Financial literacy in the Netherlands: The relation on debt, life insurance and investment behavior.

Floris Gransbergen

Erasmus University Rotterdam

613049fg@eur.nl

Abstract

In this paper the effects of financial literacy on debt, life insurance and investment behavior are studied. The data comes from a sample in the Liss Panel. The sample consists of three years (2007, 2009 and 2011) and 887 participants. Using panel data regressions and a probit regression the possible correlations are examined. The regressions show a significant influence of life insurance on debt behavior and financial planning. However, there are no clear relations between financial literacy, investment behavior and total wealth. A big effect in the form of the financial crisis seems to distort the results, which makes it difficult to draw clear conclusions.

TABLE OF CONTENTS

1. Introduction

In the last years investments became easier to access and individualism has risen drastically. people need to make more and more financial decisions. They need to plan their retirement, get a mortgage or pay the study for their children. Financial decisions tent to require financial literacy. If financial mistakes are made and budgets are wrongly estimated, financial problems can arise. The mortgage crisis showed that problems regarding financial literacy might be widespread and develop without being noticed for a long time (Hung, Yoong, Parker et al. 2009). Investing in financial literacy could potentially solve some of these budgetary issues. In this paper research is performed on the possible correlation between financial decisions and financial literacy. Aren and Aydemir (2014) write that policy makers need to look at the research done on financial literacy and take these results seriously. If financial mistakes are made it could harm the whole of society.

Financial literacy is a measure of financial knowledge and the quality to implement this knowledge in your own financial situation. It is defined by asking a panel questions on financial problems. The scores people achieve in this test will give data on the level of literacy people have.

A very important part of understanding the problems in financial literacy is the fact that individuals who make mistakes are less likely to accept that they make mistakes and acknowledge how they can do better. If people cannot or don't want to learn from their mistakes, they keep spiraling and making wrong financial decisions (Anderson Baker and Robinson 2017).

The Financial caused a change in the way people perceive their financial situation (Hung et al. 2009). To determine the effect of financial literacy research over multiple years is performed. Lower levels of financial literacy could have had a negative influence on people's financial situation. The effects of debt, investment behavior and financial planning (through the proxy of life insurance) on financial literacy are estimated.

Thanks to credit cards, mortgages, buying in terms and other forms of consumer loans, the amount of consumer debt has risen drastically (Dynan, 2009). Research by Agarwal et al. (2008) found that there is a direct effect of financial knowledge on decision making regarding loans. Lusardi and Tufano (2015) conclude that less financial literacy results in higher

borrowing costs. Lastly, people with higher financial literacy seem to behave less excessive when it comes to acquiring debt (Sevim, Sayilir and Temizel 2012).

Investment behaviour during the financial crisis is also likely to change. Financial literacy could be a big influence. People in India with high financial literacy have a higher awareness level on financial decision making. Financial illiterate people make safe investment decisions, they are less likely to buy the more risky and higher return investments (Bushan 2014). In this research the amount of money people invest is estimated over three years. However safe and more risky investments cannot be differentiated in the data used.

The last financial decision analysed is pension planning, or future financial planning. To estimate the possible effects a probit regression the proxy, life insurance. If a person chooses to get life insurance, they think more about the planning of their financial future. In France higher financial literacy is correlated with financial planning (Arrondel, Debbich and Savignac 2014). Promoting financial knowledge could result in less financial problems in the future because the planning is improved. In the U.S a very low (positive) correlation was found between financial knowledge and planning (Alhenawi and Elkhal 2013). Household scoring on average 75 percent in the knowledge part only scored 59 percent on average in the planning part (Alhenawi and Elkhal 2013). The results found are different and therefore the result this paper provides will be interesting and contribute to the existing literature.

In this paper three big financial indicators are connected to financial literacy. To estimate if there is a problem with financial literacy in the Netherlands, different databases from the Liss Panel are used. The 'big three' questions from Lusardi and Mitchell (2014) are included with an extra question on bonds and stocks. There is also a question on the perceived financial literacy in the panel. According to Anderson et al. (2017) a low perceived financial literacy indicated that the change of making suboptimal financial decisions gets higher. To estimate the difference in literacy and perceived financial literacy a variable called *estimation* is created.

Nearly all groups overestimate their financial literacy in this research. Women score on average lower and overestimate their financial literacy more. Education seems to be correlated with financial literacy. The higher the level of education, the more literate people are on average. If the level of education is higher the amount of over estimation between the perceived and actual literacy gets smaller. Higher educated people are better at determining their financial literacy.

There is an effect of financial literacy on debt behaviour. Lower financial literacy results in more debt and lower satisfaction with the financial situation. The research on investment planning and total assets gives fewer clear results, probably because there is one negative effect that distorts the results. The probit regression on life insurance does show an effect, people with higher financial literacy are more likely to acquire life insurance. The financial literate could therefore be more likely to think about financial and pension planning.

In some financial categories there then is a connection with financial literacy. It is however unclear how big the correlations between the problems in these categories and financial literacy are. The big distortion, possibly from the financial crisis, makes the results less clear. Financial literacy then might not be as big a problem as some research shows, or further research needs to be done to get a clearer estimation.

This research contributes to the existing literature because it analyses behaviour over three years and connects is with financial literacy is estimated. In these years the financial crisis did cause some big effects (Hung et al. 2009). Estimating if financial literacy contributed to any of these effects can protect people from making suboptimal financial decisions in the future. Behaviour over time regarding financial literacy has not been analysed very often, especially not in western countries during such an important period.

1. Definition and Prevelance of Financial Literacy

In the research on financial literacy a definition often misses and the ones that exist differ per research. However, the Jump$tart Coalition for Personal Finance Education defines it for the U.S. in their National Standards in K–12 Personal Finance Education as follows: 'Financial literacy is the ability to use knowledge and skills to manage one's financial resources effectively for lifetime financial security (Jump$tart, 2007, page 3).'

In Figure 1, a model is provided on financial literacy constructed by Hung et al. (2009). The figure shows the relation between the different parts of financial literacy and the possibilities of backward causality. Financial knowledge does influence the perceived knowledge, financial skills and financial behaviour (Hung et al. 2009). Financial skills and Perceived knowledge then also influence financial behaviour. However financial behaviour can also influence the financial and perceived knowledge. In a lot of studies, financial literacy is the same as financial

education. Aren and Aydemir (2014) warn that the meaning needs to be specified, otherwise researchers could be barrelling towards a misunderstanding.

Figure 1: Model on Financial Literacy
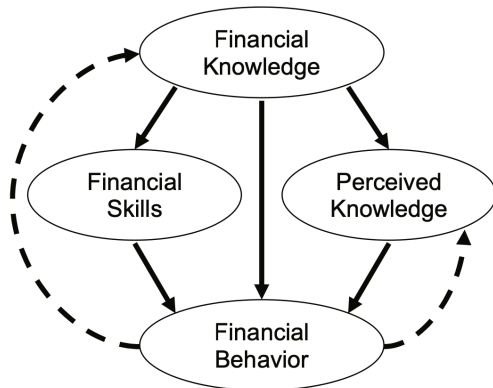
Source: Figure 1 by Hung, Parker and Yoong, page 12 (2009)

Economic models consider the discount rate, risk aversion and social welfare when it comes to spending and saving, but the 'gap between modeling and reality' is much wider than expected (Lusardi and Mitchell, 2014). Workers did not devote time to their pension plan when the government was in charge, and chances are small they suddenly have become financial masterminds now that they need to make their own decisions. It is unlikely that this factor is included perfectly in economic models. Financial literacy could be a way to make people more aware and narrow the gap between the calculated models and reality.

Lusardi and Mitchell (2014) name three important qualities to be able to understand financials:

1. *Numeracy and calculations related to interest rates.*
2. *Understanding of inflation.*
3. *Understanding of risk diversification*

When questions representing this knowledge were asked to all age groups of the US by Lusardi and Mitchell (2014) it became prevalent that knowledge of financial literacy is low. Lusardi and Tufano (2015) write that in debt literacy, only a third of the respondents knew how interest rate on debt would influence the amount of debt. This could have the possible effect of people lending money against interest rates without knowing if they will be able to pay it back or if it is a loan on fair terms.

There are different ways of measuring financial literacy. Aren and Aydemir (2014) described the following ways researchers used in the past:

1. Estimation using scales, with questions regarding financial knowledge. This way data can be created on how people score financially.

2. People evaluate their own knowledge regarding literacy.

3. Researchers use a combination of one and two. This way the real and perceived scores can be compared.

4. The last body of research is literature that estimates a proxy for financial literacy. This proxy is chosen because earlier literature showed that it influences financial literacy. However, Aren and Aydemir (2014) write this is a very small field of research. Risk averseness, time preferences and overconfidence can be used as proxies to determine the effect of financial literacy (Aren and Aydemir 2014).

5. Lusardi and Mitchell (2014) studied the research done via an instrumental variable, and for these studies the effect was always bigger than for a normal regression. This could be because of the group they influence or a measurement error. It is however likely that a normal regression underestimates the effect (Lusardi and Mitchell 2014).

2. Literature Review

In the paper of Japelli and Padula (2013) a theorical model is constructed on the investments in financial literacy. The results of this model are then confirmed with an empirical analysis, and strong support for the model is found. This research where an economic model is created and confirmed by empirical analysis seems credible. The model is built on the fact that investment in literacy increases wealth in the future. This investment depreciates over time and it decreases the current budget (Japelli and Padula 2013). It is a two-period model, where higher discount factor, higher income and higher financial literacy result in higher savings. The empirical analysis. The data is taken from 2003 and 2006 and uses waves 1, 2, and 3 from the SHARE database. Only respondents that are 50 years or above are included. OLS regressions are performed to estimate the results. The conclusion is that countries with better social security networks discourage people to invest in financial literacy or to have any savings at all, the social security will save them if they make bad financial decisions (Japelli and Padula 2013).

In their literature review, Aren and Aydemir (2014) citate the study of Atkinson and Messy (2012). In this study, 14 OECD countries are examined by asking 8 knowledge questions regarding financial literacy. The questionnaire was taken in 2010 and 2011. Atkinson and Messy

(2012) compare the scores achieved on financial literacy by the different countries. The results show that financial literacy is low in nearly all countries. Trough surveying with the same questions in all countries the results represent the levels of financial literacy in different countries.

Lusardi, Michaud and Mitchell (2017) estimated a model that tries to determine the spending and saving patterns of people through their lives, including a cost to invest in financial literacy. They want to maximize a broad utility function including family size, income, medical expenditure, and education for every year that the individual is alive (Lusardi et al 2017).

