Financial Literacy and Stock Market Participation: Evidence From the Survey of Consumer Finances

Home Assignment

Submitted to
Prof. Dr. Andreas Hackethal
Faculty of Economics and Business Administration,
House of Finance-Endowed Chair of Personal Finance – sponsored by DZ BANK-Stiftung
Goethe-University
Frankfurt am Main

by
Jonathan Ratschat

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SCF	Survey of Consumer Finances

1 Introduction

The stockholding puzzle, pioneered in the research of Haliassos and Bertaut (1995), has gained a lot of attention by researchers. The question is why a large part of the population worldwide does not invest in stocks despite the equity premium and prefers to hold their assets in low-rate liquid assets (Haliassos & Bertaut, 1995, p. 1110). Due to the demographic shift in the population, this question has become more important in the last years. Because retirees-to-workers ratios are increasing, social security and pension systems are nowadays challenged to provide retirees with enough pensions for their daily expenses. Stocks and their long-term wealth generating potential can help retirees to not be dependent on the struggling social security and pension systems (Christelis, Georgarakos, & Haliassos, 2011, p. 1918).

Limited household participation in the stock market can partly be explained by fixed participation costs. Fixed participation costs are for example the costs of sufficiently understanding basic investment principles of risk and return, costs to set up a brokerage account and brokerage fees, costs of assessing and following investment decisions over time, and costs of more complicated tax returns (Vissing-Jorgensen, 2003, p. 178-179). Costs could be also of psychological nature, e.g. when savings are put at risk (Heaton & Lucas, 2000, p. 15). As Christelis et al. (2011) point out, participation costs cannot wholly explain limited participation for some well-off households. Feasible factors that have been addressed by other researchers include asset ignorance, lack of trust, social interactions, cognitive difficulties and lack of financial literacy (p. 1919). Other explanations for the stockholding puzzle in general presented by various researchers are summarized in the work by Guiso and Sodini (2013). There, they state non-standard preferences and belief heterogeneity as other feasible factors that could influence stock market participation.

The factor that this paper focuses on is financial literacy. It has been analyzed for example using the German SAVE survey (Bucher-Koenen & Ziegelmeyer, 2014), Swedish government records (Calvet, Campbell, & Sodini, 2007), Danish panel data (Christiansen, Joensen, & Rangvid, 2008), the Bank of Italy Surveys of Household Income and Wealth (Guiso & Jappelli, 2005), and the De Nederlandsche Bank (DNB) Household Survey (van Rooij, Lusardi, & Alessie, 2011). Van Rooij et al. (2011) state that investment decisions are increasingly taken by individuals themselves. Therefore, individuals are responsible for their own financial well-being. Governments and employers take less investment decisions for individuals due to social security and pension systems that have been liberalized and structurally reformed. They summarize that

"financial illiteracy is widespread and individuals lack knowledge of even the most basic economic principles" (p. 450). Financial illiterate individuals tend to participate less in the stock market, have a higher likelihood to sell their assets in times of crisis, and do participate less or not at all in the stock market after such an event (Bucher-Koenen & Ziegelmeyer, 2014, pp. 2217–2218). Financial literate individuals on the other side are financially more experienced and therefore face lower participation costs. They tend to avoid markets that exceed their financial skills and are better diversified (Bucher-Koenen & Ziegelmeyer, 2014, pp. 2218–2219). Huston, Finke, and Smith (2012) state that participant characteristics like age, gender, and formal education can lead to omitted variable biases. These characteristics have a theoretical relationship to life cycle consumption preference and financial sophistication. To separate the life cycle consumption preference effect and the effect of financial sophistication, a measure of financial literacy is needed (p. 1275).

The contribution to the existing literature is that this paper analyzes the Survey of Consumer Finances (SCF) 2016 with regards to the effect of financial literacy to stock market participation. A new set of financial literacy questions was included in the SCF 2016 that makes it feasible to get an objective measure of financial literacy. This was not feasible in earlier series of the SCF which resulted in financial literacy either not being included in the analysis [see, e.g. (Campell, 2006); (Haliassos & Bertaut, 1995); (Malmendier & Nagel, 2011)] or being included through proxies using variables like seeking financial advice, asking friends, relatives or work contacts for financial information, whether respondent revolves more than 50 percent of their credit card limit, or the ability to understand survey questions in the SCF [see, e.g. (Christelis et al., 2011); (Huston et al., 2012); (Shum & Faig, 2006)]. While controlling for other effects like age, gender, marital status, education, log of total income, log of total financial wealth, real estate ownership, business ownership, and risk attitude, the measure of financial literacy used in this paper enables a more precise estimation of its effect on stock market participation.

