Is Financial Literacy Associated with Investment in Financial Markets in the United States?

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Abstract: Lack of investment in financial markets is one of the enduring puzzles in empirical finance. Although recent studies ascribe the lack of investment in stocks to financial literacy, the association between financial literacy and investment in financial markets remains inconclusive. We examine whether financial literacy is associated with investment in financial markets in the United States. We use investment in stocks, futures/options, investment trusts, corporate bonds, foreign currency deposits, and government bonds of foreign currency as a proxy for investment in financial markets. Using data from the Preference Parameter Study, a nationwide panel survey conducted by Osaka University of Japan, we provide evidence that financial literacy has a significantly positive association with investment in financial markets even after controlling for demographic, socioeconomic, and psychological factors. We check the robustness of our results by using an alternative proxy for investment in financial markets. Our study has far-reaching policy implications and we conclude by suggesting the introduction of financial literacy programs into the academic curriculum. Improving financial literacy could positively impact the mobilization of household funds and contribute to capital formation.

Keywords: financial literacy; household investment; risky securities; financial markets; United States

1. Introduction

Recent studies have found that a low level of financial literacy is one of the reasons that people are unwilling to invest in stocks [1–3]. Although these findings have added an important dimension in explaining the overall low levels of investment in stocks, the role of financial literacy in peoples' unwillingness to invest in other securities of financial markets, such as bonds and foreign currencies, is still inconclusive. It is important to understand how financial literacy is related to investment in bonds and foreign currencies because these securities comprise a significant portion of the overall financial market in the United States. To fill this gap, we examine whether financial literacy is associated with investment in financial markets in the United States. Investment in financial markets has been proxied by investment in stocks, futures and options, investment trusts, corporate bonds, U.S. government bonds, government bonds of foreign currencies, and foreign currency deposits. It is worth noting that perceptions of the risks of securities traded in financial markets could differ by investor characteristics. Although all securities traded in financial markets have some risk, investors need to understand the level and significance of risk for each security. For example, although bonds are less risky than stocks because of secured returns, bond prices are vulnerable to a change in interest rate. Similarly, values of foreign currencies are subject to many variables such as inflation, money supply, and interest rates, among others. Because of their complex nature and the risks associated with securities, some people may be less motivated to invest in financial markets. At the same time,

risky financial securities are associated with higher returns and provide diversification benefits as well. Against this backdrop, we hypothesize that financial literacy has a significantly positive association with investment in financial markets. We argue that financially literate people become motivated to invest in financial markets for three reasons. Firstly, financial literacy makes people knowledgeable about the risks and returns of financial products in the financial markets. Secondly, financial literacy reduces participation entry barriers and thus minimizes transaction costs and increases the efficiency of securities transactions. Thirdly, financial literacy enhances investment in financial markets by mitigating information asymmetry between buyers and sellers of financial securities.

The financial market participation puzzle is one of the enduring conundrums in the field of empirical finance. Finance theories suggest that people should invest in diversified securities in financial markets to maximize returns. Empirical finance also confirms that return on investment from financial markets is higher among the alternative investment opportunities. However, empirical evidence shows that people invest less in the financial markets and prefer to keep their funds idle or deposit in low income-generating savings accounts [4–6]. Bucks et al. [7] found that around 50% of households in the United States have no stocks in their portfolios. Iwamoto, Kawano, and Clenfield [8] reported that 67% of United States households have no investments in stocks. The empirical evidence clearly shows that people are unwilling to invest in financial markets in the United States. Previous studies have investigated why people do not invest in high return generating securities. Some studies have found that a lack of participation in the stock market is due to the cost of participation [9], certain investors' preferences [10], ignorance and lack of trust in the market and agents [11,12], cost of information to participate [13], borrowing constraints [14], and unawareness [15]. Investors' expectations about stock market performance also affect their decisions to invest [6,16]. Despite all these efforts, the explanations of why people do not invest in financial markets remain inconclusive. Limited financial market participation has implications in terms of both individual benefits and overall national development. People cannot maximize their expected returns from investment when they do not invest optimally in financial markets. Lack of investment in financial markets, in turn, restricts the formation of capital required for the economic development of a country. Overall, the suboptimal accumulation and allocation of funds inhibits economic sustainability.

Financial literacy is the possession of the knowledge, behavior, and attitude required to effectively manage and utilize financial resources to achieve maximum benefits [17,18]. Financial literacy has an important role in ensuring financial sustainability for individuals and institutions [19,20]. Over the last couple of decades, financial literacy has emerged as an important means to make better economic and financial decisions [21–25]. The role of financial literacy in facilitating better investment decisions has been demonstrated by several studies [1–3]. Van Rooij et al. [1], using a sample from the Netherlands, provided evidence that people were less interested in investing in stocks although stocks were likely to provide the highest returns among alternative investment opportunities. Yoong [2] conducted a similar study using a sample of older American respondents and found that ignorance of stock market investment knowledge significantly reduced the propensity to hold stocks in the portfolio. Thomas and Spataro [3] found a significantly positive association between financial literacy and stock market participation in nine European countries. Overall, the findings of these studies suggest that financial literacy positively influences investment in stocks. However, the role of financial literacy in explaining investment in other securities in financial markets, such as bonds and foreign currencies, has not been studied so far. The previous findings on the lack of investment in stocks cannot be applied naively to investment in bonds and foreign currencies because of the difference in the nature of these financial assets. This gap in the existing literature motivated us to investigate whether financial literacy explains a lack of investment in bonds and foreign currencies as well.

