Financial Literacy and Household Wealth

Bachelor thesis Finance

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Introduction

The current financial market becomes more and more complicated, the complexity of financial products is increasing and individuals are compelled to become more responsible for their own financial security. Therefore financial literacy is more important than ever.

The main question in this thesis will be: What is the effect of financial literacy on household wealth?

Hypotheses: 1) *There is a positive relationship between household wealth and financial literacy.*
2) *Households with more financial knowledge tend to have higher savings.*
3) *Financially sophisticated households tend to have higher worth investments.*
4) *Households who are financially illiterate are more likely to borrow.*

To measure financial literacy and assess it relation to wealth, I used data from the 2011 DNB Household Survey which covers a representative sample of the Dutch population. The dataset shows that most respondents display basic financial literacy and have basic some knowledge about interest, investments and inflation. However many respondents do not understand the effect of interest on the value of obligation nor know the effect of variation in maturity on mortgage interest.

This thesis makes a contribution since there is little to no earlier research done about the effect of financial literacy on wealth. A lot of research has been done concerning financial knowledge influencing stock market participation or retirement savings but the effect of financial literacy on total wealth of Dutch households has never been examined.

The findings of this study implicate that financial literacy effects wealth positively. Regardless if the respondent is in charge of the household finance, an increase in financial knowledge results in a substantial growth of wealth. Self-assessed literacy also has an important influence on wealth since respondents' self-assessed literacy and wealth are positively related. Furthermore it can be concluded that financial sophisticated households tend to have higher savings. Finally the results show that respondents with more financial knowledge are more likely to have higher worth investments. However with all this results it remains unclear if financial literacy is a predictor or an effect of wealth, savings and investments. Since individuals can learn by doing financial knowledge can also be a result of successful investing or savings.

This thesis structure is as follows: Chapter 1 will cover an extensive literature review of financial literacy on savings, debt, investments and wealth. The second chapter will comprehend further descriptives of the used data and the measurements of financial literacy. Furthermore the hypothesis will be elaborated. The findings of the empirical research will be reported in chapter 3. In chapter 4 recommendations for future research are exposed. Finally in chapter 5 conclusions are drawn.

Contents

1. Literature review

This chapter will cover an extensive literature review on how financial literacy affects household wealth. Besides wealth, other variables affecting financial literacy will be discussed.

1.1 Influence of financial literacy on household wealth

Household wealth is defined as the sum of savings and checking accounts, bonds, stocks, individual retirement accounts, housing equity, other real estate and vehicles minus all debt (Hurst et al., 1998).

I expect to find a positive relation between financial literacy and savings as well as a positive connection between financial knowledge and stock value on the one hand, but a negative relation between financial literacy and debt. From this it follows that financial literacy is positive related to household wealth.

This expectation is confirmed by a research from Hilgert, Hogart and Beverly (2003). They show there is a positive link between financial knowledge and behavior. Well-informed, financially sophisticated people make wiser economic decisions and thus are more able to develop a wealthier existence. Those who are financial literate are more likely to pay bills on time, reconcile their checkbook every month and have an emergency fund. Still correlation does not imply causation and so this study does not explain if financial knowledge is a cause or a result of recommended financial practice.

Since wealth is composed out of savings, investments, housing equity, vehicles minus debt it is useful to examine the mutual relations between these variables and financial literacy. In the following paragraphs results on earlier research concerning financial literacy effecting savings, investments and debt are discussed.

1.2 Influence of financial literacy on savings

Wealth is unevenly spread among households. Findings from a study of Lusardi and Mitchell (2006) show that the twenty-five percentage wealthiest households hold ten times as much wealth as the twenty-five poorest households. According to this research planning is the explanation for this spreading. People who plan hold twice the amount of wealth of non-planners. But it is obscure which way the causality of this relation works. Does wealth affect planning or does planning affect wealth? Lusardi and Mitchell assess this reverse causality and find that the effect of wealth on planning is even negative; people who grow wealthier are less likely to plan but people who do plan display higher wealth levels. Moreover planning and financial literacy are correlated. However this study is held among two cohorts of Americans over the age of 50, in which one cohort exist of only Baby Boomers. Therefore these findings can be different among other generations and other countries.

It can be said that poor planning is a result of financial illiteracy and that people with financial knowledge are more likely to plan and to succeed in their planning effort. A research among Americans shows that

planning and financial literacy are interrelated (Lusardi and Mitchell, 2005). If planning affects wealth and planning is interrelated with financial literacy, financial literacy results in an increase of wealth. However the studies of Lusardi and Mitchell are concentrated among elderly (50+) Americans and the planning refers to retirement savings. The effect of financial literacy on savings not involving retirement is not tested.

Moreover it can be argued that savings decisions are complicated and require knowledge and information about economics and so people who are financial literate are more likely to be successful savers. A more recent study from Lusardi (2008) confirms this expectation, while this study recognizes the difficulty of saving decisions as this requires time and effort to search for information. Likewise some individuals may not be able to compute the calculations which are necessary in devising a savings plan. Moreover the work of Bernheim, Garrett and Maki (2001) shows that those who were exposed to financial education programs while in high school save more later in life.

1.3 Influence of financial literacy on investments

Financial literacy affects the way people seek advice about financial concepts. Those with low financial knowledge tend to rely on family and friends for advice as more literate individuals rely on professional financial advisors, newspapers and financial information in books, in magazines and on the internet. Logically this leads to an improving knowledge for those who already are more literate. The more knowledgeable will therefore make better investment decisions and are more likely to participate in the stock market. Financial literacy and stock market participation are thus highly correlated (van Rooij et al., 2011). Problem with this study is the endogeneity of financial literacy when used as a determinant of stockholdings. Van Rooij et al. remedied this problem by collecting additional information about the financial situation of the oldest siblings of the respondents. Van Rooij et al. used this information as an instrumental variable to assess the impact of financial literacy on stock market participation. The results of the Generalized Method of Moments indicate that financial literacy is an important determinant of stock market participation.

People with well developed cognitive skills are more likely to hold stock (Christelis, Jappelli and Pedula, 2007). To explain the reasons behind this relation Christelis, Jappelli and Pedula state that stockholding is driven by information constraints. This can be concluded since the association of cognitive abilities with less information-intensive assets such as bondholding remains much weaker than those with stocks. Others have argued that there are some inertial factors among households who do not hold any stock. These inertial factors may arise from cultural influences such as marital status and gender as well as from costly information. Advice from a professional or process of investing in stock can be costly. As a result of these factors, household tend to keep avoiding the stock market (Haliassos and Beraut, 1995).

