The Role of Objective and Subjective Financial Literacy in Stock Market Participation: The SCF Evidence

Yuan Yuan
University of Wisconsin – Whitewater

This study uses the newly available financial literacy data, instead of proxies, from the Survey of Consumer Finances to assess the role of objective and subjective financial literacy on the stock market participation puzzle. Recognizing that the actual and perceived financial literacy may affect financial decisions through different mechanisms, this study examines the effects that the discrepancy between objective and subjective financial literacy has on directly-held and indirectly-held stock investment. We control for demographic characteristics and financial factors and find that objective literacy has more power to predict stock market participation, while subjective financial literacy only has a marginally significant impact on directly-held stock holdings.

INTRODUCTION AND LITERATURE

Financial illiteracy is pervasive, and people are commonly lack of basic financial knowledge in the United States (Lusardi and Mitchell, 2008, 2014) and many other developed countries (Christelis, Jappelli, and Padula, 2010; Lusardi and Mitchell, 2011a). Recent research has focused on understanding the role of financial (il)literacy on household financial behavior, and a growing body of literature has provided empirical evidence. Studies have shown that financial literacy is a contributing factor to household financial behaviors relating to stock market participation (Van Rooij, Lusardi, and Alessie, 2011; Balloch, Nicolae, and Philip, 2015), retirement planning (Hilgert, Hogarth, and Beverly, 2003; Lusardi and Mitchell, 2011b), wealth accumulation (Stango and Zinman, 2009; Behrman et. al., 2012), consumer debt (Gathergood, 2012), and risk taking (Lusardi, 2015; Bannier and Neubert, 2016).

One of the main focus of this study is to reexamine the effects of financial literacy on households' stock market participation. The stock market participation puzzle has been long recognized in the literature – a large group of households holds no equity assets, while those who do, many hold a large proportion of stocks in their financial portfolio (Campbell, 2006). However, the existing studies have only focused on the overall stock holdings and did not differentiate the channels to the equity market investment. For example, Van Rooij, Lusardi, and Alessie (2011) use a Dutch household survey data and find the financial literacy plays an important role in explaining the nonparticipation puzzle. They show that those with low literacy are much less likely to invest in stocks. Balloch, Nicolae, and Philip (2015) find the importance of stock market literacy to explain stock investment. They document that the behavioral characteristics, e.g., economic shocks and future expectations, can further explain the level of stock investment.[1] These studies, however, look at the aggregate stock holdings only.

Because of the financial market innovation, the financial integration, and the emergence of new financial products and services, people now can participate in equity market investment through various channels. Instead of only examining the total stock holdings, this study segregates the household's stock holdings into directly-held stocks and indirectly-held stocks. Directly-held stocks include stocks shares directly purchased on the equity market and stock mutual funds. Indirectly-held stocks consist of IRAs/Keoghs invested in stock, thrift-type retirement accounts invested in stock, and other managed assets (e.g., annuities, trusts) with an equity interest. This segregation analysis will provide evidence of distinct effects of financial literacy on stock investments and therefore contributes to the solving of stock market participation puzzle.

The measures of financial literacy used in the literature are lack of uniformity because the vast majority of the studies on financial literacy relied on various survey data. There exist few surveys providing both sufficient information about households' financial sophistication and data about financial characteristics. The Survey of Consumer Finances (SCF) is the most comprehensive data source on household financial information in the United States. The SCF is remarkable for the information it provides on households' financial characteristics, e.g., balance sheet, pensions, income, credit, financial institutions, as well as detailed data on demographic factors.

