field and laboratory experiments with limited background information on the participants (see e.g. Madrian and Shea, 2001, or Dhar, 1997). The intrinsic nature of such data sources prevents from quantitatively testing the relevance of any of the potential reasons listed above. Moreover, the use of survey data delivers a rather complete picture of default behavior, as the interviewed people belong to the entire population distribution rather than to a particular sub-sample (typically students or employees at selected firms). Fourth, the use of comparable Dutch and US data enables a cross-country comparison.

Our main conclusions are the following. The default option plays an important role in many situations. Individual choices are driven by different determinants across domains, but overall procrastination and financial illiteracy appear to be the most prevailing explanations for default choices. This is true in the Netherlands as well as in the US, despite differences in tradition, culture and institutions. In addition, we find that endorsement or community effects play an important role in the Dutch data; individuals giving above average weight to the opinion of others more often take decisions that are commonly viewed as being part of good citizenship, as in the case of voting or the registration for organ donation.

These findings have important policy implications. Despite the standard theoretical predictions, the default option turns out to be relevant for individual decision making. Thus, policy makers need to be careful in framing choice situations as their design is not neutral. Moreover, since the role of default is not driven by a unique determinant, the optimal design of defaults should take this into account. On one hand, when agents stick to the default because of procrastination, they may be better off with a design defaulting them into the option that is the most appropriate for them. On the other hand, when agents do not choose because of the complexity of the choice problem, education and information might be more welfare improving, especially when individual preferences are heterogeneous (e.g. in the case of pension savings). At the same time, increasing the simplicity of choice situations facilitates active decision making.

The paper is organized as follows: In Section 2, we provide a review of the literature on the role of default options in individual decision-making and potential explanations for their attractiveness. In Section 3, we describe the data used in the empirical analysis for the Netherlands, including the identification and validation of personal traits. In Section 4, we report the descriptive statistics for choice behavior in situations with a no-action default. In Section 5, we analyze the default choices and relate them to individual traits. In Section 6, we

replicate the empirical analysis with US data from the RAND American Life Panel. In Section 7, we discuss the empirical results. In Section 8, we conclude with some final remarks.

## **2. Literature**

A rapidly growing literature (largely focused on the US) points out that, when taking decisions, individuals rely on default options heavily. There are many event studies in marketing research documenting the impact of framing on consumer decisions. Johnson, Bellman and Lohse (2002) for example show that the default is relevant for Internet privacy policies. Examining online permission for the addition to e-mail distribution lists for future contacts, they find significant differences between opt-in and opt-out frames. Johnson, Hershey, Meszaros and Kunreuther (1993) document the consequences of alternative choice designs for car insurance by exploiting the variation in US state legislation. In Pennsylvania by default insurance plans include the full right to sue for any auto-related injury with the option to forego the full right in exchange for lower insurance premiums. In New Jersey car drivers acquire a restricted right to sue unless they actively choose otherwise. Differences in participation rates between the opt-out and the opt-in states were huge: 75 versus 20 percent, even though the full right insurance option is not costless at all.

The design of organ donor registration might literally bring about differences between life and death for those waiting for an organ donor transplant. Countries where everyone is defaulted into organ donation unless he registers his unwillingness to be one have much more potential organ donors than countries where nobody is a donor unless he explicitly signs a consent statement. The effective consent rates range from well below half of the population in the explicit consent countries to over 80 percent (and often close to 100 percent) in the presumed consent countries (Johnson and Goldstein, 2003). Moreover, after controlling for other determinants, actual donation rates as well appear to be considerably higher in countries where citizens are defaulted into organ donation (Abadie and Gay, 2004).

Another influential area of research on the effect of default choices focuses on life cycle savings behavior, especially in retirement plans. Madrian and Shea (2001) have documented convincing evidence of a strong influence of plan design on savings choices. They evaluate the consequences of default in a large US company in the health sector that changed their opt-in 401(k) plan into an opt-out design. This change provides a sort of natural experiment with new employees being enrolled automatically in a retirement savings plan with a fixed contribution rate invested in a default money market fund, unless they explicitly

state other preferences for participation, contribution or portfolio investment. Prior to the change, new employees were free to decide upon all these features of the retirement plan, but only after an active decision to join. Instant participation rates rose significantly from 37 to 86 percent, with the vast majority contributing the default premium rate and investing all money in the standard fund. Choi, Laibson, Madrian and Metrick (2004) extend the analysis to a longer time horizon and find that the enrolment gap is still substantial after four years. Both studies show that automatic enrolment is particularly successful raising the participation rate of lower-pay employees. This suggests that default behavior and the sensitivity to framing in choice situations might be related to personal characteristics.

The empirical evidence on the role of default in pension choices extends to other countries than the US. Cronqvist and Thaler (2004) document investment behavior in Sweden, where after a pension reform in 1999 employees had to decide how to invest part of their pension premiums in private social security accounts ('Premium Pension Funds'). One third of the participants chose the default allocation despite the government urging them not to do so. The proportion of default choices rose to 93 percent three years later, after the government stopped its campaign. This illustrates that there might be an important role for information, advertising and publicity campaigns surrounding choice occasions.

Bütler and Teppa (2007) show that default choices are relevant not only for pension wealth accumulation but also for the decumulation phase. Some company pension funds in Switzerland pay out the accrued employer pension savings as a lump sum upon retirement; other funds transfer the total capital into a lifetime annuity. While both types of companies offer the possibility to opt out the standard situation, Swiss pension fund participants massively take the default option of their pension fund for granted.

The evidence on the reasons behind the attractiveness of default options is less univocal. Samuelson and Zeckhauser (1988) introduce the term 'status quo bias' to describe the tendency for individuals to stick either to their original choices or to the current situation. The basic idea is that this preference is driven by loss aversion, i.e. individuals weigh losses more strongly than profits (Kahneman and Tversky, 1979), and the fact that the status quo serves as a reference point for their loss evaluation. Ritov and Baron (1992) claim that individuals prefer inaction above action, regardless whether the status-quo is maintained or not. This type of inertia is supported by Kahneman and Tversky (1982) and Landman (1987) who document evidence of individuals regretting an unfortunate situation more if it is the result of an active decision than if it happens because the person did not make an active choice.

More recently, a number of studies have highlighted the relevance of procrastination due to a lack of self-control, i.e. the tendency of people to postpone unpleasant tasks because of a bias for immediate gratification. The underlying concept is that of individuals discounting time inconsistently: their short term discount rate is smaller than the discount rate used for decisions in the far future. One example of time inconsistent discounting is hyperbolic discounting (Laibson, 1997), but it extends to broader classes of time preferences (O'Donoghue and Rabin, 1999a, 2001).<sup>1</sup>

O'Donoghue and Rabin (2001) show that not only naïve but also more sophisticated individuals might suffer from procrastination. Their model illustrates that providing non-procrastinators with additional choices might induce procrastination in important tasks and that the welfare costs of such behavior might be huge as in the case of insufficient pension savings.<sup>2</sup> The intuition is that individuals want to put effort in collecting information and thinking about choices with major implications. Important choices as those related to participating in a retirement savings plan thus require substantial short-term effort and costs which might invoke procrastination in the optimistic view that this decision will be tackled in the near future. This suggests that there is an additional role for complexity in relation to cognitive ability in determining the attractiveness of default options.<sup>3</sup> A high level of financial sophistication for example reduces the costs of important financial choices and illiterate individuals might show a higher aversion to taking these decisions. Indeed, Agnew and Szykman (2005) provide experimental evidence of financially illiterate participants being more likely to choose the default in complicated exercises.

The importance of financial literacy and advice-seeking also suggests that especially individuals who are careful or take many precautions face high costs in making important decisions as they are inclined to search for many sources of information and advice and think at least twice before entering a new situation. The study by Kapteyn and Teppa (2002) provides empirical evidence of the relevance of these attitudes for portfolio choices.

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<sup>1</sup> The idea of time-inconsistent discounting is not new however and goes back to the work of Strotz (1956), Phelps and Pollak (1968), Pollak (1968), and Akerlof (1991).

<sup>2</sup> See O'Donoghue and Rabin (1999b) for an extensive discussion on how procrastination might have huge economic costs in terms of retirement savings.

<sup>3</sup> Tversky and Shafir (1992) also show that when choices are difficult, i.e. when there is not one dominating alternative, it might be optimal to postpone the decision or alternatively go along with the default option to gather more information or search for alternatives. There is also experimental evidence that while basic choice theory suggests that increasing the number of choice options is always goods since the additional options may contain better alternatives, it in fact may prove to be demotivating and create dissatisfaction (Iyengar and Lepper, 2000). Indeed, empirical studies on asset allocation decisions provide examples of choice overload and participants looking for simplicity (see e.g. Iyengar and Kamenica, 2008, or Huberman and Jiang, 2006).



Another important motivation for the importance of default options is that the default is seen as an advice or endorsement (Madrian and Shea, 2001; Beshears, Choi, Laibson and Madrian, 2007). Individuals who are more sensitive to advice or in general relying more on advice might also be inclined to go along with the default option. In case of 401(k) savings plans the employer might be convinced that his employer wants the best for him, while in fact also other arguments could play a role (e.g. pension costs or liability issues). Similarly, experimental evidence confirms that people might perceive the way organ donation is organized as a reflection of the policymakers' preferences and the urge to participate (McKenzie, Liersch and Finkelstein, 2006).

All these potential explanations for the attractiveness of default options are not mutually exclusive but emphasize several aspects of choice behavior from a different perspective (Beshears, Choi, Laibson and Madrian, 2007). In the next section, we identify to what extent individuals are exposed to these types of behavior, i.e. we measure personal traits which - compared to for example age, gender, and education - are less easily observed.

### **3. Data**

We have collected information on individual choices in several situations with a default option from the households participating in the DNB Household Survey (DHS). The DHS, formerly known as the CentER Savings Survey, is an annual survey of about 2000 households in the Netherlands that started in 1993. In principle all household members aged 16 years and older are allowed to participate. The panel is run at Tilburg University by CentERdata.<sup>4</sup> In case of attrition, CentERdata recruits new participants to maintain the panel size and to keep the panel representative on a number of relevant background characteristics such as age, gender, income, education, and region of residence. The DHS dataset further contains detailed information on employment status, pension arrangements, accommodation, wealth, as well as health status and psychological concepts. The dataset thus provides the opportunity to combine both economic and psychological aspects of financial behavior.

The module we have devised on default behavior was fielded in the weekend of June 2-6, 2006. Out of the 2467 panel members contacted, 1648 completed the questionnaire, corresponding to a response rate of 66.8 percent. By merging our data with the annual DHS survey, we are able to exploit the rich aforementioned information set. The age of the respondents in our sample ranges from 16 to 91 years (mean age is 48.5); men and women are

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<sup>4</sup> More information on CentERdata, the CentERpanel and the DHS is available at their website (<http://www.uvt.nl/centerdata/dhs>).

equally represented (men account for 52.6 percent). As for household composition, 71.1 percent of the respondents are married or living with a partner, the others are single heads of the household (22.9 percent) or children living with (one of) their parents (6.0 percent). Two out of three respondents have children themselves. About one third of the respondents have a college education (which includes vocational training in addition to university degrees), about one third have an intermediate education level (secondary pre-university and intermediate vocational), and about a third have a lower education level (primary and preparatory intermediate vocational training). Overall, 19.6 percent of respondents are retired (including early retirees), 49.5 percent are employees, and 3.7 percent are self-employed. The remainder of the sample consists of individuals who are not retired and not working, including those who are disabled or unemployed and those who follow an education program or take care of the housekeeping.

### **3.1 Elicitation of individual traits**

A novelty of this paper is that we link default choices to personal traits which are not directly observable. We present the interviewees 17 statements on personal attitudes and choices in real life situations that reveal information on individual traits that are expected to be relevant for default behavior. The respondents are asked to indicate to what extent they agree with each of the statements on a scale from 1 ('totally disagree') to 7 ('totally agree'), and they have the possibility to indicate that they 'do not know' or 'refuse to answer'. The statements have been presented in a random order to prevent any ordering effects in response patterns.

Table A1 in appendix A reports the wording of these questions and the responses. There are questions on whether and how people collect advice (Q1-Q3), the importance of advice for their decisions (Q4-Q5), the role of the opinion of other people (Q6-Q9), whether the interviewees tend to postpone tasks or decisions (Q10-Q12), whether they have a preference for the status quo or no-change situation (Q13-Q14), as well as on carefulness and precaution (Q15-Q16). In addition, we included a statement on financial literacy (Q17).<sup>5</sup>

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<sup>5</sup> Instead of inserting many different questions to measure financial knowledge and ability, we have included one question on self-assessed literacy that has proved to be a good proxy for more advanced measures of financial sophistication (Van Rooij, Lusardi and Alessie, 2007). In addition, the self-assessment of financial literacy might be more relevant for the respondents' inclination to deviate from a default.

