MUNICH CENTER FOR THE ECONOMICS OF AGING
AT THE MAX PLANCK INSTITUTE FOR SOCIAL LAW AND SOCIAL POLICY

FINANCIAL LITERACY, RIESTER PENSIONS, AND OTHER PRIVATE OLD AGE PROVISION IN GERMANY

Tabea Bucher-Koenen

250-2011

Amalienstr. 33_D-70899 Munich_Phone +49 89 38602-355_Fax +49 89 38602-390_www.mea.mpisoc.mpg.de

Financial Literacy, Riester Pensions, and Other Private Old Age Provision in Germany

Tabea Bucher-Koenen*

MEA, Max-Planck-Institute for Social Law and Social Policy

December 2, 2011

Abstract

Financial knowledge is not wide spread in Germany. In that respect we confirm results found for other countries, like the United States and the Netherlands. Women, those with low education and low income, as well as households in east Germany are at risk of having low financial literacy. In 2001 a state subsidized private pension scheme (Riester pensions) was introduced in Germany. The central question is, Are Riester pensions successful at encouraging individuals with low financial literacy to save privately for old age? Our results indicate that financial literacy is positively related to privately saving for retirement independent of state subsidies. Levels of private coverage are particularly low among individuals in the lowest income quartile, who would profit most from the state subsidies. At the same time they show the lowest levels of financial literacy.

Keywords: financial literacy, retirement preparation, life-cycle savings, Riester pensions

JEL Classification: D91

*Munich Center for the Economics of Aging at the Max-Planck-Institute for Social Law and Social Policy, Amalienstr. 33, 80799 Munich, Germany. Email: bucher-koenen@mea.mpisoc.mpg.de. I would like to thank Axel Börsch-Supan, Michela Coppola, Martin Gasche, Johannes Koenen, Judith Koenen, Eberhard Kruk, Annamaria Lusardi, Fabrizio Mazzonna, Anette Reil-Held, Ulrich Schlieper and Michael Ziegelmeyer for their helpful comments. Furthermore, I am grateful to Inga Karrer and Klara May for excellent research assistance. I am particularly grateful to the German Research Foundation (Deutsche Forschungsgemeinschaft) for financing the SAVE survey. Financial support from Netspar is gratefully acknowledged.

1 Introduction

Private old age provision is growing increasingly important in times of demographic change and mounting strains on the public pension system. Major pension reforms were implemented in Germany since the mid-1990s. As a result responsibility for pension income has shifted from the state level towards the individual level. Currently about 85% of the German workforce is covered by the German public pension insurance. According to Börsch-Supan and Wilke (2006) about 88% of total disposable income during retirement in Germany is disbursed from the public pension system. After the recent reforms these payments will decrease and individuals are expected to accumulate substantial amounts of pension wealth in addition to their claims from the public pension system to bridge the gap that arises in old age income. In order to provide additional incentives for private old age savings the so called Riester pensions—state subsidized private pension or savings contracts—were introduced in 2001.[1]

Every person who may be affected by the prospective decrease of the first pillar pensions is eligible for Riester subsidies. In contrast to private (third pillar) retirement savings in the Netherlands and Sweden, Riester contracts are voluntary, supplementary pensions. Currently between 37 and 39 million individuals are estimated to be eligible,[2] and as of 2009, about 12.9 million Riester contracts have been signed (BMAS (2009)). The fundamental concept is that savers contribute 4% (at least €60) of their gross income per year to a certified private savings contract and receive a lump-sum subsidy of (currently) €154 or a tax deduction. Moreover, families with children receive €185 for each child (€300 if the child was born after 2007). Thus, the Riester scheme is particularly generous for individuals with low income and families with children. They can obtain subsidies of well over 90% of their contribution.[3]

For many individuals in Germany the need to save for old age in addition to the state pension is new. In order to evaluate the effectiveness of governmental programs, it is vital to examine who provides for their old age income and signs a Riester or other private old age savings contract and who does not. One important variable to be considered among individuals is their level of erudition as investors. In light of increasing individual

[1] See Börsch-Supan and Wilke (2004) and Wilke (2009) for details on the reform of the German retirement system.

[2] See, e.g., Fassauer and Toutaoui (2009), Sommer (2007).

[3] See Gasche (2008), Sommer (2007). For more information on the Riester pensions also see, e.g., Börsch-Supan et al. (2008) and Coppola and Reil-Held (2009).

responsibility and potential public measures such as targeted information and education programs it is therefore important to better understand the link between households' financial knowledge and financial decision making.

Studies of financial literacy in the US and the Netherlands found that in particular low income/low education households and women often lack financial literacy and thus accumulate low retirement wealth (see e.g. Lusardi and Mitchell (2011b), Van Rooij et al. (2011a)). Bucher-Koenen and Lusardi (2011) find similar results for the German population. Riester pensions could address these issues, as they were designed to be especially beneficial to households with low income and households with children. Subsidies for children are assigned to the retirement savings contracts of women by default, so that women on average benefit more from the subsidies. However, the interaction with financial literacy has not been studied up until now. The following questions need to be answered: How financially literate are individuals with a Riester compared to individuals with other private old age savings and compared to households without any private provision? Are higher levels of financial literacy associated with greater private pension coverage? How are the incentives created by the subsidies related to the level of financial literacy, i.e., how does the association between financial literacy and private pension coverage change for households with lower income and/or with children? Thus, are Riester subsidies successful at encouraging individuals with lower financial knowledge to save privately for their income after retirement?

This study contributes to the existing literature in several ways. First, I use a measure of financial literacy that has been used previously in studies in the US and the Netherlands and thus allows for a standardized way to evaluate the level of financial literacy in Germany. Second, I analyze the link between financial knowledge and owning private savings contracts for retirement. Several other studies found that the level of financial literacy among the German population is limited (e.g., Commerzbank AG (2003), Leinert (2004), Raffelhüschen and Victoria Lebensversicherung AG (2006), Bankenverband (2008)). However, these studies largely failed to link financial knowledge to financial decision making of individuals. The SAVE data—a panel data set representative for households in Germany—gives me a unique opportunity to fill this gap. Compared to Bucher-Koenen and Lusardi (2011) in which we examined the relation between financial literacy and planning for retirement using the same data set, I will go one step ahead

and look at the relation between financial literacy and actual retirement savings.[4] And finally, by analyzing the relation between financial literacy and Riester contracts as well as financial literacy and non-subsidized private pension contracts I hope to contribute to the ongoing debate about the success of financial incentives for private retirement provision.

The main findings are that there is a strong and positive association between financial literacy and any form of private retirement provisions even when controlling for differences in socio-demographic background. The coverage with old age savings products in the lowest income quartile is very low, despite the high subsidies for the poorest. More than 70% of the poorest households do not own any kind of supplementary private pensions. In the higher income quartiles this share is substantially lower: Only about 20% of the households in the top quartile do not own supplementary private pensions. Additionally, households in the lowest income quartile show the lowest level of financial literacy, even after adjusting for differences in socioeconomic status. Moreover, among low income households higher financial literacy is significantly and positively associated with ownership of a private savings contract. In contrast to this, households with high income and higher financial literacy generally have a lower coverage with Riester pensions and a higher probability to own other forms of private coverage.

The remainder of this paper is structured as follows. In the following section I will briefly review the literature on financial literacy and saving behavior and give an introduction to the design of Riester pensions. I will then state my hypotheses. Section 3 describes the SAVE data. Section 4 provides the empirical evidence on financial literacy and retirement savings. Section 5 summarizes and discusses my conclusions.

2 Literature and Hypotheses

2.1 Life-cycle Savings and Financial Literacy

When analyzing old age provision one usually draws on the classical life-cycle savings theory by Modigliani and Brumberg (1954). The central outcome of their model is that as a result of optimization behavior individuals smooth their consumption path over

[4] I will focus on demand induced ownership of Riester contracts in my analysis. Besides this, one could argue how the objectives of the supply side influence ownership structure. This aspect is discussed in more detail in Bucher-Koenen and Koenen (2010).

the life-cycle (life-cycle savings hypothesis). To compensate for income-losses at old age forward-looking individuals should accumulate capital at younger ages. Thus, taking their current information into account individuals calculate an expected value of the future development of their income, their survival probability, the discount rates, the interest rate, their investments, the pension claims and inflation. They formulate their optimal consumption and savings plan based on these grounds (Lusardi (2008)).