Due to the lack of a direct measure of financial sophistication, studies based on the SCF use a variety of variables as the proxies to the financial literacy. For example, assuming a high correlation between education and financial sophistication, Kyrychenko and Shum (2009) use education as a proxy for financial literacy. However, that assumption may not hold. Huston, Finke, and Smith (2012) create a factor score composed of four questions to serve as a proxy and find improved marginal effects estimation of some control variables. Our study uses the newly available financial literacy data, instead of proxies, in the 2016 wave of the Survey of Consumer Finances to assess the relationship between financial literacy and the stock market participation. This is the second contribution of this study to the literature. Recent literature argues that the actual and perceived financial knowledge could play different roles and exert distinct effects on financial behavior (Allgood and Walstad, 2016; Bannier and Neubert, 2016; Bannier and Schwarz, 2018). We follow this track and adopt two measures of financial literacy from the SCF 2016 wave: an objective test measure and a subjective self-rating measure. The objective test measure is based on three multiple-choice questions relating to core financial concepts and reflects the actual financial literacy level. The subjective self-rating measure is based on self-assessment questions and reveals the household's perceived financial sophistication.

The econometric analysis in this study adopts a two-stage bivariate sample selection model to overcome the biased estimates by OLS and the sample selection limitations by Tobit Model. The empirical results show that the subjective and objective financial literacy have separate and distinct effects on the stock market participation. The objective financial literacy measured as a testing score of financial knowledge appears to have more power in explaining households' stock market participation than the subjective financial literacy measured as self-assessment of financial knowledge. The objective financial literacy has a significant and positive effect on the probability that the household participates in equity investment via both indirect and direct channels. It implies that the more financially literate of the households, the more likely they hold stock investment. However, the subjective financial literacy, measured as self-assessment of financial knowledge, essentially do not have strong effects on stock investments participation. It's found to be only marginally significant to the decision on the magnitude of directly-held stock holdings.

The remainder of this paper proceeds as follows. Section 2 describes methodologies and the econometric models. Section 3 presents the data. In section 4, the empirical work and the results are analyzed. Section 5 concludes and provides policy recommendations.

METHODOLOGY

To examine the relationship between financial literacy and stock market participation, this study uses the household's stock holding (aggregate, directly-held, and indirectly-held) as the dependent variable.

Since a large proportion of populations shy away from equities investment, OLS estimates are biased as these dependent variables are not continuous and unbounded. This study employs the two-stage bivariate sample selection model[2] (Cameron and Trivedi, 2005), which consists of a participation equation:

$$d = \begin{cases} 1, & if\ y_1^* > 0 \\ 0, & otherwise \end{cases} \quad (1)$$

and an outcome equation:

$$y = \begin{cases} y_2^*, & if\ y_1^* > 0 \\ not\ observed, & otherwise \end{cases} \quad (2)$$

The y_1^* is a latent variable and determines whether the household invest in stocks, while y is observed if and only if y_1^* >0. The latent variable y_2^* determines how much to invest in stocks with $y_1^* \neq y_2^*$. The standard model specifies the linear equations for the latent variables:

$$y_1^* = x_1'\beta_1 + \varepsilon_1 \quad (3)$$

$$y_2^* = x_2'\beta_2 + \varepsilon_2 \quad (4)$$

This bivariate sample selection model provides the estimation scheme to separate the decision on whether to participate in stock investment from the decision on how much to invest in stocks. The following equations are used to model the relationship between financial literacy and stock market participation:

$$HoldStocks = \alpha + \beta_1 FinLit + \beta_2 FinKnow + \beta_3 X + \varepsilon_1 \quad (5)$$

$$Stocks = \delta + \theta_1 FinLit + \theta_2 FinKnow + \theta_3 X + \tau_1 \quad (6)$$

The dependent variable, *HoldStocks*, in the first-stage participation equation is a binary variable, which equals one if the household participates in any stock investment, and zero otherwise. *Stocks*, the dependent variable in the second-stage outcome estimation, is the value of stock holdings. The two key independent variables are *FinLit*, the objective financial literacy level, and *FinKnow*, the subjective self-assessed financial knowledge. In addition, this paper follows the literature and consider many determinants of financial behavior as control variables *X*.