Moreover there are major differences between portfolio choices of households within different wealth conditions. While it is unusual for low wealth households to hold risky financial assets, an increase in wealth leads to a higher probability of risky assets ownership (Allessie, Hochguertel and van Soest, 2002). This tendency is confirmed by the study of Campbell (2006). Wealth has a positive effect on stock market participation. Fixed costs can explain this effect since wealthier households are more likely to hold larger portfolios which justify the payments of fixed costs to raise return. An alternative explanation for this avoiding of the stock market is given by a study among Italian households by Guiso and Jappelli (2005). They argue that some households may be unaware of the existence of stocks as an asset class which results in an ignorance of investment opportunities. Furthermore entry costs are an important impediment for participation.

A survey from Sweden shows a positive correlation between financial literacy and portfolio choice. Less sophisticated households are more likely to make investments mistakes. This means showing underdiversification, inertia in risk taking and having the tendency to sell winning stock and hold losing stock, which is called the dispotion effect (Calvet, Campbell and Sodini, 2009). Furthermore Graham and Harvey (2006) argue that people with more knowledge are more likely to have more internationally diversified portfolios and tend to trade more often. Research from Campbell (2006) also finds nonparticipation in risky assets as a result of limited investment skills. He argues that nonparticipating households may be aware of their restricted knowledge which discourages them to put their money in risky assets.

Expectations are that financial illiterate households tend to avoid stockholding. Moreover it is likely that the better the financial knowledge of households, the less financial mistakes those households make and the more successful these households will be at their investments.

However there are some criticisms about several of these studies since some show a crude measurement of financial literacy. For example the studies of Lusardi and Mitchell (2006) and Gathergood (2012) rely on three questions to determine financial sophistication. Stango and Zinman (2009) rely on a single question. Moreover we have to take into account that some respondents rely on guessing and thus accidently give the correct answer. This could cause measurements to be noisy proxies of the true level of financial literacy.

1.4 Influence of financial literacy on borrowing

People who are not capable of calculating interest rates are more likely to borrow. Research from Stango and Zinman (2009) find that the less financially knowledgeable are dealing with an exponential growth bias. This bias elaborates in two directions. First it causes households to underestimate the expected future value of a yield which results in fewer saving. Second the bias results in a miscalculating of the true cost of borrowing associated with a stream of loan payments. Consequence; financially illiterate households are more likely to be in debt, save less and thus accumulate less amounts of wealth. Others argue that those who are not able to correctly calculate the cost of consumer credit are more likely to be associated with over-indebtedness (Gathergood, 2012).

Debt literacy among Americans is very low. Lusardi and Tufano (2008) explore the relation between debt literacy (which is a component of financial literacy), financial experience and the indebtedness of the respondents. Findings show that financial experiences and financial knowledge are closely related. Those who deal with high costs of borrowing are the ones who are less debt knowledgeable. Likewise those who have troubles with paying of their loans are the ones who are less financially sophisticated. However the study of Lusardi and Tufano (2008) only examines if the respondent has a mortgage, outstanding payments or some other loan but they did not study how high these loans are.

Note that in this connection there is no matter of reverse causality since more borrowing is highly unlikely to result in becoming more financial illiterate.

1.5 Summarize literature review

In this thesis I try to answer the question: *What is the effect of financial literacy on household wealth?*
Since wealth is composed out of savings, investments and debt these variables will be separately tested on financial literacy. The literature review on savings does suspect financial literacy and savings to be positively related, since research from Lusardi and Mitchell (2006) finds that individuals with financial knowledge are more likely to plan and to succeed in this planning. This results in better savings for retirement. Moreover Lusardi (2008) argues saving decisions are complex and therefore require knowledge and information about economics. Therefore it seems likely financial literacy has a positive effect on household savings.
Furthermore Stango and Zinman (2009) and Gathergood (2012) find that individuals who are not capable of calculating costs of borrowing are more likely to have a loan. For that reason I expect debt and financial literacy to be negatively correlated. I expect this to be the opposite with investments and financial knowledge. Since stock market participation and economic knowledge are highly positive correlated (van Rooij et al,. 2011) and individuals who are more knowledgeable tend to have more

internationally diversified portfolios and tend to trade more often (Calvet, Campbell and Sodini, 2009) it is likely for financial sophisticated households to hold higher worth investments.

From this it can be concluded that a lack of understanding of finance results in a lower amount of wealth since this value exists out of the sum of savings and investment (which are positively correlated with financial literacy), minus all debt (which is negatively correlated with financial literacy).

2. Data and methodology

In this chapter it will first be discussed how the data is collected. Second the measurements of financial literacy will be explained. Furthermore the four hypotheses will be discussed. Finally details about the data will be highlighted.

2.1 Collected data

I use data from the 2011 *De Nederlandsche Bank's* Household Survey. The DNB Household Survey examines the economic and psychological determinants of the saving behavior and wealth of households. The panel is run by CentERdata, a survey research institute at Tilburg University that specializes in Internet surveys. The dataset contains 2,107 Dutch respondents and was conducted over the period April 2011 – December 2011.

In addition to using data from the main core of the DNB Household Survey I use data from the CentERpanel to measure the financial literacy of the households. This data was collected during May 2011. A total of 1,706 out of 2,442 respondents completed the financial literacy questionnaires, which results in a respondent's rate percentage of 69.9.

The age of the respondents in the survey varies from 23 to 89 (mean age of the respondents is 56.8), 39,8% of the respondents have a college degree and 55.2% of the respondents are male. 29.5% of the respondents have children, 26.2% is married. 30.2% of the respondents is retired, 5.5% is self-employed and 2.3% is unemployed.

The data is collected through the Internetpanel of CentERdata. Although the Internet connection rate is one of the highest in Europe, households do not necessary have to have an Internet connection to participate in the survey. Households without access to Internet were provided with a set-top box for their television.

2.2 The measurement of financial literacy

The CentERpanel uses five questions to measure and evaluate financial literacy. These questions aim to assess basic financial knowledge. The precise phrasing of the questions is reported in the Appendix, box 1.