However, empirical studies find that individuals' savings patterns are substantially different from the predictions of the classical life-cycle savings theory. Other saving motives like precautionary saving or bequest motives were subsequently included to improve the model's predictive power.[5] There are few studies that explicitly consider the role of financial literacy in a theoretical context. Maki (2004) argues relatively informally that financial education does not change preference parameters of individuals (risk and time preferences) but alters the choice set that individuals face when planning for the future. Thus, financial education increases individuals' awareness of possible ways to save for future consumption and thereby improves their decisions. Delavande et al. (2008) argue on similar grounds and assume that individuals are limited in their ability to optimize consumption and savings over the life-cycle due to restrictions in information access and information processing. However, individuals can improve their optimization abilities by acquiring financial knowledge, which is modeled as human capital production process. Peress (2004) explains the different pattern of stock holding and wealth by endogenous differences in information. He assumes that financial information about stocks is costly, and that its value for the individual increases with the amount to be invested in stocks. Thus, individuals with more money to invest, buy information and invest more in stocks because the investment is less risky for them. They thereby accumulate further wealth. The features common to all models of financial literacy acquisition are that information about financial investment opportunities is costly and individuals can acquire knowledge. In general, financial literacy and financial decision making are mutually enhancing: The more an individual knows about different options and consequences the better her financial decisions will be. At the same time the more decisions the individual makes, the more knowledge she can acquire.

There is empirical evidence, which links financial knowledge and saving behavior. In the United States of America (US) the first studies on financial knowledge were con-

[5]For a review see Browning and Lusardi (1996).

ducted by Bernheim (1998), Hogarth and Hilgert (2002), Hilgert et al. (2003) and Moore (2003).[6] Lusardi and Mitchell link financial literacy and the accumulation of retirement wealth in various studies.[7] Furthermore, Lusardi and Mitchell (2011b), Van Rooij et al. (2011b) as well as Christelis et al. (2010) discover that individuals with less financial knowledge and numeracy have fewer risky assets in their portfolio. Campbell (2006) argues that individuals with lower knowledge may face higher fixed cost of participation in the stock market or anticipate that their portfolio choice would be less efficient and thus stay out of risky assets.

In addition to these studies of the link between financial literacy, wealth accumulation and portfolio choice, there are a number of studies that examine the relationship between financial literacy and investment mistakes. According to Lusardi and Tufano (2009) individuals who know less about the effects of compound interest are more likely to report excessive debt. Campbell (2006) finds that financially sophisticated households are more likely to refinance mortgages when this is beneficial. Less educated households are much more likely to report implausibly low mortgage rates and may therefore fail to refinance. Müller and Weber (2010) discover that financially sophisticated investors are less biased towards past returns, pay lower front-end loads and less frequently miscalibrate forecasts for their own as well as the general stock market development. They detect a minor influence of financial literacy on buying passively vs. actively managed funds. A study by the OECD (2008) summarizes the effects of low financial literacy on the decision to annuitize, i.e. to insure against longevity risk and indicates that less literate individuals might be less likely to insure against longevity risk. According to Calvet et al. (2007) more educated, wealthier households with higher income tend to invest more aggressively and at the same time more efficiently. They face only moderate losses due to under-diversification of their portfolios. Calvet et al. (2009) discover that investment mistakes (under diversification, risky share inertia and the disposition effect) decrease with wealth as well as with education and financial experience. They also identify a strong positive correlation between the share of risky assets held in the portfolio and financial sophistication.

Overall, empirical research finds a positive relation between financial knowledge and the quality of financial decision making.

[6] Lusardi (2008) provides an overview of different studies.

[7] See, e.g., Lusardi and Mitchell (2011b, 2007a,b, 2008).

2.2 Riester Pensions

Due to the recent reforms in the German pension system and the resulting increase in individuals' responsibility for financial planning, it is particularly interesting to examine the link between financial literacy and old age savings. In the course of the German public pension reform the government decided to reduce the standard pension level in order to avoid dramatic increases in contribution rates. Börsch-Supan and Gasche (2010a) estimate public pension income in 2030 to be between 14% and 16% lower compared to a situation without the reform. The so called Riester pensions, state subsidized private pension plans, are tailored to encourage private savings in order to close the gap arising in public pension income. Riester pensions are private savings plans, investment funds or private pension plans that are subsidized depending on individuals' income and number of children.[8] The contracts are offered by private firms—mainly insurance companies or banks—and have to be certified.[9] According to the Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin) more than 4,300 Riester products were certified between 2001 and 2009. The certification does not guarantee the economic stability of the provider or its cost effectiveness but is merely a check if certain criteria regarding the structure of the plan are fulfilled. For example, one of the central features of certification is that at least 70% of the accumulated sum have to be paid as annuity.

Every individual mandatorily insured in Germany's public pension system and public servants, as well as the eligible persons' spouses, are authorized to get Riester subsidies. The estimates of the number of eligible persons differ mainly due to the difficulties in estimating the number of indirectly eligible persons.[10] Most recent estimates by Fassauer and Toutaoui (2009) range between 38.2 and 39.0 million eligible individuals, i.e. more than 70% of all individuals aged between 15 and 64 can profit from the subsidy. Measuring this estimation against the 12.9 million signed Riester contracts at the end of 2009 gives a crude indication of the Riester coverage, i.e. around 34% of the individuals estimated to be eligible own Riester contracts. The analysis of micro-data in the following will give a more detailed picture of Riester coverage and its determinants.

Subsidies are either payed as lump-sum or tax deduction. The lump-sum subsidies

[8] In 2008 an additional scheme that subsidizes owner-occupied housing was introduced ("Wohn-Riester").

[9] Until June 2010 contracts were certified by the Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin), thereafter they are certified by the Bundeszentralamt für Steuern.

[10] See, e.g., Sommer (2007), Fassauer and Toutaoui (2009).

are particularly generous for low income earners and families with children, whereas the tax reduction is more beneficial for households with higher incomes. The current regulation is summarized in Table 1. Depending on the number of children low income earners can obtain a *Zulagenquote*—ratio of subsidies to total contribution—between 70 and 90% in 2008. The ratio of subsidies is reduced to between 30 and 40% for individuals with high income in 2008.[11]

Table 1: Riester Subsidies

This table summarizes the state subsidies for Riester products as applicable from 2008 onwards.

minimum percentage of income required to be saved to obtain full subsidies	4%
minimum own contribution in Euros per year	60
per capita subsidy in Euros per year	154
subsidies for children in Euros per year:	
- children born before 1.1.2008	185
- children born on 1.1.2008 and after	300
one-time bonus if the subsidized individual is younger than 25 in Euros	200
maximum tax deductible amount in Euros per year	2100

Source: based on Sommer (2007).

According to Stolz and Rieckhoff (2009) since the start of the program in 2002 a total sum of around 6 billion Euros of subsidies were granted until September 2009. This amount is based on Riester contracts in 2006, because the application for subsidies allows a possible lag of two years. Moreover, it only covers the direct subsidies and not the amount of tax deduction. The authors evaluate data of the Zentrale Zulagenstelle für Altersvermögen (ZfA)—the government agency responsible for granting the subsidies. They find that in particular individuals with an income below the average apply for subsidies. Moreover, they find that almost half of the subsidy recipients have children and the percentage of subsidies for children is higher among women than among men. The average *Zulagenquote* is around 30% between 2006 and 2008. It is particularly high for women—mostly due to lower incomes and a higher share of subsidies for children. It is slightly higher for individuals in east Germany—probably also due to lower average income levels.