By running over 5000 simulations the spending, saving and investment patterns for different people can be simulated. The optimal investment in financial literacy is when the marginal benefits are equal to the marginal cost of time and money (Lusardi et al. 2017). In the field of economic research this is known as the way to optimize profit. The level of this investment depends on the cost of accessing financial knowledge, something that differs for every individual. The estimation made with the model from Lusardi et al. (2017) shows it can be optimal to not invest at all in financial literacy if the cost of financial knowledge is too high. But if the whole society gets some early in life financial education this can however be beneficial for the total welfare (Lusardi and Mitchell 2014). Lusardi et al. (2017) find that the conclusion from the research of Japellia and Padulla (2013) is indeed true: Countries with mores social benefits often have people with lower financial literacy. The returns on investing in financial knowledge are less high because the social benefits can be accessed regardless of the level of literacy.

Table 1: Statistics on financial literacy scores worldwide by Lusardi and Mitchell (2014)

Authors	Country	Data year	Interest rate Correct	DK	Inflation Correct	DK	Risk diversification Correct	DK	All 3 correct	At least 1 do not know	Number of observations
Lusardi and Mitchell (2011d)	USA	2009	64.9%	13.5%	64.3%	14.2%	51.8%	33.7%	30.3%	42.4%	1488
Alessie van Rooij and Lusardi (2011)	Netherlands	2010	84.8%	8.9%	76.9%	13/5%	51.9%	33.2%	44.8%	37.6%	1665
Bucher-Koenen and Lusardi (2011)	Germany	2009	82.4%	11.0%	78.4%	17.0%	61.8%	32.3%	53.2%	37.0%	1059
Sekita (2011)	Japan	2010	70.5%	12.5%	58.8%	28.6%	39.5%	56.1%	27.0%	61.5%	5268
Agnew, Bateman and Thorp (2013)	Australia	2012	83.1%	6.4%	69.3%	13.0%	54.7%	37.6%	42.7%	41.3%	1024
Crossan, Feslier and Hurnard (2011)	N. Zealand	2009	86.0%	4.0%	81.0%	5.0%	27.0%	2.0%*	24.0%*	7.0%	850
Brown and Graf (2011)	Switzerland	2011	79.3%	2.8%*	78.4%	4.2%	73.5%	13.0%*	50.1%*	16.9%*	1500
Forenero and Monticone (2011)	Italy	2007	40.0%*	28.2%*	59.3%*	30.7%	52.2%*	33.7%*	24.9%*	44.9%*	3992
Almenberg and Säve-Söderbergh (2011)	Sweden	2010	35.2%*	15.6%*	59.5%	16.5%	68.4%	18.4%	21.4%*	34.7%*	1302
Arrondel, Debbich and Savignac (2013)	France	2011	48.0%*	11.5%*	61.2%	21.3%	66.8%*	14.6%	30.9%*	33.4%*	3616
Klapper and Panos (2011)	Russia	2009	36.3%*	32.9%*	50.8%*	26.1%	12.8%*	35.4%*	3.7%*	53.7%*	1366
Beckmann (2013)	Romania	2011	41.3%	34.4%	31.8%*	40.4%	14.7%	63.5%	3.8%	75.5%*	1030

Table by Lusardi and Mitchell (2014) to show how many people got the three questions regarding financial literacy right in different countries for different researchers. Correct shows the percentage of respondents that got that specific question right. Dk reports the percentage of people that answered 'Do not know'. All 3 correct reports the amount of people that got all three questions right. At least 1 don't know reports the amount of people that answered 'Do not know' at least 1 time. * Indicates research where different wording was used then in the questions of Lusardi and Mitchell (2014) stated below.

In the table above by Lusardi and Mitchell (2014) results for different research are presented regarding financial literacy scores. These questions were used to estimate the level of knowledge and are known as the big three in financial literacy (Lusardi and Mitchell 2014). The right answer is written in bold text:

1. Suppose you had 100% in a savings account and the interest rate was two percent per year. After five years, how much do you think you would have in the account of you left the money to grow: ***More than,*** *exactly or less than **102$.***
2. Imagine that the interest rate on our savings account was one percent per year and inflation was two percent per year. After one year, would you be able to buy: *more than,*

*exactly the same as, or **less than today** with the money in this account. Do not know, refuse to answer.*

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

Lusardi and Mitchell show as much research as possible using the same 'big 3' questions described above. Comparing all this research shows if there is a consistency in the results. The table shows that financial literacy is indeed low everywhere like Atkinson and Messy (2012) examined. The part of financial literacy that people are least good at seems to be risk diversification, on this question researchers overall find the lowest score and the highest amount of people that filled in 'do not know'.

3.1 Perceived Financial Literacy

People give themselves relatively high grades regarding their own financial knowledge, even though the actual scores are low (Lusardi and Mitchell 2014). The perceived knowledge is estimated by asking the following question:

On a scale from 1 to 7, where 1 means very low and 7 means very high, how would you asses your overall financial knowledge?

In Table 2, Lusardi and Mitchell (2014) show the perceived scores found in different research. The percentage of people that reported a certain perceived financial knowledge score in different research is displayed.

Lusardi and Mitchell (2014) then use a similar approach as Atkinson and Messy (2012). By surveying people with the same questions an overview can be created on the (perceived) financial literacy scores. The Authors calculations are estimated using data from the U.S American Life Panel in 2009.

Table 2: Perceived Financial literacy against actual scores.

Authors	Country	Dataset	1-2	3	4	5	6	7	Average score
Authors' calculations	USA	NFCS 2012	3.9%	5.2%	14.9%	33.2%	26.1%	13.6%	5.1
Lusardi (2011)	USA	NFCS 2009	7.5%	6.0%	16.2%	32.3%	20.2%	17.5%	5
Lusardi and Tufano (2009a)	USA	TNS Global 2007	4.9%	7.7%	19.5%	31.9%	18.9%	10.7%	4.9
Authors calculations on data from Lusardi and Mitchell (2009)*	USA*	ALP 2009*	5.3%	11.6%	27.2%	34.7%	16.7%	4.4%	4.6
Bucher-Koenen, Lusardi, Alessie and van Rooij (2012)	Netherlands	DHS 2010	7.3%	10.9%	23.0%	32.0%	23.4%	3.5%	4.6
Bucher-Koenen, Lusardi, Alessia and van Rooij (2012)	Germany	SAVE 2009	8.3%	14.2%	23.0%	32.2%	15.6%	6.8%	4.5
Sekita (2011)*	Japan*	SLPS 2010*	71%*	23.3%*		5.6%*			

*Table from Lusardi and Mitchel (2014) on perceived literacy against the actual scores. The 'Authors' calculations are from Lusardi and Mitchell (2009). * Note that the wording of the questions from Lusardi and Mitchell (2009) was slightly different. The research in Japan asked the perceived financial knowledge on a scale of 1-5.*

In research using the RAND's American Life Panel the relationship between the perceived score, hypothetical and actual financial decisions were used in empirical research by Parker et al. (2012). The data collected from the survey was compared to the outcome of four hypothetical financial tasks performed in 2006 and 2007. Linear regressions are used to estimate the results. People who perceive a higher score, participate in retirement planning and perform better on hypothetical investment tasks, even if their actual scores are lower (Parker et al. 2012). Testing hypothetical tasks against real world data gives a comparison between tests that people perform for research and the actual performance.

Anderson et al. (2017) provide a study on the (perceived) financial literacy of people that are on LinkedIn. They try to examine the financial literacy of people by asking them questions trough a survey, which was taken in January and July of 2014. The focus is on misperceptions that people have about their financial knowledge, and the fact that overestimation can cause people to make bad financial decisions. Perceived knowledge people think they have is the estimator, rather than the actual knowledge. Anderson et al. (2017) finds that lower knowledge cause overestimation. It is a classic regression comparison, with important control variables and a lot of significant results. The Robustness tests performed seem credible.

Respondents mis calibrating their financial literacy are more likely to have saved in case something changes in their financial situation (Anderson et al. 2017). This means that people estimating their financial literacy lower have more money to spare. The last question in the survey of Anderson et al. (2017) asks if people are the decision makers in their household regarding budget and investments. Individuals who oversee the budget in their household perceive a higher level of financial literacy. However reverse causality can be a problem. When someone oversees the budget, they automatically may believe they have a high financial literacy. The conclusion is then that mistakes made in the estimation of financial literacy can be as important as the financial literacy itself (Anderson et al. 2017).

Just like Lusardi and Mitchell (2014), Anderson et al. (2017) found that men score higher on financial literacy than women. Men overestimate themselves more. Even women who are alone and therefore in charge of the financial decision-making score lower on financial literacy.

3.2 Education and Financial Literacy

Impulsivity is often neglected in the research on financial literacy. Ottaviani and Vandone (2018) perform empirical research on debt burden with 445 observations and financial literacy and impulsivity as predictors. This research is created to control for impulsivity and was performed over 2 years. A standard OLS regression was performed to estimate these results. Ottaviani and Vandone (2018) believe that this variable has a big influence. Observations are lower for this research, which could decrease extrinsic value. The findings of this research show that educational programs on financial decision making need to be tailored to niche groups. Providing financial courses to the public does not seem to be the solution because they have very little or no effect (Ottaviani and Vandone 2018). Bernheim and Scholz (1993) perform a factual analysis on the saving and spending patterns of Americans. The data from the Survey of Consumer Finances is used. A regression is performed on different financial variables. They find that too many Americans do not have enough savings. The level of education is correlated with the holding of wealth (Bernheim and Scholz 1993). This could be explained by the cognitive skills that smarter people automatically have. Specific and broad knowledge both contribute to financial decision making. Specific knowledge is an investment in human capital that will not be achieved by more years of schooling (Lusardi and Mitchell 2014).

3.3 Consequences of Financial Illiteracy

French (2008) compared investment fees, expenses and trading costs and market value between 1980 and 2006 using data on from the Securities and Exchange Commission. He calculated that in America the possible fees, trade costs and expenses mark up to 100 billion dollars. This is mostly paid by the financial illiterate, because they are not very sensitive to fees. French (2008) estimated his results by analysing millions of transactions using the data. Brown and Graf (2013) use a survey of 1500 household to estimate the effects between financial literacy and retirement planning in Switzerland in 2011. A difference in difference analysis is chosen as the most suitable method. Marital status and financial interest are used to determine the treatment and control group. They find that illiterate people do not answer consistently and maybe focussed on parts of the question that do not matter. This could be the reason why the illiterate are less sensitive to fees, which was found by French (2008).