2 Data Set

The source of household data for this paper is the Survey of Consumer Finances 2016, a cross-sectional survey of U.S. families. Previous research has used older series of the SCF to analyze stock market participation [see, e.g., Campell (2006); Christelis and Georgarakos (2013); Christelis, Georgarakos, and Haliassos (2011); Haliassos and Bertaut (1995); Heaton and Lucas

(2000); Malmendier and Nagel (2011); Shum and Faig (2006)]. It includes information concerning the families' balance sheets, pensions, income, and demographics. Kennickell (1998) states that many financial variables in the SCF show extreme skewness in their distribution while others do not. To be able to analyze both types of variables, the SCF consists of a dual frame design. A standard multi-stage national area probability design is used to generate a representative sample of the entire population, while a list sample design is used to oversample wealthy households (p. 2). Based on the ideas of Campell (2006), a survey used for household finance should present a representative sample of the entire population, give a detailed insight into different wealth categories and asset classes, be of high accuracy, and be panel data so that households can be analyzed over time (p. 1555-1556). The SCF itself gives a representative sample of the entire population and a detailed insight into different wealth categories, while the other characteristics of an ideal data set are not fulfilled. As Campell (2016) states it can only be used to address asset allocation and not diversification since individual assets possessed are not reported (p. 1556). Accuracy is affected negatively through unit- and item-nonresponse. For example, the lowest response rate was 13 percent in the highest stratum in the list sample while the highest response rate was at 66 percent for the area-probability sample respondents in 1995 (Kennickell, 1998, pp. 2–3). Multiple imputation is used to handle item-nonresponse. Therefore, the public data set consists of five implicates. Also, the participants in the SCF have only been repeatedly interviewed twice in the history of the SCF – 1986 to 1989 and 2007 to 2009 (Board of Governors of the Federal Reserve System, 2017, para. 2).

For the analysis, these shortcomings are either not relevant or mitigated because the paper focuses only on household's decision to participate in the stock market. Due to time constraints and the difficulty of preparing and analyzing the data, this paper only uses the first implicate of the multiple imputed data set for the analysis which leads to an underestimation of the variance and higher likelihood of statistically significant effects (Hanna, Kim, & Lindamood, 2018, p. 413). Since this paper only uses one implicate, the weighting variable provided in the public SCF 2016 is changed following the approach used by Hanna, Kim, and Lindamood (2018) to derive estimates that reflect all households in the U.S. (p. 10). After deleting four of five implicates, the data set consists of 6,248 observations. Observations in which the stock market participation variable was completely missing are excluded since it is the independent variable in the analysis, leading to a decrease to 6,169 observations. Each observation reflects one primary

economic unit. A primary economic unit "consists of an economically dominant single individual or couple (married or living as partners) in a household and all other individuals in the household who are financially interdependent with that individual or couple" (Board of Governors of the Federal Reserve System, 2016). For this paper, household and respondent are used as synonyms for primary economic unit. The focus of this paper are households that are financially able to invest in the stock market. Some participate but others choose not to invest. Therefore, only households that have a positive financial net worth and a positive total income are included. To include households that only have positive non-financial assets but zero net financial net worth, the zero financial net worth is transformed to one so that they can be included in the later described log of net financial wealth variable. This step only concerns 29 households. The final number of observations is 4,569.

3 Explanatory Variables

The selection of explanatory variables is based on previous research in the area of stock market participation and new variables introduced in the SCF 2016. The empirical specification recognizes that there are many determinants of stock ownership. Thus, a wide set of variables is considered. In the following section the set of explanatory variables is introduced.

Financial literacy: In the SCF 2016, a new set of financial literacy questions were included that test the respondent's financial literacy objectively in the area of risk diversification, interest compounding, and the joint effects of interest and inflation. These types of questions were first introduced by Lusardi and Mitchell (2011) in the Health and Retirement Study and afterwards introduced to other surveys. A dummy variable that assesses the basic financial literacy of the respondents is created. One is assigned to the financial literacy variable when the respondent has answered all three questions correctly and zero otherwise. Therefore, a one implies that the respondent shows basic financial skills while zero implies that the respondent is financial illiterate. Van Rooij et al. (2011) used the data set of the DND Household survey which also tested more advanced financial questions in the topics of difference between stocks and bonds, function of the stock market, or the relationship between bond prices and interest rates. These answers were then used to classify respondents according to different financial literacy levels. The SCF does not contain such advanced financial questions, but it does ask the respondents to rate their own knowledge about personal finances. The respondents are classified into a self-assessed financial literacy measure ranging from zero to ten. The exact wording of the financial

literacy questions is found in the appendix. For the analysis, the base and the self-assessed financial literacy measure are used. I expect that stock market participation increases with one of the financial literacy variables since both financial literacy measures have a weak positive correlation (correlation = 0.16, p-value < .001).