These questions measure the ability to perform simple interest calculations (first question), effects of inflation (second question) and the effect of interest on obligations (third question). The fourth question assesses the knowledge of mortgages and the fifth question assesses the knowledge of investments.

The outcomes of these questions are reported in Table 1. Most of the respondents were able to answer the question about interest calculations and the one about investments correctly. The question about inflation also has a relative high proportion of correct answers. On the contrary, the question about the effect of interest on the value of obligations has a large response of incorrect answers. Almost 74% of the respondents did not manage to answer this question correctly. Also the question about mortgages seems hard to answer since more than 40% of the responses were incorrect.

Panel B of Table 1 shows the proportion of the number of correct answers for all the respondents. Only 14% of the respondents were able to answer all the financial literacy questions correctly, against 0.4% of the respondents who answered all of the questions incorrect. With an average of 3.6 of correct answers, most individuals did mention to answer some of the questions correctly. However there were only a few who were capable of answering all the questions right. Since the questions are relative simple, it can be said that financial knowledge among Dutch households is limited.

Table 1
Basic financial literacy
Panel A states the proportion of correct answers for each question on financial literacy.
Panel B enumerates the number of correct answers of the respondents on the basic financial literacy questions.

Panel A: Financial Literacy							
Weighted percentage of correct and incorrect answers (N=1,409)							
	Question 1	Question 2	Question 3	Question 4a	Question 4b		
Correct	95.5	87.6	26.2	59.0	92.5		
Incorrect	4.5	12.4	73.8	41.0	7.5		
Panel B: Summary of responses							
Weighted number of correct and incorrect answers (N=1,409)							
	Number of correct and incorrect answers (out of five questions)						
	None	1	2	3	4	All	Mean
Correct	0.4	1.4	7.9	33.1	41.4	14.4	3.6

The distribution of financial literacy across education, age, gender and self-assessed literacy is shown in Table 2. From this table it is clear to see financial literacy increases with education. The respondent with a university degree display higher financial literacy. Furthermore those who were only educated at primary school or preparatory intermediate vocational are much more represented in de lower quartiles of financial literacy. Also Table 2 reports a higher financial knowledge among the male, while the male average of correct answers lies 0.3 higher than the female. Similar results were found by Lusardi (2006). There is no big difference in financial literacy among age groups.

Panel B of Table 2 shows the financial knowledge of the respondents across self-assessed literacy, which measures the review of the respondents own understanding of economic aspect such as calculating, dealing with money and tracking of economic news. The exact phrasings of these questions are reported in Box 2 of the Appendix. From Table 2 it follows that most respondents assess their knowledge as being above average, 85,2% of the respondents estimated their knowledge of economic 3 or more (on a scale of

1 to 5). Furthermore Table 2 panel B shows the consistency of financial literacy with the self-assessed literacy of the respondents. It follows that respondents are aware of their own knowledge about economics since financial literacy and self-assessed literacy are positive correlated. As is shown in the correlation matrix Table 7 and Table 8 in the appendix, financial literacy and self-assessed literacy are significantly positive related. Moreover respondents who indicate their self-assessed knowledge as poorly, do have lower financial literacy, as shown in Table 2.

Table 2 Financial literacy across demographics (weighted percentages).
This table reports the distribution of financial literacy across different levels of education, different age groups, and across gender. Furthermore the table shows the distribution of financial literacy across self-assessed literacy.

	Financial literacy (N=1,407)							
Education	0 (low)	1	2	3	4	5 (high)	Mean	N
Primary school		3.2	19.4	38.7	35.5	3.2	3.16	62
Preparatory intermediate voc.	1.0	2.3	14.1	38.1	34.0	10.5	3.33	391
Secondary pre-university		0.6	5.5	30.5	47.0	16.5	3.73	164
Intermediate vocational		2.2	9.6	36.5	38.3	13.5	3.51	230
Higher vocational	0.26	0.53	3.2	32.4	45.3	18.4	3.77	380
University		0.56	1.1	20.6	50.0	27.8	4.03	180
	Financial literacy (N=1,409)							
Age	0 (low)	1	2	3	4	5 (high)	Mean	N
15-35 years		2.6	9.2	21.1	52.6	14.5	3.67	76
35-44 years	0.5	2.3	7.5	32.2	43.0	14.5	3.58	214
45-54 years		0.3	8.6	36.1	40.2	14.8	3.60	291
55-64 years	0.3	0.8	6.5	36.0	41.1	15.4	3.63	397
65 years and older	0.7	2.1	8.8	31.1	39.7	17.6	3.60	431
	Financial literacy (N=1,409)							
Gender	0 (low)	1	2	3	4	5 (high)	Mean	N
Female	0.3	1.6	10.3	38.4	40.6	8.9	3.44	631
Male	0.4	1.3	6.0	28.9	42.0	21.3	3.75	778
Panel B: Basic literacy versus self-assessed literacy								
	Financial literacy (N=1,409)							
Self-assessed literacy	0 (low)	1	2	3	4	5 (high)	Mean	N
1 ≤ Self-assessed lit. < 2(very low)		0	20.0	35.0	40.0	5.0	3.3	20
2 ≤ Self-assessed lit. < 3		2.7	14.9	37.2	38.8	6.4	3.31	188
3 ≤ Self-assessed lit. < 4	0.6	1.5	8.0	34.0	43.1	12.8	3.56	662
4 ≤ Self-assessed lit. < 5	0.2	0.9	5.5	30.9	40.4	22.1	3.77	456
Self-assessed lit = 5 (very high)		1.2	2.4	28.9	39.8	27.7	3.90	83

2.3 Hypotheses

The model will answer the main question: "*What is the effect of financial literacy on household wealth*?". Based on former research of Hilgert, Hogart and Beverly in 2003, I expect financial literacy to influence household wealth positively.

Hypothesis 1: There is a positive relationship between household wealth and financial literacy.

This is the most important hypothesis. I expect wealth and financial literacy to be positively correlated since savings and investments have a positive effect on wealth while debt has a reducing effect. The way of causality in this relation is unclear. With further examination I will clarify the effect of financial literacy on wealth. Data research will answer the question: 'Are those who display high financial literacy more likely to accumulate wealth?'

Hypothesis 2: Households with more financial knowledge tend to have higher savings.