Response patterns reveal a high degree of heterogeneity among respondents. The number of refusals and do not knows is limited.<sup>6</sup>

To summarize the information from the responses to the statements, we run a principal component analysis for the 1509 respondents who provided an answer to the full set of questions, i.e. we do not include respondents who filled in one or more ‘do not knows’ or ‘refusals’. It appears that the variation in the responses can be adequately captured by five factors.<sup>7</sup> Factor loadings measure to what extent each factor is correlated with the responses to the original statements. For each statement we identify the factor with the highest correlation (reported in Table A2 in appendix A). Reviewing these statements provides us with a meaningful interpretation of the factors.<sup>8</sup> The first factor is clearly related to the three statements on *procrastination*. We label the second factor as *trust* as it measures to what extent respondents gather and trust advice from family and friends.<sup>9</sup> The third factor measures *inertia* as it is related to the intensity in which people adhere to the status quo, possibly because they want to carefully consider the alternatives before taking action. The fourth factor measures to what extent people feel *endorsed* by others as it scores high on the statements related to how important it is what other people say. The last factor measures self-assessed *financial literacy* and the unwillingness to leave important decisions to somebody else.<sup>10</sup> Based on the clustering in Table A2, we perform a principal component analysis on each group of questions and extract principal component factors.<sup>11</sup>

### 3.2 Validation of individual traits

Table 1 reports the results of OLS regressions of the five factors on directly observable information. Besides gender, age, education, and household composition, we include a dummy for home ownership and quartile dummies for private household financial assets

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<sup>6</sup> We have experimented with additional statements, in particular on regret aversion. However, the number of ‘do not know’ and ‘refusal’ answers signaled that either the respondents did not have a strong opinion on these issues or that these questions were not fully clear to them. Therefore, we decided to exclude these additional statements from our analysis.

<sup>7</sup> We retain factors with an eigenvalue that exceeds 1, i.e. those factors which explain a more than proportional part of the variation in responses.

<sup>8</sup> The five factors are listed in order of relevance starting with the most important one, i.e. the one with the highest contribution to explaining the variance in response patterns of the original 17 statements. The cumulative proportion of variance that is explained by the five factors amounts to 53 percent.

<sup>9</sup> The important role of trust or distrust in financial decision-making is highlighted by Guiso, Sapienza, and Zingales (2008), and Agnew, Szykman, Utkus and Young (2007).

<sup>10</sup> This implies that the financial literacy factor extracted here does not have exactly the same meaning as in the other papers collected in this thesis. Nevertheless, we use this label to emphasize that it is the most important determinant of this factor.

<sup>11</sup> One of the endorsement questions also loads on procrastination. We group it together with the endorsement questions as it appeals more strongly to this personal trait.

(bank and savings accounts and investments in stocks, bonds and mutual funds) and gross personal income.<sup>12</sup> This serves as a basic test for the validity of the identified personal traits and provides additional information on whether they are not simply proxies for or closely related to e.g. age or financial well-being.

Procrastination appears to be more prevalent among men and younger persons and, surprisingly, the self-employed. Women, young respondents, those with children and couples show more trust in the advice of other persons. Inertial behavior is more common among the elderly and those with larger financial assets, i.e. we expect that these groups have a higher likelihood of sticking to the current situation perhaps as a result of the wish to rethink changes carefully before taking any action at all. Inertial behavior is less common for the highly educated respondents and the self-employed. Apparently, for these groups any wish to carefully consider alternatives is not a threshold for taking actions. Those with more schooling might perceive lower costs in processing information necessary for comparing alternatives and the self-employed are used to take many decisions. Endorsement is negatively related to age; thus older cohorts seem less sensitive to the opinion of other people. Financial literacy correlates strongly with gender, education, and financial well-being (income and home ownership). Overall, the correlations found for the five personal traits we have identified seem plausible and thereby underscore the interpretation given to the factors.

The ultimate validation of the individual traits lies in the association with factual behavior. Panel members of the DNB Household Survey were given the chance to log in to the survey website and fill in the questionnaire between Friday afternoon (5 pm) and Tuesday midnight. CentERdata records the starting time and the duration of the interview. This provides us with the opportunity to test whether actual response behavior is related to our proxies for attitude.<sup>13</sup> In particular, one could expect that those panel members who are more inclined to procrastinate are also postponing the participation in the interview. We have ranked the respondents according to their starting time and calculated the correlation with our measure of procrastination. Indeed, our hypothesis is confirmed. The correlation is positive (i.e. late participants in the survey are also those who procrastinate more) and strongly significant.

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<sup>12</sup> For children living with their parents, we assume that their level of financial assets belongs to the bottom quartile. The regressions correlating the personal traits to background characteristics are based upon 1422 instead of 1509 observations because we lose some observations due to process of merging our survey with wealth and income information from other DHS modules.

<sup>13</sup> We are indebted to Robert Slonim for this suggestion.

**Table 1. Personal traits and individual background characteristics in the Netherlands**

	Procrastination	Trust	Inertia	Endorsement	Financial literacy
Male	0.33*** (5.37)	-0.36*** (5.92)	-0.083 (1.35)	-0.057 (0.92)	0.18*** (2.76)
Age dummy (36-50)	-0.18** (2.34)	-0.43*** (6.34)	0.21*** (2.76)	-0.11 (1.42)	-0.025 (0.33)
Age dummy (51-65)	-0.28*** (3.21)	-0.56*** (7.24)	0.33*** (3.87)	-0.31*** (3.58)	0.079 (0.98)
Age dummy (>65)	-0.43*** (3.32)	-0.68*** (5.29)	0.62*** (5.07)	-0.31** (2.40)	-0.066 (0.55)
Intermediate education	0.016 (0.24)	0.024 (0.38)	-0.21*** (3.33)	-0.084 (1.18)	0.21*** (3.03)
College education	-0.070 (0.98)	0.053 (0.77)	-0.32*** (4.93)	-0.022 (0.30)	0.21*** (3.00)
Employed	0.10 (1.16)	-0.092 (1.07)	-0.15* (1.82)	0.043 (0.48)	-0.10 (1.20)
Self-employed	0.32** (2.20)	0.005 (0.04)	-0.30* (1.88)	-0.091 (0.67)	-0.21 (1.34)
Retired	0.007 (0.07)	-0.036 (0.33)	-0.066 (0.65)	0.038 (0.36)	0.038 (0.34)
Married	-0.066 (0.88)	0.20*** (2.75)	-0.062 (0.79)	0.007 (0.09)	-0.036 (0.51)
Has children	-0.087 (1.17)	0.21*** (2.86)	0.022 (0.31)	-0.043 (0.57)	-0.033 (0.47)
Homeowner	0.041 (0.60)	-0.018 (0.24)	0.046 (0.65)	0.019 (0.26)	0.15** (2.03)
Gross income quartile 2	-0.13 (1.50)	0.12 (1.41)	0.076 (0.88)	-0.046 (0.50)	0.28*** (3.04)
Gross income quartile 3	-0.14 (1.39)	0.075 (0.83)	0.033 (0.33)	-0.067 (0.63)	0.36*** (3.36)
Gross income quartile 4	-0.089 (0.76)	-0.005 (0.05)	-0.14 (1.35)	-0.080 (0.72)	0.59*** (5.21)
Financial assets quartile 2	-0.089 (1.11)	0.17** (2.23)	0.23*** (2.90)	0.034 (0.40)	0.018 (0.23)
Financial assets quartile 3	-0.096 (1.18)	0.11 (1.34)	0.40*** (4.98)	0.12 (1.42)	-0.045 (0.56)
Financial assets quartile 4	-0.16* (1.90)	0.10 (1.19)	0.38*** (4.82)	0.11 (1.25)	-0.027 (0.32)
Constant	0.24** (2.45)	0.20** (2.30)	-0.19* (1.90)	0.21** (2.15)	-0.53*** (5.22)
Observations	1422	1422	1422	1422	1422
R-squared	0.07	0.11	0.14	0.02	0.10
p-value test age = 0	0.00	0.00	0.00	0.00	0.26
p-value test education = 0	0.40	0.74	0.00	0.44	0.00
p-value test income = 0	0.38	0.28	0.025	0.91	0.00
p-value test finan. assets = 0	0.30	0.17	0.00	0.41	0.85

Note: OLS estimation results; Standard errors are clustered at the household level: absolute value of robust t-statistics in parentheses; \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The dependent variables are the output of the principal component analysis; The reference group for age contains respondents less than 36 years, for education respondents with low education and for income and wealth respondents in the bottom quartiles.

#### **4. Decisions with a default alternative: empirical evidence**

We explore actual choices in organ donation, voting participation, having a will, consent to receive marketing, cancellation of subscriptions, retirement savings and early retirement arrangements. While some of these domains are generally not thought of as traditional default situations, each of them has a no-action alternative. Especially for voting however there could also be another type of default, i.e. respondents might feel a moral responsibility to vote. In addition, there can be peer pressure, i.e. the social norm in a community might be that one ought to vote. Nevertheless, we can still learn about the relevance of personal traits and attitudes for choice behavior. For example, the effect of procrastination proves to be even more powerful if it induces people not to vote, despite strong moral intentions and peer pressure. The same applies to organ donation.

##### **4.1 Organ donation**

Two systems of organ donation are used worldwide. In an opt-in system, individuals are asked to register their willingness to become a donor. Countries that run the alternative system assume that their citizens consent to organ donation unless they indicate otherwise and explicitly opt out. In the Netherlands the former regime applies: people willing to donate their organs have to record themselves in the donor register.

We have asked our respondents whether they think that in general people ought to be prepared to be an organ donor, whether they are themselves willing to be an organ donor, and whether they actually are organ donors, i.e. whether they are registered in the donor register as being willing to act as organ donor. Table 2A reports the wording of the questions and the responses. A large majority of the respondents (close to 70 percent) agrees that people ought to be prepared to be an organ donor and that they are willing to be organ donors themselves (differences in the responses to both questions are small). Yet, conditioning upon those who are willing to act as organ donors, almost three out of ten persons are not registered. If the government wants to improve upon this number (without changing the default of no-consent), it is important to learn about the reasons why those 27 percent stick to the default.<sup>14</sup>

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<sup>14</sup> While 70 percent of our sample population has a positive attitude towards making their organs available, less than 50 percent (803 out of 1648) is registered as an organ donor. However, the official figure of organ donor registration is at most half of this percentage. This illustrates the fact that individuals participating in surveys are generally more socially involved (see also the discussion in Section 4.2).

**Table 2A. Organ donation in the Netherlands**

	Do you think in general people ought to be prepared to be an organ donor?		Are you willing to be an organ donor?		Are you an organ donor, i.e. are you registered in the donor register as being willing to act as an organ donor?	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	1145	69.5	1121	68.0	803	71.6
<b>No</b>	321	19.5	320	19.4	<b>299</b>	<b>26.7</b>
Refusal	18	1.1	19	1.2	6	0.5
DK	164	10.0	188	11.4	13	1.2
Total	1648	100.0	1648	100.0	1121	100.0

Note: Default option in bold; DK = 'I do not know'.

## 4.2 Voting participation

One of the distinguishing features of a democracy is universal voting: each individual is entitled to participate in local or national elections, conditional on satisfying some legal requirements, like age and nationality or residence. In most countries, including the Netherlands, voting participation is a right and not a legal requirement. Thus, the default (no-action) option in elections is not to vote. Respondents are asked to indicate whether they think that in general everybody ought to vote, and whether they have voted themselves in the most recent national (January 2003), European (June 2004) and local (March 2006) elections, respectively. The reason to consider these three types of elections is that they could reveal different information. Respondents might be more interested in national issues than in discussions at the European level or they might feel more influential in local elections. In addition, the amount and sort of publicity surrounding the different elections and the issues at stake differ substantially.

Nine out of ten respondents indicate that in principle everybody should vote (Table 2B). A large number of them (ranging from 84 to 94 percent) did actually vote at the most recent elections. The group of non-voters is relatively small, particularly in light of the fact that the official statistics report substantially lower voting participation rates (80, 40 and 58 percent for the national, European and local elections, respectively).<sup>15</sup> These findings illustrate that individuals participating in (panel) surveys are generally more socially involved

<sup>15</sup> Even if we use weights to correct for differences in the sample composition and population statistics regarding age, income, gender and education, this discrepancy does not vanish completely, at least not for the European and local elections. Weighted voting participation rates are 84 percent for the national elections, 74 percent for the European elections, and 77 percent for the local elections.

and more attached to the society which might lead to important differences in voting numbers (Voogt and Saris, 2003). Note, however, that any self-selection along the dimension of social involvement, while reducing the number of respondents that stick to the default, does not affect the qualitative relations in our empirical analysis. If anything, as our sample is intrinsically motivated to vote, explanations for sticking to the default instead of voting prove to be really important.

In addition, we also cannot rule out the possibility that part of the discrepancy between voting participation and official statistics relates to incorrect statements, i.e. non voting respondents answering they did vote due to recall bias or social desirability bias. These incorrect statements would show up in our empirical analysis as measurement error in the dependent variable of voting participation regressions. However, insofar as the measurement error is unrelated to the right hand side variables, the slope coefficients are still estimated consistently. Moreover, the self-administered character of an internet panel not requiring contact with an interviewer makes social desirable answers less likely than in personal interviews (Chang and Krosnick, 2003).

**Table 2B. Voting participation in the Netherlands**

	Do you think in general people ought to vote?		Did you vote last time for the <i>national elections</i> ?		Did you vote last time for the <i>European elections</i> ?		Did you vote last time for the <i>local elections</i> ?	
	Freq.	Percent.	Freq.	Percent.	Freq.	Percent.	Freq.	Percent.
Yes	1471	89.3	1378	93.7	1242	84.4	1279	87.0
<b>No</b>	<b>114</b>	<b>6.9</b>	<b>87</b>	<b>5.9</b>	<b>214</b>	<b>14.6</b>	<b>191</b>	<b>13.0</b>
Refusal	5	0.3	0	0.0	0	0.0	1	0.1
DK	58	3.5	6	0.4	15	1.0	0	0.0
Total	1648	100.0	1471	100.0	1471	100.0	1471	100.0

Note: Default option in bold; DK = 'I do not know'.