Age: The age of the respondents is clustered in four age groups (1 = 18 to 35 years old, 2 = 36 to 50 years old, 3 = 51 to 65 years old, 4 = over 65 years old). This factor variable can consider the humped-shaped effect between age and stock market participation found in other studies [see, e.g. (Campell, 2006), (Guiso & Sodini, 2013), (Shum & Faig, 2006)]. Young investors have less equity exposure than middle-aged investors while middle-aged investors have more equity exposure than older investors (Cocco, Gomes, & Maenhout, 2005, p. 520). As Campell (2006) explains it is not feasible in portfolio choice to distinguish between age effects, time effects, and cohort (birth year) effects. The approach from Campell (2006) in setting cohort effects to zero is adopted in this paper (p. 1565-1566). Because a cross-sectional study is analyzed, the time effect cannot be observed in the data set. I assume that stock market participation increases with age.

Gender: Literature suggests that stock market participation is much lower for women than for men [see, e.g. (Christiansen et al., 2008); (Haliassos & Bertaut, 1995); (van Rooij et al., 2011)]. Also, it has been shown by Lusardi and Mitchell (2008) that women are on average less financially literate than men. Therefore, this paper controls for gender in the analysis.

Marital status: The marital status is used widely in the stock market participation literature as a control variable [see, e.g. (Haliassos & Bertaut, 1995); (Christiansen et al., 2008); (van Rooij et al., 2011)]. Love (2010) finds that married respondents hold more risky assets than single respondents. Therefore, I include this variable in my analysis.

Education: Education was used either as a proxy for financial literacy or it was observed as closely related to financial literacy in other studies [see, e.g. (Bucher-Koenen & Ziegelmeyer, 2014); (Calvet et al., 2007); (Calvet, Campbell, & Sodini, 2009); (Christelis et al., 2011); (Kyrychenko & Shum, 2009)]. According to Haliassos and Bertaut (1995), participation costs have been lowered through the free acquisition of information in today's world. However, Christelis and Georgarakos (2013) argue that education leads to more efficient processing of information and that higher educated individuals typically earn higher incomes (p. 2074). Therefore, education is used as a control variable for financial literacy in the analysis. The

education variable consists of four factors (1 = education lower than high school, 2 = graduated high school or has been in college but has no degree, 3 = a college degree or bachelor's degree, 4 = a master's degree or higher). Based on this information, I expect that education positively effects stock market participation.

Log of total income: An income variable is included in the analysis that consists of the total sum of wages, salaries, and professional income including farm income. To decrease the effect of extreme values, the log of total income is used. This paper follows the argumentation of Shum and Faig (2006) who highlight that income is a measure of human capital. They point out that households with more human capital are less exposed to the risk of their financial portfolios. Therefore, these households should have higher participation rates in the stock market (p. 10).

Log of total financial net worth: According to Vissing-Jorgensen (2013), wealth can dampen the impact of participation costs leading to higher participation rates in the stock market. Also, wealth has been commonly used as a proxy for financial literacy (Bucher-Koenen & Ziegelmeyer, 2014, p. 2236). Therefore, a measure of financial wealth is included in the analysis. To calculate total financial net worth, credit card balances after last payment, installment loans (e.g. education loans), and other debt (e.g. loans against pensions or life insurance) are deducted from total financial assets (e.g. directly held stocks, savings bonds, quasi-liquid retirement assets, etc.). To decrease the effect of extreme values, the log of total financial net worth is used.

Real estate: As Heaton and Lucas (2000) describe, real estate is a relatively illiquid and undiversified investment whose risk and return characteristics are difficult to observe. They also cite Flavin and Yamashita (1998) who claim that younger households have often highly levered positions when buying real estate. This should positively affect their risk aversion and therefore negatively affect stock market participation compared to older households (p. 6). The paper controls for ownership of real estate by using a binary variable that is one when the respondent owns real estate and zero otherwise. I chose to assign a zero to households where the value of primary residences, other residential real estate, and net equity in non-residential real estate is below 10,000 USD to exclude relatively small values (median = 40,000 USD, mean = 1,847,493 USD). I expect that owning real estate has a negative impact on stock market participation.