In research using household investment data in Sweden under diversification of risk is found to be a problem (Calvet, Campbell and Sodini 2007). Data is collected from the MSCI world index. They use different pooled regressions to estimate investment mistakes and financial sophistication. 1 in 10 people losing 4.5 percent of a mean annual household income (Calvet, Campbell and Sodini 2007). Campbell (2006) uses Survey of Consumer Finances to estimate household finance in the U.S. With the use of logit regressions it is found that people who refinance their mortgages in a suboptimal way. This is costing US homeowners between 50-100 billion dollars per year. For some of these findings, the amount that is caused by financial literacy needs to be nuanced. It is likely other factors like income and education have a big effect as well. However, the effects of financial literacy cannot be underestimated. Lusardi and Tufano (2015) analyse a sample of Americans on their financial literacy and perceived financial knowledge through logit regressions. They partnered with a research firm, Taylor Nelson Sofres (TNS) Global, to contract and distribute a survey. The 'cost of ignorance' is big problem (Lusardi and Tufano 2015). This correlation was for example found regarding credit card fees. People with lower financial literacy have 50 percent higher fees than the average person who uses a credit card (Lusardi and Tufano 2015).

When offered different annuities and ways to get their pension provided, financial literate people tend to give answers that are consistent with their preferences (Brown and Graf 2013). The Illiterate answer different for every question. Partly because they focus on things totally irrelevant to the question and partly because they do not understand the assignment completely.

This could be one of the reasons why their costs and losses are much higher in the study of French (2008), Calvet et al. (2007) and Campbell (2006).

4. Hypotheses

In the prevision section, some problems regarding financial literacy are developed and explained. People spend too much money because of a low financial literacy level, which means debts are higher than optimal (Campbell, 2006). With investing, people lose a lot of money because they make suboptimal choices, not only regarding the return, but also fees and other expenses (French, 2008). In France higher financial literacy is correlated with financial planning (Arrondel, Debbich and Savignac 2014). To estimate financial planning, the proxy of life insurance is used. Now that the economic problems regarding life insuarance are developed, the following hypotheses can be tested:

People with higher financial literacy have less debt, a higher average value of investments and a higher chance of acquiring life insurance.

It is expected that financial literacy will have a negative effect on debt, because the literate people are more familiar with the consequences of getting in debt. The investment portfolio is expected to be bigger for individuals with higher literacy, they are more involved because of their knowledge. The acquiring of life insurance is an indication of financial planning. Therefore, a positive effect of financial literacy on life insurance is expected. Financial literate people are expected to be more involved in financial planning.

5. Methodology

The datasets are merged on the individual code that is assigned to individuals participating in the panel *(nomem_encr)*. Combined with the scores on financial literacy they can be followed over time before and after the financial crisis.

To estimate effects over time, a panel data regression will be the most suitable method. An individual fixed effects panel data regression gives very detailed information on the changing variables. Controlling for individual characteristics is however very important. Including the scores individuals achieved on financial literacy or the highest education that people completed can give more detailed information on the subgroups where this problem exists. When the

individual characteristics do not change over time, they cannot be included in an individual fixed effects analysis. A panel data regression using individual fixed effects will always report these variables as omitted. The characteristics are very important because it provides information on which subgroups could benefit from a higher level of financial literacy if significant effects are found. It became clear that financial literacy can be best improved if educational programs are tailored to specific groups (Ottaviani and Vandone 2018). Therefore characteristics are included, to estimate which subgroups need more support with financial problems.

The following regression is performed with different independent variables:

$$Y = \beta_0 + \beta_1 Age + \beta_2 Gender + \beta_3 Netincome + \beta_4 Financialliteracy$$
$$+ \beta_5 Perceivedfinancialliteracy + \beta_6 Education + \beta_7 Housing$$

5.1 Dependent variables

The standard errors are clustered on *nomem_encr*, which is the code assigned to every individual in the panel. This way groups are created per individual that participates and the differences between them and over time. The Y in the regression equation represents five different dependent variables that estimate the effects of financial literacy in different categories. The first dependent variable is *Total debt (TD)*. This is the total amount of debt people owe in euros. Performing a regression on this variable should account for the effect of (perceived) financial literacy on debt behavior. To get an even better estimation of the effects of financial literacy on debt, the second regression is performed on *Financial situation score (FSS)*. People rank their own financial situation on a scale of one (a lot of debt) until five (a lot of money to spare). Performing a regression on this variable should account for the effect of (perceived) financial literacy debt behavior. The next dependent variable is *Total balance (TB)*. The total assets minus the debt that people have in euros. This number can be negative if the debt is bigger than the assets. Performing a regression on this variable should account for the effect of (perceived) financial literacy on debt behavior as well as total assets. To investigate the literacy effects on investments *Value of investments (VOI)* is used. This represents the total amount of money invested in euros. Performing a regression on this variable should account for the effect of (perceived) financial literacy on investment behavior. Lastly, *Life insurance (LI)* will be used to estimate the amount of people and which subgroups have life insurance. People answer with yes or no on the answer if they have acquired life

insurance. This creates a proxy for financial planning. Performing a regression on this variable should account for the effect of (perceived) financial literacy on life insurance.

5.2 Independent variables

The important independent variables for this research are *financial literacy* and *perceived financial literacy*. These variables will show if there is an actual relationship between (perceived) financial literacy and the independent variables.

To estimate *financial literacy (FL),* a variable representing the score is created. The number of questions answered right in the test on financial literacy. This results in a score between zero and four. The big three described by Lusardi and Mitchell (2014) are included, with two additional questions on the perceived level of and the relation of inflation to bond prices (Liss Panel Financial Literacy 2011b). The questions were originally asked in Dutch. Right answers are written in bold text.

Question one: How would you score your understanding of financial matters (on a scale of one to seven, where one means 'very poor and seven means 'very good')?

*Question two: Suppose you have 100 euros on savings account and the interest is 2 percent per year. How much do you think you will have on the savings account after five years, assuming that you leave all your money on this savings account: **more than 102 euros**, exactly 102 euros, less than 102 euros?*

*Question three: Suppose that the interest rate on your savings account is 1 percent per year and that the inflation amounts to 2 percent per year. After one year, would you be able to buy more, exactly the same or **less** then you could today with the money on that account?*

*Question four: A share in a company usually offers a more certain return than an investment fund that only invests in shares. **False***

*Question five: If the interest rate goes up, what should happen to the bond prices? **Go down***

For Perceived financial literacy (PFL) question one from the questions stated above is used (Liss Panel Financial Literacy). The grade of one to seven that people give themselves on their own financial knowledge. This variable can provide information on the effect of over or

underestimation of knowledge. The perceived knowledge might be more important than the actual knowledge in making financial decisions (Anderson et al. 2017). For that reason, it needs to be integrated in this research.

5.3 control variables

Now that the dependent and independent variables are defined, the control variables can be explained. The first control is *Age*. The age an individual has in years in the year that the data was retrieved from. Financial problems could be correlated with age, and this way policies can be tailored to different generations.

As seen in the literature review, the (perceived) financial literacy differs between genders. Therefore, *Gender* is an important control. one if the individual identifies as male, two if the individual identifies as female. This information can be useful to tailor specific programs to a certain gender.

The income of people influences their financial decisions. *Netincome (NI)* is also controlled for: The self-reported income earned per month in euros, multiplied by 12 to create the yearly income variable. Income does have an impact on the financial situation of people and therefore a correlation could exist between income and financial literacy.

An important measure of knowledge is *Education*. The highest education completed by the individual, ranking from one to 27, where one means 'no education completed' and 27 a 'Ph.D'. It is likely that there is a correlation between financial literacy, financial knowledge and education. The holding of wealth is correlated with education, and wealth often correlates with good financial decisions (Bernheim and Scholz 1993).

On of the biggest financial decisions people make in their life is buying a house. It is one of the main reasons people acquire debt, they take out a mortgage. To account for this effect *Housing* is included. one if people own their home or two if it is a 'rental dwelling'. Housing is important because if the home is bought, there is often more debt. With a rental this debt needs to come from other loans.

Lastly, the variable *Estimation* is created. The amount of over or under estimation. This variable is calculated by taking the percentage the total score and the percentage of the perceived score. Then the percentage of the actual score is subtracted from the percentage of the perceived score:

$$estimation = \frac{perceived\ score - 1}{6} - \frac{score}{4}$$

Now the difference in estimation is calculated, where a positive number means over- and a negative number under estimation. It is relevant to calculate this variable, because the perceived score can be more important than the actual level (Anderson et al. 2017). It is expected that the bigger overestimation causes more financial mistakes because they think their financial knowledge is better than it is. *Perceived financial literacy* and *Financial literacy* are included in the regression. *Estimation* is omitted because the way this variable develops is already included in the regression. It does not at any value to the regression analysis. It will be run in a separate set of regressions replacing the independent variables to see if correlations change.

To estimate a yearly effect, the period is linearly controlled for in all regressions. This accounts for the difference that could exist between years. It is expected that 2009 will have the biggest positive effect on total debt and the negative effect on financial situation score, total assets and value of investments, because the effects of the financial crisis were very big in that year.

The Table 3 provides summary statistics of the variables used. In the N (observations) column it becomes clear that not all variables are available for all observations. The mean of the *Financial Literacy Score* is 2.469 questions right, and the mean *Income* is 29249.76 over the whole sample. The *Estimation* for the whole sample is 6.5% overestimation.

Table 3: Summary Statistics

Variable	N	Mean	Standard deviation	Min	Max
Totaldebt	459	22769.67	36463.88	35	22026.47
Financialsituationscore	2642	3.438	1.002	1	5
Totalbalance	2402	57048.55	93612.479	-200000	59874.142
Valueofinvestments	576	45594.784	87445.069	-200	59874.142
Life insurance	2661	.195	.396	0	1
Financial Literacy	2661	2.469	1.039	0	4
Perceived Financial Literacy	2661	5.091	1.239	1	7
Age	2661	55.191	13.862	19	91
Gender	2661	1.317	0.465	1	2
Netincome	2537	29249.760	103694.3	0	2169180
Education	2661	14.953	6.471	1	27
Housing	2661	1.355	0.508	1	4
Estimation	2661	0.065	0.288	-.83333333	1

Table 3 reports summary statistics of 2007, 2009 and 2011 for specific variables from the Liss Panel. Financial Literacy and Perceived Financial literacy are only reported in 2011. The standard deviation shows how much variation there is in the sample.