#### 4.3 Will, commercial leaflets, telemarketing and subscriptions

Table 2C reports choices related to having a will, the consent to receive marketing, and the cancellation of subscriptions. A *will* or testament typically declares the destination of a person's belongings after her death or regulates the custody of children. A notary provides advice, puts up the will and takes care of its execution. Having a will is neither a quick nor a



costless decision and not having a will is clearly the default. According to our data, some 60 percent of the respondents do not have a will.

In the Netherlands, as well as in a many other countries, a lot of companies and other institutions massively send around unaddressed *advertisements* and publicity materials. What is probably typical for the Netherlands is that people who are bothered by these mailings or consider it is a waste of the environment may choose not to receive these commercial leaflets by putting a ‘no/no’ (or a ‘no/yes’) sticker on their mailbox.<sup>16</sup> The stickers are costless. Sometimes they are distributed by local authorities, but they are always easy to order via internet or by calling a special phone number. In addition, many companies and other organizations hire call centers to approach potential customers by phone (often around dinner time) to sell their products (*telemarketing*). As in many countries, it is possible in the Netherlands to register yourself to get rid of these phone calls. Online registration is easy and costless; one phone call or letter is sufficient to enter the register. Table 2C shows that even though many households complain about the high number of superfluous commercial leaflets they receive in their mailbox or annoying phone call during dinner time, only a small proportion has undertaken any action to protect themselves from these marketing efforts. Some 16 percent of the respondents have a sticker on their mailbox, and 12 percent has registered to get rid of phone calls.

**Table 2C. Will, commercial leaflets, telemarketing, subscriptions in the Netherlands**

	Do you have a will?		Do you have a ‘no/yes’ or a ‘no/no’ sticker on your mailbox?		Have you registered yourself in order not to receive telemarketing?		Are you thinking of canceling any subscriptions which are automatically continued?	
	Freq.	Percent.	Freq.	Percent.	Freq.	Percent.	Freq.	Percent.
Yes	637	38.7	261	15.8	192	11.7	136	30.6
<b>No</b>	<b>981</b>	<b>59.5</b>	<b>1349</b>	<b>81.9</b>	<b>1404</b>	<b>85.2</b>	232	67.1
Refusal	9	0.6	6	0.4	6	0.4	0	0.0
DK	21	1.3	32	1.9	46	2.8	10	2.3
Total	1648	100.0	1648	100.0	1648	100.0	378	100.0

Note: Default option in bold; DK = ‘I do not know’.

<sup>16</sup> The ‘no/yes’ sticker tells the mailman that the household living at this specific address does not want to receive commercial leaflets but does like to read the free local papers; the ‘no/no’ sticker stipulates that none of these are welcome.

Virtually all households have contracts or *subscriptions* for a fixed period of time, often a year, which are automatically continued unless they are cancelled in time. Examples include public transport cards, subscriptions to magazines, newspapers, and television-guides, contracts for monthly participation in the lotto, membership of charity organizations, and fitness clubs. Respondents are asked whether they intend to cancel any of them; and, if so, why they have not cancelled these subscriptions yet. About a third of the respondents with subscriptions actually intends to terminate one or more contracts but has not taken any action yet (Table 2C).

#### **4.4 Retirement savings**

The pension system in the Netherlands consists of three pillars: the first pillar is a pay-as-you-go state pension; the second layer consists of fully funded, privately provided pension provisions; the third component is fully voluntary. Employees have hardly any discretion about their first and second pillar arrangements that is if we disregard an indirect influence via voting (potentially affecting the state pension) and via the negotiations of trade unions (potentially affecting the company retirement plan). The state pension is a monthly benefit of about €900 for single persons and the employer contributes part of the salary payments, together with the company matching, to a pension fund that administers the company plan. This way, over 90 percent of the Dutch employees saves compulsorily for their retirement (Van Els, Van Rooij and Schuit, 2007).

The basic retirement choices that are available in the Dutch pension system are whether to set apart additional savings via third pillar retirement savings products, or whether to retire earlier than the regular retirement date. A third of the respondents has taken other arrangements for their pension apart from the standard customary pension of the employer (Table 2D). The others stick to the default, in this case meaning that they did not purchase voluntary, often tax-deductible, pension products.

Until recently, early retirement schemes were often included in the - tax deductible - compulsory second pillar savings scheme. There was a lot of heterogeneity among companies, but within a company the freedom of choice was usually limited. Many companies run a pension scheme with a retirement date before the age of 65 when Dutch citizens start receiving the state pension. As of 2006, these early retirement schemes have become unattractive due to a change in legislation. At the same time, the government introduced a new savings vehicle for employees, the life cycle savings scheme ('levensloopregeling'). Employees are allowed to save up to 12 percent of their gross wage in a tax friendly way to

finance a future period of absence (e.g. early retirement or a sabbatical, parental, long care or educational leave).

The publicity surrounding the introduction of the life cycle savings arrangement emphasized the possible use for early retirement and trade unions and employers often promoted it as the replacement of the existing early retirement schemes. Yet, the default is non-participation. In fact, upon joining the life cycle savings arrangements employees have to end their participation in another popular tax-favored savings plan for employees (the ‘spaarloonregeling’).<sup>17</sup> Differences in tax facilities and many other characteristics complicate the assessment of the relative attractiveness of both arrangements which also very much depends on personal circumstances and preferences. However, if an employee is sure that he wants to retire before the age of 65, it is certainly attractive to join the life cycle arrangement. Yet, while the vast majority of employees plans to retire early, the participation rate in the life cycle savings arrangement is limited to 8 percent (Table 2D). In the following, we will basically interpret the life cycle savings account as an early retirement vehicle, since the majority of participants intends to use this instrument for early retirement and to a lesser extent for parental leave or a sabbatical period (Van Els, Van Rooij and Schuit, 2007).

**Table 2D. Voluntary retirement and life cycle savings in the Netherlands**

	Do you have other arrangements for your pension apart from the standard customary pension you build up through your employer?		Do you participate in a life cycle savings arrangement (‘levensloopregeling’)?	
	Frequency	Percentage	Frequency	Percentage
Yes	543	33.0	71	7.5
<b>No</b>	<b>954</b>	<b>57.9</b>	<b>831</b>	<b>88.0</b>
Refusal	18	1.1	6	0.6
Do not know	133	8.1	36	3.8
Total	1648	100.0	944	100.0

Note: Default option in bold.

#### 4.5 The role of default options

The descriptive tables make clear that the default is a popular choice in many areas of individual decision-making. The default option seems to attract the majority in domains

<sup>17</sup> Currently, employees are allowed to save up to €613 out of their gross income per year without paying income or wealth taxes. After four years, the employee is free to spend these savings. Alessie, Hochguertel and Van Soest (2006) discuss this savings vehicle in more detail.

where the decision requires some additional financial skills (retirement savings) or in situations where the marginal disutility associated to postponing the decision is lower (getting rid of commercial leaflets, subscriptions or telemarketing). This is the case even in a non-economic domain like organ donation where socially involved panel participants can be expected to deviate more often from the default.

In interpreting these findings, one should take into account that the investigated domains are heterogeneous. Organ donation, for example, is a reversible decision, potentially driven by moral or religious convictions. Voting occurs at fixed dates and is an irreversible but recurring action. Having a will is a reversible choice, but involving non negligible costs. Getting rid of commercial leaflets or telemarketing is also a reversible decision, but by far much less costly. Cancellations of periodical subscriptions are subject to deadlines. Finally, voluntary (early) retirement saving is a continuous, dynamic choice, certainly requiring some additional specific financial expertise. Obviously, these different properties might have different implications for the decision making process. Below, we search for an explanation for the variation in individual choices in these heterogeneous situations using the personal traits identified in Section 3.

## **5. What explains the attractiveness of default options?**

The purpose of this study is to investigate the explanation for default behavior, or more precisely to identify the determinants that make a choice more likely only because it is framed as the default option. Therefore, it is important to discriminate between two cases. Sticking to the default option might be either the consequence of a lack of choice or the outcome of an active decision process after careful consideration of the alternatives. Respondents in the latter group would opt for the same option when the choice would be framed differently. The former group is the one we are interested in. To make sure that the regressions reported in this section concentrate on explaining default behavior, we therefore exclude those observations where it is obvious that the default alternative coincides with the preferred choice.

In the case of organ donation and voting we start conditioning our sample on those respondents who are prepared to be an organ donor and those who agree that basically everyone who is eligible ought to vote, respectively. Other selections are based upon the responses to the question why the respondent did not deviate from the default option. In the case of organ donation, this means that we also exclude those respondents who indicate that they are not eligible, have instructed their family what to do, or have not registered because of

skepticism about the organ donation procedures. In studying the relation between individual characteristics and not having a will, we exclude those respondents who have no children and indicate that they do not have a will due to the absence of assets.<sup>18</sup> Investigating the default of not taking action to get rid of commercial leaflets or phone marketing, we disregard the group who states that they find this kind of marketing useful; a group that is quite large in the case of commercial leaflets. In the subscriptions domain, we limit our analysis to those people who have subscriptions and indicate that they are thinking of canceling a subscription but did not do so for other reasons than that they just made this decision and had to respect the terms of cancellation. In analyzing what type of respondents do not have voluntary pension savings, we exclude those who are retired or claim to have other assets making additional pension savings unnecessary. In analyzing the participation in life cycle savings arrangements we consider employees, excluding those who state that it is more attractive to save otherwise.

### **5.1 Personal attitudes and default choices**

We have run probit regressions for each of the choice situations discussed in Section 4 based upon the respondents selected as explained above. The dependent variable takes the value 1 if respondents choose the default option and the value 0 otherwise. Tables 3A and 3B report the results in terms of marginal effects of a probit regression on the personal traits identified in Section 4. A positive sign implies that the higher the degree of the corresponding explanatory variable, the higher the probability of sticking to the default option. In most regressions the personal traits clearly contribute to the explanation of default behavior.<sup>19</sup>

Procrastination and financial literacy seem to matter in many domains (mostly at the 1 percent significance level). The more individuals procrastinate, the higher the probability of not being an organ donor, not voting, not having a will, not canceling subscriptions, and not participating in the life cycle savings plan. The strongest effect is found in the subscription domain: a one unit increase in procrastination<sup>20</sup> reduces the probability of canceling subscriptions by almost 10 percentage points. A similar increase in procrastination reduces the probability of being an organ donor and having a will by approximately 4 percentage points, and the probability of participating in the life cycle plan by 6 percentage points. A

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<sup>18</sup> Admittedly, the selection of respondents who consciously have decided not to have a will is more difficult than in other domains as a will can serve two main purposes regarding financial matters as well as taking care of the custody over young children. The results reported below do not change qualitatively however when the selection is based on financial assets only, irrespective of the presence of kids.

<sup>19</sup> Only in the commercial leaflet regression the joint significance is far from the standard significance thresholds.

<sup>20</sup> The five factors or personal traits are normalized, i.e. all have mean 0 and standard deviation 1.

smaller effect is found for voting behavior: the effect ranges from a 3 percentage points lower probability of voting for the European elections to 1 percentage point for elections for the national Parliament which by far attracts the most publicity and public interest.

**Table 3A. Default choices and personal traits in the Netherlands**

	Organ donation	Voting national	Voting European	Voting local	Will
Procrastination	0.039*** (3.11)	0.014*** (2.86)	0.029*** (2.85)	0.020** (2.12)	0.042*** (2.81)
Trust	-0.014 (1.02)	0.014** (2.55)	-0.009 (0.94)	0.010 (1.17)	0.012 (0.76)
Inertia	0.008 (0.58)	-0.007 (1.37)	-0.007 (0.66)	-0.016* (1.73)	-0.051*** (3.34)
Endorsement	-0.034** (2.45)	-0.018*** (2.90)	-0.012 (1.08)	-0.022** (2.28)	0.018 (1.11)
Financial literacy	-0.022 (1.63)	-0.020*** (3.99)	-0.012 (1.34)	-0.008 (0.84)	-0.054*** (3.56)
Observations	915	1369	1362	1375	1292
Pseudo R-squared	0.02	0.06	0.01	0.02	0.02
p-value test coeff. = 0	0.00	0.00	0.03	0.02	0.00

Note: Marginal effects from probit estimates; Standard errors are clustered at the household level: absolute value of robust z-statistics in parentheses; \* significant at 10%, \*\* significant at 5%, \*\*\* significant at 1%; For each domain (column), the dependent variable takes value 1 if respondents report to stick to the default option, and 0 otherwise.