DATA

The data used in this study are sourced from the Survey of Consumer Finances 2016 wave, which gathers information from 6,248 households in the US. The 2016 SCF is sponsored by the Federal Reserve Board and is conducted by the National Opinion Research Center at the University of Chicago. The SCF is the most comprehensive data source on household financial information in the US and supports a wide variety of research on topics including investment, saving, pension coverage, debt payments, credit discrimination, and financial markets.

Compared with previous waves, the SCF 2016 wave has some major changes, for example, updates on the credit card section and education loan section, adding a new set of risk aversion variables and a new set of questions relating to the fundamental financial knowledge. Based on the newly available information on the SCF, two distinct measures of financial sophistication are constructed. The objective financial literacy variable *FinLit* is the number of correct responses to the three new financial literacy questions, which is an objective measure of financial literacy and reveals what people actually know. The subjective financial literacy variable *FinKnow* is the self-rated assessment reported by the household about their financial knowledge on a scale from zero to ten, which reflects how much people believe they know about finance.

All the regressions control for demographic and economic characteristics including age, race, marital status, ethnicity, number of kids, self-reported health status, education, employment status, homeowner, family income, risk aversion, credit constraint, and liquidity constraint (Van Rooij, Lusardi, and Alessie, 2011; Lusardi and Mitchell, 2011b, 2014; Balloch, Nicolae, and Philip, 2015). To control the impact of outliers, the empirical tests exclude the observations with an extremely high value of annual income, financial assets, or net worth. The households with annual income in the bottom 5 percentile are also screened out because the low-income families may present quite different financial behaviors. The final data sample contains 4,729 observations.

TABLE 1
VARIABLE STATISTICS SUMMARY

This table reports the summary statistics for the outcome and control variables. The number of observations is 4,729.

Variables	Mean	Median	Std. Dev.	Min	Max
Hold stock investment (1=Yes)	0.686	1	0.464	0	1
Hold Indirect stocks (1=Yes)	0.648	1	0.478	0	1
Hold direct stocks (1=Yes)	0.281	0	0.449	0	1
Total stock holdings ($'000)	320	15.00	1000	0	12000
Indirectly-held stocks ($'000)	150	8.90	450	0	7500
Directly-held stocks ($'000)	170	0	750	0	10000
Financial literacy	2.322	3	0.816	0	3
Self-assessed financial knowledge	7.524	8	1.986	0	10
Age<35	0.173	0	0.378	0	1
Age36-50	0.282	0	0.450	0	1
Age51-65	0.325	0	0.468	0	1
Age>66	0.220	0	0.414	0	1
Household head gender (1=Male)	0.785	1	0.411	0	1
Married (1=Married)	0.654	1	0.476	0	1
Race (1=White & non-Hispanic)	0.708	1	0.454	0	1
Number of Kids	0.815	0	1.129	0	7
Education	3.074	3	0.982	1	4
Employed	0.739	1	0.439	0	1
Unemployed	0.261	0	0.439	0	1
Annual income(log)	11.342	11.24	1.023	9.32	14.98
Checking account balance(log)	7.537	8.01	2.845	0	14.08
Risk aversion	5.303	5	2.629	0	10
Credit turned down or feared denial	0.161	0	0.368	0	1
Private business owner	0.226	0	0.418	0	1
Late payment	0.113	0	0.314	0	1
Liquid asset ($'000)	71.667	9.70	2.650	0	6590
Health risk (1= fair or poor)	0.257	0	0.437	0	1
Homeowner	0.715	1	0.451	0	1