6. Empirical research

The data is constructed as displayed in Table 4. The datasets are all merged on the individual code (*nomem_encr*) assigned to participants. The variables used in this dataset are given the same name over the years. This way the append command can be used when different years are merged. The database is modified in such a way that only individuals available for all 3 years are included. 887 participants are left. Over 3 years this means there are 2661 observations.

Table 4: Construction of the Data.

Database	Observations:
Financial literacy	4860
Work and Schooling 2007	6951
Assets 2007	5644
Income 2007	6032
Housing 2007	3065
General 2007	11897
2007 merged*	1613
Work and Schooling 2009	6366
Assets 2009	5560
Income 2009	5610
Housing 2009	3626
General 2009	13412
2009 merged*	2560
Work and Schooling 2011	6013
Assets 2011	5588
Income 2011	5761
Housing 2011	3292
2011 merged*	2336
Income 2007	11897
Income 2009	13412
Income 2011	11515
Income All	36824
Final database	2661

Table on the observations per original database in the Liss Panel and the final data base used in this research. * means the year is merged with the financial literacy database.

6.1 Analyzing the Data
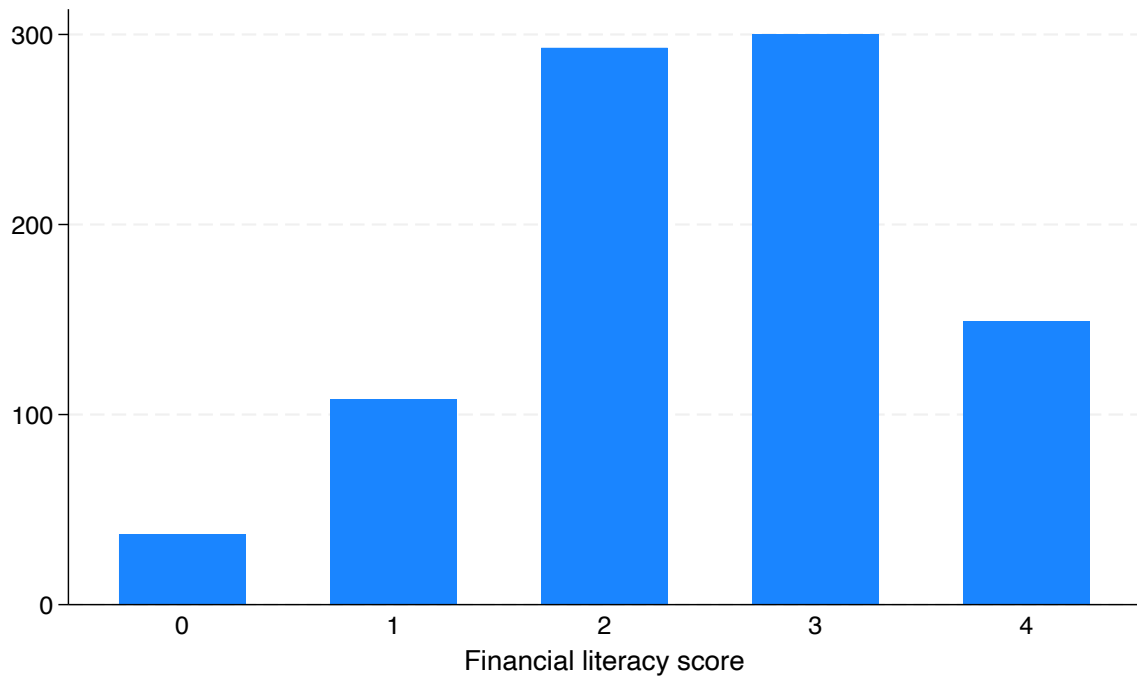
Figure 2: Frequency of Literacy Scores.

Figure on the frequency that certain financial literacy scores were achieved. Total of 887 participants.

Figure 2 displays the financial literacy scores, with a mean of 2.47. The mean is at 61.75 percent of the maximum score.

Figure 3: Frequency Perceived Financial Literacy Scores.
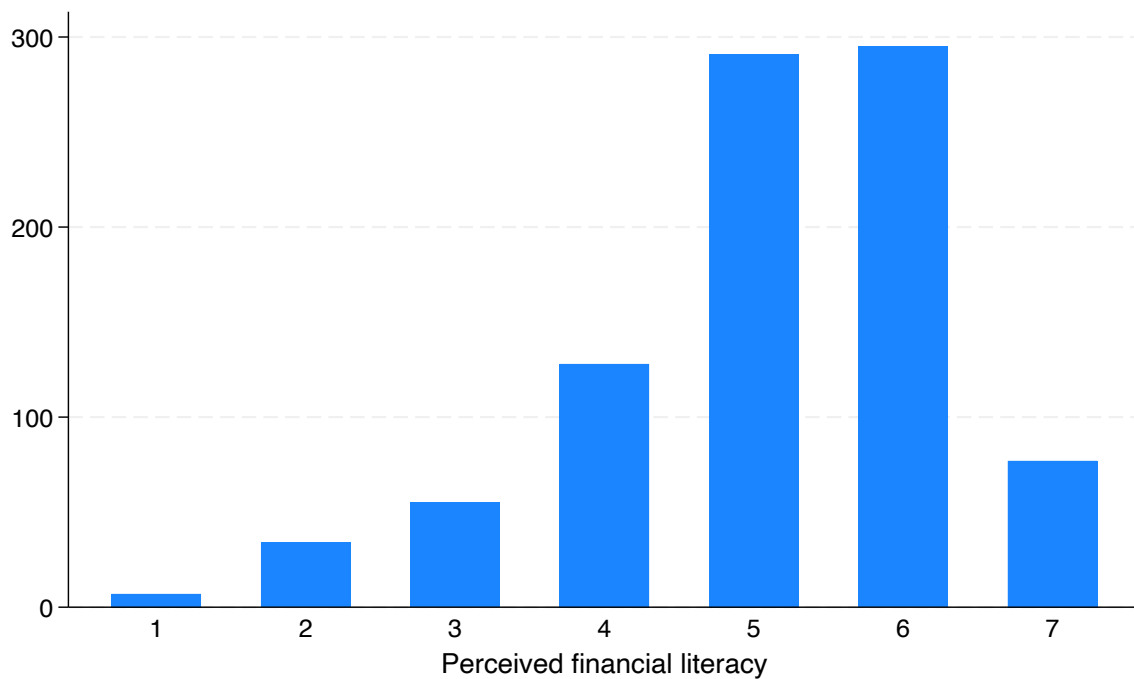
Figure on the frequency that certain perceived levels of financial literacy scores were reported. Total of 887 participants.

In Figure 3 the Perceived financial literacy is displayed, and the mean is 5.09. This is 72.71 percent of the maximum score. The average overestimation for the entire sample is 10.96 percent. 53.55 percent of the respondents have an *estimation* higher than zero, they overestimate their financial literacy, which is very close to the 54 percent found by Anderson et al. (2017).

Figure 4: Income Projected Against Financial Literacy
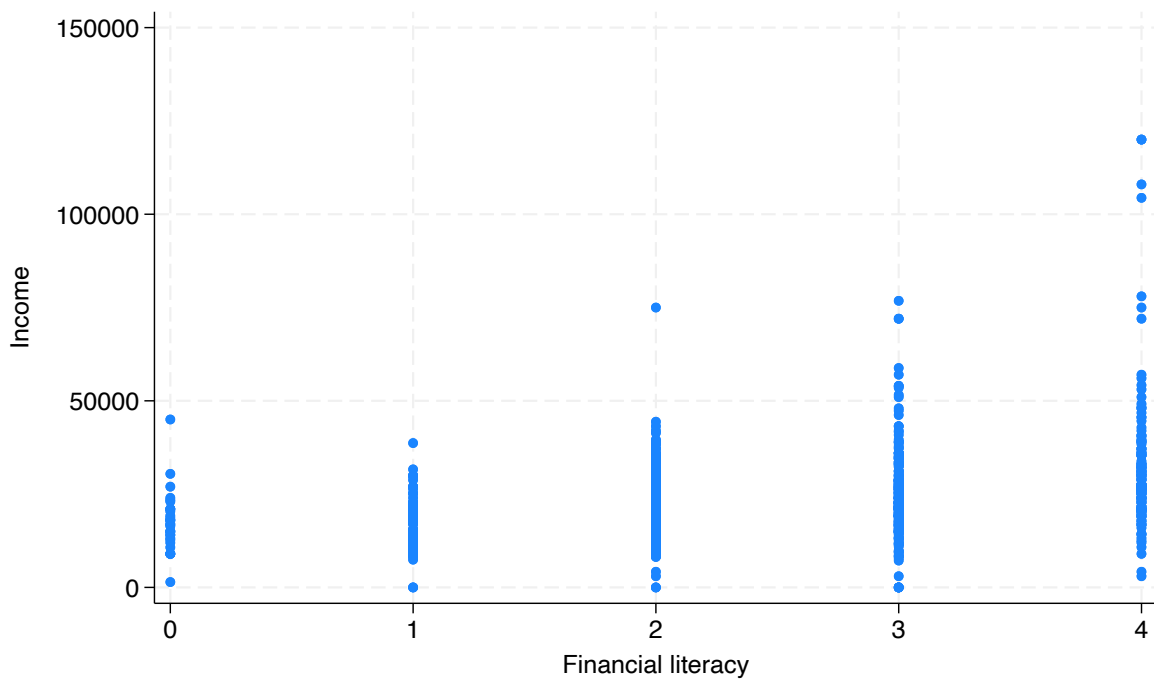
Income projected against the different financial literacy scores that were achieved.

In Figure 4 is the score of financial literacy that people achieved displayed against the net year income that people received. Outliers above 150000 were removed because the distributions would otherwise not be displayed as clearly. The graph shows that people with low income can score high on financial literacy, but high incomes are less likely to score low.

Below, an overview of the different categories and the statistics that belong to them is provided. These statistics give information on the characteristics of certain subgroups. This way correlations between (*Perceived*) *Financial Literacy* and *Gender, Income, Education, Housing* or *Estimation* are displayed.

In Table 5, the perceived level of financial literacy that people assign themselves is displayed against the actual score, the net yearly income and the level of education. The number of observations are displayed in the brackets behind the results. For example, the people that assign themselves perceived financial literacy level 3 score on average on the financial literacy test. 2.07 with 165 observations. 27976.1 is their average income and their level of education is 15.32. They underestimate their financial literacy by 18.42 percent.