**Table 3B. Default choices and personal traits in the Netherlands**

	Commercial leaflets	Phone marketing	Subscription	Voluntary pension savings	Life cycle savings
Procrastination	-0.003 (0.16)	-0.005 (0.51)	0.10*** (3.67)	-0.018 (1.00)	0.056** (2.51)
Trust	0.009 (0.47)	0.005 (0.47)	-0.038 (1.50)	0.071*** (3.51)	0.024 (0.95)
Inertia	0.028 (1.31)	0.007 (0.72)	0.026 (0.99)	0.032 (1.61)	-0.007 (0.30)
Endorsement	-0.051** (2.35)	-0.006 (0.70)	0.042 (1.63)	-0.043** (2.20)	-0.041* (1.77)
Financial literacy	-0.006 (0.29)	-0.033*** (3.54)	-0.007 (0.27)	-0.075*** (3.68)	0.003 (0.12)
Observations	639	1463	415	808	302
Pseudo R-squared	0.01	0.01	0.05	0.03	0.03
p-value test coeff. = 0	0.22	0.01	0.00	0.00	0.09

Note: Marginal effects from probit estimates; Standard errors are clustered at the household level: absolute value of robust z-statistics in parentheses; \* significant at 10%, \*\* significant at 5%, \*\*\* significant at 1%; For each domain (column), the dependent variable takes value 1 if respondents report to stick to the default option, and 0 otherwise.

The higher the degree of financial literacy, the higher the probability of voting for national elections, having a will, getting rid of phone marketing, and having additional, voluntary pension savings schemes. The marginal effects are largest for the supplementary retirement savings (8 percentage points), and lowest for voting participation (2 percentage points). Also in the domains where the effect of financial literacy is not significant, more financially literate people tend to deviate from the default. The only exception is the life cycle savings arrangement.<sup>21</sup> There is also an important but unexpected role for the endorsement factor. Our prior was that respondents that score high on this factor could interpret the default option as an endorsement or implicit recommendation from the company on pension savings (in line with the evidence on automatic enrollment plans in the US (Madrian and Shea, 2001)) or from the government on organ donation (McKenzie, Liersch, and Finkelstein, 2006). The implication is that we would expect a positive association with the probability to choose the default option in our regression. Instead, we find that these respondents more often deviate from the default in the organ donation, pension and other domains.

To shed light on this relationship, we go back to the questions determining the endorsement factor. These questions all relate to what other people say, suggesting that this factor could as well measure a community effect, i.e. to what extent the respondent is influenced by what friends, neighbors and colleagues think, say or do. Those who are more sensitive to peer opinion are more likely to deviate from the default when the alternative is commonly thought of as a good deed as is the case in e.g. organ donation and voting. This interpretation is in line with the evidence on the importance of social interactions documented in the literature for participation in retirement plans (Duflo and Saez, 2002, 2003) and the stock market (Hong, Kubik and Stein, 2004; Brown, Ivkovic, Smith and Weisbenner, 2008). It is also consistent with the implications of the theory of conformity by Bernheim (1994) whose model shows how status and social interactions explain individuals behaving conform perceived social norms. The interpretation of the endorsement factor as a measure of peer pressure and conformity explains why some individuals are in a number of situations more likely to deviate from the default option (e.g. organ donation, voting and retirement savings).

The role of trust and inertia seems to be less important for default decisions. Trusting individuals are less likely to enter into additional retirement savings products; they are

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<sup>21</sup> We cannot draw strong conclusions from this as, besides being insignificant, the coefficient follows from a regression based on a relatively low number of observations. This said, it could indicate that literate employees do not assess the life cycle savings arrangement attractive enough e.g. because of the restrictions of these savings plans (tax advantages for example are foregone when the employee changes his mind and does not want to retire early or use the savings account for another period of absence).

apparently confident that the state pension plus the mandatory pension savings will make up an adequate retirement benefit. The fact that inertia is positively related to having a will might well be explained by the role of carefulness. Instead of postponing the decision to take a will as a result of sustained deliberations, careful and precautious persons might be more motivated to take care of survivors in the case of an unfortunate event.

## **5.2 Pooling personal attitudes and individual background characteristics**

In the previous section, we have focused on the relation between personal attitudes and default behavior. Now, we extend the set of control variables with personal background characteristics (gender, age, level of education, job status, household composition, home ownership, gross personal income, and household financial assets). Tables 4A and 4B report the probit regression results. The personal background information contributes significantly to the explanation of the observed choices. This is to be expected as benefits of deviating from the default alternative are often related to background characteristics, e.g. having a will is more likely for households with many real or financial assets.

Compared to the previous estimates, a striking difference is that procrastination is no longer relevant for voting participation. This might be related to the age effect, as age appears to be positively related to the likelihood of voting, whereas Table 1 shows that the elderly procrastinate less. More interestingly, the other coefficients of the personal attitude variables measuring procrastination, financial literacy and the effect of conformity remain by and large unchanged. The level of significance is sometimes reduced, but the total number of observations is also lower due to missing information for individual background variables thereby decreasing the efficiency of the estimates. In addition, the weakening of financial literacy might also be related to the fact that it served as a proxy for income and wealth in previous regressions. Across the board, however, the estimation results confirm that procrastination, financial illiteracy and conformity are important determinants of choice behavior in the Netherlands not only in decisions of relatively minor relevance but also in situations with a potentially huge impact on personal wellbeing (saving for (early) retirement) or the wellbeing of others (having a will, organ donation).

Turning to the background characteristics that appear most relevant for individual choice-making, *gender* significantly affects in particular organ donation, voting behavior (at the national elections), and having a will. Compared with women, men have a 7 percentage points lower probability to have filled in the organ donor registration form, a 3 percentage points lower probability to vote, and a 10 percentage points lower probability to have a will.



**Table 4A. Default choices and personal traits plus background characteristics in the Netherlands**

	Organ donation	Voting national	Voting European	Voting local	Will
Male	0.073** (2.43)	0.031*** (3.44)	0.033 (1.48)	0.031 (1.56)	0.096** (2.44)
Age dummy (36-50)	0.020 (0.50)	-0.017* (1.74)	-0.071*** (2.91)	-0.058*** (2.67)	-0.094* (1.70)
Age dummy (51-65)	0.033 (0.76)	-0.028** (2.38)	-0.12*** (4.22)	-0.078*** (2.99)	-0.14** (2.42)
Age dummy (>65)	0.082 (1.14)	-0.039*** (2.85)	-0.11*** (2.74)	-0.10*** (3.31)	-0.31*** (3.84)
Intermediate education	-0.048 (1.48)	-0.019** (2.10)	-0.039* (1.74)	-0.020 (0.93)	0.023 (0.54)
College education	-0.030 (0.85)	-0.026** (2.19)	-0.072*** (2.86)	-0.052** (2.14)	0.017 (0.40)
Employed	-0.083* (1.80)	-0.008 (0.65)	-0.043 (1.45)	-0.014 (0.52)	0.042 (0.81)
Self-employed	-0.12** (2.19)	0.019 (0.69)	-0.065 (1.33)	0.030 (0.58)	-0.11 (1.22)
Retired	-0.096** (2.08)	0.008 (0.46)	-0.040 (0.93)	0.014 (0.40)	-0.039 (0.63)
Married	0.005 (0.14)	-0.009 (0.82)	-0.012 (0.45)	-0.024 (0.97)	-0.066 (1.34)
Has children	-0.038 (1.06)	-0.023* (1.85)	-0.001 (0.05)	-0.014 (0.56)	0.031 (0.59)
Homeowner	-0.043 (1.24)	-0.007 (0.78)	-0.059** (2.40)	-0.018 (0.80)	-0.35*** (7.94)
Gross income quartile 2	-0.016 (0.38)	-0.023** (2.41)	-0.008 (0.25)	-0.022 (0.84)	0.027 (0.51)
Gross income quartile 3	-0.012 (0.24)	-0.020* (1.73)	-0.005 (0.14)	-0.013 (0.40)	-0.001 (0.02)
Gross income quartile 4	-0.002 (0.04)	-0.029** (1.99)	0.036 (0.88)	-0.038 (1.16)	-0.054 (0.80)
Financial assets quart. 2	0.011 (0.28)	-0.009 (0.91)	-0.042* (1.65)	-0.028 (1.12)	-0.075 (1.39)
Financial assets quart. 3	-0.062 (1.56)	-0.003 (0.26)	-0.035 (1.37)	0.003 (0.13)	-0.020 (0.36)
Financial assets quart. 4	0.028 (0.68)	-0.018 (1.52)	-0.044 (1.57)	-0.019 (0.68)	-0.10* (1.84)
Procrastination	0.044*** (3.44)	0.004 (0.88)	0.009 (0.85)	0.004 (0.44)	0.030* (1.74)
Trust	-0.004 (0.29)	0.011** (2.28)	-0.018* (1.71)	0.003 (0.35)	0.009 (0.50)
Inertia	0.000 (0.02)	0.000 (0.01)	0.010 (0.94)	-0.007 (0.66)	-0.034* (1.87)
Endorsement	-0.037*** (2.64)	-0.016*** (3.36)	-0.010 (0.91)	-0.020** (2.20)	0.017 (0.91)
Financial literacy	-0.018 (1.36)	-0.012*** (2.95)	-0.010 (1.06)	-0.004 (0.37)	-0.051*** (2.86)
Observations	869	1285	1278	1291	1218
Pseudo R-squared	0.07	0.21	0.09	0.07	0.15
p-value test age = 0	0.73	0.02	0.00	0.00	0.00
p-value test education= 0	0.33	0.04	0.02	0.10	0.86
p-value test income = 0	0.97	0.06	0.51	0.61	0.43
p-value test fin. assets= 0	0.08	0.43	0.29	0.54	0.18

Note: Marginal effects from probit estimates; Standard errors are clustered at the household level: absolute value of robust z-statistics in parentheses; \* significant at 10%, \*\* significant at 5%, \*\*\* significant at 1%; For each domain (column), the dependent variable takes value 1 if respondents report to stick to the default option, and 0 otherwise; The reference group for age contains respondents less than 36 years, for education respondents with low education and for income and wealth respondents in the bottom quartiles.

**Table 4B. Default choices and personal traits plus background characteristics in the Netherlands**

	Commercial leaflets	Phone marketing	Subscriptions	Voluntary pension savings	Life cycle savings
Male	0.008 (0.17)	-0.020 (1.09)	0.12* (1.87)	-0.041 (0.85)	0.030 (0.66)
Age dummy (36-50)	-0.15** (2.00)	-0.074** (2.50)	0.041 (0.52)	-0.041 (0.73)	0.031 (0.58)
Age dummy (51-65)	-0.13 (1.52)	-0.009 (0.28)	-0.059 (0.65)	-0.17*** (2.68)	-0.003 (0.05)
Age dummy (>65)	-0.32*** (3.01)	-0.012 (0.29)	-0.16 (1.08)		
Intermediate education	-0.10* (1.78)	0.015 (0.70)	-0.057 (0.77)	-0.074 (1.45)	0.044 (0.95)
College education	-0.25*** (4.22)	0.040* (1.74)	-0.015 (0.21)	-0.049 (0.85)	0.13*** (2.66)
Employed	0.077 (1.09)	-0.022 (0.72)	-0.22*** (2.60)	-0.11* (1.85)	0.022 (0.30)
Self-employed	0.20** (2.20)	-0.000 (0.00)	-0.085 (0.61)	-0.053 (0.50)	
Retired	0.16** (2.06)	-0.026 (0.73)	-0.021 (0.18)		
Married	0.14** (2.31)	0.026 (1.02)	-0.020 (0.28)	-0.079 (1.41)	0.042 (0.79)
Has children	0.23*** (3.74)	0.044* (1.78)	-0.079 (1.10)	0.011 (0.21)	0.048 (0.85)
Homeowner	-0.037 (0.68)	-0.040* (1.71)	-0.017 (0.24)	-0.11** (2.31)	-0.12*** (2.99)
Gross income quartile 2	0.054 (0.73)	0.002 (0.06)	0.091 (1.05)	-0.072 (1.09)	-0.29** (2.48)
Gross income quartile 3	0.089 (1.11)	0.022 (0.64)	0.070 (0.68)	-0.20*** (2.76)	-0.40*** (2.96)
Gross income quartile 4	0.11 (1.23)	0.000 (0.00)	0.092 (0.86)	-0.29*** (3.66)	-0.48*** (3.15)
Financial assets quart. 2	-0.013 (0.17)	-0.030 (1.07)	-0.099 (1.25)	-0.069 (1.21)	-0.034 (0.64)
Financial assets quart. 3	0.003 (0.04)	-0.038 (1.35)	0.086 (1.11)	-0.088 (1.54)	-0.074 (1.25)
Financial assets quart. 4	-0.064 (0.93)	0.022 (0.73)	0.005 (0.07)	-0.15** (2.46)	-0.16** (2.19)
Procrastination	-0.024 (1.12)	0.002 (0.26)	0.097*** (3.41)	0.002 (0.07)	0.078*** (4.34)
Trust	-0.004 (0.18)	0.005 (0.56)	-0.022 (0.75)	0.050** (2.21)	0.026 (1.19)
Inertia	0.028 (1.19)	0.009 (0.94)	0.022 (0.71)	0.029 (1.29)	0.009 (0.42)
Endorsement	-0.055** (2.29)	-0.006 (0.65)	0.029 (1.02)	-0.033 (1.56)	-0.060*** (2.73)
Financial literacy	-0.014 (0.56)	-0.027*** (2.76)	-0.025 (0.87)	-0.047** (2.07)	0.023 (1.13)
Observations	599	1378	389	751	277
Pseudo R-squared	0.11	0.05	0.08	0.15	0.21
p-value test age = 0	0.01	0.03	0.43	0.01	0.68
p-value test education=0	0.00	0.21	0.71	0.35	0.02
p-value test income = 0	0.65	0.76	0.75	0.00	0.02
p-value test fin.assets=0	0.68	0.12	0.12	0.10	0.18

Note: Marginal effects from probit estimates; Standard errors are clustered at the household level: absolute value of robust z-statistics in parentheses; \* significant at 10%, \*\* significant at 5%, \*\*\* significant at 1%; For each domain (column), the dependent variable takes value 1 if respondents report to stick to the default option, and 0 otherwise; The reference group for age contains respondents less than 36 years, for education respondents with low education and for income and wealth respondents in the bottom quartiles.