This analysis slightly misrepresents the true effect of the Riester campaign because the effect of tax deductions is not considered. Evaluations of micro-data confirm that Riester contracts are popular among women and individuals living in east Germany. In

[11] For further details on the structure of the subsidies, eligibility rules and the dynamics of the Riester plans see, e.g., Börsch-Supan et al. (2008), Coppola and Reil-Held (2009) and Sommer (2007).

contrast to the result by Stolz and Rieckhoff (2009) the coverage among individuals at the bottom of the income distribution is still relatively low, but reveals a high dynamic (see Coppola and Reil-Held (2009) and Geyer and Steiner (2009)). Gasche and Ziegelmeyer (2010) find that there was no increase in new subsidized private savings contracts due to the financial crisis, however, they still detect a growing distribution of Riester contracts in the lowest income quintile 2009.

Generally, even nine years after the introduction, a vivid debate still rages about the effectiveness of Riester pensions, their distributional and macroeconomic effects.[12]

2.3 Hypotheses

Studies of financial literacy in the US and the Netherlands find that in particular households with lower income and lower education as well as women are at risk of lacking financial literacy and thus accumulate low retirement wealth (see e.g. Lusardi and Mitchell (2011b), Van Rooij et al. (2011a)). Bucher-Koenen and Lusardi (2011) showed that financial literacy in Germany is particularly low among individuals with low income, low education, women, and those living in east Germany. However, whether these groups are also at risk of accumulating low retirement wealth remains an open question. Riester pensions are especially beneficial to households with low income and households with children. By default the subsidies for children are assigned to the contracts of women, so that on average women benefit more from the subsidies. This means that incentives to save for retirement are tailored to those groups that are identified to be at risk of having lower financial literacy in previous studies. Thus, it is interesting to study the effect of financial literacy on owning a Riester contract compared to other non-subsidized forms of private provision for old age. The question I would like to answer is: Are Riester pensions successful at encouraging individuals with lower financial literacy to save privately for their old age? The hypothesis to be tested is therefore:

Hypothesis 1: High state subsidies for Riester pensions create additional incentives for German households to provide privately for retirement. As incentives are particularly high for individuals with lower levels of financial literacy I expect the level of financial literacy of owners of Riester contracts on average to be lower compared to owners of

[12]See, e.g., Börsch-Supan et al. (2010), Börsch-Supan and Gasche (2010b), Coppola and Reil-Held (2009), Corneo et al. (2009), Börsch-Supan and Gasche (2010a), Gasche and Ziegelmeyer (2010), Pfarr and Schneider (2011), Sommer (2007).

other non-subsidized pensions.

Subsidies for Riester pensions differ considerably across income and for families with children. Previous evidence on the respondence of US households to incentives created by pension systems suggests that only those who are aware of the incentives also respond (see Chan and Stevens (2008)). Therefore my second central question is: How are financial literacy and the level of subsidies related? I would like to test the following hypothesis:

Hypothesis 2: I expect individuals with higher financial literacy to be better at realizing the size of the subsidy and therefore buy Riester contracts. Therefore, I propose that there exists a positive effect of financial literacy at the bottom of the income distribution and among households with children on owning a Riester contract.

There is a tension between the propositions in hypotheses one and two. In hypothesis one the expectation is that all households independent of their level of financial expertise will react to financial incentives and thus financial incentives can to some extent mitigate the lack of financial literacy on private retirement savings. Hypothesis two specifies that only those with higher levels of expertise will react to the incentives. For the evaluation of public policy I think it is particularly interesting to see which of the two behavioral assumptions describes actual behavior more accurately.

3 Data

3.1 SAVE

I use SAVE, a representative German household panel designed to improve the understanding of savings behavior, for the analysis. The survey was first conducted in 2001 by the Mannheim Research Institute for the Economics of Aging (MEA). Consecutive surveys were in the field in 2003/2004, and in every year since 2005. The data were collected during the early summer of 2009. The questionnaire is in paper and pencil format.[13]

I use the random route sample for my analysis and restrict the sample to respondents without missing answers in the financial literacy task, i.e. 1,007 households remain in the sample. Missing information on other variables is imputed using an iterative multiple

[13] A detailed description of the scientific background, design, and results of the survey can be found in Börsch-Supan et al. (2009).

imputation procedure based on a Markov-Chain Monte-Carlo method (Schunk (2008), Ziegelmeyer (2009, 2011)). Thereby the efficiency of estimates is increased due to a larger number of observations and the item non-response bias that occurs if observations with and without missing values differ systematically is reduced. Five multiple imputed data sets are used for the analysis and results are derived using Rubin's method (Rubin (1987, 1996)). Table A8 in the appendix describes the socioeconomic details of the households in the sample. Sample specific weights with respect to age and income classes are constructed on the basis of the German Mikrozensus 2008 and are applied to the all descriptive statistics.

In the first part of the empirical analysis I spend some time to describe the performance of German households on the financial literacy task. It is based on the sample of 1,007 respondents representative of the German population. In the second part of the paper I am interested in individuals' saving behavior prior to retirement. Thus, I restrict the analysis to households below the age of 60. Additionally, I proxy Riester eligibility and restrict the sample in the following way: I exclude single households who are retired and households where both partners are retired from the analysis.[14] In addition to the retired households I exclude self-employed and non-working households as long as they are not unemployed, raising children, or doing a civil or military service. Thus, in section 4.2 sample size is reduced to 509 households.

3.2 Measuring Financial Literacy

Much research has been conducted on ways to measure financial literacy, pioneered primarily by Annamaria Lusardi and Olivia Mitchell. Their stepping stone was the development of three quiz-like questions testing the understanding of inflation, interest and risk (Lusardi and Mitchell (2011b)). Their focus is on measuring actual knowledge rather than decision making skills or financial experience. These questions have been included in various surveys around the world and allow for some comparison of financial knowledge across countries. Based on these questions an extended set of questions was developed for the Dutch Household Panel (DNP) (Van Rooij et al. (2011b)) which was also used in the RAND American Life-Panel (ALP) (Lusardi and Mitchell (2007b)). Some of these questions were included in SAVE 2009 and form the basis for the analysis

[14]Since 2008 disabled persons are also eligible for Riester subsidies. In SAVE I cannot distinguish between the forms of retirement. Therefore, I slightly underestimate the number of eligible households.

in this paper. Hung et al. (2009) aim at defining and validating various measures of financial literacy. They find that the extended measure of Lusardi and Mitchell (2007b) is internally consistent, shows good test-retest reliability and is stable over time.

In SAVE 2009 we included nine of the original questions measuring financial literacy. Four of the questions are classified as measuring basic financial concepts.[15] The first question concerns the understanding of interest and mainly requires the ability to calculate. The second question examines the understanding of the joint effects of interest and inflation. A third question deals with calculating compound interest and a fourth question is related to money illusion. Five additional questions are categorized as measuring advanced financial knowledge. They deal with risk and diversification, understanding asset fluctuations, the stock market, mutual funds, and bond pricing. The wording of the questions is contained in appendix B. These questions are used to measure financial literacy in a German household survey for the first time. Therefore, I will elaborate on the answering behavior in some detail in section 4.1.

3.3 Measure of Old Age Provision

Each year participants are requested to fill in a detailed household balance sheet. We obtain information on the kinds of saving products households own and how much of their wealth is invested in these. Regarding old age provision, households are requested to report if they owned private life insurances (*Private Lebensversicherung*),[16] state subsidized private pensions (*staatlich geförderte private Altersvorsorge*), or other non-subsidized private pensions (*private Rentenversicherungen*) at the end of the previous year, i.e. at the end of 2008. More specifically for each category we know the number of contracts the household owns, the amount of wealth invested, and the monthly contributions during 2008. For the analysis in this paper I am only using information on whether households own the respective contracts. I construct a dummy variable equal to one if households own state subsidized pension contracts ("Riester"). Additionally, I use a dummy if households have non-subsidized private pensions, i.e. private life-insurance or other non-subsidized private pensions ("non subsidized private old age provision"). There is some overlap between households with Riester and other non-subsidized forms

[15] Van Rooij et al. (2011b) conduct factor analysis to categorize the questions and aggregate them into measures of basic and advanced financial literacy.