Table 5: Statistics on Perceived Financial Literacy

Perceived financialliteracy	Financialliteracy	Income	Education	Estimation
1	1.57 (21)	14349.71 (21)	13.43 (21)	-39.25%
2	2 (102)	19611.6 (100)	15.66 (102)	-33.33%
3	2.07 (165)	27976.1 (158)	15.32 (165)	-18.42%
4	2.08 (384)	26911.5 (359)	14.78 (384)	-2%
5	2.47 (873)	21975.67 (838)	14.89 (873)	4.92%
6	2.69 (885)	36369.88 (848)	14.84 (885)	16.08%
7	2.81 (231)	40400.96 (213)	15.47 (231)	29.75%

Table on the characteristics of the perceived financial literacy.

Financial Literacy gradually rises with the *Perceived Financial Literacy*, but the relative increase is small. The more people overestimate their scores, the higher they rank their perceived financial literacy. With income, the connection is less clear. It does not rise with the perceived financial literacy, but in the higher categories of six and seven, the mean income does suddenly increase. People with higher income think on average that their financial literacy is high. Education stays the same over the categories. Only the people who estimate their financial literacy in the lowest category have a clear lower average level of completed education.

Table 6: Statistics on Financial Literacy

Financialliteracy	Perceived financial literacy	Income	Education	Estimation
0	4.3 (111)	36520.25 (96)	10.81 (111)	55%
1	4.83 (324)	27223.88 (303)	11.16 (324)	38.83%
2	4.89 (879)	28993.5 (841)	13.95 (879)	14.83%
3	5.2 (900)	28648.32 (863)	16.22 (900)	-5%
4	5.65 (447)	30748.5 (434)	18.16 (447)	-22.5%

Table on the characteristics of the groups that achieved a certain financial literacy.

In table 6 the characteristics of people that achieve a certain score in the financial literacy test can be determined. The *Perceived Financial Literacy* does increase as people get more

questions right. When all questions are answered wrong and there is a financial literacy of zero, the mean estimation is still 4.3. The conclusion is then that the lowest scoring individuals still estimate their financial knowledge better than average. The mean yearly income is the highest in the groups that score zero and four. *Education* rises with *Financial Literacy*, which is interesting because in the perceived knowledge categories, the differences were very small. In the table above there is a clear increase in *Education* as the *Financial Literacy* goes up. *Education* then does have a possible effect on the actual score achieved. Lusardi and Mitchell (2014) conclude that specific and broad knowledge contribute to financial decision making, and this broad knowledge achieved through education could be the reason why this category correlates positively with the scores.

Lastly, Table 7 provides an insight on the differences between subgroups in this sample. This way subgroups that have a different *(Perceived) Financial Literacy* can be identified.

Table 7: Statistics on Different Subgroups

Group	Financialliteracy	Perceivedfinancial-literacy	Estimation
Gender			
Female	2.03 (843)	4.85 (843)	13.42%
Male	2.67 (1818)	5.2 (1818)	3.25%
Housing			
Self-owned	2.70 (1743)	5.24 (1743)	3.17%
Rental	2.07 (905)	4.81 (905)	11.75%
Education			
Primary school (1-7)	1.65 (205)	4.90 (205)	23.75%
High school (8-15)	2.31 (696)	5.12 (696)	10.92%
Professional education (16-27)	2.72 (1534)	5.1 (1534)	0%
Age categories			
24 and younger (1-2)	2.71 (24)	5.17 (24)	1.75%
25-44 years (3-4)	2.51 (610)	4.97 (610)	3.42%
45-64 (5-6)	2.49 (1291)	5.14 (1291)	11.25%
65 and older (7)	2.40 (736)	5.10 (736)	8.33%
Income categories (net income per month)			
1500 or lower (0-3)	2.50 (240)	5 (240)	4.17%
1501-3000 (4-6)	2.68 (1433)	5.20 (1433)	3%
3001-4500(7-9)	3.09 (163)	5.31 (163)	-5.42%
More than 4501 (10-12)	3.25 (52)	5.77 (52)	-1.75%

Graph on the characteristics of subgroups regarding Financialliteracy, Perceivedfinanicalliteracy and Estimation.

In the table above, the statistics on subgroups are displayed. Males score higher on average and estimate themselves a bit higher than in females. In the paper of Anderson et al. (2017) the same results were found. Overestimation is bigger for females at 13.42 percent. For males this is 3.25 percent. The overestimation for females is higher in this sample then for men, which is different from the findings of Anderson et al. (2017).

With housing, people that own their own home score higher than people who rent. The ones who rent overestimate their knowledge more. This could be correlated with *Income* and *Education*.

As explained with Table 6, *Education* can be an important factor on the level of *Financial Literacy* and the score does drastically rise as education levels get higher. The overestimation gets lower when the education level gets higher. For the lowest educated group, the biggest overestimation was found out of all subgroups in Table 5 (23.75 percent).

The Liss panel variable for age categories provides a good foundation to create statistics on the different generations and their financial literacy scores. There is a very slight decrease in the *Financial Literacy* scores as people get older. In the *Perceived Financial Literacy* score there is no trend to be found. Some of the observations are very low, which means they may be less representative and the influence from outliers can be bigger.

The last category is income. The Liss panel includes a categorial variable on net monthly income, which is used in the table above. As the income increases, the average score goes up as well. This could be caused by the earlier described findings of Mitchell and Lusardi (2014) on general and specific knowledge. An interesting finding is the lowest scoring group estimates their knowledge at 66.66 percent and scores 50 percent on average. The highest income group estimates their knowledge 79.5 percent but scores 81.25 percent on average. In conclusion, the highest income category underestimates their knowledge on average. Bernheim and Scholz (1993) found that wealth is correlated with knowledge, which could be the reason why financial literacy increases when income goes up.

The conclusion from Table 7 is then that overestimation gets lower as *Financial Literacy* gets higher. The only time this is not completely true is within the age categories. *Education* is the

variable with the biggest variation on *Financial Literacy* between subgroups. This could be an important variable in the regressions performed in the results section.

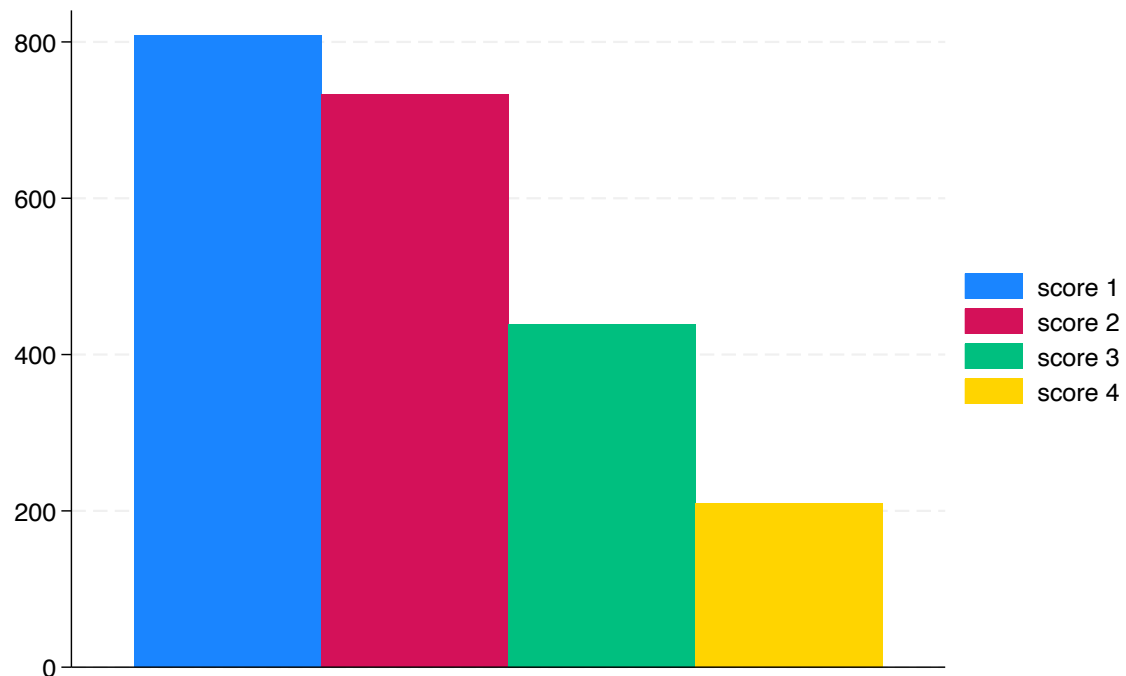**Figure 5: Amount of People that Answered the Questions Right.**

Figure shows how many people in the data got a certain question right in the financial literacy test.

In figure 5 the amount of people that got a specific question right is displayed. The interest rate and inflation are subjects participants understand well. Question three and four are focused on the investment market, stock and bond prices. The scores achieved here are already much lower, with roughly 200 out of 887 people answering question four right.

In the study of Lusardi and Trufano (2015) a result was found where only one third of people understood the question about interest rates and debt. In this sample, nearly all respondents got these questions right. More than 800 people understand the question about interest rate and savings.

As found by Calvet et al. (2007), understanding of diversification is a big problem. This is represented in the amount of people that answered question three and four right, only 157 out of the 887 respondents. People getting these questions right are on average the same age as the mean of the total sample, 55.19 for the whole sample and 55.22 for the specific group. They

rent their home more often than on average, 1.18 against 1.35. The net yearly income is nearly the same, with 29476.29 for the whole sample and 30484.64 for this specific group. With education there is a difference. 14.95 for the whole sample and 17.86 for this group. There then seems to be a connection between education and getting the questions that tend to be more difficult right. Just like there seems to be a connection between the level of education and financial literacy, estimated in Tables 6 and 7.