*Age* is significant in seven out of ten cases. Older respondents are more likely to vote, to have a will, and to have taken action to prevent them from receiving commercial leaflets. Age is also related to voluntary pension savings. Older generations (not including those who are already retired) have more often put additional money aside for their pension.

The level of *education* turns out to be jointly significant for voting, commercial leaflets, and life cycle savings. The higher the education level, the higher the likelihood of voting and getting rid of commercial leaflets and the lower the probability to join the life cycle savings scheme.

Another control that contributes significantly to the explanation of choice behavior in several domains is *home ownership*. Home ownership is among others relevant for having a will and life cycle savings (1 percent significance level), voluntary pension savings and voting for European elections (5 percent), and telemarketing (10 percent significance level). Home owners are more likely to have a will, to join both the new life cycle savings arrangements and supplementary retirement schemes, to vote and to get rid of telemarketing. Particularly strong is the magnitude of the marginal effect for the will domain: being home owner increases the probability of having a will by 35 percentage points. This very strong effect might in part explain the insignificant role of both income and financial assets in this domain. The marginal effects for the other domains are smaller, but still in the order of 4-12 percentage points.

The *financial situation* (gross personal income and household financial assets) does not seem to play a very significant role in respondents' behavior regarding non-economic domains. In pension decisions the financial situation matters a lot. Richer individuals are more likely to have both voluntary pension savings and life cycle (early retirement) savings.

## **6. Default choices in the US: evidence from the RAND American Life Panel**

The empirical analysis for the Netherlands is based on a questionnaire that was added to the Dutch DNB Household Survey and fielded in 2006. We have devised a similar module for the United States, by including the questions in the RAND American Life Panel (ALP).<sup>22</sup> This way, we can compare two countries with their own culture and institutional background. Historically, the US population is used to more freedom of choice in many situations (e.g. in pension savings), while the Netherlands has a more generous system of social security which

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<sup>22</sup> We are grateful to Arie Kapteyn and Arthur van Soest for pointing us at this opportunity and their help in entering the formal application procedure. A description of the RAND American Life Panel is available at the website of RAND ([http://www.rand.org/labor/roybald/american\\_life.html](http://www.rand.org/labor/roybald/american_life.html)).

impacts labor market decisions and the consequences of unemployment or disability. The comparison may not only shed light on the impact of culture on decision behavior, but it also provides information on the robustness of the methodology employed for the Netherlands to investigate default choices and link these to individual traits.

## **6.1 Data**

The American Life Panel is a joint project between RAND and the University of Michigan modeled in the spirit of the panel run by CentERdata. Households without an internet connection are provided with the necessary technology to participate through their television (a so-called Web TV). They are selected via the University of Michigan's Survey of Consumers which interviews a representative sample of the US population. Newly selected members run through the existing waves of the ALP. All members within the households are allowed to participate. Participants are interviewed four to six times a year for at most 30 minutes per time. This means that the number of respondents to our module increases with time. The current sample size equals 1038 individuals with new respondents added as time evolves and new panel members are being recruited. Contrary to the members of the Dutch household panel, the ALP participants are paid for their cooperation (\$20 for a 30 minutes survey).

The age of the respondents in our sample ranges from 18 to 87 years (mean age: 50.2 years). Women are slightly in the majority (54.9 percent). As regards education, somewhat more than 2 out of 10 respondents have a college education, about 6 out of 10 have an intermediate education level (having some college) and about 2 out of 10 have less education (until and including high school graduates). High income households are overrepresented as 41.7 percent of the respondents belong to the top quartile for disposable household income; 16.7 percent are in the lowest income quartile, and the other respondents are about evenly distributed among the second and the third income quartile. Overall, 19.6 percent of respondents are retired, and 63.0 percent are employed. As for household composition, 63.4 percent of the respondents are married or living with a partner. No information about children is available.

## **6.2 Identification of personal traits: evidence from the US**

The US ALP survey contains the same 17 statements on personal attitudes and choice behavior as the Dutch DHS equivalent. Table B1 in appendix B summarizes the responses. Applying the principal components analysis to the US data delivers results that are mostly

similar to the Dutch case. Again five factors have been retained (reported in Table B2 in appendix B), easily traceable to the ones elicited for the Netherlands. Three out of seventeen questions are attributed to another factor.<sup>23</sup> This illustrates that the factors touch upon personal characteristics that might be interrelated to some extent. Overall, however, the resemblance of the findings for the US and the Netherlands seems to confirm the soundness of the methodology and makes us rather confident on the validity of the information conveyed by the personal traits stemming from the factor analysis.

**Table 5. Personal traits and individual background characteristics in the US**

	Procrastination	Trust	Inertia	Endorsement	Financial literacy
Male	0.15** (2.10)	-0.42*** (6.00)	-0.11 (1.57)	-0.22*** (3.17)	0.35*** (4.92)
Age dummy (36-50)	-0.073 (0.65)	-0.14 (1.24)	-0.15 (1.27)	0.080 (0.78)	0.31*** (2.78)
Age dummy (51-65)	-0.32*** (3.04)	-0.26** (2.43)	-0.21* (1.90)	0.12 (1.22)	0.31*** (3.01)
Age dummy (>65)	-0.60*** (3.89)	-0.16 (1.05)	-0.45*** (2.87)	0.53*** (3.53)	0.49*** (3.17)
Intermediate education	0.088 (0.80)	0.29*** (2.85)	0.090 (0.79)	-0.15 (1.37)	0.023 (0.20)
College education	0.13 (1.05)	0.27** (2.19)	0.28** (2.16)	-0.24* (1.88)	0.054 (0.41)
Retired	0.024 (0.22)	0.15 (1.43)	0.16 (1.44)	0.020 (0.17)	-0.073 (0.62)
Married	-0.11 (1.41)	0.040 (0.46)	0.10 (1.26)	-0.006 (0.08)	-0.29*** (3.64)
Income quartile 2	-0.20* (1.66)	-0.13 (1.05)	-0.19 (1.49)	-0.002 (0.01)	0.064 (0.53)
Income quartile 3	-0.16 (1.26)	-0.030 (0.24)	-0.056 (0.46)	-0.051 (0.41)	0.094 (0.77)
Income quartile 4	-0.20 (1.58)	-0.036 (0.29)	-0.009 (0.08)	-0.18 (1.49)	0.13 (1.08)
Constant	0.31** (2.22)	0.12 (0.88)	0.083 (0.56)	0.19 (1.41)	-0.37*** (2.68)
Observations	809	809	809	809	809
R-squared	0.05	0.06	0.03	0.06	0.06
p-value test age = 0	0.00	0.10	0.04	0.00	0.01
p-value test education = 0	0.58	0.02	0.04	0.17	0.91
p-value test income = 0	0.37	0.72	0.35	0.25	0.75

Note: OLS estimation results; Standard errors are clustered at the household level: absolute value of robust t-statistics in parentheses; \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The dependent variables are the output of the principal component factors analysis. The reference group for age contains respondents less than 36 years, for education respondents with low education and for income respondents in the bottom quartiles.

<sup>23</sup> The question ‘If someone tells me to something, I tend to do the opposite’ moves from the endorsement factor to procrastination. The question ‘When I have to buy products requiring specific expertise, I follow the advice of experts’ moves from inertia to trust, replacing the question ‘When making important decisions, I usually take these decisions on my own’ which goes to the literacy factor.

As before, we regress each of the five extracted components on the available background characteristics. Table 5 reports the results. A comparison with the Dutch data is hampered due to the lower number of observations (809 versus 1422) and the unavailability of some controls used previously (self-employed dummy, financial assets hold, having children and being a home owner). Nevertheless, the effect of gender is broadly similar across both countries. Compared to women, men procrastinate more, have less trust in advice, and are more confident on their financial literacy. In addition, US men seem to pay less attention to the opinion of other people than women. Elderly seem to procrastinate less, both in the US and the Netherlands. The pattern of other age (and to some extent education) coefficients shows somewhat more differences but these could also be related to the association between age and education on the one hand and the missing variables in the US specification on the other hand (e.g. age and education might be related to home ownership and financial assets).

### **6.3 Choice behavior: evidence from the US**

The analysis for the US involves a smaller number of domains with a default option than for the Netherlands as a result of the exclusion of inapplicable situations like European elections, stickers on mailbox, and the typical Dutch life cycle savings arrangements for early retirement. In addition, the automatically renewed subscriptions domain has been dropped due to the low number of observations. Tables 6A, 6B and 6C report the descriptive statistics for organ donation, voting participation at the Presidential and local level, having a will, telemarketing and pension savings. The most striking difference with the Netherlands is that in the US only 18 percent of respondents stick to the default option of not taking any action to prevent them from receiving telemarketing contacts, versus 85 percent in the Netherlands. Moreover, in interpreting the figures for voluntary additional pension savings an important caveat should be taken into account, as the pension systems differ substantially in the two countries, thus affecting individual pension savings decisions.

Following the same procedure as before, we first relate the choice behavior in these situations to the personal traits extracted from the principal component analysis and thereafter include other individual background characteristics. Tables 7 and 8 report the results. Overall, it seems somewhat more difficult to adequately describe choice behavior in the US which might be related to a loss of efficiency due to the smaller sample size and the fact that we have less information on background characteristics. Nevertheless, procrastination and self-assessed financial literacy come forward as the most important personal attitude variables. However, in the US financial literacy appears to be relatively more important whereas in the

**Table 6A. Organ donation in the US**

	Do you think in general people ought to be prepared to be an organ donor?		Are you willing to be an organ donor?		Are you an organ donor, i.e. have you signed an affidavit?	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	689	66.8	774	72.1	445	59.8
<b>No</b>	116	11.2	119	11.5	<b>254</b>	<b>34.1</b>
Refusal	47	4.5	35	3.4	13	1.8
DK	180	17.4	134	13.0	32	4.3
Total	1032	100.0	1032	100.0	774	100.0

Note: Default option in bold; DK = 'I do not know'.

**Table 6B. Voting participation in the US**

	Do you think in general people ought to vote?		Did you vote last time for the <i>Presidential elections</i> ?		Did you vote last time for the <i>local elections</i> ?	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	981	95.1	860	87.7	742	75.6
<b>No</b>	<b>23</b>	<b>2.2</b>	<b>106</b>	<b>10.8</b>	<b>221</b>	<b>22.5</b>
Refusal	20	1.9	13	1.3	11	1.1
DK	8	0.8	2	0.2	7	0.7
Total	1032	100.0	981	100.0	981	100.0

Note: Default option in bold; DK = 'I do not know'

**Table 6C. Will, telemarketing, additional retirement savings in the US**

	Do you have a will?		Have you registered yourself in order not to receive telemarketing?		Do you have any other arrangements for your pension apart from Social Security and company pension plans or defined contribution plans?	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	509	49.3	823	79.3	464	45.0
<b>No</b>	<b>506</b>	<b>49.0</b>	<b>185</b>	<b>17.8</b>	<b>483</b>	<b>46.8</b>
Refusal	16	1.6	11	1.1	40	3.9
DK	1	0.1	13	1.3	45	4.4
Total	1032	100.0	1032	100.0	1032	100.0

Note: Default option in bold; DK = 'I do not know'.

**Table 7. Default choices and personal traits in the US**

	Organ donation	Voting national	Voting local	Will	Phone marketing	Additional pension savings
Procrastination	0.027 (1.23)	0.009 (0.78)	0.030** (1.97)	0.067*** (3.34)	0.005 (0.36)	0.081*** (3.61)
Trust	0.001 (0.04)	-0.002 (0.22)	0.028* (1.72)	-0.013 (0.65)	0.002 (0.15)	-0.005 (0.24)
Inertia	-0.020 (0.92)	-0.019* (1.66)	0.001 (0.06)	-0.009 (0.48)	-0.023 (1.50)	-0.062*** (2.70)
Endorsement	0.037* (1.69)	-0.003 (0.28)	-0.027* (1.75)	-0.004 (0.20)	0.013 (0.91)	0.049** (2.23)
Financial literacy	-0.025 (1.09)	-0.009 (0.73)	-0.007 (0.42)	-0.031 (1.57)	-0.019 (1.42)	-0.091*** (3.85)
Observations	525	761	761	772	796	579
Pseudo R-squared	0.01	0.01	0.01	0.02	0.01	0.05
p-value test coeff. = 0	0.37	0.58	0.05	0.00	0.53	0.00

Note: Marginal effects from probit estimates; Standard errors are clustered at the household level: absolute value of robust z-statistics in parentheses; \* significant at 10%, \*\* significant at 5%, \*\*\* significant at 1%; For each domain (column), the dependent variable takes value 1 if respondents report to stick to the default option, and 0 otherwise.