[16] In Germany private life-insurance contracts in the form of capital life-insurance contracts are a common way to accumulate retirement wealth.

of private provision. I construct an additional dummy equal to one, if households own both forms of private provision ("Riester and other").

4 Empirical Evidence

4.1 Basic and Advanced Financial Literacy

The responses given to all nine financial literacy questions are shown in Table 2. Overall, more respondents are able to give correct answers to the basic financial literacy questions (Panel A) compared to the advanced financial literacy questions (Panel B).

Basic Financial Literacy. Among the basic questions, most respondents answer the interest question correctly (83%). Surprisingly, almost 20 percentage points fewer respondents (83% compared to 63%) give a correct answer to the compound interest question despite the similarity in the style of the questions. Compound interest is calculated correctly by 63% of the respondents and incorrectly answered by around one fourth. For the money illusion question the frequency of incorrect answers is even higher (32%). Only around 56% correctly reply that the purchasing power of their money remains constant. The question regarding inflation has the fewest incorrect answers (5%) and the largest frequency of "do not know" (17%) among the basic questions. It is correctly answered by 79% of the individuals.

Panel A in Table 3 displays the number of correct answers on the basic financial literacy task as summary measure for basic financial literacy. Around 10% of the respondents are unable or unwilling to answer any of the questions and 38% give four correct answers. In the multivariate regression I will use a dummy equal to one if a respondent is able to give four correct answers as a measure for basic financial literacy.

Advanced Financial Literacy. Regarding advanced financial literacy I find that the bond question is the most difficult for individuals (see Table 2 Panel B). Only 9% are able to correctly answer this question. More than half of the respondents give an incorrect answer. Interestingly, the number of "do not know" is only second highest for this question. More respondents admit to be uninformed about the design of mutual funds compared to bond prices. The questions about stock market risk and returns of certain investment products are each answered correctly by around 62% of the respondents. I summarize the number of correctly answered questions on the advanced financial liter-

Table 2: Responses to the Financial Literacy Task

Panel A–**Basic Financial Literacy**: This table contains the relative frequencies of respondents who gave correct or incorrect answers to the questions on the basic financial literacy task. DK/refuse refers to those respondents who were unwilling (refuse) or unable (do not know) to answer the respective question. N=1,007.

	Interest	**Inflation**	**Compound Interest**	**Money Illusion**
Incorrect	6.33	4.62	25.45	31.32
Correct	82.66	78.52	62.54	55.88
Dk/refuse	11.01	16.86	12.01	12.8
Total	100	100	100	100

Panel B–**Advanced Financial Literacy**: This table contains the relative frequencies of respondents who gave correct or incorrect answers to the questions on the advanced financial literacy task. DK/refuse refers to those respondents who were unwilling (refuse) or unable (do not know) to answer the respective question. N=1,007.

	Risk	**Return Volatility**	**Stock Market**	**Mutual Funds**	**Bond**
Incorrect	5.88	10.24	18.07	7.16	53.38
Correct	62.1	62.54	48.52	41.86	8.86
Dk/refuse	32.02	12.01	33.41	50.98	37.77
Total	100	100	100	100	100

Source: SAVE 2009, data is weighted.

acy task in Table 3 Panel B. The bond question is excluded from the advanced financial literacy measure, because there are so few correct answers.[17] Overall, more than 20% of the respondents are unable to give any correct answer. Just slightly more than 27% of the individuals answer all questions correctly. I will use a dummy variable equal to one if four questions are answered correctly to measure advanced financial literacy in the multivariate regressions.

Advanced and basic financial literacy are correlated. Table 4 shows the number of correct answers on each of the tasks. No respondent who is unable to correctly answer any of the questions on the basic task obtains four correct answers on the advanced task. However, respondents with four correct answers on the basic task are very likely to obtain four correct answers on the advanced task. In total almost 18% of the respondents are able to answer all eight questions considered. The spearman rank correlation between the two measures is 0.54 (p-value 0.0000).

International Comparison. Figures C1 and C2 in the appendix show the relative frequencies of correct responses to all nine questions in an international comparison. Currently results on the performance of individuals from the Netherlands (Van Rooij

[17]Principal components analysis revealed that this item does not correlate well with the other items.

Table 3: Basic and Advanced Financial Literacy Index

Panel A–**Basic Financial Literacy**: This table contains the frequency and the proportion of respondents who were able to answer zero to four questions on the basic financial literacy task.

No. of correct answers	Freq.	Percent
0	98	9.74
1	72	7.13
2	153	15.15
3	299	29.71
4	385	38.27
Total	1007	100

Panel B–**Advanced Financial Literacy**: This table contains the frequency and the proportion of respondents who were able to answer zero to four questions on the advanced financial literacy task.

No. of correct answers	Freq.	Percent
0	208	20.61
1	138	13.66
2	167	16.58
3	220	21.82
4	275	27.33
Total	1007	100

Source: SAVE 2009, data is weighted.

Table 4: Basic and Advanced Financial Literacy

This table shows the joint distribution of basic and advanced financial literacy among the respondents. N=1,007.

		Advanced Financial Literacy Index					
No. of correct answers		0	1	2	3	4	Total
Basic Financial Literacy Index	0	8.08	1.16	0.35	0.14	0	9.74
	1	2.44	2.47	1.05	0.57	0.61	7.14
	2	3.79	2.85	3.53	3.1	1.88	15.15
	3	4.38	4.34	5.81	8.29	6.9	29.72
	4	1.97	2.78	5.89	9.67	17.94	38.25
	Total	20.66	13.6	16.63	21.77	27.33	100

Source: SAVE 2009, data is weighted.

et al. (2011b)) and the US (Lusardi and Mitchell (2007b)) are available. The comparison reveals that German respondents are slightly less likely to give correct responses to all questions. The Dutch respondents outperform the US on the compound interest calculation and on the mutual funds question. However, the differences here are small. The US American respondents perform best on the rest of the questions. However, one should not over-interpret the differences detected between the countries. Besides being related to institutional differences deviations can be related to the design of the surveys (ALP respondents have higher education and income than the average American population[18])

[18]See, Lusardi and Mitchell (2007b), p.4.

or the design of the questionnaire (SAVE is a paper and pencil questionnaire, whereas DNP and ALP are internet panels).[19]

Financial Literacy and Socio-demographics. Financial literacy increases with education and income. Additionally, individuals older than 65 are less likely to know responses to the advanced questions. There are no differences between age-groups in the probability to answer the basic literacy questions. Levels of basic and advanced financial literacy are lower in east Germany. Women in west Germany are significantly less likely to be financially literate. The gender differences in the west are larger and more significant for advanced financial literacy compared to basic literacy. Interestingly, there are no differences across gender in advanced and basic financial literacy in east Germany: Men and women know equally little. Thus, the pattern detected for the three financial literacy questions in Bucher-Koenen and Lusardi (2011) seems relatively stable when using a more extensive measure of financial literacy.

4.2 Private Old Age Provision

Table 5 shows the prevalence of certain forms of old age provision for a sample of 509 non-retired households younger than 60 who are eligible for Riester subsidies. The analysis reveals that around 39% of the respondents eligible for Riester subsidies in 2009 actually own at least one Riester contract: 16% own Riester contracts only, while around 23% own Riester in addition to other non-subsidized private savings contracts. This is broadly in line with our crude previous estimation of a Rister coverage of 34% based on aggregate information. Moreover, all in all 43% of the households own non-subsidized private old age savings contracts and almost 41% of the households do not own any form of supplementary private old age provision.

4.3 Financial Literacy and Private Old Age Provision

Hypothesis 1. I propose that high state subsidies for Riester pensions create additional incentives for German households to save privately for retirement. As incentives are particularly high for individuals identified with low levels of financial literacy, i.e. those with low income and women, I expect the level of financial literacy of owners of Riester

[19]For further international comparisons based on three financial literacy questions see Lusardi and Mitchell (2011a).