Table 8: Regression results

Variables	TD (1)	FSS (2)	TB (3)	VOI (4)	LI (5)	c0
Constant	73251.879***	2.89***	187224.959***	176211.726***	-1.292***	
	(17583.692)	(0.24)	(68857.244)	(43823.667)	(0.347)	
Age	-6415.304 ***	.01***	-8614.969***	-13354.692***	-0.002	-0.2%
	(2335.829)	(0.00)	(7577.735)	(4560.866)	(0.003)	
Gender	7750.491	-1.33*	-23012.758	-43675.622	-0.246**	-24.6%
	(18303.082)	(0.065)	(18150.908)	(38651.710)	(0.102)	
NI	274.790	0.000	-12434.570*	-36914.65***	-0.004*	-0.4%
	(1207.230)	(0.001)	(6546.555)	(4667.543)	(-0.002)	
FL	-8670.300***	0.070**	-45944.49***	-49023.658**	0.209***	20.9%
	(8346.682)	(0.31)	(8670.300)	(19447.401)	(0.049)	
PFL	-5417.368	0.086***	-11668.441*	-10920.917	0.098***	9.8%
	(5634.011)	(0.025)	(24920.809)	(24920.809)	(0.037)	
Education	-7402.274	0.016***	-10701.639**	8084.587	0.022***	2.2%
	(4880.018)	(0.004)	(4709.914)	(9658.304)	(0.007)	
Housing	9771.001	-.348***	14423.639	42784.283	-0.313***	31.3%
	(13801.835)	(0.057)	(17502.661)	(50664.275)	(0.097)	
Period						
2009	7292.611	0.072*	-58909.420***	-71469.200***	-0.206***	-20.6%
	(11595.927)	(0.032)	(4709.914)	(27874.609)	(0.049)	
2011	-10143.857	0.036	-79295.277***	-56387.752***	-0.264***	-26.4%
	(11953.642)	(0.035)	(17502.661)	(25686.776)	(0.049)	
N	439	2520	2308	561	2537	
R²	0.108	0.112	0.1833	0.128	0.088	

Model 1 until 4 are a Panel data random effects regression. Model 1 is a regression of financial literacy on total debt. People report their own debt in the Liss Panel. In the observations per group, the average is 1.7. This means that on average data per person is available for 1.7 years. Model 2 is a regression of financial literacy on the Financial situation score. People report their own financial situation score on a scale of 1 (a lot of debt) to 5 (a lot of money to spare) in the Liss Panel. In the observations per group, the average is 2.9. This means that on average data per person is available for 2.9 yeas. Model 3 is a regression of financial literacy on the total balance. People report their own total balance considering assets and debt in the Liss Panel. In the observations per group,

*the average is 2.7. This means that on average data per person is available for 2.7 years. Model 4 is a regression of financial literacy on the value of investments. People report their own value of investments in the Liss Panel. In the observations per group, the average is 2.1. This means that on average data per person is available for 2.1 years. Model 5 is a probit regression of financial literacy on the chance of having life insurance. People report if they have life insurance (0 means no and 1s yes) in the Liss Panel. The robust standard errors are between brackets. N reports the number of observations. R^2 gives the percentage of variance in the independent variable declared by the model. Significant p values are reported with significance stars: * p<0.1 ** p < 0.05 *** p < 0.01.*

6.2 Regression results

In Table 8 model 1, the results of the regression on *Total Debt* are reported. Some significant results were found, with age having a negative effect on total debt of 6415,30 euros per year. The score people achieve in the financial literacy test was significant as well, with a negative effect of 8670,30 euro per question that was answered right. When looking at the period effects, the difference is extremely big. Financial literacy is then a factor that influences the total amount of debt that people acquire just like Sevim et al. (2012) found.

The regression performed in Table 8 model 2 is using another measure for debt. When looking at these results, there are a lot more observations then in the first regression, which should improve the extrinsic value of the analysis. More significant results are found.

If a person scores one point higher in the financial literacy test, the *Financial Situation Score* rises on average with .07 points. If they rank their *Perceived Financial Literacy* 1 point higher, they rank their financial situation on average 0.856 higher. The effect of *Financial Literacy* is much smaller than the effect of *Perceived Financial Literacy.* In 2009 people report a significantly better situation compared to 2007. This is a self-reported score, which means that people could value or perceive their financial situation differently.

Sevim et al. (2012) found a correlation between financial literacy and the amount of debt acquired. These findings can be connected to the effects found on the regressions in table 8 models 1 and 2.

The regression in Table 8 model 3 tests the effect of financial literacy on *Total Balance*. The panel was asked the following question: 'What was the total balance of your current accounts, savings accounts, term deposit accounts, savings bonds or savings certificates on 31 December

(*year*)? In case of a negative balance, please add a minus sign before the amount.'(Liss Panel Economic Situation: Assets, wave 1 2008a; Liss Panel Economic Situation: Assets, wave 2 2010a; Liss Panel Economic Situation: Assets, wave 3 2012a).

In the regression results on *Total Balance*, all variables have a negative effect apart from *Housing*. The results are not in line with the previous regressions, the effect of the *Financial Literacy* score is -45944.49 and *Perceived Financial Literacy* is -11668.44 for every point the (perceived score) rises. The higher the actual and perceived scores get, the lower the *total balance* is. The effect of the period effects show us that in 2009 the totalbalance is significantly 58909.42 euro's lower than in 2007, and in 2011 this is 79295,28. The conclusion is then that the shift in negative *total balance* is extremely big in the time window of this research. A possible explanation could be that literate people had more money in stocks and investments. This could be the reason why they lost a lot more compared to the illiterate during the financial crisis, hence te negative regression results.

The next performed regression in table 8 model 4 estimates the effect of financial literacy on the *value of investments*. People in the Liss Panel report how much money they have invested in total. This could provide information on the investment differences between people with low and high financial literacy. The results are again negative overall, as seen in the previous regression on *Total balance*. The coefficients for *financial literacy* (-49023.66) and *perceived financial literacy* (-10920.92) are nearly the same as in model 3. People could have gotten anxious because of the financial crisis, and therefore having a higher financial literacy, age or income results in a negative effect on the money invested.

Lastly, in Table 8 model 5 a probit regression is performed to estimate the chance that people have life insurance. The coefficients can be interpreted as an increase or decrease of the chance that people acquire life insurance. In the coefficient's column, the probability changes are displayed in percentages. The financial literacy and perceived financial literacy scores have a positive significant effect on the chance somebody bought life insurance, namely 20.9 and 9.8 percent. The period effects are both negative, which means people are less likely to buy life insurance in 2009 and 2011. Higher financial literacy might result in thinking more about the future of their financial situation and are therefore more likely to get life insurance. This is the same conclusion as Mahdzan and Victorian (2013) made. Financial literate people can still

choose to have life insurance, although the argument in this research is different. Mahdzan and Victorian (2014) think people get life insurance because they are risk averse. But another argument could be that they care about financial planning. Arrondel et al. (2014) found that there is a correlation between financial literacy and financial planning. There is a negative coefficient for income. An explanation could be that the higher the income the less likely it is that people worry about getting life insurance. The effect of perceived financial literacy on life insurance is positive. Parker et al. (2012) found a positive effect of perceived financial literacy on financial planning. If financial literacy is higher, chances are higher that someone acquires life insurance. Financial literacy can therefore be an indicator on monetary planning. People who plan their budget are less likely to encounter financial problems when they grow older.

In table A6 in the Appendix, the important dependent variables *Financial Literacy* and *Perceived Financial Literacy* are replaced by *Estimation*. *Estimation* contains the characteristics of both dependent variables, but unfortunately results from these regressions are extremely different. Therefore, it is used as robustness test.

7. Robustness

The methodology section showed that a lot of observations are lost. This devalues the extrinsic value of the research. Furthermore, there are variables that cannot be controlled for, like the 'impulsivity' that could influence financial decision making according to Ottovania and Vandone (2018). In table 8 model 3 and 4, there are no usable results. It is likely that there is a very big negative effect that unfortunately was not controlled for. These regressions cannot give any information on the effects of financial literacy.

To check the robustness of the regressions they are performed in another functional form to determine if the relationship between the variables is decided by the form. For the panel data regressions, the independent variable is changed to a logarithmic scale. The probit regression is performed like a normal regression to compare the relations between variables. The comparisons of the different regressions can be found in Tables A1 till A5 in the Appendix.

The Tables A1 till A5 in the Appendix show that the relationship stays largely the same, with sometimes a slight decrease in the significance for the new functional form. The standard errors in model 2 in the appendix are largely bigger compared to the coefficient. This means the coefficient is less trustworthy.

In Table A6 in the Appendix the important independent variables are exchanged for the *estimation* variable. Unfortunately, the relations change between models. This does make the correlations found less stable.

The conclusion is that there are some limitations regarding the dataset. Relations stay largely the same when functional form of the regressions is changed. However, there are some less significant results, and the standard errors are overall bigger in the log regressions. The relationships still exist, but the functional form does enhance these effects.

8. Discussion

In the results section a correlation was found between debt behaviour and financial literacy. The effect on total debt was negative and the effect on the financial situation score was positive. On total balance and value of investments (model 2 and 3) the results change drastically. A possibility is that nearly all effects become negative because of the big effect of the financial crisis. The financial literate might have been more engaged in stocks, investments or have had more assets overall. In the financial crisis individuals with a lot of funds were vulnerable to lose big amounts of money. Data was available from 2007 onwards, and the financial literacy was measured in 2011. The time window of this research was dominated by the financial crisis. It is likely that the effects of financial literacy are less clear because of the period the data was collected. Lastly a proxy on financial planning is used in the form of life insurance. An indication on financial literacy increases the acquisition of life insurance and benefits financial planning.

The correlations found are only on debt behaviour and financial planning. Policy changes that could be beneficial according to this research need to be focussed on increasing financial literacy for the people struggling with these problems.

The government can play an important role in promoting financial literacy. It can provide extra financial programs in schools to educate. Lusardi et al. (2017) found in their research that the whole society benefits if everybody is educated. Ottaviani and Vandone (2015) advice to tailor financial programs to different subgroups for the best result. Developing specific financial programs for all subgroups will however be a lot more difficult and require more resources.

The government can apply legislation to the financial sector to increase literacy and protect people from making the wrong decisions. More advice with mortgages for example. Companies need to be more transparent about the pension plans they provide and what kind of income it will provide people in the future.

Financial literacy then might not be the big problem that it was expected to be at the beginning of this paper. Correlations on debt behaviour and financial planning were found, but the regressions on investments and total balance shows that there are other effects in this research that were not controlled for and can influence the results drastically.

9. Recommendations on further research and Conclusion

In the results and discussion parts of this paper, it became clear that effects are influenced by the financial crisis. It is difficult to draw proper conclusions, especially on the total assets and value of investments. To estimate the effects of financial literacy data from another period is needed. For example, a financial literature test from 2019, and general data collected in 2015, 2017 and 2019. Research without the effect of the financial crisis provides a much clearer image. More observations would benefit the results, but the biggest problem that needs to bet tackled seems to be the period of the data.