The rest of this paper is organized as follows. Section 2 describes the variables used in this study, Section 3 outlines the data and explains the methodology, Section 4 summarizes the empirical results, Section 5 discusses the results, and Section 6 provides the conclusions.

2. Definition of Variables and Measurement Issues

2.1. Dependent Variable

The dependent variable in our study is the investment in financial markets. We used respondents' holding of securities such as stocks, investment trusts, futures/options, U.S. government bonds, government bonds of foreign countries, corporate bonds, and foreign currency deposits as a proxy for the investment in financial markets. Respondents who had investment in the financial markets during the period of the survey were included in the empirical analysis. The reason for using the current investment in financial markets is to associate this with the concurrent financial literacy of the respondents. During the study period of 2011–2012, the economic conditions were generally positive and financial market performance was growing, as reflected by the increasing trends in major economic and financial market indices [26,27]. There were no major obstacles in the market that could artificially restrict prospective investors from investing in the financial markets.

2.2. Independent and Control Variables

The main independent variable in our study is financial literacy, which is measured by the respondents' ability to understand elementary financial calculations, inflation, and risks of financial securities. Previous studies evaluated financial literacy in different ways: Stango and Zinman [28] relied on only one question to measure financial literacy, while Lusardi and Mitchell [21,22] and Van Rooij, Lusardi, and Alessie [1] utilized three and five questions, respectively. For this study, we used the methodology of Lusardi and Mitchell [21,22] to measure financial literacy. The questions used to measure financial literacy are included in Table 1. From the first two questions, we can evaluate the knowledge that respondents have of basic financial calculations. The last question is associated with financial instruments, targeted at assessing the respondents' ability to understand the fundamental property of financial securities. We analyzed each response and assigned one point to each correct answer, without deducting points for the wrong ones. From the answers, we were able to determine the level of financial literacy of each respondent.

Many authors find that demographic factors such as age, gender, marital status, education, and number of children have an effect on households' financial decision making and investment behavior [13,29–31]. These studies find that individuals with higher levels of education; men, rather than women; households without children; young investors and unmarried ones are more open to investing in financial markets because of their tolerance for risk. Thus, we control for different variables related to respondents' demographic characteristics (like age, gender, education, marital status, and children) to have a better understanding of how financial literacy (alone) influences decisions regarding investments in financial markets.

Different studies provide evidence that wealth has a positive relationship with stock investment [4,31,32]. We expect that households with higher asset ownership and who earn more have a higher tendency to invest in financial markets. We, therefore, control for individuals' earning capacity and wealth status. We estimate household income as the yearly income of households, and assets as the total of all financial assets held by the household. The unemployed, or households with high and variable business income, are more likely to find investment in financial markets unappealing [32]. By contrast, individuals employed in the financial sector are more prone to acquire financial market securities than those in other industries. To account for this, we control for the occupation and employment status of investors. In our model, we use the variable "finance and insurance related job" as the occupation that may cause investment in financial markets to increase.

Table 1. Definition of variables.

Variable	Definition
	Dependent variable
Investment in financial markets	Whether respondents have invested in securities traded in the financial markets such as stocks, investment trusts, futures/options, corporate bonds, foreign currency deposits, and government bonds of foreign currency.
	Independent Variables
Financial literacy	Financial literacy is measured by respondents' ability to understand basic financial calculations, inflation, and risks of financial securities. Financial literacy scores are calculated by the number of correct answers from three financial literacy questions. Financial literacy is a continuous variable ranging from 0 to 1. Following questions were asked to respondents: 1. Suppose you had $100 in a savings account, the interest rate is 2% per year and you never withdraw money or interest payments. After five years, how much would you have in this account? ☐ More than $102 ☐ Exactly $102 ☐ Less than $102 ☐ Do not know ☐ Refuse to answer 2. Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After one year, how much would you be able to buy with the money in this account? ☐ More than today ☐ Exactly the same ☐ Less than today ☐ Do not know ☐ Refuse to answer 3. Please indicate whether the following statement is true or false: "Buying a company stock usually provides a safer return than a stock mutual fund." ☐ True ☐ False ☐ Do not know ☐ Refuse to answer
Gender	1 = male, 0 = female
Age	Actual age of respondents
Marital status	1 = married, 0 = otherwise
Living with children	1 = respondents who are currently living with children, 0 = otherwise
Education	Years of education
Household income	Household income of the respondents. Household income was coded 1 to 12 to represent income from $5000 to $200,000.
Household assets	Balance of financial assets of the entire household. Household balance of financial assets was coded 1 to 10 to represent the balance of financial assets from $12,500 to $1,000,000.
Employment status	1 = respondents who are currently employed, 0 = otherwise
Occupation	1 = respondents working in finance and insurance sectors, 0 = all other occupations
Anxiety	Respondents' anxiety about life in old age, which was measured by the following statement: "I have anxieties about my life after I turn 65" (5 being the highest and 1 being the lowest).
Future orientation	Respondents' perceptions about the future, which was measured by the following statement: "Since the future is uncertain, it is a waste of time thinking about it" (1 being completely disagree and 5 being completely agree).
Financial satisfaction	Respondents' current level of financial satisfaction, which was measured by the following statement: "How satisfied are you with the current financial situation of your family?" (5 being highest satisfaction and 1 being lowest satisfaction).
Lack of trust	Respondents' trust of other people, which was measured by the following statement: "In general, most people are trustworthy" (1 being completely agree and 5 being completely disagree).