Private business: Private business ownership, like real estate, is a relatively illiquid and undiversified investment. Additionally, the returns of private businesses correlate with the stock market (Heaton & Lucas, 2000, p. 6). Interests in private business are controlled for by including a binary variable that is one when the household owns a business and zero otherwise. A zero is assigned to households where the value of the business is below 10,000 USD because of the same reasoning mentioned for the real estate variable (median = 0 USD, mean = 7,715,000 USD). Stock market participation should be negatively affected by business ownership.

Risk attitude: Respondents self-assess their risk attitude by choosing one of four statements that most matches their risk willingness when saving or investing (1 = take substantial financial risks expecting to earn substantial returns, 2 = take above average financial risks expecting to earn above average returns, 3 = take average financial risks expecting to earn average returns, 4 = not willing to take any financial risks). This variable was used by past research to classify the risk attitude of the respondents [see, e.g. (Malmendier & Nagel, 2011); (Shum & Faig, 2006). I expect that risk seekers have higher stock market participation rates compared to risk-averse respondents.

4 Descriptive Analysis

All descriptive statistics are weighted by the weighting variable (X42001) included in the SCF 2016. As described in Chapter 2, this weighting variable is transformed following the approach described by Hanna et al. (2018). Therefore, results are representative for the U.S. population. Nevertheless, one must keep in mind that this paper does not use the multiple imputed data set. Therefore, variances are underestimated and there is a higher likelihood of statistically significant effects (Hanna et al., 2018, p. 413). To get an overview of the data in the SCF 2016, this paper begins the descriptive analysis by reporting the sociodemographic characteristics of the sample in Table 1.

Table 1: Sample statistics

	Mean	Std. Err.	Min	Max
Age	55	0.308	18	95
Age: 18 to 35	0.157	0.006	1	4
Age: 36 to 50	0.242	0.007	1	4

Age: 51 to 65	0.314	0.008	1	4
Age: over 65	0.287	0.008	1	4
Men	0.744	0.008	0	1
Married or living with a partner	0.581	0.009	0	1
Education: lower than high school	0.119	0.006	1	4
Education: high school graduate or some college but no degree	0.391	0.009	1	4
Education: college degree or bachelor's degree	0.340	0.008	1	4
Education: master's degree or higher	0.150	0.006	1	4
Employed	0.597	0.009	0	1
Unemployed	0.030	0.003	0	1
Retired	0.274	0.008	0	1
Total income 2015 (USD)	122,979	3,423.230	911.373	287,690,006
Net financial wealth - end of 2015 (USD)	450,130	16,156.190	1	1,013,208,000

Notes: This table contains sample statistics for 4,569 respondents in the SCF 2016. Data consists of first implicate of the SCF 2016 and is weighted.

In addition, the financial literacy of households is analyzed based on their answers provided in the objective financial literacy questions in the SCF 2016.

Table 2: Share of financial literacy 2016 in the population by gender

Gender	Illiterate	Literate
Men	48%	52%
Women	68.1%	31.9%
Total	53.1%	46.9%

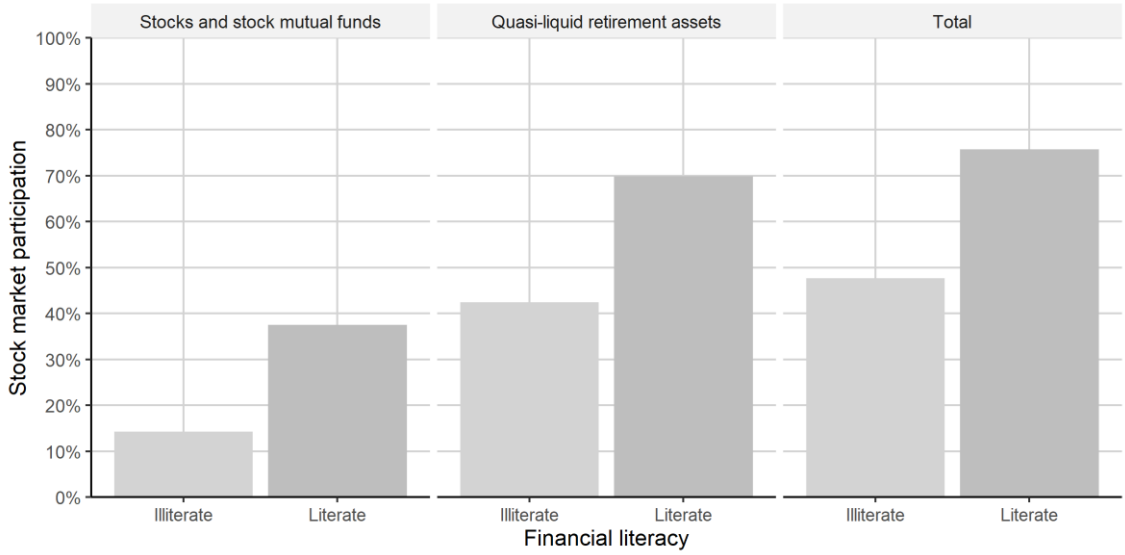
Notes: Households with basic financial literacy are able to answer all three financial literacy questions in the SCF 2016 correctly (Illiterate = mistake in at least one of the questions, Literate = correctly answered all three questions). Data consists of first implicate of the SCF 2016 and is weighted. N = 4,569.