Table 5: Private Old Age Provision and Financial Literacy

This table contains the frequency and the proportion of households with different forms of private old-age provision. It also shows the average number of respondents' correct answers on the basic and advanced financial literacy task. Standard errors are in parentheses. N= 509.

			Financial Literacy	
	Freq.	**Percent**	**Basic**	**Advanced**
no private old age provision	207	40.6	2.55 (0.10)	2.02 (0.10)
Riester	82	16.2	2.86 (0.15)	2.41 (0.17)
other private old age provision	103	20.2	3.10 (0.12)	2.66 (0.14)
Riester and other	117	23.0	3.21 (0.09)	2.78 (0.12)
Total	509	100.0	2.86 (0.06)	2.39 (0.07)

Source: SAVE 2009, data is weighted and imputed (not financial literacy).

contracts on average to be lower compared to owners of other non-subsidized pensions.

In addition to private pension ownership, Table 5 displays the average number of correctly answered basic and advanced financial literacy questions for households with different forms of private old age provision. The average number of correctly answered basic and advanced literacy questions increases with private pension ownership. Households without a private savings contract have the lowest levels of financial literacy: on average they are able to answer 2.6 of the basic questions and 2 of the advanced questions. Their level of basic and advanced financial literacy is significantly lower than that of households with private savings contracts—Riester or other.[20]

Furthermore, households who only have a Riester contract and no non-subsidized private old age provision are slightly less literate than households who either only have non-subsidized forms of private old age provision or have a Riester contract in addition to non-subsidized private old age provision. They are able to answer on average 2.9 of the basic and 2.4 of the advanced literacy questions. There is a significant difference (at 5%) in basic financial literacy between those who only have a Riester contract and those who have a Riester in addition to a non-subsidized contract. The difference between Riester savers and non-Riester savers is not significant. The same pattern is detected using the advanced measure of financial literacy.

In summary, I find a significantly positive association between financial literacy and saving privately for retirement among SAVE respondents who are younger than 60. Also,

[20]Differences in the means between the four groups are tested using two-sided t-tests. Basic financial literacy: no provision vs. Riester, significant at 10%; no provision vs. other private provision, significant at 1%; no provision vs. Riester+other private provision, significant at 1%. Advanced financial literacy: no provision vs. Riester, significant at 10%, no provision vs. other private coverage,significant at 1%, no provision vs. Riester+other private provision, significant at 1%.

the possession of Riester contracts is associated with a slightly lower level of financial literacy than the possession of other non-subsidized forms of private old age provision.

In order to separate the effects of the subsidies and financial literacy I conducted multivariate probit regressions (see Table 6). I control for the size of the subsidies by adding income and children. Other control variables are gender, living in east Germany, age, and education. In specification I in Table 6 I examine the association between financial literacy and owning a Riester contract, while controlling for other forms of private old age provision. In specification III I examine the relationship between other forms of old age provision and financial literacy while controlling for ownership of a Riester pension. In both regressions I find a positive association of advanced financial literacy with saving for old age: Answering all advanced questions correctly is associated with a 10% higher probability to own non-subsidized old age provision and an 8% higher probability to own a Riester contract. The effects are significant at the 5% level. Basic financial literacy does not show any significant effect in these regressions. In Hypothesis 1 I proposed that the association between financial literacy and private retirement savings should be stronger in case of non-subsidized contracts. In order to test the difference in the size of the effects across regressions a simultaneous equation model was estimated. The χ^2-test for the equality of coefficients is not rejected. Thus, in a multivariate context I find that advanced financial literacy is almost equally positively related to ownership of subsidized and non-subsidized private provision. Unfortunately, a causal interpretation of the coefficients is not possible, because of endogeneity issues, omitted variable bias and measurement error. Nevertheless, these issues should affect both regressions equally so that the interpretation of the difference between the two coefficients should be possible. I will further comment on this in the discussion.

Table 6: Probit: Determinants of Private Old Age Provision

This table reports the effect of financial literacy and various covariates on owning private old-age provision. The dependent variable in specification I and II is a dummy that indicates if a household owns a Riester contract. In specification III the dependent variable is a dummy indicating if a household owns other non-subsidized private pension contracts. I report marginal effects (me) after estimating a probit evaluated at the mean of all variables and the respective standard errors (se). Marginal effects and standard errors are calculated using 5 imputed data sets and combined according to Rubin's Rule (Rubin (1987, 1996)). Marginal effects in the model with interaction terms are calculated according to Ai and Norton (2003). Basic and advanced financial literacy each are measured by a dummy equal to one if all questions of the respective tasks were correctly answered. (d) indicates the change of a dummy variable from 0 to 1. Ref. indicates the reference category if various dummies are used.

	Riester				**Non-subsidized private old age provision**	
	I		II		III	
	me	se	me	se	me	se
Private old age provision (d)	0.15	0.04***	0.18	0.05***	-	-
Riester (d)	-	-	-	-	0.15	0.04***
Advanced financial literacy (d)	0.08	0.05**	0.11	0.06**	0.10	0.05**
Basic Financial Literacy (d)	-0.01	0.05	-0.01	0.05	0.00	0.05
Male (d)	-0.11	0.04***	-0.12	0.05***	-0.08	0.04**
Living in East Germany (d)	0.00	0.05	0.00	0.06	0.02	0.05
Age: 36 and younger (d)	0.07	0.05	0.07	0.06	-0.03	0.05
Age: 36-50	ref.	ref.	ref.	ref.	ref.	ref.
Age: 51-60 (d)	-0.11	0.05**	-0.12	0.06**	0.15	0.05**
Lower secondary education (d)	-0.04	0.07	-0.03	0.08	-0.13	0.08**
Upper secondary education (d)	ref.	ref.	ref.	ref.	ref.	ref.
Post sec. non tert. Education (d)	0.04	0.08	0.06	0.09	0.06	0.08
Tertiary education (d)	-0.03	0.06	-0.03	0.07	0.00	0.06
1st income quartile	ref.	ref.	ref.	ref.	ref.	ref.
2nd income quartile (d)	0.16	0.07***	0.18	0.08**	0.20	0.07***
3rd income quartile (d)	0.20	0.07***	0.21	0.08***	0.31	0.06***
4th income quartile (d)	0.20	0.07***	0.22	0.08***	0.41	0.06***
Children living in the hh (d)	0.10	0.05**	0.12	0.05**	0.00	0.05
2nd income * advanced financial literacy (d)			-0.24	0.17*		
3rd income * advanced financial literacy (d)			-0.32	0.18**		
4th income * advanced financial literacy (d)			-0.29	0.16**		
Children * advanced financial literacy (d)			0.13	0.11		
Observations	483		483		483	
Pseudo R2	0.11		0.12		0.18	

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

Hypothesis 2. Previous evidence suggests that only those who are aware of financial incentives within the US pension system also respond to these incentives (see Chan and Stevens (2008)). Börsch-Supan et al. (2008) and Coppola and Reil-Held (2009) find that among households with the lowest income Riester pension coverage is still quite low but increases rapidly over time. Moreover, they identify a higher coverage of families with children. In a next step I will analyze how this is related to financial knowledge. I expect individuals with high financial literacy at the bottom of the income distribution and among families with children to be better at realizing the benefits from the high subsidies and buy Riester contracts.

Table 7 compares the relative frequencies of private old age provision and the average number of correctly answered financial literacy questions over income quartiles. First of all, it is notable that the share of households without private coverage decreases strongly with increasing income. In the lowest (first) income quartile almost three quarters of the households are without any kind of private coverage. Around 18% own Riester pensions and around 13% own non-subsidized pensions.[21] In the upper parts of the income distribution the share of households without private pensions decreases from 45% in the second quartile to 27% in the third and 21% in the fourth quartile. Riester coverage as well as the percentage of households with non-subsidized pensions increases with income. An interesting aspect is that the increase in the prevalence of non-subsidized contracts is much steeper (from 13.5% to 67%) than the increase in the prevalence of Riester pensions (17.5% to 52%).