It remains from the literature review that people with better financial knowledge are more likely to plan for retirement which leads to a wealthier existence as they retire. However in my study savings do not only contain retirement accounts but also savings and checking accounts. The challenge of this study is the endogeneity of financial literacy when used as a determinant of saving behavior. Therefore I will try to determine the way of causality in this connection between financial knowledge and savings.

Hypothesis 3: Financially sophisticated households tend to have higher worth investments.

Previous studies show that low wealth households and illiterate households tend to avoid the stock market. Additionally financial knowledge has a positive effect on stock market participation (van Rooij et al., 2011). I will examine if the value of investments and financial literacy of households are correlated. With this it is much likely that households can learn by doing and so it remains unclear if financial literacy is a determinant or an effect of successfully investing. Moreover it is possible for financial literacy to be both a determinant and an effect of successful investing.

Hypothesis 4: Households who are financially illiterate are more likely to borrow.

On the contrary I expect illiterate households to save less and borrow more. The literature review confirms this prospect.

2.4 Data

To determine the relation between financial literacy and wealth, I allocated the data from the DNB Household Survey into four different subgroups; savings, debt, investment and wealth. The precise composition of these variables is shown in Table 3a.

Table 3a Variables

Financial literacy	Financial knowledge of the respondents, based on five questions (see Appendix box 1). The value on financial literacy can differ from 0 to 5, since the financial literacy score is based on the number of correct answers.
Self-assessed literacy	This variable represents the respondents' own assessment of economic knowledge. The variable is based on three questions about respondents own understanding of economic aspect such as calculating, dealing with money and tracking of economic news (see phrasings of these questions in Box 2 Appendix). The respondents were asked to review their own knowledge about each aspect of literacy on a scale from 1 to 5. I divided these outcomes into five self-assessment quartiles.
Wealth	Total value of the wealth of the respondent. This variable is computed by the sum of *Savings*, *Investments*, total amount of checking accounts, total amount of real estate, total amount of cars, motorbikes, boats and caravans/trailers, total amount owner of a house and total amount owner of a second house minus the variable *Debt & Mortgages*.
Savings	Total savings of the respondent. Total savings are determined based on the total amount of the respondents' employer-sponsored saving plan, the total amount of the respondents' savings/deposit accounts and the total amount of the respondents' deposit books.
Investment	Total investments of the respondent. This variable is based on four values; the total amount of the respondents' mutual funds/accounts, total amount of the respondents' bonds, total amount of the respondents' shares and the total amount of the respondents stocks from substantial holding.
Debt	Total debt of the respondent, excluding mortgages. This variable consists out of the respondents' total amount of private loans, extended lines of credit, outstanding debt, finance debt, loans from family/friends, study loans, credit card debt and loans not mentioned before.
Debt & Mortgages	Total debt of the respondent, including mortgages. This variable consists out of debt plus the total amount of the respondents' mortgages on the house, total amount mortgages on the second house and total amount mortgages on real estate.

To test the four hypotheses, several control variables have to be taken into account. A regression analysis between a dependent and an independent variable can result in a wrong conclusion because of different other independent variables, also called control variables, which also have an impact on the independent variable. These control variables are displayed in Table 3b.

Table 4 shows the means, standard deviations, minimum, maximum and the number of observations of each variable. An analyse of these outcomes is added in the table.

Table 3b Control Variables

Age dummies	The respondents are divided into five age groups; those with age 15-35, 25-34, 35-44, 45-54, 55-64 and those who are 65 and older. Then I created five dummies, for each age group one. The dummy has a value of 1 when the respondent is in that particular age group and 0 if the respondent belongs in another age group.
Education dummies	There are six different levels of education; Primary school, Preparatory intermediate vocational, Secondary pre-university, Intermediate vocational, Higher vocational and University. For each educational level I created a dummy with value 1 if this level was the highest education level the respondent graduated, otherwise the value of the dummy was 0.
Male	Gender of the respondent. If the respondent is male this variable has a value of 1, when the respondent is female this variable has a value of 0.
Married	If the respondent is married this control variable has a value of 1, otherwise it has a value of 0.
Number of children	The number of children of the respondent living at home.
Number of members household	The number of members of the household the respondent lives in.
Retired	This variable controls for retirement. If the respondent is retired this variable has a value of 1. If the respondent is not retired the variable has a value of 0.
Self-employed	This variable controls for respondents who are self-employed. When the respondent is self-employed this variable has a value of 1, otherwise it has a value of 0.
Unemployed	This variable controls for unemployment. If the respondent is unemployed, this variable has a value of 1, otherwise it has a value of 0.
Net income	Value of the total net income of the respondent.
Net income household	Total value of the net income of the entire household.
Total real estate	Total value of the real estate of the respondent. This variable consists out of the respondents' total amount of houses and other real estate.

Table 4 Summary Statistics

To clarify the distribution of the different variables in this table the means, standard deviation, minimum, maximum and the number of observations are reported. Strikingly in this table is the fact that the mean of savings is more than twice as big as the total amount of investments. Furthermore it can be concluded most respondents are not in debt, while those who are, are dealing with high debt ness since the maximum of debt is 405,000 and the standard deviation is 20,830. However when mortgages are added to debt, the value of this variable increases largely to a mean of 57,916.51.

Variable	Mean	Standard Deviation	Minimum	Maximum	Observations
Financial Literacy	3.61	0.92	0	5	1,409
Self-assessed literacy	3.59	0.75	1	5	1,409
Wealth	159,587.20	220,959.90	-664,426.8	1,729,300	1,409
Savings	23,167.19	49,107.16	0	535,370	1,409
Investments	11,076.67	54,537.47	0	1,028,432	1,409
Debt	3,320.20	20,830.29	0	405,000	1,409
Debt & Mortgage	57,916.51	111,107.90	0	1,650,000	1,409
Age	56.80	13.41	23	89	1,409
Education	3.72	1.53	1	6	1,407
Gender*	1.45	0.50	1	2	1,409
Married**	0.26	0.44	0	1	1,409
Number of children	0.57	0.99	0	5	1,409
Number of members household	2.36	1.18	1	7	1,409
Retired***	0.30	0.46	0	1	1,409
Self-employed	0.05	0.23	0	1	1,409
Unemployed****	0.02	0.15	0	1	1,409
Net income	1,767.61	2,837.90	0	93,212	1,388
Net income household	2,841.52	3,032.38	0	93,212	1,409
Total real estate	173,712.9	209,111.50	0	1,933,000	1,409