In Table 2, the proportion of financial literacy based on gender are shown. There is a significant difference in the scores for financial literate men (mean = 52 percent, (robust) standard deviation = 0. 0.00997) and financial literate women (mean = 31.9 percent, (robust) standard deviation = 0.01607) conditions, t(4,567) = -10.559, p-value < .001. Hence, the result of Lusardi and Mitchell (2008) are confirmed who stated that men are on average more financially literate than women. In total, the share of financial literate households is lower than the share of financial illiterate households in the population.

More importantly, the difference of stock market participation rates is evaluated based on financial literacy. This paper defines that a household participates in the stock market when the reported equity value of stocks and mutual funds and quasi-liquid retirement assets are higher than 100 USD. Exchange Traded Funds are included in the mutual fund category. It is chosen to neglect holdings below 100 USD to account for accidental holdings. An independent-samples t-test is conducted to compare the stock market participation rate for the financial literate and financial illiterate condition. There is a significant difference in the scores for financial literate respondents (mean = 75.4 percent, (robust) standard deviation = 0.01093) and financial illiterate households (mean = 47.1 percent, (robust) standard deviation = 0.01207) conditions, t(4,567) = 17.382, p-value < .001.

In the next step, it is documented with which asset classes households participate in the stock market. Respondents can either invest in the stock market via stocks, stock mutual funds, combined mutual funds, or quasi-liquid retirement assets. It is assumed that 50 percent of assets held in combined mutual funds are hold in stocks. These assets are included in the stock mutual funds category. Quasi-liquid retirement assets are for example individual retirement accounts/Keoghs or thrift saving plans. The SCF 2016 reports equity holdings of these accounts.

Figure 1: Types of financial assets and stock market participation over financial literacy