Table 1 provides the statistic summaries. Consistent with the evidence in the literature, the statistic summary shows a small group, 28 percent of households, invest in stocks by directly holding stock shares or stock mutual funds. However, about 65 percent of households indirectly participate in equity investment through retirement accounts, annuities, trusts or other channels. The overall equity participation rate is 68.7 percent. The median total stock investment is $15,000, and the median is $8,900 for indirectly-held stocks investment. The objective financial literacy variable shows that the respondents answer slightly more than two of the questions correctly on average. The subjective financial literacy measure indicates, on average, the household believes they are financially sophisticated at a scale of 7.52 out of 10. The demographic statistics summary displays that 78.5 percent of household head are males,[3] 65.4 percent are married, 71 percent are White and non-Hispanic, more than half of the household heads have college or associate degree or higher, 74 percent are employed, and the sample data is evenly distributed among each age group. The empirical tests also include related factors to control for the financial characteristics, for example, income (Bucciol and Miniaci, 2014), risk aversion (Dimmock, Kouwenberg, and Mitchell, 2016), homeowner (Beaubrun-Dian and Maury, 2016), health risk (Rosen and Wu, 2004), liquidity constraint (Faig and Shum, 2002), and credit constraint (Cardak and Wilkins, 2009).

RESULTS

This study test the distinct effects of the objective and the subjective financial literacy on the aggregate stock investment, the indirectly-held stock investment, and the directly-held stock investment separately. Table 2 and 3 reports the two-stage bivariate Tobit model regression results.[4] Table 2 is for the total stock investment, Table 3 is for indirectly-held stocks, and Table 4 is for directly-held stocks. This estimation scheme separates the decision to participate in stock investment from the decision on the value of stocks to hold. The column (1), (3), and (5) are first-stage participation equation results, in which the dependent variable equals one if the respondent reports ownership of any stocks, indirectly-held stocks, or directly-held stocks. The column (2, (4), and (6) are second-stage outcome equation results, in which the dependent variable is the value of equity investment. The number of observations is 4,729.

TABLE 2
TWO-STAGE BIVARIATE SELECTION MODEL REGRESSION RESULTS
(TOTAL STOCKS)

Explanatory variables	Total Stock Investment					
	(1) Prob[Y>0]			(2) Y|Y>0		
	Coef.		Std. Err.	Coef.		Std. Err.
Financial literacy	0.145	***	0.028	0.218	***	0.062
Self-assessed financial knowledge	-0.016		0.011	0.005		0.023
Age<35	-0.133		0.089	-1.396	***	0.251
Age36-50	0.061		0.083	-0.694	***	0.181
Age51-65	0.062		0.072	-0.085		0.182
Married	-0.007		0.052	-0.014		0.126
Race (1=White & non-Hispanic)	0.332	***	0.049	0.397	***	0.109
Number of Kids	-0.037		0.022	-0.123	***	0.044
Education	0.170	***	0.025	0.280	***	0.073
Employed	0.256	***	0.065	-0.527	***	0.131
Annual income(log)	0.576	***	0.039	1.152	***	0.060
Checking account balance(log)	0.011		0.009	0.029		0.018
Risk aversion	-0.036	***	0.008	-0.159	***	0.021
Credit turned down	-0.111	*	0.060	-0.398	***	0.145
Private business owner	-0.313	***	0.063	-0.127		0.102
Late payment	0.020		0.068	-0.489	***	0.161
Liquid asset ('000)	0.079	**	0.037	0.035	***	0.013
Health risk	-0.149	***	0.051	-0.069		0.122
Houseowner	0.321	***	0.054	0.619	***	0.137
Constant	-6.960	***	0.406	-3.229	***	0.763

TABLE 3
TWO-STAGE BIVARIATE SELECTION MODEL REGRESSION RESULTS
(INDIRECTLY-HELD STOCKS)