Netherlands we find a bigger role for procrastination. The most important difference however is that the endorsement variable that seems to measure social interactions and peer effects does not play a role in US choice behavior while it was influential in the Netherlands.

## 7. Discussion

This paper explores individual traits that might explain why default options attract a disproportionately high number of decision-makers. To the best of our knowledge, it is the first contribution that relates individual choices in very different situations with a default option to an extensive set of individual background information including several personal traits and behavioral attitudes potentially responsible for default choices. Since these behavioral attitudes and personal traits are not observed directly, we have developed measures based upon statements on choices that respondents have made or would make in several real-life situations. The motivation is that people possess intrinsic traits that characterize their personality and basically guide their behavior in many situations.

We study how individuals decide upon pension savings (both for old age and early retirement), organ donation, having a will, voting participation, and how they deal with the cancellation of subscriptions and no-consent choices towards receiving marketing by mail or phone. These very heterogeneous choice situations all have a default option; i.e. the option that results if no action is taken. Our analysis is explorative and the measurement of the relevant personal traits may benefit from an extensive testing of the information contained in



simple statements on actual choice behavior. More research on these topics in different settings with other datasets may shed light on the robustness of our results. Nevertheless, the fact that the estimation procedure delivers plausible results on the identification of personal traits and their relation to individual decision-making justifies some confidence in the benefits of this approach. Especially since this is true for two different countries, the Netherlands and the US, with their own culture, traditions and institutions.

**Table 8. Default choices and personal traits plus background characteristics in the US**

	Organ donation	Voting national	Voting local	Will	Phone marketing	Additional pension savings
Male	0.15*** (3.50)	-0.017 (1.02)	-0.035 (1.18)	0.025 (0.62)	0.093*** (3.48)	-0.037 (0.79)
Age dummy (36-50)	-0.018 (0.26)	-0.062*** (3.52)	-0.098** (2.48)	-0.20*** (3.05)	-0.047 (1.29)	-0.15** (2.18)
Age dummy (51-65)	0.017 (0.26)	-0.10*** (5.04)	-0.15*** (3.76)	-0.37*** (5.88)	-0.049 (1.39)	-0.23*** (3.32)
Age dummy (>65)	-0.028 (0.29)	-0.11*** (4.40)	-0.21*** (4.44)	-0.53*** (7.77)	-0.077 (1.59)	-0.27* (1.65)
Intermediate education	-0.17** (2.45)	-0.12*** (4.61)	-0.083* (1.86)	-0.031 (0.52)	0.007 (0.20)	-0.29*** (4.20)
College education	-0.19*** (2.70)	-0.076*** (3.97)	-0.13*** (2.97)	-0.12* (1.72)	-0.050 (1.13)	-0.33*** (4.47)
Retired	0.017 (0.25)	-0.000 (0.01)	-0.049 (1.00)	-0.016 (0.25)	-0.079** (2.11)	0.036 (0.43)
Married	-0.11** (2.24)	-0.055*** (2.80)	-0.068* (1.93)	-0.082* (1.77)	-0.089*** (2.80)	0.078 (1.30)
Income quartile 2	-0.043 (0.55)	-0.020 (0.88)	0.029 (0.59)	-0.15** (2.18)	-0.065* (1.74)	-0.092 (1.09)
Income quartile 3	0.094 (1.19)	-0.042* (1.95)	-0.003 (0.07)	-0.18** (2.57)	-0.091** (2.46)	-0.32*** (4.28)
Income quartile 4	0.14* (1.72)	-0.044* (1.84)	0.016 (0.33)	-0.27*** (4.00)	-0.14*** (3.26)	-0.44*** (5.40)
Procrastination	0.020 (0.86)	-0.004 (0.51)	0.015 (0.99)	0.036* (1.66)	-0.012 (0.89)	0.083*** (3.24)
Trust	0.017 (0.75)	-0.003 (0.38)	0.017 (1.10)	-0.024 (1.12)	0.008 (0.55)	0.011 (0.47)
Inertia	-0.027 (1.15)	-0.010 (1.15)	0.008 (0.48)	-0.002 (0.10)	-0.015 (1.04)	-0.046* (1.83)
Endorsement	0.041* (1.81)	-0.006 (0.74)	-0.022 (1.38)	0.001 (0.05)	0.011 (0.81)	0.010 (0.40)
Financial literacy	-0.049** (2.08)	-0.001 (0.10)	0.002 (0.13)	-0.035* (1.68)	-0.023* (1.78)	-0.083*** (3.29)
Observations	524	760	760	771	795	579
Pseudo R-squared	0.05	0.19	0.08	0.15	0.09	0.20
p-value test age = 0	0.87	0.00	0.00	0.00	0.37	0.01
p-value test education = 0	0.02	0.00	0.01	0.13	0.25	0.00
p-value test income = 0	0.04	0.20	0.89	0.00	0.01	0.00

Note: Marginal effects from probit estimates; Standard errors are clustered at the household level; absolute value of robust z-statistics in parentheses; \* significant at 10%, \*\* significant at 5%, \*\*\* significant at 1%; For each domain (column), the dependent variable takes value 1 if respondents report to stick to the default option, 0 otherwise; The reference group for age contains respondents less than 36 years, for education respondents with low education and for income respondents in the bottom quartiles.

Our descriptive statistics corroborate the stylized fact that default options are a major attractor in many choice situations. The empirical analysis shows that a large part of the heterogeneity in individual choice behavior can be explained by objective personal characteristics and circumstances such as age, education or the financial position. Nevertheless, procrastination and financial illiteracy prove to be the most important determinants of default choices in the Netherlands as well as in the US.<sup>24</sup> Choices are deferred because people have an inherent tendency to do so or because of the complicated nature of choice problems. Moreover, the empirical evidence for the Netherlands suggests that the extent to which individuals are sensitive to the opinion of others (e.g. through social norms or peer effects) matters in explaining deviations from the default option.

The latter result raises new questions. Are peer effects and social norms in the Netherlands indeed more important than in the US? And if so, why is that the case and what are the implications for policy? One explanation could be that in the Netherlands, a relatively small densely populated country, the society is more homogeneous than in the US where large differences with respect to income, education, and racial composition of its population can be found. If social interactions are relevant for individual decisions, this suggests that publicity campaigns might play an important role as well as the behavior of policymakers and public persons in so far this information and these people, respectively, influence social norms.

In the US there seems to be a larger role for financial illiteracy; whereas in the Netherlands procrastination appears relatively more important. While we can only speculate about the reasons for this divergence, it could be that whereas in the US private schools are not uncommon, the Dutch system of public schooling historically might have been more focused on the provision of a common education contributing to a less pronounced role of literacy. At the same time, US citizens are accustomed to more freedom of choice and individual responsibility and might therefore be used to act more decisively reducing the relevance of procrastination. While the cause of these differences is important in itself, its explanation goes beyond the scope of this paper.

For policy responses however the relative importance of different explanations is very relevant. Our estimation results suggest that in the US the provision of information, educating the public and simplifying choice situations might be the most effective policy instruments to affect decisions without changing the default. While also relevant for the Netherlands, it

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<sup>24</sup> We have also experimented with the inclusion of interaction effects as one could argue for example that the impact of financial illiteracy is stronger for individuals who are more likely to procrastinate anyway. We did not find empirical evidence for the importance of such interaction effects though.

might be equally effective to deal with the consequences of procrastination, for example by increasing awareness. Recent experiments on raising the number of organ donor registrations by presenting a registration form to anyone who enters the town hall to renew a passport might be viewed in this perspective. Thereby, the existence and the urgency of the donor register are brought under the attention of citizens every five years instead of once upon turning eighteen years old. The introduction of a legal obligation for pension funds to send their participants a pension letter with an overview of pension rights in the form of some simple scenarios is another example of increasing awareness of the Dutch public.

The pension domain is an important example where both financial illiteracy and procrastination are relevant for household financial behavior in the US as well as in the Netherlands. This stresses the need of easily accessible and comprehensible information about pension products and a constant need to induce people to think about these decisions. Alternatively, this could motivate a design of the retirement savings system as to prevent procrastinators from poverty in old age. Moreover, the finding for the Netherlands that procrastination matters for early retirement savings suggests that the recent redesign of early retirement institutions in the Netherlands from collective to individual arrangements might turn out to be very effective in increasing the average retirement age, illustrating the relevance of default behavior for public policy.

Regarding voluntary and early retirement savings in the Netherlands, we also find a role for trust and peer effects, respectively. One interpretation is that employees assess the compulsory nature of employer pension savings as a well-thought advice with no need for voluntary additional savings. For the life cycle savings accounts, the association with being a successor of former early retirement arrangements – as advertised by trade unions and employers - might have induced some employees to deviate from the no-action default of nonparticipation. These effects come on top of the usual results that employees with better income and wealth positions (who can afford to save for early retirement or additional old age provisions) are also more likely to deviate from the default of non-saving, and that higher educated individuals *ceteris paribus* show less interest in early retirement as they might have more challenging or less physically demanding jobs. The fact that compulsory pension savings (or the publicity around new pension products or arrangements) might have an impact on savings outcomes because interpreted as an endorsement assigns a lot of responsibility to governments, trade unions and pension funds in developing ‘optimal’ designs and explaining their consequences.

## **8. Concluding remarks**

This paper contributes to the literature on explaining the relevance of the default option in decision-making. The adopted approach is innovative as it considers choice behavior in very different situations and relates these choices to a large set of personal traits and behavioral attitudes. While more research is needed to validate the results, we believe that it is worthwhile to further pursue this approach.

The results suggest that overall procrastination and financial illiteracy are important determinants of decisions. Nevertheless the relative importance depends upon the specific situation and differs across counties. The implication is that there is no straightforward advice for the use of default options in public policy. The use of defaults should for instance depend upon the heterogeneity or homogeneity in the preferences of decision-makers (Beshears, Choi, Laibson and Madrian, 2007). In addition, the results underline the importance of simplifying decision processes, where possible, and of informing and educating the public to increase awareness and help them in making decisions.

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## Appendix A. Seventeen statements about attitudes and choice behavior in the Netherlands: data and principal component analysis

**Table A1. Statements about personal attitudes and choice behavior in the Netherlands: Wording and summary of responses**  
Percentages of total number of respondents (N=1648)

	1	2	3	4	5	6	7	DK	Mean <sup>2)</sup>
Please indicate on a scale from 1 to 7 to what extent you agree with each of the following statements (1 means 'totally disagree' and 7 means 'totally agree')?									
When making important decisions (e.g. buying a car or investing money)									
Q1 - I usually talk with other people about it	3,1	8,6	8,0	13,8	25,1	27,4	11,7	2,1	4,8 (1,6)
Q2 - I usually take these decisions on my own	19,8	24,9	16,3	9,7	9,7	11,4	5,5	2,4	3,2 (1,9)
Q3 - I usually leave it to someone else	37,6	29,3	13,8	8,0	5,0	2,7	1,4	1,9	2,3 (1,4)
When I have to buy products requiring specific expertise (e.g. a financial or a technological product)									
Q4 - I follow the advice of experts	0,9	1,2	5,3	14,8	34,4	31,8	9,2	2,4	5,2 (1,1)
Q5 - I talk about it with family or friends	3,0	7,2	7,9	14,7	29,5	24,6	10,6	2,4	4,8 (1,5)
Q6 - I often rely on what people say	8,9	23,3	24,2	25,7	12,3	3,3	0,4	1,6	3,2 (1,3)
Q7 - If someone tells me to do something, I tend to do the opposite	10,9	24,3	17,7	25,0	12,3	5,1	2,3	2,2	3,3 (1,5)
Q8 - I usually do what other people tell me to do	13,8	26,7	22,2	21,4	10,7	2,7	0,4	1,8	3,0 (1,4)
Q9 - I have troubles to say no to people	6,4	14,8	12,1	13,5	25,9	18,5	7,0	1,6	4,2 (1,7)
Q10 - I do chores right away	4,7	14,4	23,4	21,2	17,8	12,7	4,5	1,1	3,9 (1,5)
Q11 - I tend to make promises that I cannot keep	29,4	38,8	13,6	8,1	5,9	1,7	0,6	1,6	2,3 (1,3)
Q12 - When I promise to do something, I usually do that later than I should	18,8	34,4	16,6	11,0	12,3	3,6	1,6	1,5	2,8 (1,5)
Q13 - Changes are scary	12,7	26,9	20,4	20,7	13,1	3,3	1,0	1,6	3,1 (1,4)
Q14 - Changes are often not an improvement	4,3	13,8	14,5	30,4	16,6	11,8	6,0	2,5	4,0 (1,5)
Q15 - I would describe myself as a careful person	1,6	5,6	11,9	20,9	27,9	23,7	6,6	1,5	4,7 (1,4)
Q16 - When there is possible danger, I take many precautions	0,4	4,1	8,0	17,4	31,9	25,5	10,1	2,4	5,0 (1,3)
Q17 - How would you assess your financial skills	2,4	6,7	12,3	25,4	31,8	16,9	1,5	2,7	4,4 (1,3)

1) For this question respondents are asked to indicate their skills on a 7-points scale, where 1 means 'very bad' and 7 means 'very good'.

2) Mean refers to the average of the seven response categories from 1 to 7 (standard deviation in parentheses).

Note: DK = 'I do not know'; DK's and response categories 1-7 do not sum up to 100% due to refusals.