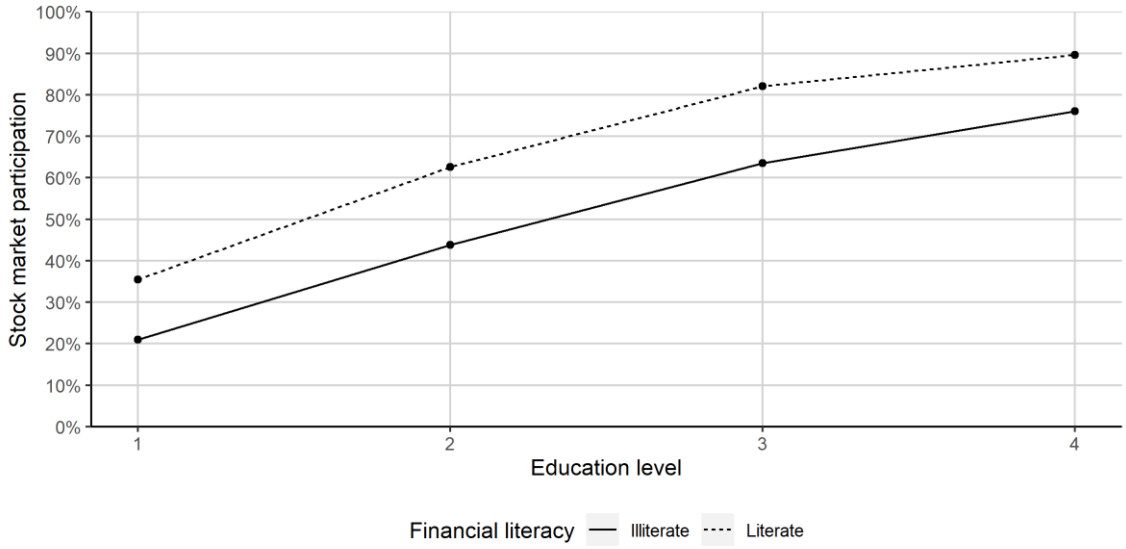


Notes: Stock market participation is measured at the end of 2015 (SCF 2016). A household is participating in the stock market when the equity value of stocks and mutual funds and quasi-liquid retirement assets are higher than 100 U.S. dollars. Data consists of first implicate of the SCF 2016 and is weighted. N = 4,569.

In Figure 1, the probability of stock market participation of households with high and low levels of financial literacy is shown based on the asset classes held. As expected, households that have answered all three financial literacy questions right show higher stock market participation rates than their counterparts. Stock market participation through investing in single stocks and/or stock mutual funds is 166.4 percent higher for financially sophisticated households. For households that participate in the stock market through quasi-liquid retirement assets, financial literate households have a 66.1 percent higher stock market participation than financial illiterate households. Also, it becomes clear that most households that own stocks and/or mutual funds also own quasi-liquid retirement funds. Of the 37.3 percent of the financial literate population that own stocks and/or mutual funds, 5.8 percent do not have any quasi-liquid retirement assets. Likewise, of the 14.3 percent of the financial illiterate population that own stocks and/or mutual funds, 5.8 percent do not have any quasi-liquid retirement assets. However, there is still a large portion of the population that does not participate in the stock market at all, neither through stocks and/or mutual funds or quasi-liquid retirement assets.

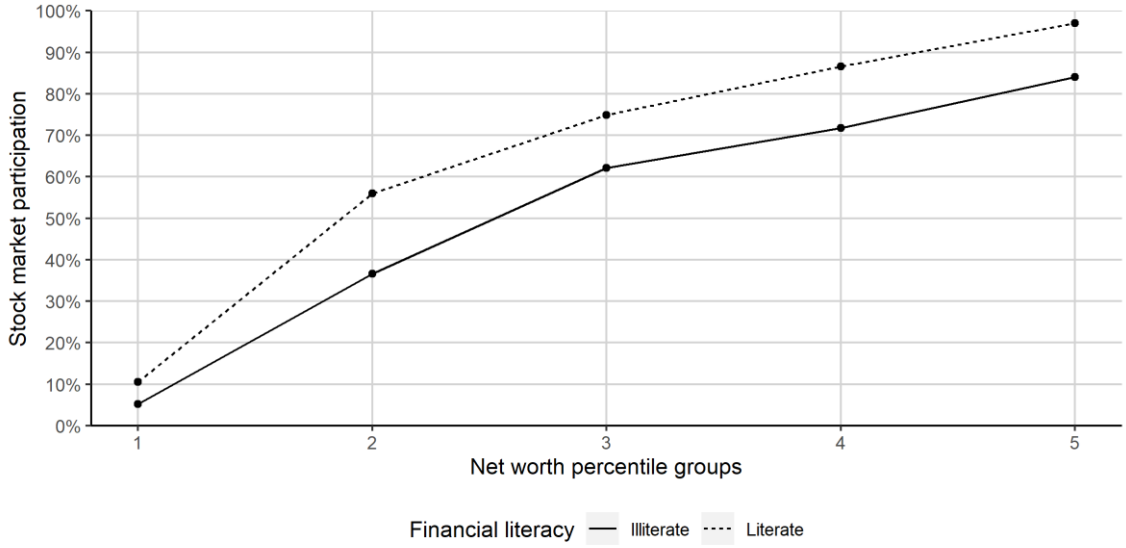
To explore the common procedure of using education and wealth as proxies for financial literacy in the literature so far, the paper descriptively analyzes both variables with regards to the variable for basic financial literacy.

Figure 2: Share of stock market participation by education levels and financial literacy



In Figure 2, the probability of stock market participation of financial literate and illiterate households over households that have (1) an education lower than high school, (2) graduated high school or have been in college but have no degree, (3) a college degree or bachelor's degree, (4) or a master's degree or higher is shown. As expected, an increase in stock holdings is observed with increasing education levels in Figure 2. Respondents that are financially literate have a higher average participation rate in the stock market than respondents that are not financially literate in each education group. The smallest relative change in stock market participation is 17.7 percent for the fourth education group, while the stock market participation rate showed the highest increase by 67.3 percent for the first education group.