The possible effects between financial literacy and debt, investment behaviour and life insurance were researched. Correlations between financial literacy and debt behaviour and financial literacy and life insurance were found. On investment behaviour and total balance, it was difficult to estimate an effect. The effect of the financial crisis gives to much distortion to provide a clear answer. Unfortunately, there was no other period available due to data restrictions. The literate then behave differently regarding debt and acquiring life insurance.

To improve the financial literacy on problems that are correlated, two different solutions were presented. Educational programs can provide everyone extra financial knowledge from a young age. The government can provide legislation in the financial sector to protect people from wrongful advice resulting in suboptimal financial decisions.

A clear conclusion cannot be drawn from this research. It was performed in a turbulent period, with the negative effect of the financial crisis distorting the results. The takeaway is that literate

people are desirable, but it is uncertain if higher literacy optimizes financial decision making and solves big financial problems.

10. Reference List

Agarwal, S., J. Driscoll, X. Gabaix and D. Laibson. 2008. Learning in the Credit Market. *National Bureau of Economic Research*. SSRN Working Paper No. 1091623

Alhenawi, R., and K. Elkhal. 2013. Financial Literacy of U.S. Households: Knowledge vs. Long-Term Financial Planning . *Financial Services Review*, 22(3), 211-244.

Anderson, A., F. Baker and D. Robinson. 2017. Precautionary Savings, Retirement Planning and Misperceptions of Financial Literacy. *Journal of Financial Economics* 126(2), 383–398.

Aren, S. and S. Aydemir. 2014. A Literature Review on Financial Literacy. *Finansal Araştırmalar ve Çalışmalar Dergisi*, 11(5), 33-49

Arrondel, L., M. Debbich and F. Savignac. 2014. Financial Literacy and Financial Planning in France. Banque de France Working Paper No. 456.

Assefa, M. and P. Durga Rao. 2018. Financial Literacy and Investment Behavior of Salaried Individuals: A Case Study of Wolaita Sodo Town. *International Journal of Business and Management Invention,* 7(1), 43-50.

Atkinson, A. and F. Messy. 2012. Measuring Financial Literacy: Results of the OECD / International Network on Financial Education (INFE) Pilot Study. *OECD Working Papers on Finance, Insurance and Private Pensions,* No. 15.

Bernheim, B. and J. Scholz. 1993. Private Saving and Public Policy. *Tax Policy and the Economy,* 7, 73-110.

Brown, M. and R. Graf. 2013. Financial Literacy and Retirement Planning in Switzerland. *Journal of Financial Risk Management,* 11(2), 1-21.

Bushan, P. 2014. Relationship Between Financial Literacy and Investment Behavior of Salaried Individuals. *Journal of Business Management & Social Sciences Research,* 3(5), 82-87.

Calvet, E., J. Laurent, Y. Campbell, and P. Sodini. 2009. Measuring the Financial Sophistication of Households. *American Economic Review,* 99(2), 393–98.

Centerdata. 2007. Background Variables > Wave December 2007. Liss Panel. https://www.dataarchive.lissdata.nl/study-units/view/322

Centerdata. 2009. Background Variables > Wave December 2009. Liss Panel. https://www.dataarchive.lissdata.nl/study-units/view/322

Centerdata. 2011. Background Variables > Wave December 2011. Liss Panel. https://www.dataarchive.lissdata.nl/study-units/view/322

Centerdata. 2008a. Economic Situation: Assets > Wave 1. Liss Panel. https://www.dataarchive.lissdata.nl/study-units/view/331.

Centerdata. 2010a. Economic Situation: Assets > Wave 2. Liss Panel. https://www.dataarchive.lissdata.nl/study-units/view/331.

Centerdata. 2012a. Economic Situation: Assets > Wave 3. Liss Panel. https://www.dataarchive.lissdata.nl/study-units/view/331.

Centerdata. 2008b. Economic Situation: Housing > Wave 1. Liss Panel. https://www.dataarchive.lissdata.nl/study-units/view/307.

Centerdata. 2010b. Economic Situation: Housing > Wave 3. Liss Panel. https://www.dataarchive.lissdata.nl/study-units/view/307.

Centerdata. 2012b. Economic Situation: Housing > Wave 5. Liss Panel. https://www.dataarchive.lissdata.nl/study-units/view/307.

Centerdata. 2008c. Economic Situation: Income > Wave 1. Liss Panel. https://www.dataarchive.lissdata.nl/study-units/view/328.

Centerdata. 2010c. Economic Situation: Income > Wave 3. Liss Panel. https://www.dataarchive.lissdata.nl/study-units/view/328.

Centerdata. 2012c. Economic Situation: Income > Wave 5. Liss Panel. https://www.dataarchive.lissdata.nl/study-units/view/328.

Centerdata. 2011b. Financial Literacy. Liss Panel. https://www.dataarchive.lissdata.nl/study-units/view/257.

Centerdata. 2008d. Work and Schooling > Wave 1. Liss Panel. https://www.dataarchive.lissdata.nl/study-units/view/17

Centerdata. 2010d. Work and Schooling > Wave 3. Liss Panel. https://www.dataarchive.lissdata.nl/study-units/view/145

Centerdata. 2012d. Work and Schooling > Wave 5. Liss Panel. https://www.dataarchive.lissdata.nl/study-units/view/327

Dynan, K. 2009. Changing Household Financial Opportunities and Economic Security. *Journal of Economic Perspectives*, 23(4), 49–68.

Japelli, T. and M. Padula. 2013. Investment in Financial Literacy and Saving Decisions. *Journal of Banking & Finance*. 37(8) 2727-2792.

Kenneth, F. 2008. The Cost of Active Investing. Working paper SSRN 1105775.

Hung, A., A. Parker and J. Yoong. 2009. Defining and Measuring Financial Literacy. RAND Working Paper Series WR-708.

Jump$tart Coalition for Personal Financial Literacy. 2007. *National Standards in K–12 Personal Finance Education*. 3rd ed. https://www.schwab.com/public/file/P-4041374/standardbook_rev-ALL-B.pdf, 3.

Lusardi, A. and C. De Bassa Scheresberg. 2013. Financial Literacy and High-Cost Borrowing in the United States. *Social Science Research Network*. SSRN working paper 2585243

Lusardi, A. and O. Mitchell. 2014. The Economic Importance of Financial Literacy: Theory and Evidence. *Journal of Economic Literature.* 52(1), 5-44.

Lusardi, A. and O. Mitchell. 2015. Financial Literacy and Economic Outcomes: Evidence and Policy Implications. *The Journal of Retirement,* 3(1), 107-114.

Lusardi, A., P. Michaud and O. Mitchell. 2017. Optimal Financial Knowledge and Wealth Inequality. *Journal of Political Economy,* 125(2), 293-623

Lusardi, A. and P. Tufano. 2015. Debt literacy, Financial Experiences, and Overindebtedness. *Journal of Pension Economics and Finance*, 14(04), 332-368.

Mahdavi, M. and N. Horton. 2014. Financial Knowledge among Educated Women: Room for Improvement. *Journal of Conumser Affairs,* 48(2), 403-417.

Mahdzan, N. and S. Victorian. 2013. The Determinants of Life Insurance Demand: A Focus on Saving Motives and Financial Literacy. *Canadian Center of Science and Education*, 9(5), 274-284.

Mccardle, J., J. Smith, and R. Willis. 2011. Cognition and Economic Outcomes in the Health and Retirement Survey. NBER Working Paper No. 15266.

Meier, S. and D. Sprenger. 2013. Discounting Financial Literacy: TimePreferences and Participation in Financial Education Programs, 95(3), 159–174.

Moore, D. 2003. Survey of Financial Literacy in Washington State: Knowledge, Behavior, Attitudes and Experiences. *SESRC Technical Report,* 03-39.

Ottovania, C. and D. Vandone. 2018. Financial literacy, Debt Burden and Impulsivity: A Mediation Analysis. *Economic Notes.* 47 (2-3), 439-454.

Parker, A., W. Bruine de Bruin, J. Yoong and R. Willis. 2012. Inappropriate Confidence and Retirement Planning: Four Studies with a National Sample. *Journal of Behavioral Decision Making,* 25(4), 382-389.

Van Rooij, M., A. Lusardi, R. Alessie. 2011. Financial literacy and stock market participation. *Journal of Financial Economics,* 101(2), 449-472.

Van Rooij, M., C. Kool and H. Prast. 2007. Risk-Return Preferences in the Pension Domain: Are People Able to Choose? *Journal of Public Economics*, 91(3), 701-722.

Sevim, N., Ö. Sayilir, and F. Temizel. 2012. The Effects of Financial Literacy on the Borrowing Behaviour of Turkish Financial Consumers. *International Journal of Consumer Studies*, 36(5), 573-579.

Wang, H., D. Zhang, A. Guariglia and G. Fan. 2021. Growing Out of the Growing Pain: Financial Literacy and Life Insurance Demand in China. *Pacific-Basin Finance Journal,* 66.

Wang, M., C. Keller and M. Siegrist. 2011. The Less You Know, the More You are Afraid of a Survey on Risk Perceptions of Investment Products. *Journal of Behavioral Finance,* 12(1), 9-19.

11. Appendix

Table A1: Comparison of Regressions on Total Debt.

	Totaldebt (1)	Logtotaldebt (2)
Variables		
Constant	73251.879***	21.071***
	(17583.692)	(3.203)
Age	-6415.304***	-0.058* (0.032)
	(2335.829)	
Gender	7750.491	0.170
	(18303.082)	(0.914)
Netincome	274.790	0.002
	(1207,230)	(0.005)
Financialliteracy	-8670.300***	-1.505***
	(8346.682)	(0.408)
Perceivedfinanicallliteracy	-5417.368	-0.033 (0.280)
	(5634.011)	
Education	-7402.274	-0.106 (0.065)
	(4880.018)	
Housing	9771.001	-0.444 (0.665)
	(13801.835)	
Period		
2009	7292.611	-0.175 (0.584)
	(11595.927)	
2011	-10143.857	-0.197 (0.587)
	(11953.642)	
N	439	439
R^2	0.108	0.077

Comparison of the panel data random effects regressions of financial literacy on total debt. Model one is the regular regression and in model two the logarithmic value of total debt is used. People report their own debt in the Liss Panel. The observations per group are on average 1.7. This means that on average data per person is available for 1.7 years. The robust standard errors are between brackets. N reports the number of observations.

R^2 gives the percentage of variance in Totaldebt declared by the model. Significant p values are reported with significance stars: * $p<0.1$ ** $p < 0.05$ *** $p < 0.01$.