**Table A2. Statements and the highest factor loadings from a principal component analysis for the Netherlands**

Statements	Factors				
	Procrastination	Trust	Inertia	Endorsement	Financial literacy
I do chores right away	-0,64				
I tend to make promises that I cannot keep	0,69				
When I promise to do something, I usually do that later than I should	0,80				
When making important decisions, I usually talk with other people about it		0,84			
When making important decisions, I usually take these decisions on my own		-0,55			
When I have to buy products requiring specific expertise, I talk about it with family or friends		0,77			
When I have to buy products requiring specific expertise, I follow the advice of experts			0,36		
Changes are scary			0,55		
Changes are often not an improvement			0,64		
I would describe myself as a careful person			0,73		
When there is possible danger, I take many precautions			0,62		
I often rely on what people say				0,69	
If someone tells me to do something, I tend to do the opposite				-0,48	
I usually do what other people tell me to do	0,48			0,76	
I have troubles to say no to people				0,47	
When making important decisions, I usually leave it to someone else					-0,69
How would you assess your financial skills					0,73

Note: For each of the statements we report the highest factor loading from a principal component analysis using varimax rotation; N = 1.509.

**Appendix B. Seventeen statements about attitudes and choice behavior in the United States: data and principal component analysis**

**Table B1. Statements about personal attitudes and choice behavior in the US: Wording and summary of responses**  
 Percentages of total number of respondents (N=1038)

	1	2	3	4	5	6	7	DK	Mean <sup>2)</sup>
Please indicate on a scale from 1 to 7 to what extent you agree with each of the following statements (1 means 'totally disagree' and 7 means 'totally agree')?									
When making important decisions (e.g. buying a car or investing money)									
Q1 - I usually talk with other people about it	3,1	5,9	5,7	11,3	21,3	26,5	25,0	1,4	5,3 (1,6)
Q2 - I usually take these decisions on my own	12,6	15,6	13,1	15,2	14,2	17,0	10,3	2,0	4,1 (2,0)
Q3 - I usually leave it to someone else	53,7	25,7	8,8	5,2	2,4	2,0	0,3	1,9	1,9 (1,5)
When I have to buy products requiring specific expertise (e.g. a financial or a technological product)									
Q4 - I follow the advice of experts	1,0	2,5	5,0	16,3	31,7	28,5	12,8	2,2	5,8 (1,5)
Q5 - I talk about it with family or friends	2,4	5,2	7,9	12,0	23,4	24,6	22,8	1,7	5,2 (1,3)
Q6 - I often rely on what people say	7,1	14,1	19,2	29,4	21,3	5,8	1,6	1,5	4,4 (1,7)
Q7 - If someone tells me to do something, I tend to do the opposite	24,3	31,3	15,9	19,0	3,7	1,7	1,3	2,9	1,9 (1,6)
Q8 - I usually do what other people tell me to do	18,8	26,0	19,8	22,5	7,4	2,6	0,8	2,2	2,3 (1,6)
Q9 - I have troubles to say no to people	13,4	18,8	12,7	14,1	19,4	12,9	7,7	1,1	4,0 (1,7)
Q10 - I do chores right away	4,4	9,2	17,2	21,9	18,6	17,4	10,0	1,4	5,2 (1,6)
Q11 - I tend to make promises that I cannot keep	47,1	33,9	9,3	4,8	3,0	1,5	0,4	0,1	1,9 (1,2)
Q12 - When I promise to do something, I usually do that later than I should	25,1	31,8	15,2	10,7	9,9	4,1	1,8	1,5	2,7 (1,6)
Q13 - Changes are scary	8,1	14,3	15,0	23,8	19,7	10,2	6,9	2,0	3,3 (2,0)
Q14 - Changes are often not an improvement	7,1	14,4	15,3	26,6	14,7	8,4	10,0	3,5	3,1 (1,4)
Q15 - I would describe myself as a careful person	1,1	1,9	5,8	13,9	25,5	32,2	18,4	1,3	4,1 (1,8)
Q16 - When there is possible danger, I take many precautions	0,5	1,4	6,4	10,6	21,8	31,2	26,5	1,7	5,6 (1,3)
Q17 - How would you assess your financial skills	2,2	4,7	10,5	24,6	31,9	19,0	5,2	1,9	4,7 (1,4)

1) For this question respondents are asked to indicate their skills on a 7-points scale, where 1 means 'very bad' and 7 means 'very good'.

2) Mean refers to the average of the seven response categories from 1 to 7 (standard deviation in parentheses).

Note: DK = 'I do not know'; DK's and response categories 1-7 do not sum up to 100% due to refusals.

**Table B2. Statements and the highest factor loadings from a principal component analysis for the US**

Statements	Factors				
	Procrastination	Trust	Inertia	Endorsement	Financial literacy
I do chores right away	-0,63				
I tend to make promises that I cannot keep	0,48				
When I promise to do something, I usually do that later than I should	0,65				
If someone tells me to do something, I tend to do the opposite	0,58				
When making important decisions, I usually talk with other people about it		0,80			
When I have to buy products requiring specific expertise, I follow the advice of experts		0,42			
When I have to buy products requiring specific expertise, I talk about it with family or friends		0,81			
Changes are scary			0,63		
Changes are often not an improvement			0,60		
I would describe myself as a careful person			0,59		
When there is possible danger, I take many precautions			0,64		
I often rely on what people say				0,66	
I usually do what other people tell me to do				0,74	
I have troubles to say no to people				0,56	
When making important decisions, I usually leave it to someone else					-0,63
How would you assess your financial skills					0,65
When making important decisions, I usually take these decisions on my own					0,61

Note: For each of the statements we report the highest factor loading from a principal component analysis using varimax rotation; N = 941.



**SAMENVATTING (SUMMARY IN DUTCH)**



## 1. Achtergrond en motivatie

Dit proefschrift bevat vier empirische artikelen over het financiële gedrag van Nederlandse gezinnen. Inzicht in financiële keuzes en het vermogensbeheer van gezinnen is om verschillende redenen van belang. Enerzijds bevindt het algemene welvaartsniveau zich op ongekende hoogte. Dit geeft veel gezinnen de mogelijkheid om geld opzij te legen, te beleggen en keuzes te maken ten aanzien van verdeling van consumptie, vrije tijd en arbeid (aantal gewerkte uren en het moment van pensionering) over de levenscyclus. Anderzijds wordt in toenemende mate van mensen verwacht dat zij individueel verantwoordelijkheid nemen voor het eigen financiële welzijn. Tegelijkertijd heeft de deregulering van financiële markten de concurrentie tussen financiële instellingen vergroot en financiële innovaties gestimuleerd wat onder andere heeft geleid tot een continue stroom van nieuwe financiële producten. Deze ontwikkelingen dragen bij aan de toegenomen, wereldwijde belangstelling van economen voor het financiële gedrag van gezinnen (zie de openingsrede voor *de American Finance Association* door John Campbell (2006)) en verklaren tevens de toenemende aandacht in beleidsdiscussies hiervoor aangezien de effectiviteit van budgettaire en monetair beleid in belangrijke mate afhangt van de gedragsreacties van consumenten.

Het levenscyclusmodel voor consumptie- en spaargedrag vormt nog steeds het belangrijkste startpunt voor een beschrijving van het financiële gedrag van gezinnen. De meest eenvoudige versies van deze modellen voorspellen dat gezinnen tijdens hun werkzame leven vermogen opbouwen om daarmee hun pensionering te financieren (Modigliani en Brumberg, 1954; Friedman, 1957). Sindsdien zijn deze modellen op verschillende manieren uitgebreid om ze realistischer te maken bijvoorbeeld door rekening te houden met onzekerheid, liquiditeitsbeperkingen en erfenismotieven (zie Browning en Lusardi (1996) voor een overzicht). De basale, onderliggende veronderstellingen zijn echter onveranderd in de meeste modellen; consumenten worden beschouwd als rationele agenten die alle relevante informatie verzamelen en gebruiken om het verwachte nut over hun resterende levensduur te maximaliseren. Psychologisch onderzoek betwist deze aanname en beargumenteert dat consumenten vuistregels gebruiken en dat hun gedrag beter kan worden verklaard uit psychologische concepten zoals verliesaversie, bijziendheid of mentaal boekhouden. Tegelijkertijd bestaan diverse voorbeelden van financiële missers van gezinnen die de impliciete aanname uit het levenscyclusmodel schenden dat huishoudens over voldoende financiële vaardigheden beschikken om optimale beslissingen te nemen. Het verbindende element van de artikelen verzameld in dit proefschrift is de rol van financiële vaardigheden bij financiële beslissingen vooral in relatie tot pensioenkeuzes. In het bijzonder besteden de

bijdragen aandacht aan pensioenvoorkeuren van werknemers, hun bereidheid om pensioeninvesteringen zelf ter hand te nemen en hun capaciteiten om dat te doen; het meten van financiële kennis en vaardigheden en de gevolgen daarvan voor beleggingsgedrag, vermogensopbouw en pensioenplanning; en tot slot de rol van financiële geletterdheid en andere determinanten voor beslissingen in keuzesituaties met een standaardoptie dat wil zeggen de keuze die impliciet of expliciet wordt gemaakt door geen actie te ondernemen.

De bijdragen in dit proefschrift zijn niet normatief, maar doen een poging het gedrag van gezinnen te beschrijven en te verklaren met behulp van gegevens die worden verkregen uit specifiek voor dit doel ontworpen internetenquêtes onder een panel van Nederlandse huishoudens van CentERdata. In het verleden hebben economen zich behoudend opgesteld ten aanzien van het nut van enquêtes en het informatiegehalte van subjectieve antwoorden, maar tegenwoordig worden deze wijdverbreid gebruikt en is overtuigend duidelijk geworden dat zij nuttige informatie opleveren met voorspellende waarde voor het gedrag van gezinnen.<sup>1</sup> Bovendien zijn dit type enquêtes onmisbaar voor het verkrijgen van informatie over heterogene voorkeuren en houdingen van gezinnen die cruciaal zijn om individuele beslissingen te begrijpen.

## **2. Onderzoeksresultaten**

Het eerste artikel getiteld ‘Risk-return preferences in the pension domain: Are people able to choose?’ bestudeert pensioenvoorkeuren en beleggingsgedrag van Nederlandse werknemers. Nederland vormt een interessante casestudy omdat haar pensioensysteem nauwelijks enige keuzevrijheid biedt, terwijl de laatste drie decennia wereldwijd sprake is van een verschuiving van risico’s en verantwoordelijkheid voor pensioenbeleggingen van werkgevers naar werknemers. De Verenigde Staten en het Verenigd Koninkrijk bijvoorbeeld hebben een sterke verschuiving laten zien naar beschikbare premieregelingen (Defined Contribution ofwel DC pensioenregelingen) ten koste van regelingen die uitgaan van een toezegging ten aanzien van de pensioenuitkering (Defined Benefit of DB-regelingen). Nieuwe internationale boekhoudstandaarden, de aandelenmarktcrisis van 2000-2003 en de structurele afname van kapitaalmarktrentes hebben een debat aangezwengeld over de houdbaarheid van het DB-systeem en of ook in Nederland meer beleggingsvrijheid en meer risico naar werknemers moet worden geschoven.

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<sup>1</sup> Zie bijvoorbeeld Hurd en McGarry (2002), Manski (2004), Donkers en Van Soest (1999), en Kapteyn en Teppa (2002).



De onderzoeksresultaten laten zien dat een grote meerderheid van de Nederlandse werknemers tegenstander is van veranderingen in de richting van meer individuele verantwoordelijkheid voor pensioenen. Deze voorkeuren zijn consistent met hun houding ten aanzien van risico en een zelfinschatting van de eigen financiële vaardigheden. Respondenten blijken namelijk in hoge mate risicomijdend, in het bijzonder waar het om pensioenen gaat, en hebben een sterke voorkeur voor een gegarandeerd inkomen na pensionering. Daarnaast beschouwt de gemiddelde respondent zichzelf als financieel ondeskundig en is niet bereid om de zeggenschap over pensioenbesparingen uit te oefenen zelfs als hem de mogelijkheid wordt geboden zijn financiële expertise te vergroten. Uit een experiment volgt dat respondenten die, in een denkbeeldig DC-systeem, in eerste instantie kiezen voor een relatief veilige beleggingsportefeuille veelal switchen naar een meer risicovolle beleggingsstrategie conform de keuze van de gemiddelde respondent als zij worden geconfronteerd met de gevolgen van hun keuze voor de kansverdeling van toekomstige pensioenuitkeringen. Dit suggereert dat de financiële vaardigheden ontoereikend zijn om controle uit te oefenen over hun eigen pensioenvermogen. Terwijl het zeer wel mogelijk is dat deze uitkomsten deels worden veroorzaakt door een gebrek aan ervaring met het uitoefenen van invloed op de opbouw van het pensioenvermogen in het verleden, roepen zij tegelijkertijd vragen op over het algemene niveau van financiële geletterdheid van de Nederlandse bevolking.