Figure 3: Share of stock market participation over percentiles of total net worth and financial literacy



In Figure 3, the share of stock market participation of financial literate and illiterate households over percentiles of net worth at the end of 2015 is shown. The result is similar to Figure 2, as the average stock market participation increases per net worth percentile group, but financially literate respondents still show higher stock market participation rates than respondents that are financially illiterate. Here, the smallest relative change in stock market participation is 15.4 percent in the fifth net worth percentile group and the highest relative change is 92.7 percent for the first net worth percentile group.

Thus, these findings indicate that financial literacy influences the decision to participate in the stock market in my sample.

5 Probit Regression Analysis

The decision to participate in the stock market is analyzed using Probit regression models. In Table 3, the Probit regression results are documented. The dependent variable is equal to one if the respondent does participate in the stock market and to zero if otherwise. Heteroskedasticity is a problem in the data set. Therefore, the survey package in R is used to produce design-based standard errors. Since the SCF 2016 does not include information on strata in their public dataset, similar standard errors are derived with the survey package compared to heteroskedasticity-consistent or model-robust standard errors produced for example by the sandwich package in R (Lumley, 2010, p. 90).

Table 3: Probit regression

	Dependent variable:	
	Stock market participation	
	(1)	(2)
Basic financial literacy		0.172*** (0.062)
Self-assessed financial literacy		0.005 (0.014)
Age: 36 to 50	0.201** (0.094)	0.203** (0.094)
Age: 51 to 65	-0.132 (0.094)	-0.133 (0.094)
Age: over 65	-0.516*** (0.103)	-0.526*** (0.103)
Men	0.031 (0.086)	0.051 (0.086)
Married or living with partner	0.191** (0.081)	0.192** (0.081)
Education: high school graduate or some college but no degree	0.184* (0.104)	0.172 (0.105)
Education: college degree or bachelor's degree	0.271** (0.113)	0.232** (0.114)
Education: master's degree or higher	0.235* (0.133)	0.185 (0.135)
Ln(Total Income)	0.257*** (0.054)	0.255*** (0.054)
Ln(Net financial wealth)	0.378*** (0.021)	0.374*** (0.021)
Real estate ownership	0.078 (0.072)	0.076 (0.072)
Business ownership	-0.347*** (0.097)	-0.354*** (0.097)
Risk attitude: take above average financial risks	0.612*** (0.170)	0.623*** (0.171)
Risk attitude: take average financial risks	0.501*** (0.162)	0.522*** (0.162)
Risk attitude: not willing to take any financial risks	0.019 (0.163)	0.052 (0.163)
Constant	-6.918*** (0.518)	-6.959*** (0.521)
Log Likelihood	-1,535.666	-1,529.719
Akaike Inf. Crit.	3,103.333	3,095.439
Cox & Snell Pseudo R^2	0.4621386	0.4634311

Notes: Coefficients significant at the 10% level are denoted by ∗, at the 5% level by ∗∗, and at the 1% level by ∗∗∗. (Robust) standard errors in parentheses. In the reference household, the household head is a financial illiterate single woman aged between 18 to 35 who has not graduated high school and takes substantial financial risks. A household is participating in the stock market when the equity value of stocks and mutual funds and quasi-liquid retirement assets are higher than 100 U.S. dollars. Data consists of first implicate of the SCF 2016 and is weighted. N = 4,569.

Table 3 presents results from Probit regressions using common household financial outcome variables to illustrate the empirical effect of including basic and self-assessed financial literacy measures. Basic financial and self-assessed financial literacy increase the likelihood of stock ownership. Education is the explanatory variable in which the coefficients vary by the highest magnitudes when comparing the Probit regression models. While all education groups are significant in the Probit regression model without financial literacy measures, the effect of high school graduation or having a master's degree or above turns insignificant and the magnitude of the effect of having a college or bachelor's degree decreases when adding variables describing financial literacy. The other control variables on stock market participation do only vary slightly in the magnitude of the effect but the significance and the effect of the variables is the same for both Probit regression models.