*1=male, 2=female ** 0=unmarried, 1=married ***0=not retired , 1=retired ****0=employed, 1=unemployed

3. Empirical Research

This chapter shows the results of the empirical regression of this thesis. To test the effect of financial literacy on the different depend variables I performed three different regressions. The first regression estimates the effect of financial literacy on wealth. The results of this regression analyse are shown in Table 5. The results of the other regression analyses concerning financial literacy and self-assessed literacy are shown in Table 6. Table 6 is divided into two sections. The first section reports the results of the different dependent variables effecting financial literacy and the second part concerns the same dependent variables regressed with self-assessed literacy. For each dependent variable I used three different specifications. The first regression is a basic specification (Ordinary Least Squares ((OLS)1), regressing financial literacy to the dependent variable without controlling for any other variables. In the second specification I regress financial knowledge to the dependent variable and I add all the control variables (OLS(2)). In this first and second specification I dropped those respondents who are not in charge of the household administration out of the survey. This way only those individuals who are responsible for the household finance are taken into the regressions. The results of the regression with all the control variables taken into account and all member of the household added (note: not only the household head) are reported in the third specification (OLS(3)).

3.1 Results on wealth

In Table 5 the results of the regression analyses between financial literacy and wealth are reported. The R-squared of the OLS(2) and OLS(3) regression show that these models explain about 23% of the variation in wealth.

In the OLS(2) regression the coefficient of the variable financial literacy is 29,613.99, at a 0.01 significance level. The estimates are sizeable, when financial literacy increases with 1%, total wealth rises with 0.01*29,613.99. Note that the effect of gender and the effect of self-employment are even larger; the coefficients are respectively 49,066.14 and 161,603.30.

The results of the OLS(3) regression show financial literacy, gender, number of members of the household, self-employment and net income all have a significant positive impact on wealth. The coefficient of financial literacy has a value of 27,738.08, with a significance level of 0.01. Marriage on the other hand has a negative significant effect on wealth, at a coefficient of –45,182.65, with a significance level of 0.01. Additionally number of children has a negative effect on wealth, with a coefficient of -28,527.01 and a significance level of 0.1.

To clarify the effect of financial literacy on wealth I run a regression taken wealth squared as dependent variable. The results of this regression are shown in Table 6. The coefficients of the financial literacy

variable increase extremely, while all three specifications remain significant. These results imply that the influence of financial literacy on wealthier household is even bigger than it is for the poorer households.

Moreover the effect of self-assessed literacy on household wealth is examined. Results of these regressions are reported in Table 6. These results suggest that the respondents' own assessment of economic knowledge has a positive effect on his or her wealth. Both OLS(2) and OLS(3) regressions are significant with a positive coefficient and it can therefore be concluded that an increase in a respondents' self-assessed literacy would lead to a growth in wealth.

These results imply empirical evidence is found financial literacy influences household wealth positively, regardless if this concerns the household member who is in charge of the household finance.

Table 5 Multivariate analysis of wealth: OLS results.
This table reports OLS estimates of the effect of financial literacy and several control variables on household wealth. The data are from the 2011 DNB Household Survey.

	OLS (1)		OLS (2)		OLS (3)	
Financial literacy index	53,363.42***	(6.79)	29,613.99***	(3.86)	27,738.08***	(4.55)
Age dummies						
15≤age≤34			(omitted)		(omitted)	
35≤age≤44			22,273.91***	(0.69)	31,538.22	(1.17)
45≤age≤54			95,095.36***	(3.02)	96,925.06***	(3.69)
55≤age≤64			159,726.5***	(5.16)	154,215.4***	(5.93)
Age≥65			226,306.60	(6.39)	198,736.3***	(6.69)
Education dummies						
Primary school			2,917.69	(0.02)	-32,478.97	(-0.23)
Preparatory intermediate voc.			11,096.39	(0.07)	-16,195.76	(-0.12)
Secondary pre-university			31,837.17	(0.21)	16,921.69	(0.12)
Intermediate vocational			33,233.83	(0.22)	6,792.47	(0.05)
Higher vocational			53,207.86	(0.36)	29,830.32	(0.21)
University			140,495.9	(0.95)	114,180.40	(0.81)
Male			49,066.14***	(2.85)	48,434.81***	(3.37)
Married			-24,126.92	(-1.08)	-45,182.65***	(-2.63)
Number of members household			21,028.37	(1.22)	40,768.49***	(2.80)
Number of children			-5,171.55	(-0.25)	-28,527.01*	(-1.71)
Retired			14,170.21	(0.64)	8,604.06	(0.47)
Self-employed			161,603.30***	(5.08)	110,800.8***	(4.39)
Unemployed			-46,310.67	(-1.08)	-34,914.59	(-0.99)
Net income			-9,546.34	(-1.07)	1,233.22*	(1.85)
Dummy net income			-32,325.65	(-0.97)	-22,566.59	(-0.92)
Household net income			1,174.39	(1.40)	-8.54	(-1.38)
Dummy household income			38,239.11	(0.48)	18,696.39	(0.28)
Constant	-16,758.98	(-0.57)	-208,884.10	(-1.34)	-187,729.8	(-1.29)
Observations		(1,040)		(1,025)		(1,388)
R-squared		(0.0425)		(0.2362)		(0.2236)
Adjusted R-squared		(0.0416)		(0.2194)		(0.2111)

Note: T-values are reported in parentheses; ***p<0.01, **p<0.05, *p<0.1

Table 6 Restricted Regression Results

This table reports OLS estimates of the effect of financial literacy on household wealth, household wealth squared, savings, investments, debt and debt&mortgages. In the second part of the table, the same regression are run only with a different independent variable; self-assessed literacy. Control variables are omitted of the table. The data are from the 2011 DNB Household Survey.