Table A2: Comparison of Regressions on Financialsituationscore

Variables	Financialsitua-tionscore (1)	Logfinancialsituationscore (2)
Constant	2.89*** (0.24)	0.989*** (0.092)
Age	0.005*** (0.002)	0.002*** (0.001)
Gender	-1.33* (0.065)	-0.38 (0.024)
Netincome	0.000 (0.001)	0.000 (0.002)
Financialliteracy	0.070** (0.31)	0.021** (0.011)
Perceivedfinanicalliteracy	0.086*** (0.025)	0.031*** (0.10)
Education	0.016*** (0.004)	0.005*** (0.002)
Housing	-0.348*** (0.057)	-0.138*** (0.023)
Period		
2009	0.072* (0.032)	0.027** (0.012)
2011	0.036 (0.035)	0.015 (0.092)
N	2520	2520
R^2	0.112	0.106

Comparison of the panel data random effects regressions of financial literacy on the financial situation score. Model one is the regular regression and in model two the logarithmic value of financialsituationscore is used. People report their own financial situation score on a scale of 1 (a lot of debt) to 5 (a lot of money to spare) in the Liss Panel. The observations per group are on average 2.9. This means that on average data per person is available for 2.9 years. The robust standard errors are between brackets. N reports the number of observations. R^2

Table A3: Comparison of Regressions on Total Balance.

	Totalbalance	Logtotalbalance
	(1)	(2)
Variables		
Constant	187224.959***	24.461***
	(68857.244)	(1.866)
Age	-8614.969***	-0.049***
	(7577.735)	(0.015)
Gender	-23012.758	-0.718
	(18150.908)	(0.486)
Netincome	-12434.570*	-0.004
	(6546.555)	(0.003)
Financialliteracy	-45944.49***	-0.931***
	(8670.300)	(0.228)
Perceivedfinanicalliteracy	-11668.441*	-0.445**
	(24920.809)	(0.181)
Education	-10701.639**	-0.067*
	(4709.914)	(0.032)
Housing	14423.489	0.845*
	(17502.661)	(0.471)
Period		
2009	-58909.420***	-1.236***
	(14828.644)	(0.304)
2011	-79295.277***	-1.851***
	(14423.489)	(0.308)
N	2308	2211
R^2	0.1833	0.057

Comparison Panel data random effects regressions of financial literacy on the total balance. Model one is the regular regression and in model two the logarithmic value of totalbalance is used. People report their own total balance considering assets and debt in the Liss Panel. In the observations per group, the average is 2.7. This means that on average data per person is available for 2.7 years. N reports the number of observations. R^2 gives the percentage of variance in Totalbalance declared by the model. Significant p values are reported with significance stars: * p<0.1 ** p < 0.05 *** p < 0.01.

Table A4: Comparison of Regressions on Value of Investments

Variables	Valueofinvestments (1)	Logvalueofinvestments (2)
Constant	176211.726***	25.331***
	(43832.667)	(3.750)
Age	-13354.692***	-0.064 **
	(4560.866)	(0.030)
Gender	-43675.622	-1.404
	(38651.710)	(0.919)
Netincome	-36914.65***	-0.016***
	(4667.543)	(0.005)
Financialliteracy	-49023.658**	-1.169*
	(19447.401)	(0.479)
Perceivedfinanicalliteracy	-10290.917	-0.485
	(24920.809)	(0.368)
Education	8084.587	0.061
	(9658.304)	(0.061)
Housing	42784.283	0.374
	(50644.275)	(1.144)
Period		
2009	-71469.200***	-1.496***
	(27874.609)	(0.521)
2011	-56387.752***	-1.167**
	(25686.776)	(0.528)
N	561	556
R^2	0.128	0.049

Comparison of panel data random effects regressions of financial literacy on the value of investments. Model one is the regular regression and in model two the logarithmic value of totalbalance is used. People report their own value of investments in the Liss Panel. In the observations per group, the average is 2.1. This means that on average data per person is available for 2.1 years. N reports the number of observations. R^2 gives the percentage of variance in Valueofinvestments declared by the model. Significant p values are reported with significance stars: * p<0.1 ** p < 0.05 *** p < 0.01.

Table A5: Comparison of Regressions on Life Insurance

Variables	Lifeinsurance (1)	Coefficient	Lifeinsurance (2)	Coefficient
Constant	-1.292***		0.094	
	(0.347)		(.079)	
Age	-0.002	0.2%	-0.000	0%
	(0.003)		(0.001)	
Gender	-0.246**	-24.6%	-0.057**	-5.7%
	(0.102)		(0.023)	
Netincome	-0.004*	-0.4%	-0.001*	-0.1%
	(0.002)		(0.000)	
Financialliteracy	0.209***		0.049***	4.9%
	(0.049)		(0.012)	
Perceivedfinanical-literacy	0.098***	20.9%	0.024***	2.4%
	(0.037)		(0.008)	
Education	0.022***	9.8%	0.006***	0.6%
	(0.007)		(0.002)	
Housing	-0.313***	2.2%	-.065***	-6.5%
	(0.097)		(0.020)	
Period				
2009	-0.206***	-20.6%	-0.055***	-5.5%
	(0.049)		(0.013)	
2011	-0.264***	-26.4%	-0.068***	-6.8%
	(0.049)		(0.013)	
N	2537		2537	
R^2	0.088		0.079	

*Comparison of the panel data random effects and regular regression of financial literacy on the chance of having life insurance. People report if they have life insurance (0 means no and 1s yes) in the Liss Panel. N reports the number of observations. R^2 gives the (pseudo) percentage of variance in Lifeinsurance declared by the model. Significant p values are reported with significance stars: * p<0.1 ** p < 0.05 *** p < 0.01.*

Table A6: Regression with eatimation as independent variables

Variables	TD (1)	TD (2)	FSS (1)	FSS (2)	TB(1)	TB(2)	VOI(1)	VOI (2)	LI	Coefficients	LI (2)	Coefficients
Constant	50158.090*** (14909.674)	73251.879*** (17583.692)	3.609**** (0.181)	2.89**** (0.24)	129295.354 (54938.909)	187224.959*** (68857.244)	101762.272*** (31277.581)	176211.726*** (43832.667)	0.419*** (0.067)		-1.292*** (0.347)	
Age	7051.351*** (2346.795)	-6415.304*** (2335.829)	0.005*** (0.002)	0.005*** (0.002)	-8793.826*** (7797.062)	-8614.969*** (7577.735)	-11536.307** (4590.675)	-13354.692*** (4560.866)	-0.000 (0.001)	0%	-0.002 (0.003)	0.2%
Gender	17677.081 (18601.178)	7750.491 (18303.082)	0.182*** (0.063)	-1.33* (0.065)	-4590.675 (17745.754)	-23012.758 (18150.908)	-20419.772 (37112.124)	-43675.622 (38651.710)	-0.085*** (0.023)	-8.5%	-0.246** (0.102)	-24.6%
Estimation	18069.877** (26530.526)		0,050 (0.111)		76006.927** (29414.195)	23127.789 (65472.918)			-0.063 (0.039)	-6.3%	0.209*** (0.049)	20.9%
Netincome	-58.5576 (1198.064)	274.790 (1207.230)	0.000 (0.001)	0.000 (0.001)	-13631.69* (6372.091)	-12434.570* (6546.555)	-37990.18*** (5361.221)	-36914.65*** (4667.543)	-0.000 (0.000)	0%	-0.004* (-0.002)	-0.4%
Financial literacy		-8670.300*** (8346.682)	0.070** (0.31)	0.070** (0.025)	-45944.49*** (8670.300)	-49023.658*** (19447.401)	7094.680 (24920.809)	8084.587 (24920.809)	0.005*** (0.002)	5%	0.022*** (0.007)	2.2%
Perceived-financialliteracy		-5417.368 (-5634.011)		0.086*** (0.025)		-11668.441* (24920.809)		-10290.917 (24920.809)			0.098*** (0.037)	9.8%
Education	3040.577** (4923.882)	-7402.274 (4880.018)	0.019*** (0.004)	0.016*** (0.004)	14815.361*** (4769.533)	-10701.639** (4709.914)						
Housing	4113.772 (14189.360)	9771.001 (13801.835)	0.398*** (0.056)	0.348*** (0.057)	32979.552* (17340.600)	14423.489 (17502.661)	60692.099 (52021.799)	42784.283 (50644.275)	-0.085*** (0.019)	-8.5%	-0.313*** (0.097)	31.3%
Period			(0.056)	(0.057)								
2009	4113.722 (11625.736)	7292.611 (11595.927)	0.071** (0.032)	0.072* (0.032)	58342.204*** (14909.674)	-58909.420*** (14828.644)	-73089.817*** (28036.670)	-71469.200*** (27874.609)	-0.055*** (0.013)	-5.5%	-0.206*** (0.049)	-20.6%
2011	-6590.765 (12043.070)	-10143.857 (1953.642)	0.034 (0.035)	0.036 (0.035)	-79295.277*** (14423.489)	79075.012*** (14423.489)	56608.017*** (25767.807)	-56387.752*** (25686.776)	-0.070*** (0.013)	-7%	-0.264*** (0.049)	-26.4%

46

Model 1 until 4 are a Panel data random effects regression. The difference with Table 7 is that the independent variables are replaced by estimation. Model 1 is a regression of estimation on total debt. People report their own debt in the Liss Panel. In the observations per group, the average is 1.7. This means that on average data per person is available for 1.7 years. Model 2 is a regression of estimation on the Financial situation score. People report their own financial situation score on a scale of 1 (a lot of debt) to 5 (a lot of money to spare) in the Liss Panel. In the observations per group, the average is 2.9. This means that on average data per person is available for 2.9 yeas. Model 3 is a regression of estimation on the total balance. People report their own total balance considering assets and debt in the Liss Panel. In the observations per group, the average is 2.7. This means that on average data per person is available for 2.7 years. Model 4 is a regression of estimation on the value of investments. People report their own value of investments in the Liss Panel. In the observations per group, the average is 2.1. This means that on average data per person is available for 2.1 years. Model 5 is a probit regression of estimation the chance of having life insurance. People report if they have life insurance (0 means no and 1s yes) in the Liss Panel. The robust standard errors are between brackets. N reports the number of observations. R^2 gives the percentage of variance in the independent variable declared by the model. Significant p values are reported with significance stars: * p<0.1 ** p < 0.05 *** p < 0.01.