Moreover, the share of households with just a Riester contract is somewhat hump-shaped over income. It is highest for households in the middle of the income distribution. Households in the higher income quartiles are more likely to own non-subsidized forms of private old age provision either only or in addition to a Riester contract. The coverage in the lowest income quartile is still very low. Despite the high subsidies these households do not save for retirement.

Bernheim (1997, 1998) argues that it is important to distinguish between individuals who actively choose not to save due to budget restrictions or their preferences and individuals who save too little to meet their own objective or even fail to form an objective due to the inability to calculate correctly. The low old age saving in the lowest

[21] The shares do not add to 100% because households can own both, a Riester and a non-subsidized contract.

Table 7: Private Old Age Provision and Financial Literacy over Household Income
This table contains the frequency and the proportion of households with different forms of private old-age provision in the four income quartiles. It also shows the average number of respondents' correct answers on the basic and advanced financial literacy task. Standard errors are in parentheses. N=509.

			Financial Literacy	
	Freq.	**Percent**	**Basic**	**Advanced**
		1st Quartile		
no private oldage provision	89	73.5	2.57 (0.15)	1.90 (0.16)
Riester	16	13.0	2.85 (0.27)	2.76 (0.34)
other private oldage provision	11	9.0	3.01 (0.30)	1.52 (0.47)
Riester and other	5	4.4	2.87 (0.51)	1.88 (0.93)
Total	121	100.0	2.66 (0.12)	1.97 (0.14)
		2nd Quartile		
no private oldage provision	49	45.4	2.30 (0.21)	2.17 (0.22)
Riester	20	18.7	2.50 (0.30)	1.87 (0.22)
other private oldage provision	19	17.7	3.10 (0.27)	2.84 (0.29)
Riester and other	20	18.2	2.94 (0.18)	2.45 (0.32)
Total	109	100.0	2.59 (0.12)	2.28 (0.14)
		3rd Quartile		
no private oldage provision	32	27.3	2.50 (0.27)	1.74 (0.27)
Riester	26	22.4	3.07 (0.26)	2.46 (0.27)
other private oldage provision	29	25.0	2.89 (0.23)	2.54 (0.25)
Riester and other	30	25.3	3.30 (0.18)	2.64 (0.22)
Total	118	100.0	2.93 (0.11)	2.33 (0.13)
		4th Quartile		
no private oldage provision	34	21.3	2.95 (0.21)	2.42 (0.29)
Riester	19	12.1	2.99 (0.32)	2.68 (0.38)
other private oldage provision	44	27.2	3.28 (0.18)	2.96 (0.22)
Riester and other	63	39.5	3.28 (0.12)	3.04 (0.17)
Total	161	100.0	3.18 (0.09)	2.84 (0.12)

Source: SAVE 2009, data is weighted and imputed (not financial literacy).

income quartile might on the one hand reflect reluctance to buy an old age savings contract due to skepticism and lack of knowledge. On the other hand households might not save due to budget limitations or save in more liquid forms due to being close to the budget restriction. However, Table 7 also indicates that overall the households in the lowest income quartile show a lower probability to be financially literate.

Comparing the average number of basic and advanced financial literacy questions correctly answered by respondents (Table 7) shows that basic and advanced financial literacy increase with income. In the bottom income quartile households on average answer 2.7 of the basic and less than 2 of the advanced questions correctly. In the top quartile households on average give more than 3 (almost 3) correct answers on the basic (advanced) task. Moreover, within all income quartiles the average number of correctly

answered basic financial literacy questions is lowest for households without any private old age provision. The association between the level of advanced financial literacy and the probability to save privately for old age is strongest in the upper half of the income distribution. In the bottom half of the income distribution the pattern is less clear, however, the number of observations in some of the cells here is very low and standard errors are substantial.

To investigate this point a little further I conduct a probit regression including interaction terms between advanced financial literacy and income as well as having children (see specification II in Table 6). This gives me the opportunity to examine the relationship between financial literacy and ownership of Riester for different levels of subsidies. In line with previous results, e.g., by Börsch-Supan et al. (2008) and Coppola and Reil-Held (2009), specification II reveals that households belonging to the lowest 25% of the income distribution show a significantly lower probability of owning subsidized private old age provision compared to individuals with higher incomes. Households with children are more likely to own Riester pensions compared to households without children.

Within the lowest income quartile advanced financial literacy shows a significantly positive (at 5%) association with ownership of a Riester contract. In the upper income quartiles financial literacy is negatively associated with ownership of a Riester contract. A possible explanation might be that financially literate individuals at the top of the income distribution already had private pensions before Riester subsidies were introduced. Alternatively, these households maybe look for more profitable ways of saving for old age especially in light of the debate about the high cost of Riester contracts. The interaction between having children and advanced financial literacy is positive but insignificant.

Thus, these results are at least partly in line with the second hypothesis. Financial sophistication appears to be positively associated with Riester ownership at the bottom of the income distribution where subsidies are particularly generous. However, I do not find this effect for families with children.

5 Discussion and Conclusions

In this paper I use a set of financial literacy questions to evaluate financial knowledge among German respondents which was previously used to evaluate financial sophistication in the US and the Netherlands. Overall, the level of financial sophistication among

German respondents is similar to results found for US and Dutch respondents. Financial literacy is not wide spread: Less than 40% of the respondents were able to answer four basic financial literacy questions related to concepts like interest and inflation. The financial market specific knowledge is even lower: Only around 27% of all respondents were able to answer all four advanced questions. Financial literacy is particularly low among women, households with low education and low income, and among those living in east Germany. These groups have previously already been identified at risk of low literacy in Germany and other countries (see Lusardi and Mitchell (2011a)).

The objective was to examine whether financial literacy in Germany is related to private retirement provision. Overall, the analysis shows that financial literacy is positively associated with any form of private pension contract even when controlling for differences in education and income. The relation between financial literacy and ownership of non-subsidized private old age provision is slightly stronger than the relation between financial literacy and Riester ownership. However, the difference is not very big and not significant when comparing the size of the coefficients after multivariate regressions. Moreover, private provision in the lowest income quartile is still lower than in the rest of the population even though the subsidies for Riester are very high for those households. About three-quarters of those in the lowest income quartile do not save for retirement. At the same time financial literacy at the bottom of the income distribution is particularly low. The association between financial literacy and ownership of a Riester pension is strong and positive among these households.

Unfortunately, a causal interpretation of the effect of financial literacy on retirement savings is not feasible on the basis of my analysis. The main reasons are a possible endogeneity of financial literacy, omitted variable bias due to missing information on variables like, e.g., general ability, and measurement error. Overall the effect of financial literacy might be biased upwards or downwards. However, previous analyses using the same data set showed a strong positive effect of financial literacy on retirement planning using an instrumental variable (IV) approach (see Bucher-Koenen and Lusardi (2011)). Additionally, many other studies, like e.g. Lusardi and Mitchell (2007b, 2011a), Van Rooij et al. (2011b), also use IV estimation and find strong positive effects of financial literacy on retirement planning and stock market participation. Interestingly, most of the studies using IV regressions find that the effect of financial literacy on financial decision making is stronger when using instruments. Thus, the effect of financial literacy

on private pension ownership found in this paper most likely underscores the true effect.

Thus, despite these drawbacks, I would like to conclude that the analysis above indicates that the subsidies provided by Riester fail to encourage those with lower levels of financial literacy to save privately for old age. This result is in line with evidence provided by Coppola and Gasche (2011) that many of the households who do not own a Riester pension are unaware of the fact that they are eligible for subsidies. Only those with higher levels of financial literacy seem to respond to the financial incentives provided by the Riester scheme. Thus, more effort is needed here. One promising way can be to develop financial education programs targeted to specific groups at risk of low financial literacy and inform them about financial topics in general and the subsidies in particular.