Financial Literacy						
	OLS (1)		OLS (2)		OLS(3)	
	Coëfficiënt	R-squared	Coëfficiënt	R-squared	Coëfficiënt	R-squared
Wealth	53,363.42***	0.0425	29,613.99***	0.2362	27,738.08***	0.2236
$Wealth^2$	3.96e+10***	0.0196	2.14e+10**	0.1286	2.03e+10***	0.1165
Savings	9,114.49***	0.0239	6,103.05***	0.0869	6,585.45***	0.0892
Investments	9,396.28***	0.0184	6,320.02***	0.0868	5,026.77***	0.0772
Debt	203.84	0.0001	-48.10	0.0113	7.00	0.0105
Debt&Mortgages	17,888.57***	0.0226	1,332.46	0.3307	1,813.20	0.3262
Self-Assessed Literacy						
	OLS (1)		OLS (2)		OLS(3)	
	Coëfficiënt	R-squared	Coëfficiënt	R-squared	Coëfficiënt	R-squared
Wealth	65,252.74***	0.0403	32,543.89***	0.2335	33,270.31***	0.2230
$Wealth^2$	4.46e+10***	0.0158	2.31e+10**	0.1274	2.15e+10***	0.1150
Savings	11,200.68***	0.0228	7,695.37***	0.0870	7,269.00***	0.0866
Investments	13,884.80***	0.0255	10,525.47***	0.0924	8,979.04***	0.0844
Debt	-752.94	0.0005	-967.41	0.0120	-557.25	0.0109
Debt&Mortgages	18,607.37***	0.0155	4,672.83	0.3314	2455.12	0.3262

***p<0.01, **p<0.05, *p<0.1

3.2 Results on savings

The results of the regression analyse between financial literacy and savings are reported in Table 6. The results of the OLS(2) regression show that the model explains 8.7% of the variation in savings. The coefficient of the variable financial literacy is 6,103.05, with a significance level of 0.01. This implies that empirical evidence is found that financial literacy influences household savings. When financial literacy increases with 1%, total household savings rise with 0.01*6,103.05.

The third regression OLS(3), which include all household members and not only those respondents who are in charge of the household administration, results also in a significant positive coefficient of financial literacy, with a coefficient of 6,585.45. This model explains 8.9% of the variation in savings.

Furthermore self-assessed literacy has a positive effect on savings, with a coefficient of 7,695.37 at a significance level of 0.01 in the OLS(2) regression. It is to be expected that the results on financial literacy and self-assessed literacy are related, since these to variables are correlated (as shown in the correlation matrix Table 7 and Table 8 in the Appendix).

Since the result of financial literacy on savings is strongly significant, it can be concluded that the effect of financial literacy is strongly positive. So, a better understanding of finance results in an increase of

savings. Risk with this conclusion is that it is possible for the causality to be the other way around, since an increase in savings can bring the respondent some more financial experience which can lead to more financial knowledge.

3.3 Results on investment

As shown in Table 6 the effect of financial literacy and self-assessed literacy on investments is positive.

The first regression concerning financial literacy, OLS(1), explains only 1,8% of the variation in investments. The second and third regression however, explains more 8,7% of the variation in the total value of the respondents investments. Financial knowledge has a positive effect on total investments of the respondent. The variations between the three different OLS regressions results are not very notable. According to the specification OLS(2), financial literacy of the household head has an significant coefficient of 6,320.02. At the third specification OLS(3), where all household members are included, this coefficient has a value of 5,026.77. Both coefficients are significant at a 0.01 level.

Also the results of the regression between self-assessed literacy and investments are reported in Table 6. The outcomes of the three different specifications are all significant, while the coefficients were strongly positive. Although the specification concerning only the household heads has a larger coefficient than the one concerning all household members, 10,525.47 over 8,979.04, they both show a positive relation between self-assessed literacy and investments. This implies that respondents who believe to be more financial literate are more likely to have higher worth investments.

The results of Table 6 imply that there is a strong positive relationship between respondents' total value of investments and financial knowledge/self-assessed literacy.

3.4 Results on debt

The results on debt are reported in two regression analyses. In the first regression analyse all debts of the respondents are taken into account, excluding the respondents mortgages. However total mortgages of the respondent are added in the regression with debt & mortgages. Since mortgages could be seen as an investment in housing equity, there has to be a control variable to correct for this investment opportunity. In the current Dutch system, having a mortgage is favorable since home owners are allowed to deduct all their mortgage repayments from tax. For this reason a mortgage cannot be seen as normal debt and we have to control for investing in housing equity. Therefore the control variable total real estate is inserted in this regression.

Apart from the OLS(1) regression with debt & mortgages, none of the results on debt or on debt & mortgages are significant. The OLS(1) results on debt & mortgages suggest a positive relation between

debt (including mortgages) and financial literacy. Also the regression OLS(1) with self-assessed literacy and debt & mortgages is positive. These results would suggest that an increase in financial literacy would lead to an increase in debt including mortgages. The hypothesis would therefore be rejected. However these regressions do not control for any variables. With a R-squared of 2%, the results on this regression are not very notable. Since the regressions with control variables do not show any significant results, I cannot define the effect of financial knowledge on household debt. Therefore hypothesis 4 cannot be adopted nor be rejected.

4. Discussion and recommendations

The way of causality in the hypotheses is questionable. Although financial literacy is significant correlated with savings, investments and wealth (as shown in Table 7 and Table 8 of the Appendix, correlation matrix) still it remains unclear if financial literacy is a predictor of these variables or an effect. Individuals can learn by doing. For example households who do not participate in the stock market are expected to have less knowledge about stocks and investments than those households who do participate and gain knowledge by experience. Same can be said for savings, since some savings programs are complex and require knowledge and information. To address the direction of causality between financial literacy and wealth, an instrumental variable has to be found. This variable should affect financial literacy but would have been exogenous with respect to wealth. In the 2011 DNB Household Survey no such variable could be found. For that reason further research would be required to investigate this two-way causality.

Additionally the measurement of financial literacy of the respondents could have been more precise and adequate. Since there were no possibilities for respondents to answer the financial literacy question with 'do not know', respondents who did not know the correct answer were forced to guess. This can result in a bias given that some households were implied to have good financial knowledge while this actually was a result of guessing.

5. Conclusions

The main goal of this thesis was to define the effect of financial literacy on wealth. There has been a lot of research regarding financial literacy and planning for retirement, retirement savings, borrowing, stock market participation and portfolio choice. Although there are researchers who found a positive relation between savings and financial sophistication as well as a positive effect of financial knowledge on portfolio choice, still there has not been any research on the effect of financial knowledge on household wealth.