Explanatory variables	Indirectly-held Stock Investment					
	(3) Prob[Y>0]			(4) Y|Y>0		
	Coef.		Std. Err.	Coef.		Std. Err.
Financial literacy	0.157	***	0.028	0.115	**	0.048
Self-assessed financial knowledge	-0.012		0.011	0.013		0.018
Age<35	0.004		0.092	-1.541	***	0.145
Age36-50	0.176	**	0.080	-0.659	***	0.115
Age51-65	0.171	**	0.071	-0.072		0.102
Married	0.089	*	0.052	0.015		0.095
Race (1=White & non-Hispanic)	0.283	***	0.048	0.255	***	0.080
Number of Kids	-0.039	*	0.023	-0.065	**	0.032
Education	0.172	***	0.026	0.182	***	0.041
Employed	0.261	***	0.063	-0.348	***	0.100
Annual income(log)	0.489	***	0.035	0.910	***	0.048
Checking account balance(log)	0.019	**	0.009	0.015		0.011
Risk aversion	-0.032	***	0.008	-0.116	***	0.014
Credit turned down	-0.095		0.065	-0.284	**	0.113
Private business owner	-0.293	***	0.059	-0.061		0.083
Late payment	0.030		0.079	-0.432	***	0.134
Liquid asset ('000)	-0.003		0.012	0.021	*	0.011
Health risk	-0.146	***	0.050	-0.135		0.099
Houseowner	0.306	***	0.054	0.546	***	0.098
Constant	-6.458	***	0.378	-0.242		0.682

In reviewing the results, it is found that the two key independent variables, Financial literacy and Self-assessed financial knowledge, do play distinct roles in explaining the stock market participation. The marginal effects of objective financial literacy show that the actual financial literacy has a significant and positive effect on the probability that the household participates in equity investment including both indirect and direct channels. It implies that the more financially literate of the household, the more likely they hold stock investment. The marginal effect is sizeable too as shown, for example, in Column (1) that the probability to participate in stock investment increases by 14.5 percent when getting one additional question correct on the actual financial literacy score. In examining the magnitude of stock holdings, the significant and positive marginal effects in column (2) and (4) indicate that the higher the actual financial literacy, the more aggregate stocks investment. When we decompose the stock investment into indirect and direct stock holdings, the higher objective financial literacy promotes more indirect stocks investment. However, the result does not provide the evidence of the objective financial literacy contributing to the decision on how much directly-held stocks to carry.

TABLE 4
TWO-STAGE BIVARIATE SELECTION MODEL REGRESSION RESULTS
(DIRECTLY-HELD STOCKS)

Explanatory variables	Directly-held Stock Investment					
	(5) Prob[Y>0]			(6) Y|Y>0		
	Coef.		Std. Err.	Coef.		Std. Err.
Financial literacy	0.185	***	0.032	0.151		0.105
Self-assessed financial knowledge	-0.011		0.012	0.067	**	0.033
Age<35	-0.092		0.093	-1.843	***	0.240
Age36-50	-0.135	*	0.082	-1.075	***	0.203
Age51-65	-0.064		0.068	-0.399	***	0.156
Married	-0.103	*	0.054	-0.201		0.137
Race (1=White & non-Hispanic)	0.217	***	0.055	0.097		0.165
Number of Kids	-0.077	***	0.025	-0.136	**	0.066
Education	0.190	***	0.028	0.206	**	0.092
Employed	-0.187	***	0.066	-0.871	***	0.161
Annual income(log)	0.414	***	0.031	1.042	***	0.118
Checking account balance(log)	0.020	**	0.009	0.003		0.018
Risk aversion	-0.072	***	0.009	-0.126	***	0.031
Credit turned down	-0.284	***	0.079	-0.244		0.246
Private business owner	-0.087		0.057	-0.041		0.127
Late payment	-0.508	***	0.097	-0.554		0.377
Liquid asset ('000)	0.019	**	0.009	0.040	**	0.016
Health risk	-0.045		0.056	-0.185		0.142
Houseowner	0.189	***	0.063	-0.044		0.185
Constant	-5.898	***	0.357	-0.992		1.977

The results show further evidence that subjective and objective financial literacy have separate effects on the stock market participation. We find that the self-assessment of financial knowledge essentially does not have strong effects on equity investments. Specifically, this study only find a positive and significant coefficient estimate in Column (6). The greater subjective financial literacy is associated with more investment in directly-held stocks, which implies that people perceiving themselves as highly literate hold more stock shares or stock mutual funds. However, it tends that the perceived financial literacy does not play an important role when respondents decide on whether to buy direct or indirect stocks as well as how much indirect stocks to hold.