Het tweede artikel getiteld 'Financial literacy and stock market participation', richt zich op het meten van financiële kennis en cognitieve vaardigheden. Niet alleen pensioenbeslissingen, maar vele financiële keuzes zijn ingewikkelder geworden door financiële innovaties en het stijgende aanbod van financiële producten zoals op de markt voor leningen. Terwijl financiële vaardigheden een noodzakelijke voorwaarde zijn om in te spelen op de toename in individuele verantwoordelijkheid voor het eigen financiële welzijn, staat pas relatief kort de vraag centraal of consumenten wel in staat zijn zich door deze nieuwe financiële omgeving te bewegen. Wij hebben een uitgebreide vragenlijst ontworpen om inzicht te krijgen in basale financiële vaardigheden gerelateerd aan eenvoudige rekenvaardigheden, de werking van inflatie en rentevoeten en meer gevorderde onderwerpen gerelateerd aan financiële instrumenten (aandelen, obligaties en beleggingsfondsen). Ons werk vormt daarbij een stap voorwaarts ten opzichte van eerdere studies door meer verfijnde maatstaven voor financiële geletterdheid te beschouwen.

Onze gegevens laten zien dat de meerderheid van de respondenten over een zekere basale, financiële kennis beschikt en enig inzicht heeft in de werking van samengestelde rente, inflatie en de tijds waarde van geld. Vaak reikt het kennisniveau echter nauwelijks verder:

velen zijn niet goed op de hoogte van het verschil tussen obligaties en aandelen, de relatie tussen obligatiekoersen en rentevoeten en de voordelen van risicodiversificatie. Tevens verschaft ons onderzoek informatie over de methodologie van het meten van financiële kennis: wij tonen aan dat er veel ruis zit in de antwoorden van respondenten. Het blijkt dat de formulering van de vragen van groot belang is voor het meten van financiële kennis en dat kleine veranderingen in de woordvolgorde grote consequenties kunnen hebben voor de beantwoording van de vragen. Deze gevoeligheid voor de formulering van enquêtevragen laat zien dat het van groot belang is om dergelijke vragen om financiële kennis te meten eerst te testen en te valideren in een pilot-versie van de enquête, maar vormt tevens een aanvullende illustratie voor een beperkte financiële kennis.

Wij illustreren het belang van financiële geletterdheid door na te gaan of personen met een grotere financiële kennis meer kans hebben om in aandelen te beleggen. Hierbij sluiten wij aan bij de literatuur die de zogenoemde ‘stockholding puzzle’ probeert te verklaren (Haliassos en Bertaut, 1995). Standaardmodellen gebaseerd op de maximalisatie van het verwachte nut geven aan dat het voor vrijwel iedereen aantrekkelijk is om op zijn minst een klein deel, van het vermogen in aandelen te beleggen. De puzzel is dat in de praktijk in vele landen een grote meerderheid zich niet op de aandelenmarkt begeeft (Guiso, Haliassos en Jappelli, 2002). In de literatuur is een zekere consensus ontstaan dat een belangrijke rol in de verklaring is weggelegd voor de kosten van het verzamelen en verwerken van informatie inclusief bijvoorbeeld de kosten die gemoeid zijn met het uitzoeken hoe men kan beleggen, en het monitoren van adviseurs en beleggingsuitkomsten. Tegelijkertijd kan dit niet afdoende verklaren waarom meer vermogende huishoudens niet vaker beleggen in aandelen. Andere onderzoeken wijzen op het belang van vertrouwen en sociale interacties. Een hoger kennisniveau verlaagt de informatiekosten en de relevantie van de verschillende drempels voor aandelenmarktparticipatie. Onze empirische resultaten geven ondersteuning aan deze visie. Vanwege de mogelijkheid van omgekeerde causaliteit, dat wil zeggen dat respondenten financiële kennis opdoen door hun activiteiten in de aandelenmarkt, maken wij gebruik van de variatie in de mate waarin respondenten hebben blootgestaan aan economische scholing, een maatstaf voor de aanwezige financiële kennis in een periode van het leven waarin de kans dat mensen al beleggen in de aandelenmarkt uitermate gering is.

Het derde artikel getiteld ‘Financial literacy, retirement planning, and household wealth’, richt zich op de gevolgen van financiële geletterdheid voor de netto vermogenspositie van huishoudens. Daarmee onderzoekt het de relevantie van financiële kennis voor huishoudgedrag en financiële uitkomsten vanuit een breder perspectief. Er zijn

veel voorbeelden bekend van financiële missers door huishoudens en Amerikaans onderzoek rapporteert enig empirisch bewijs, hoewel niet onbetwist, dat financiële educatie leidt tot meer besparingen (zie Lusardi (2004) voor een overzicht). Deze studies richten zich echter niet specifiek op de vraag of het effect van financiële educatie op spaargedrag loopt via een toename in financiële kennis of via andere kanalen. De gevonden effecten op besparingen kunnen namelijk – op zijn minst ten dele – ook samenhangen met het beschikbaar stellen van informatie, het aanbieden van middelen om je te committeren aan besparingen, sociale interacties of het gevolg zijn van zelfselectie van respondenten in het geval van het bijwonen van financiële seminars.

Onze schattingsresultaten laten een statistisch en economisch significant effect zien van financiële kennis op het netto vermogen. Dit is een belangrijk resultaat uit het oogpunt van overheidsbeleid met het oog op de vrees dat huishoudens wellicht onvoldoende sparen voor hun pensioen. De onderzoeksresultaten laten inderdaad zien dat financiële kennis een stimulans vormt om te plannen voor het pensioen. Deze planning gaat gepaard met het verzamelen en verwerken van informatie over (toekomstige) inkomsten en uitgaven en het doen van de daarvoor noodzakelijke berekeningen. Dit proces voorziet planners van informatie over benodigde besparingen, terwijl de gerelateerde activiteiten hen kunnen helpen eventuele zelfbeheersingproblemen te overwinnen en hun vermogen te vergroten (Ameriks, Caplin en Leahy, 2003; Lusardi en Mitchell, 2007). Tegelijkertijd draagt het feit dat financiële kennis de participatie op de aandelenmarkt stimuleert mogelijk ook bij aan een hogere vermogensopbouw. Toetreding tot de aandelenmarkten vergroot immers de mogelijkheden voor huishoudens om hun vermogen te spreiden en te profiteren van de risicopremie op aandelenbeleggingen wat bij kan dragen aan een efficiënter beheer van de vermogensportefeuille. Beide genoemde kanalen vormen potentiële verklaringen die kunnen bijdragen aan het positieve effect van financiële kennis op het netto gezinsvermogen. Tenslotte laten de schattingsresultaten zien dat degenen die relatief veel vertrouwen hebben in hun eigen financiële vaardigheden ook een grotere kans hebben aan pensioenplanning te doen. Blijkbaar is de mate waarin mensen zich op hun gemak voelen met hun financiële vaardigheden een apart element dat mensen al dan niet weghoudt van informatie-intensieve beslissingen. Dit suggereert dat in aanvulling op financiële educatie inspanningen om keuzeproblemen op een heldere en begrijpelijke manier te presenteren effectief kunnen zijn bij de ondersteuning van huishoudens bij het nemen van complexe beslissingen.

Het vierde artikel getiteld ‘Choice or no choice: What explains the attractiveness of default options?’ onderzoekt het effect van financiële geletterdheid op pensioenbeslissingen

vanuit een ander perspectief. In de literatuur is uitgebreid gedocumenteerd dat de standaardoptie in beslissingsproblemen door een disproportioneel groot aantal beslissers wordt gekozen. Vanuit theoretisch oogpunt zou de manier waarop keuzeproblemen worden aangeboden - en in het bijzonder wat de standaardkeuzemogelijkheid is - er niet toe moeten doen zolang de voorkeuren van de beslisser duidelijk zijn en de kosten van het kiezen uit de alternatieven verwaarloosbaar klein zijn. Van oudsher is de gedachte altijd geweest dat een vergroting van het aantal keuzemogelijkheden leidt tot een hoger welvaartsniveau omdat beslissers ervoor kunnen kiezen nieuwe alternatieven buiten beschouwing te laten. Inzichten uit psychologisch onderzoek laten echter zien dat informatie overbelasting en keuze stress een belangrijke invloed uitoefenen op uitkomsten van beslissingsprocessen en een keuze voor de standaardoptie meer waarschijnlijk maken. Er zijn echter ook andere mogelijke verklaringen waarom standaard keuzeopties vaker worden gekozen zoals laksheid, een voorkeur voor de status quo, de interpretatie van standaardopties als een impliciet advies en uitstelgedrag.

Zover wij weten bestaat er geen studie die het relatieve belang van de verschillende verklaringen empirisch heeft onderzocht. De achterliggende veronderstelling in onze studie is dat degenen die beslissingen in de ene situatie uitstellen bijvoorbeeld vanwege het complexe karakter ervan, dit type gedrag mogelijk ook in andere situaties zullen vertonen. Wij beschouwen een aantal zeer verschillende keuzesituaties met verschillende karakteristieken en onderzoeken of er een dominante factor is die de keuze voor de standaardoptie verklaart. Op basis hiervan willen wij lessen trekken voor belangrijke financiële keuzes en in het bijzonder pensioenbeslissingen.

Onze bevindingen voor Nederlandse respondenten laten zien dat uitstelgedrag en financiële geletterdheid belangrijke determinanten zijn van het keuzegedrag in situaties met eens standaardoptie. De situaties die wij beschouwen bevatten belangrijke financiële beslissingen zoals sparen voor de oude dag of voor vroegpensioen en het afsluiten van een testament. Daarnaast bestuderen wij beslissingen ten aanzien van de registratie als orgaandonor, het uitbrengen van je stem tijdens verkiezingen, het opzeggen van abonnementen, en het aantekenen van bezwaar tegen het ontvangen van marketing via de post of telefoon. Op basis van de regressieanalyses lijkt een belangrijke rol weggelegd voor sociale interacties en sociale normen bij de verklaring van afwijkingen van de standaard keuzeoptie vanwege de invloed van de mening van anderen op keuzegedrag.

Dit artikel bevat ook een vergelijkende analyse voor de Verenigde Staten, aangezien wij de kans hadden een verkorte versie van de vragenlijst voor te leggen aan de leden van het RAND American Life Panel. Ook in de VS komen uitstelgedrag en financieel analfabetisme

naar voren als belangrijke verklaringen voor de aantrekkelijkheid van de standaardoptie, maar wij vinden geen rol voor sociale normen en interacties vergelijkbaar met die voor de Nederlandse situatie. Bovendien lijkt in de VS financiële ongeletterdheid relatief gezien belangrijker, terwijl in Nederland uitstelgedrag een meer dominante rol vervult. Terwijl wij alleen kunnen gissen naar de oorzaak van deze verschillen, die waarschijnlijk hun achtergrond hebben in bestaande verschillen tussen instituties, cultuur en tradities hebben zij belangrijke gevolgen voor het te voeren beleid. Zo suggereren de uitkomsten voor Nederland dat nieuwe beleidsinitiatieven een grotere rol zouden moeten toekennen aan het verhogen van het bewustzijn, terwijl in de VS meer nadruk op een goede informatievoorziening en een heldere en eenvoudige presentatie van keuzeproblemen wellicht de meest effectieve aanpak is.

Terwijl de vier artikelen verschillende dimensies van financieel gedrag en individuele beslissingen adresseren, is het overkoepelende beeld dat naar voren komt dat 1) financiële vaardigheden van cruciaal belang zijn voor huishoudbeslissingen en 2) dat er een groot gat zit tussen de daadwerkelijke financiële kennis van huishoudens aan de ene kant en de vaardigheden die nodig zijn voor pensioenbeslissingen aan de andere kant. Nederlandse werknemers lijken zich hiervan echter terdege bewust en zijn daarom niet happig op het uitoefenen van meer invloed en verkrijgen van meer beleggingsverantwoordelijkheid ten aanzien van het pensioen. De artikelen tonen verder dat het verminderen van de complexiteit van financiële beslissingen de kwaliteit van huishoudbeslissingen ten goede kan komen; dat er een belangrijke rol lijkt weggelegd voor informatievoorziening en educatie; en dat de manier waarop keuzeproblemen zijn vormgegeven er toe doet voor financiële uitkomsten. Een belangrijke vraag voor vervolgonderzoek is welke typen opleidingsprogramma's en activiteiten de financiële geletterdheid van gezinnen op de meest effectieve manier kunnen verhogen.

Al met al, laten de resultaten echter zien dat het niet waarschijnlijk is dat financiële educatie alleen voldoende zal zijn om moeilijkheden die gezinnen ondervinden bij het maken van financiële beslissingen op te lossen. Het beleid moet er tevens op gericht zijn om waar mogelijk financiële beslissingen eenvoudiger te maken en te waarborgen dat informatie en advies over financiële producten begrijpelijk is en op een transparante, onafhankelijke manier tot stand komt. Wat wel duidelijk is dat een hoger niveau van financiële kennis gepaard gaat met veel voordelen in termen van wat algemeen als slim financieel gedrag wordt beschouwd.

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## CURRICULUM VITAE

Maarten van Rooij (1970) works as a senior research economist in the Economics & Research Division of De Nederlandsche Bank. He is affiliated to Netspar (Network for Studies on Pensions, Aging and Retirement) and member of the editorial board of the Dutch journal TPEdigitaal. In 1995 he received his Masters degree in Econometrics (cum laude) from Tilburg University with a special focus in the fields of monetary economics, operations research and applied econometrics. He has worked among others on macroeconomic forecasting and business cycle analysis at De Nederlandsche Bank for about seven years before switching to the field of pensions and household financial behavior in 2003.