4.1 Conclusions on the empirical research

For conclusions on the empirical research the main question will be answered: *What is the effect of financial literacy on household wealth?* To answer this question, I allocated the definition of wealth into four different hypotheses;

1) *There is a positive relationship between household wealth and financial literacy.*
2) *Households with more financial knowledge tend to have higher savings.*
3) *Financially sophisticated households tend to have higher worth investments.*
4) *Households who are financially illiterate are more likely to borrow.*

When looking at the wealth regression in chapter 3, the conclusion can be drawn that financial literacy effects wealth positively. Regardless if the respondent is in charge of the household administration, an increase in financial literacy results in a substantial growth of wealth. Therefore the main question of this thesis: *'What is the effect of financial literacy on household wealth?'* can be answered. Financial literacy has a positive effect on total wealth. If financial literacy of a respondent, who's in charge of the household finance, increases with 1% the total amount of wealth rises with 0.01*29,613.99. It therefore seems favorable for individuals to improve their financial knowledge since this has a big impact on their wealth. Likewise evidence is given for a positive relation between respondents' self-assessed literacy and household wealth.

In hypothesis 2 I expected financial literacy to have a positive effect on savings. This expectation can be confirmed after empirical research in Chapter 3. All the three regressions on savings implicate a positive relation between financial knowledge and savings. Therefore it can be concluded that financial knowledge has an important influence on savings.

Hypothesis 3 is correct. Empirical research confirmed financial sophisticated households tend to have higher worth investments. When the financial literacy of a household head increases with 1% the total amount of investments rises with 0.01*6,320.02. Furthermore self-assessed literacy also has a significant

positive effect on investments. This implies that respondents who believe to be more financial literate are more likely to have higher worth investments.

At last the results on hypothesis 4. Hypothesis 4 is found partly incorrect since the results on the regression debt and mortgages on financial literacy suggested a positive relation. An increase in financial literacy would lead to an increase in debt and mortgages. Note that mortgages have a big influence on this regression since the analyse where mortgages were not included in the regression did not give any significant results. However the effect of financial knowledge of the respondents' debt cannot be defined based on this study since the OLS(1) regression does not control for any variables. Therefore hypothesis 4 cannot be rejected nor be adopted. Based on this research the effect of financial literacy on household debt remains unclear.

6. References

Alessie, R., Hochguertel, S., Van Soest, A., 2002. Household portfolios in the Netherlands. In: Guiso, L., Haliassos, M., Jappelli, T. (Eds.), Household Portfolios. MIT Press, Cambridge, MA, pp. 341–388.

Bernheim, D., Garrett D. and Maki D., 2001. Education and Savings: The Longterm Effect of High School Financial Curriculum Mandates. *Journal of Public Economics,* 85, 435-565.

Calvet, L., Campbell, J., Sodini, P., 2009. Measuring the financial sophistication of households. *American Economic Review 99*, 393–398.

Campbell, J., 2006. Household Finance. *Journal of Finance 61*, 1553-1604.

Christellis, D., T. Jappelli and M. Padula, 2010. Cognitive Abilities and Portfolio Choice. *European Economic Review* 54 (2010) 18-38.

Gathergood, J., 2012. Self-control, financial literacy and consumer over-indebtedness. *Journal of Economic Psychology 33,* 590-602.

Graham, John R., Campbell R. Harvey, and Hai Huang, 2005, Investor competence, trading frequency, and home bias, NBER working paper no. 11426.

Guiso, L., Jappelli, T., 2005. Awareness and stock market participation. *Review of Finance 9*, 537–567.

Haliassos, M., and C. Bertaut, 1995. Why do so few hold stocks? *Economic Journal*, 105, 1110-1129.

Hilgert, M., Hogarth, J., Beverly, S., 2003. Household financial management: the connection between knowledge and behavior. *Federal Reserve Bulletin July*, 309–322.

Hurst, E., Luoh, M. C., Stafford, F., Gale, W., 1998. The Wealth Dynamics of American Families, 1984-94. *Brooking Papers on Economic Activity,* Vol. 1998, No. 1.

Lusardi, A., Mitchell, O.S., 2005. Financial Literacy and Planning: Implications for Retirement Wellbeing. Working Paper, University of Michigan Retirement Research Center.

Lusardi, A.. 2006. Planning and Financial Literacy: How do women fare? Working Paper, University of Michigan Retirement Research Center.

Lusardi, A., Mitchell, O.S., 2007. Baby boomers retirement security: the role of planning, financial literacy and housing wealth. Journal of Monetary Economics 54, 205–224.

Lusardi, A., Tufano, P., 2008. Debt Literacy, Financial Experience and Overindebtedness. NBER Working Paper No. 14808.

Lusardi, A., 2008. Household Saving Behavior: The Role of Financial Literacy, Information, and Financial Education Programs. Dartmouth College and NBER.

van Rooij, Lusardi, A., M., Alessie, R., 2011. Financial Literacy and stock market participation. *Journal of Financial Economics 101,* 449-472.

Stango, V., Zinman, J., 2009. Exponential growth bias and household finance. *Journal of Finance 64*, 2807–2849.

7. Appendix

Box 1 Basic Literacy Questions.

1) Stel u hebt vandaag €100 aan spaargeld op een rekening bij de bank staan.
   Op deze rekening wordt elk jaar 2% rente uitgekeerd op uw spaarsaldo.
   Hoeveel geld zou u na 5 jaren op deze rekening hebben staan, indien u het geld niet tussentijds opneemt?
   (i) meer dan €102; (ii) €102; (iii) minder dan €102.

2) Stel de spaarrente op uw bankrekening bedraagt jaarlijks 1%. De inflatie is gelijk aan 2% per jaar.
   Hoeveel zou u voor uw geld na 1 jaar kunnen kopen van uw geld op deze bankrekening?
   (i) meer dan vandaag; (ii) precies evenveel als vandaag; (iii) minder dan vandaag.

3) Stel de algehele rentestand gaat morgen stijgen, wat gebeurt er daardoor met de waarde van uitstaande obligaties?
   (i) deze zullen in waarde stijgen; (ii) deze zullen in waarde dalen; (iii) deze blijven gelijk in waarde; (iv) er bestaat geen relatie tussen de rentestand en waarde van obligaties.

4) Geef aan of de volgende stelling juist of onjuist is:
   Een 15-jarige hypotheek kent doorgaans hogere maandlasten dan een 30-jarige hypotheek (met gelijke leensom), maar de totale rentelasten die men betaalt over de leentermijn van een 15-jarige hypotheek zijn wel lager.
   1 juist
   2 onjuist

5) Geef aan of de volgende stelling juist of onjuist is:
   Het beleggen in aandelen van 1 enkel bedrijf is doorgaans veiliger, dan hetzelfde bedrag beleggen in een beleggingsfonds.
   1 juist
   2 onjuist

Box 2 Self-assessed Literacy Questions.