This study provides the new evidence to the literature as discussed above. Perceived financial literacy has been shown in the literature to be strongly correlated with a large number of financial decisions. For example, Allgood and Walstad (2016) use the National Financial Capability Study 2009 survey and show that subjective financial literacy is significant and important in affecting investment behavior regardless of the level of actual financial literacy. Using the more recent SCF 2016 survey data, we find that the subjective financial literacy plays a less significant role than actual financial literacy in stock market participation. People seem to make relatively more rational decisions on equity investment, especially when investing in stocks through retirement accounts, annuities, and trusts. This could be evidence that

people appear becoming more aware of the self-responsibility of making important financial decisions. With the rapid spread of complex financial products to individual investors, it now further imposes stronger responsibility on the household and has been a big challenge for financially unsophisticated investors. This finding could also be partially explained by the legislation and education efforts post the 2007/2008 financial crisis. For instance, the Dodd-Frank Act of 2010 established the U.S. Consumer Financial Protection Bureau, whose mandate is to promote financial education and monitor financial markets for new risks to consumers.

In addition to the main focus of financial literacy, the demographic results are generally consistent with what would be expected to be found. For example, it's found that White & non-Hispanic household head, well-educated, and homeowners are associated with higher probability of stock market investment and higher magnitude of stock holdings. In line with the extant literature, households with higher income, lower health risk, lower risk aversion, lower credit constraint, or lower liquidity constraint are found to be more likely to participate in the stock market as well as hold more equity investments.

CONCLUSION

This paper contributes to the literature in two aspects. Firstly, this study uses the newly available financial literacy data, instead of proxies, in the Survey of Consumer Finances to reassess the relationship between financial literacy and stock market participation. This study examines the influence of both the actual objective financial literacy and the subjective financial sophistication on the household's equity holdings. Secondly, we decompose the stock market participation into direct and indirect stock investment, which further provide insights into the impact of financial sophistication on the household's stock holdings.

Controlling for demographic characteristics and financial factors, the evidence of this study confirms the earlier findings and supports the general hypothesis that financial literacy plays an important and significant role in stock market participation. Households presenting higher financial literacy are more likely to participate in the equity market. This study further extends the scope of the analyses on several accounts. We then examine the effects that the discrepancy between objective and subjective financial literacy has on directly-held and indirectly-held stock investment.

What is more revealing in the findings is that using the most recent SCF data, this study indicates the objective financial literacy measured as a testing score of financial knowledge appears to have more power in explaining households' stock market participation than the subjective financial literacy measured as self-assessment of financial knowledge. The actual objective financial literacy is positively associated with the decision of stock market participation through either direct or indirect channels. In addition, the higher objective financial literacy contributes to the higher magnitude of indirectly-held stock holdings. However, the subjective financial literacy only contributes to the decision on the magnitude of directly-held stock holdings.

This study provides important policy implications. The financial environment has been getting more complex, changing, and costly. It now imposes enormous challenges than ever to people when making important financial decisions. Financial education maintains a critical role as financial illiteracy is still prevalent and a large portion of the population is lack of basic economic knowledge. Much work remains to be done to develop and promote rewarding financial education programs.

ENDNOTES

1. Studies in behavioral finance show the stock market participation puzzle can be explained by a large set of households' behavioral characteristics and psychological factors, e.g., self-confidence, cognitive ability, trust in financial markets, and sociability.
2. It is a two-step Heckman estimation scheme on the Tobit model (Heckman, 1979).
3. Gender is not included in the regression due to high correlations.
4. The SCF data is imputed to account for the variability due to missing information. In our empirical estimations, Rubin's combination rule (Rubin, 1987) is applied to the estimated coefficients. The standard errors are also adjusted to generate the correct inference.

REFERENCES

Allgood, S. & Walstad, W. B. (2016). The effects of perceived and actual financial literacy on financial behaviors. *Economic Inquiry,* 54(1), 675-697.