Age affects the decision to participate in the stock market. As predicted, this effect is hump-shaped. Stock market participation increases in the 35 to 50 age group and decreases afterwards. All age groups except for the age group 51 to 65 are significant. In addition, gender dummy, being married or living with a partner, and real estate ownership have a higher likelihood to participate in the stock market, while the factor variable business ownership has negative relationship to stock market participation. The log of total income and log of net financial wealth have a positive effect on stock ownership. Taking substantial financial risks when making saving and investment decisions has a negative effect on stock market participation. Households that take above average or average financial risks show a higher likelihood to participate in the stock market compared to the more extreme risk attitudes. The following explanatory variables lead to a significant higher likelihood of stock ownership: basic financial literacy, age except for the 51 to 65 age group, married or living with partner, having a college or bachelor's degree, log of total income, log of financial wealth, business ownership, and risk attitude. The largest positive significant coefficients are taking above average or average financial risks when saving

and investing and the log of financial wealth, while the largest negative significant coefficients are being older than 65 and business ownership.

The financial literacy Probit regression model in Table 3 is mostly consistent with expectations expressed in Chapter 3. As anticipated, only one of the financial literacy measures is significant. The objective financial literacy measure is superior to self-assessed financial literacy. Exceptions from the expectations are the effect of education, real estate ownership, and risk attitude. As described, education loses in all education levels besides having a college or bachelor's degree the significance. Real estate ownership has a positive insignificant coefficient on stock market participation in contrast to my expectation. One of the reasons for this outcome could be that the binary variable chosen in the Probit regression model is not able to fully reflect the level of importance that real estate in the portfolio of the respondents have. Since 1,600 households are excluded to focus on households that are able to structure meaningful portfolios, it could also be that the real estate variable plays a more important role when including these households. As explained by Shum and Faig (2006), the effects between the financial portfolio and owning real estate are ambiguous (p. 16-17). The risk attitude variable shows an unexpected result since being risk-seeking (take substantial financial risks expecting to earn substantial returns) has a negative effect on stock market participation compared to the other risk attitudes.

6 Discussion

To conclude, I find robust evidence that higher basic financial literacy is positively related to the decision to participate in the stock market. When adding basic financial literacy in my Probit regression model, education loses its significance except for the college or bachelor's degree education level. Other factors that have a positively significant effect on stock market participation are being married or living with a partner, log of total income, log of total financial net wealth, and risk attitude. Business ownership has a significantly negative effect on the likelihood to hold stocks. Age significantly increases stock market participation in the 36 to 50 age group and afterwards decreases stock market participation (insignificantly in 51 to 65 age group and significantly in over 65 age group).

For further series of the SCF, I propose to include additional financial literacy measures since the current objective financial literacy questions only measure the basic financial literacy in the area of risk diversification, interest compounding, and the joint effects of interest and inflation.

Unfortunately, these three areas are not enough to objectively measure advanced financial literacy as performed for example by van Rooij et al. (2011). There, the authors find that advanced financial literacy has a much stronger effect on stock market participation than basic financial literacy. Having basic financial understanding about the three areas tested in the SCF 2016 does not mean that households have enough information and confidence concerning portfolio choice and rebalancing. Therefore, more advanced financial literacy measures would greatly benefit the research on financial literacy in the SCF. Another weakness of the analysis is that the internal validity of the analysis is affected because of missing values in the dependent variable. Therefore, the number of observations of the sample was decreased. The external validity of the analysis is weakened because the sample only consists of respondents that can structure meaningful portfolios.

However, my analysis contributes to current research by researching the effect of financial literacy on the stock market participation. In the descriptive analysis, I was able to show that there is a difference of stock market participation conditional on financial literacy. Also, financial literacy proxies used in previous research like education and wealth show structural differences in stock market participation when separated in financial literacy groups. More importantly, the Probit regression analysis confirms the results that financial literacy has indeed a significant effect in the decision to participate in the stock market. Therefore, I show that a lack of financial knowledge is a significant deterrent to stock ownership.

7 Appendix

7.1 Financial Literacy Questions

Risk diversification: Do you think that the following statement is true or false: buying a single company's stock usually provides a safer return than a stock mutual fund? (i) True; (ii) False; (iii) Don’t know; (iv) Refused

Interest compounding: Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow: more than $102, exactly $102, or less than $102? (i) More than $102; (ii) Exactly $102; (iii) Less than $102; (iv) Don’t know; (v) Refused

Effects of inflation: Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy more than today, exactly the same as today, or less than today with the money in this account? (i) More than today; (ii) Exactly the same as today; (iii) Less than today; (iv) Don’t know; (v) Refused

Self-assessment: Some people are very knowledgeable about personal finances, while others are less knowledgeable about personal finances. On a scale from zero to ten, where zero is not at all knowledgeable about personal finance and ten is very knowledgeable about personal finance, what number would you (and your {husband/wife/partner}) be on the scale?

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