Wilt u aangeven in hoeverre u het eens bent met onderstaande stellingen?

1) Ik ben goed in het omgaan met geld
2) Ik ben goed in rekenen
3) Ik houd regelmatig het financieel economische nieuws bij

   1: 1 helemaal oneens
   2: 2
   3: 3
   4: 4
   5: 5 helemaal eens

Table 7 Correlation matrix; All household members

	Financial Literacy	Savings	Debt	Debt & Mortgage	Investments	Wealth	Age	Education	Gender
Financial Literacy	1								
Savings	0.169***	1							
Debt	0.016	-0.051	1						
Debt & Mortgage	0.144***	-0.010	0.265***	1					
Investments	0.128***	0.179***	-0.005	0.023	1				
Wealth	0.195***	0.479***	-0.041	-0.012	0.459***	1			
Age	-0.003	0.134***	-0.021	-0.150***	0.115***	0.284***	1		
Education	0.251***	0.141***	0.051	0.219***	0.126***	0.166***	-0.189***	1	
Gender	-0.168***	-0.113***	-0.013	-0.145***	-0.096***	-0.280***	-0.151***	-0.090***	1
Married	-0.101***	-0.106***	-0.040	-0.158***	-0.081**	-0.222***	-0.082**	-0.191***	0.538***
Number of children	-0.012	-0.124***	-0.024	0.035	-0.066*	-0.115***	-0.465***	0.002	0.067*
Number of members household	0.004	-0.108***	-0.030	0.053*	-0.045	-0.075**	-0.401***	-0.018	-0.001
Retired	0.010	0.131***	-0.006	-0.071**	0.068*	0.214***	0.671***	-0.064*	-0.217***
Self-employed	0.044	-0.011	0.078**	0.042	0.079**	0.110***	-0.090***	0.097***	-0.041
Unemployed	-0.001	-0.031	-0.009	-0.010	-0.014	-0.028	-0.037	0.050	-0.036
Net income	0.114***	0.078**	0.012	0.118***	0.088**	0.137***	0.700**	0.106***	-0.146***
Net income household	0.126***	0.052	0.004	0.120***	0.078**	0.086**	0.007	0.101***	-0.033
Self-assessed literacy	0.198***	0.172***	-0.005	0.126***	0.166***	0.226***	0.087**	0.162***	-0.253***

	Married	Number of children	Number of members household	Retired	Self-employed	Unemployed	Net income	Net income household	Self-assessed literacy
Married	1								
Number of children	0.170***	1							
Number of members household	0.258***	0.914***	1						
Retired	-0.146***	-0.360***	-0.292***	1					
Self-employed	0.006	0.048	0.047	-0.158***	1				
Unemployed	-0.018	-0.004	-0.027	-0.102***	-0.037	1			
Net income	-0.201***	-0.066*	-0.076**	0.056*	0.001	-0.032	1		
Net income household	0.015	0.017	0.084**	-0.002	0.009	-0.038	0.918***	1	
Self-assessed literacy	-0.242***	-0.097***	-0.076**	0.109***	-0.020	-0.002	0.091***	0.053*	1

***Correlation is significant at the 0.00 level.
**Correlation is significant at the 0.01 level.
*Correlation is significant at the 0.05 level.

Table 8 Correlation matrix; Household Head

In this correlation matrix only the data involving household head are taken into account.

	Financial Literacy	Savings	Debt	Debt & Mortgage	Investments	Wealth	Age	Education	Gender
Financial Literacy	1								
Savings	0.155***	1							
Debt	0.008	-0.062**	1						
Debt & Mortgage	0.150***	-0.028	0.312***	1					
Investments	0.136***	0.161***	-0.010	0.015	1				
Wealth	0.206***	0.470***	-0.051	-0.004	0.479***	1			
Age	0.031	0.149***	-0.014	-0.152***	0.134***	0.325***	1		
Education	0.243***	0.120***	0.036	0.222***	0.123***	0.153***	-0.171***	1	
Gender	-0.225***	-0.097***	0.000	-0.157***	-0.100***	-0.255**	-0.183***	-0.099***	1
Married	-0.109***	-0.061**	-0.017	-0.097***	-0.069**	-0.143***	-0.129***	-0.167***	0.465***
Number of children	-0.030	-0.127***	-0.017	0.027	-0.071**	-0.115***	-0.454***	0.006	0.090***
Number of members household	0.006	-0.087***	-0.018	0.065**	-0.034	-0.041	-0.364***	-0.002	-0.024
Retired	0.044	0.142***	-0.006	-0.082***	0.076**	0.238***	0.678***	-0.064**	-0.226***
Self-employed	0.036	-0.022	0.074**	0.063**	0.098***	0.147***	-0.063**	0.089***	-0.061**
Unemployed	-0.024	-0.034	-0.010	-0.044	-0.022	-0.049	-0.046	0.041	-0.034
Net income	0.108***	0.058*	0.003	0.099***	0.077**	0.111***	0.086***	0.073**	-0.115***
Net income household	0.119***	0.053*	0.006	0.127***	0.080***	0.107***	0.028	0.078**	-0.063**
Self-assessed literacy	0.180***	0.151***	-0.023	0.124***	0.160***	0.201***	0.105***	0.092***	-0.264***

	Married	Number of children	Number of members household	Retired	Self-employed	Unemployed	Net income	Net income household	Self-assessed literacy
Married	1								
Number of children	0.214***	1							
Number of members household	0.303***	0.897***	1						
Retired	-0.154***	-0.353***	-0.252***	1					
Self-employed	-0.016	0.017	0.021	-0.161***	1				
Unemployed	-0.013	-0.005	-0.034	-0.108***	-0.0370	1			
Net income	-0.163***	-0.067**	-0.066**	0.056*	0.007	-0.040	1		
Net income household	-0.006	0.014	0.079**	0.011	0.011	-0.046	0.950***	1	
Self-assessed literacy	-0.198***	-0.057*	-0.004	0.122***	-0.026	-0.029	0.057*	0.047	1

***Correlation is significant at the 0.00 level.

**Correlation is significant at the 0.01 level.

*Correlation is significant at the 0.05 level.