References

Ai, C. and Norton, E. C.: 2003, Interaction Terms in Logit and Probit Models, *Economics Letters* **80**, 123–129.

Bankenverband: 2008, *Ökonomische Bildung und Finanzplanungskompetenz*.

Bernheim, B. D.: 1997, *Facing the Age Wave*, Hoover Institution Press, chapter The Adequacy of Personal Retirement Saving: Issues and Options.

Bernheim, B. D.: 1998, *Living with Defined Contribution Pensions*, University of Pennsylvania Press, chapter Financial Illiteracy, Education, and Retirement Savings, pp. 38–68.

BMAS: 2009, *Entwicklung der privaten Altersvorsorge (Stand III. Quartal 2009)*, Bundesministerium für Arbeit und Soziales.

Börsch-Supan, A., Coppola, M., Essig, L., Eymann, A. and Schunk, D.: 2009, *The German SAVE Study - Design and Results*, second edn, Mannheim Institute for the Economics of Aging (MEA).

Börsch-Supan, A. and Gasche, M.: 2010a, Kann die Riester-Rente die Rentenlücke in der gesetzlichen Rente schliessen?, *MEA Discussion Paper* **201**.

Börsch-Supan, A. and Gasche, M.: 2010b, Zur Sinnhaftigkeit der Riester-Rente, *MEA Discussion Paper* **197**.

Börsch-Supan, A., Gasche, M. and Ziegelmeyer, M.: 2010, Auswirkungen der Finanzkrise auf die private Altersvorsorge, *Perpektiven der Wirtschaftspolitik* **11**(4), 383–406.

Börsch-Supan, A., Reil-Held, A. and Schunk, D.: 2008, Saving Incentives, Old-age Provision and Displacement Effects: Evidence from the Recent German Pension Reform, *Journal of Pension Economics and Finance* **7**(3), 295–319.

Börsch-Supan, A. and Wilke, C. B.: 2004, The German Public Pension System: How it was, How it will be, *NBER Working Paper* **10525**.

Börsch-Supan, A. and Wilke, C. B.: 2006, *Gratwanderungen zwischen Generationenvertrag und Eigenvorsorge: Wie Europa die Herausforderungen des demographischen Wandels annimmt*, Deutsches Institut für Altersvorsorge (DIA).

Browning, M. and Lusardi, A.: 1996, Household Saving: Micro Theories and Micro Facts, *Journal of Economic Literature* **34**, 1797–1855.

Bucher-Koenen, T. and Koenen, J.: 2010, Do Smarter Consumers Get Better Advice?—An Analytical Framework and Evidence from German Private Pensions, *mimeo* .

Bucher-Koenen, T. and Lusardi, A.: 2011, Financial Literacy and Retirement Planning in Germany, *Journal of Pension Economics and Finance* **10**(4), 565 – 584.

Calvet, L. E., Campbell, J. Y. and Sodini, P.: 2007, Down or Out: Assessing the Welfare Costs of Household Investment Mistakes, *Journal of Political Economy* **115**(5), 707–747.

Calvet, L. E., Campbell, J. Y. and Sodini, P.: 2009, Fight or Flight? Portfolio Rebalancing by Individual Investors, *Quarterly Journal of Economics* **124**(1), 301–348.

Campbell, J. Y.: 2006, Household Finance, *The Journal of Finance* **LXI**(4), 1553–1604.

Chan, S. and Stevens, A. H.: 2008, What you don't know can't help you: Pension knowledge and retirement decision.making, *Review of Economics and Statistics* **90**, 253–266.

Christelis, D., Jappelli, T. and Padula, M.: 2010, Cognitive Abilities and Portfolio Choice, *European Economic Review* **54**, 18–38.

Commerzbank AG: 2003, Finanzielle Allgemeinbildung in Deutschland, *Commerzbank AG* .

Coppola, M. and Gasche, M.: 2011, Die Riester-Förderung—das unbekannte Wesen, *MEA* **244-11**.

Coppola, M. and Reil-Held, A.: 2009, Dynamik der Riester-Rente: Ergebnisse aus SAVE 2003 bis 2008, *MEA Discussion Paper* **195**.

Corneo, G., Keese, M. and Schröder, C.: 2009, The Riester Scheme and Private Savings: An Empirical Analysis based on the German SOEP, *Schmollers Jahrbuch* **129**(2), 312–332.

Delavande, A., Rohwedder, S. and Willis, R.: 2008, Preparation for Retirement, Financial Literacy and Coginitive Resources, *Michigan Retirement Research Center* **190**.

Fassauer, S. and Toutaoui, N.: 2009, Die Anzahl des förderberechtigten Personenkreises der Riester-Rente—eine Annäherung, *Deutsche Rentenversicherung* **6**, 478–486.

Gasche, M.: 2008, Und sie lohnt sich doch! Riestern ist auch und gerade für Geringverdiener wichtig, *Allianz Dresdner Economic Reserach Working Paper* **107**.

Gasche, M. and Ziegelmeyer, M.: 2010, Verbreitung der Riester-Rente—Hat die Finanz- und Wirtschaftskrise Spuren hinterlassen?, *MEA Discussion Paper* **198**.

Geyer, J. and Steiner, V.: 2009, Die Zahl der Riester-Renten steigt sprunghaft—aber Geringverdiener halten sich noch zurück, *DIW Wochenbericht* **32**.

Hilgert, M. A., Hogarth, J. M. and Beverly, S. G.: 2003, Household Financial Management: The Connection between Knowledge and Behavior, *Federal Reserve Bullentin* **July**, 309–322.

Hogarth, J. M. and Hilgert, M. A.: 2002, Financial Knowledge, Experience and Learning Preferences: Preliminary Results from a New Survey of Financial Literacy, *Consumer Interest Annual* **48**.

Hung, A. A., Parker, A. M. and Yoong, K. K.: 2009, Defining and Measuring Financial Literacy, *RAND Working Paper* **WR-708**.

Leinert, J.: 2004, Finanzieller Analphabetismus in Deutschland: Schlechte Voraussetzungen für eigenverantwortliche Vorsorge, *Gesundheits- und Sozialpolitik* **3-4**, 24–30.

Lusardi, A.: 2008, Financial Literacy: An Essential Tool for Informed Consumer Choice?, *Center for Financial Studies* **19**.

Lusardi, A. and Mitchell, O.: 2007a, Baby Boomer Retirement Security: The Roles of Planning, Financial Literacy, and Housing Wealth, *Journal of Monetary Economics* **54**(1), 205–224.

Lusardi, A. and Mitchell, O.: 2007b, Financial Literacy and Retirement Planning: New Evidence from the Rand American Life Panel, *Pension Research Council Working Paper* **PRC-WP2007-33**.

Lusardi, A. and Mitchell, O.: 2008, Planning and Financial Literacy: How Do Women Fare?, *American Economic Review: Papers and Proceedings* **98**, 413–417.

Lusardi, A. and Mitchell, O.: 2011a, Financial Literacy Around the World: An Overview, *Journal of Pension Economics and Finance* **10**(4), 497–508.

Lusardi, A. and Mitchell, O.: 2011b, *Financial Literacy: Implications for Retirement Security and the Financial Marketplace*, Vol. forthcoming, Oxford University Press, chapter Financial Literacy and Planning: Implications for Retirement Wellbeing.

Lusardi, A. and Tufano, P.: 2009, Debt Literacy, Financial Experiences, and Overindebtedness, *NBER Working Paper* **14808**.

Maki, D. M.: 2004, *Private Pensions and Public Policy*, Brooking Institution Press, chapter Financial Education and Private Pensions, pp. 126–145.

Modigliani, F. and Brumberg, R.: 1954, *The Collected Papers of Franco Modigliani - The Life-Cycle Hypothesis of Saving*, MIT Press, chapter Utility Analysis and Aggregate Consumption Functions: An Attempt at Integration, pp. 128–197.