Balloch, A., Nicolae, A. & Philip, D. (2015). "Stock market literacy, trust, and participation." *Review of Finance,* 19, 1925-1963.

Bannier, C.E. & Neubert, M. (2016). Gender differences in financial risk-taking: The role of financial literacy and risk tolerance. *Economics Letters,* 145, 130-135.

Bannier, C. E. & Schwarz, M. (2018). Gender-and education-related effects of financial literacy and confidence on financial wealth. *Journal of Economic Psychology,* 67, 66-86.

Behrman, J.R., Mitchell, O.S., Soo, C.K., & Bravo, D. (2012). "How financial literacy affects household wealth accumulation. *American Economic Review: Papers and Proceedings,* 102(3), 300-304.

Bucciol, A., & Miniaci, R. (2014). Household portfolio risk. *Review of Finance,* 19(2), 739-783.

Cameron, A. C., & Trivedi, P.K. (2005). *Microeconometrics: Methods and Applications*. Cambridge University Press.

Campbell, J. Y. (2006). Household finance. *Journal of Finance* 61(4), 1553-1604.

Cardak, B. A., & Wilkins, R. (2009). The determinants of household risky asset holdings: Australian evidence on background risk and other factors. *Journal of Banking and Finance* 33(5), 850-860.

Christelis, D., Jappelli, T., & Padula, M. (2010). Cognitive abilities and portfolio choice. *European Economic Review,* 54(1), 18-38.

Dimmock, S. G., Kouwenberg, R., Mitchell, O. S., & Peijnenburg, K. (2016). Ambiguity aversion and household portfolio choice puzzles: Empirical evidence. *Journal of Financial Economics,* 119(3), 559-577.

Faig, M., & Shum, P. (2002). Portfolio choice in the presence of personal illiquid projects. *The Journal of Finance,* 57(1), 303-328.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica,* 43, 153-161.

Hilgert, M.A., Hogarth, J.M., & Beverly, S.G. (2003). Household financial management: the connection between literacy and behavior. *Federal Reserve Bulletin,* 88, 309-322.

Huston, S.J., Finke, M.S., & Smith, H. (2012). A financial sophistication proxy for the survey of consumer finances. *Applied Economics Letters,* 19(13), 1275-1278.

Gathergood, J. (2012). Self-control, financial literacy, and consumer over-indebtedness. *Journal of Economic Psychology,* 33(3), 590-602.

Kyrychenko, V., & Shum, P. (2009). Who holds foreign stocks and bonds? Characteristics of active investors in foreign securities. *Financial Services Review,* 18, 1-21.

Lusardi, A., & Mitchell, O.S. (2008). Planning and financial literacy: How do women fare? *American Economic Review,* 98, 413-417.

Lusardi, A., & Mitchell, O.S. (2011)a. Financial literacy around the world: an overview. *Journal of Pension Economics and Finance,* 10(4), 497-508.

Lusardi, A., & Mitchell, O.S. (2011)b. Financial literacy and retirement planning in the United States. *Journal of Pension Economics and Finance,* 10(4), 509-525.

Lusardi, A., & Mitchell, O.S. (2014). The economic importance of financial literacy: theory and evidence. *Journal of Economic Literature,* 52(1), 5-44.
Lusardi, A. (2015). Risk literacy. *Italian Economic Journal,* 1(1), 5-23.
Rosen, H. S., & Wu, S. (2004). Portfolio choice and health status. *Journal of Financial Economics,* 72(3), 457-484.
Rubin, D.B. (1987). *Multiple Imputation for Nonresponse in Surveys*. New York: John Wiley and Sons.
Stango, V., & Zinman, J. (2009). What do consumers really pay on their checking and credit card accounts? Explicit, implicit, and avoidable costs. *American Economic Review: Papers and Proceedings,* 99(2), 424-429.
Van Rooij, M., Lusardi, A., & Alessie, R. (2011). Financial literacy and stock market participation. *Journal of Financial Economics,* 101(2), 449-472.