Moore, D.: 2003, *Survey of Financial Literacy in Washington State: Knowledge, Behavior, Attitudes, and Experiences*.

Müller, S. and Weber, M.: 2010, Financial Literacy and Mutual Fund Investment: Who buys Actively Managed Funds?, *Schmalenbach Business Review* **62**, 126–153.

OECD: 2008, Financial Education and Annuities, *Working Paper on Private Pensions* .

Peress, J.: 2004, Wealth, Information Acquisition, and Portfolio Choice, *Review of Financial Studies* **17**, 879–914.

Pfarr, C. and Schneider, U.: 2011, Anreizeffekte und Angebotsinduzierung im Rahmen der Riester-Rente: Eine empirische Analyse geschlechts- und sozialisationsbedingter Unterschiede, *Perspektiven der Wirtschaftspolitik* **12**(1), 27–46.

Raffelhüschen, B. and Victoria Lebensversicherung AG: 2006, *Arbeiten, Leben, Vorsorge - Studie zur betrieblichen Altersvorsorge*, Victoria Lebensversicherung AG.

Rubin, D. B.: 1987, *Multiple Imputation for Nonresponse in Surveys*, New York: Wiley.

Rubin, D. B.: 1996, Multiple Imputation After 18+ Years, *Journal of the American Statistical Association* **91**(434), 473–489.

Schunk, D.: 2008, A Markov Chain Monte Carlo Algorithm for Multiple Imputation in Large Surveys, *Advances in Statistical Analysis* **92**, 101–114.

Sommer, M.: 2007, Fiskalische Auswirkungen einer Erweiterung des Förderungsrahmens von Riesterrenten, *MEA Discussion Paper* **122**.

Stolz, U. and Rieckhoff, C.: 2009, Beitragsjahr 2006: Erstmals mehr als eine Milliarde Euro Zulagenförderung durch die ZfA, *RVaktuell* **11**, 376–383.

Van Rooij, M., Lusardi, A. and Alessie, R.: 2011a, Financial literacy and retirement planning in the Netherlands, *Journal of Economic Psychology* **forthcoming**.

Van Rooij, M., Lusardi, A. and Alessie, R.: 2011b, Financial Literacy and Stock Market Participation, *Journal of Financial Economics* **forthcoming**.

Wilke, C. B.: 2009, German Pension Reform, *Sozialökonomische Schriften* **34**.

Ziegelmeyer, M.: 2009, Documentation of the logical imputation using the panel structure of the 2003-2008 German SAVE Survey, *MEA Discussion Paper* **173-09**.

Ziegelmeyer, M.: 2011, Illuminate the Unknown: Evaluation of Imputation Procedures Based on the SAVE Survey, *MEA Discussion Paper* **235-11**.

A Appendix A: Summary Statistics

Table A8: Summary Statistics

This table contains summary statistics for 1,007 respondents in the SAVE random route sample in 2009.

Variable	Mean	Std. Dev.	Min	Max
Age	51.87	16.63	22	91
Men	0.47	0.50	0	1
Living in east Germany	0.36	0.48	0	1
Rural Region (below 5,000 inh.)	0.08	0.27	0	1
Married	0.55	0.50	0	1
Single	0.20	0.40	0	1
Divorced	0.13	0.33	0	1
Widowed	0.09	0.29	0	1
Separated	0.02	0.15	0	1
Partner	0.63	0.48	0	1
Household size	2.40	1.26	1	8
Number of Children	1.68	1.41	0	10
Children in the Household	0.35	0.48	0	1
Employed	0.53	0.50	0	1
Full-time	0.33	0.47	0	1
Part-time	0.20	0.40	0	1
Retired	0.30	0.46	0	1
Lower secondary schooling	0.10	0.31	0	1
Upper secondary schooling	0.61	0.49	0	1
Post sec., non-tert. schooling	0.10	0.30	0	1
Tertiary schooling	0.14	0.35	0	1
Other schooling	0.04	0.20	0	1
Income (per month in Euros)	2,158	1,505	0	15,000
Net wealth (end of 2008 in Euros)	129,404	251,906	-287,222	6,050,000

Source: own calculation on the basis of SAVE 2009, data is weighted and imputed.

B Appendix B: Measures of Financial Literacy

Basic Literacy

1. *Understanding of Interest Rate (Interest)*

   "Suppose you had €100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow: more than €102, exactly €102, less than €102?" do not know / refuse to answer

2. *Understanding of Inflation (Inflation)*

   "Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy more than, exactly the same as, or less than today with the money in this account?" do not know / refuse to answer

3. *Understanding of Compound Interest (Compound Interest)*

   "Suppose you had €100 in a savings account and the interest rate is 20% per year and you never withdraw money or interest payments. After 5 years, how much would you have on this account in total: more than €200, exactly €200, less than €200 ?" do not know / refuse to answer

4. *Understanding of Money Illusion (Money Illusion)*

   "Suppose that in the year 2012, your income has doubled and prices of all goods have doubled too. In 2012, how much will you be able to buy with your income: more than today, the same, less than today?" do not know / refuse to answer

Advanced Literacy

1. *Understanding of Risk and Diversification (Risk)*

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

2. *Understanding Average Asset Fluctuations (Return Volatility)*

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

3. *Understanding of the Main Function of the Stock Market (Stock Market)*

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

4. *Understanding of Mutual Funds (Mutual Funds)*

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

5. *Bond Prices and Interest (Bond)*

   "If the interest rate falls, what should happen to bond prices?" Rise / Fall / Stay the same / None of the above / Do not know/ refuse to answer

C Appendix C: International Comparison of Financial Literacy

Figure C1: International Comparison of Basic Financial Literacy

This figure shows the relative frequency of correct responses to the basic financial literacy questions in SAVE 2009 (Germany) in comparison to responses in the American Life Panel (ALP, USA) as reported in Lusardi and Mitchell (2007b) and the Dutch National Household Panel (Netherlands) as reported in Van Rooij et al. (2011b).

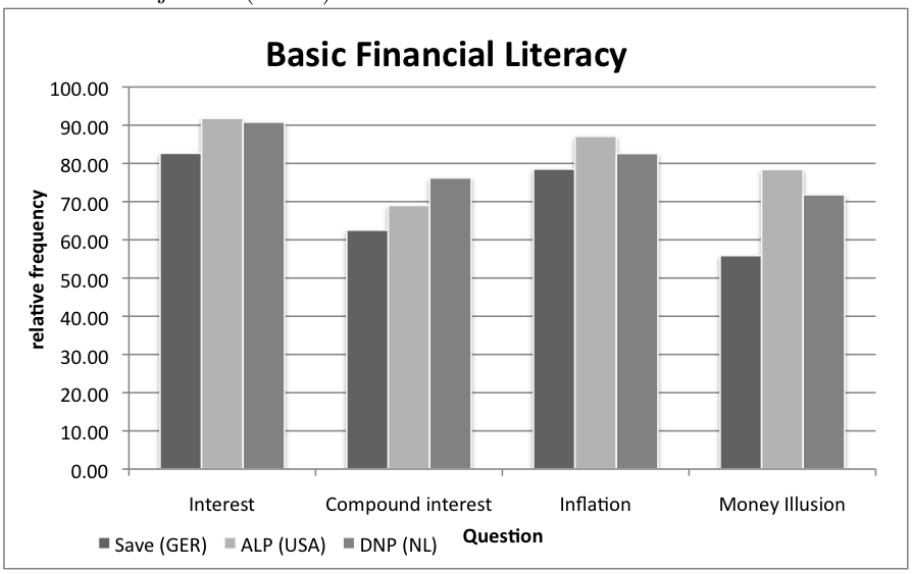

Figure C2: International Comparison of Advanced Financial Literacy

This figure shows the relative frequency of correct responses to the advanced financial literacy questions in SAVE 2009 (Germany) in comparison to responses in the American Life Panel (ALP, USA) as reported in Lusardi and Mitchell (2007b) and the Dutch National Household Panel (Netherlands) as reported in Van Rooij et al. (2011b).