Source: Authors.

In this study, we use four variables to control the individuals' behavior and psychological characteristics. These variables are anxiety about life at an old age, future orientation, the current state of financial satisfaction, and lack of trust. We used a five-point scale to measure these four variables. People who want a secure, risk-free life when they are old could find investing in financial market securities less attractive. The first variable captures this from the anxiety which they feel regarding life in their old age. Future orientation is likely to affect investment in financial markets since respondents who are more inclined toward the present are less likely to have an incentive to invest in financial markets. To measure individuals' future orientation, we asked participants how much they agree with the statement "Since the future is uncertain, it is a waste of time to think about it." The current state of financial satisfaction influences individuals' investment in financial markets since, if they are satisfied with their present status, they could be motivated to invest. We measured financial satisfaction by asking how satisfied they are currently with their financial situation. Finally, trust impacts respondents' investment behavior because the lower the trust level, the less investment they will make in financial markets. To measure this variable, individuals were asked the extent to which they agreed with the statement "In general, most people are trustworthy." Table 1 presents the definitions of variables used in this study.

3. Data and Methodology

3.1. Data

To conduct this study, we used data from the Preference Parameter Study (PPS) conducted by Osaka University's 21st Century COE Program, "Behavioral Macrodynamics based on Surveys and Experiments" and its Global COE project "Human Behavior and Socioeconomic Dynamics" (the survey information is available at https://www.iser.osaka-u.ac.jp/survey_data/eng_application.html) [33]. The PPS was a panel survey from which we collected data, mainly from the 2012 wave, but information concerning the respondents' level of financial literacy was taken from the 2010 wave and the educational information from the 2011 wave as these questions were not included in the 2012 wave. Thus, we used cross-sectional data from the 2012 wave but included some data from the 2010 and 2011 waves. Since the respondents were identical in all the waves, we retrieved some necessary data from the other waves. The PPS used multistage sampling at a nationwide level, except for the states of Alaska and Hawaii. The survey did not use weights for the sample since specific procedures were followed to balance the sample during the sampling and screening process. The survey considered all observations of equal strength and tried to ensure proper representation from all sociodemographic backgrounds. Respondents to this survey were 18 years or older and were split based on age, gender, and race ethnicity into 36 samples. The final sample size we used was 1501, with no missing values. We deleted 61 responses because important information such as investment in financial securities and socioeconomic variables was missing. To understand whether the missing responses could produce biased results, we compared the distribution of data with and without the missing responses in an unreported analysis and found the two fairly similar, indicating that the missing responses would not produce biased results. We used STATA software to organize the survey data and for the statistical analysis of this study.

Table 2 shows the summary statistics of the major variables used in the study. The results show that 62.96% (SD = 48.31%) of the respondents have investments in financial markets. Moreover, respondents invested 37.90% (SD = 35.80%) of their total assets in financial markets. On average, the financial literacy score of the respondents is 0.6883 (SD = 0.3382) out of 1. Demographic and socioeconomic characteristics of the respondents reveal that 49.57% of them are female, the average age is 53.02 years (SD = 15.37 years), 68.55% are married (SD = 46.45%), 31.25% (SD = 46.37%) live with children, the average number of years of education is 13.90 (SD = 1.77 years), 64.36% (SD = 47.91%) are employed, and 4.60% (SD = 20.95%) work in the finance and insurance sectors. The respondents hold average financial assets of \$218,729.20 (SD = \$276,334.10) and earn a yearly income of

$70,562.96 (SD = $47,000). Regarding behavioral features, respondents' average scores in level of anxiety about life in old age, future orientation, financial satisfaction, and level of trust are 2.52 (SD = 1.26), 2.25 (SD = 1.06), 3.40 (SD = 1.22), and 2.71 (SD = 0.93), respectively, on a 5-point scale.

Table 2. Descriptive statistics of key variables.

Variable	Obs	Mean	Std. Dev.	Min	Max
Investment in financial markets	1501	0.6296	0.4831	0	1
Investment in financial markets as a percentage of total assets	1501	0.3790	0.3580	0	1
Financial literacy	1501	0.6883	0.3382	0	1
Gender	1501	0.4957	0.5001	0	1
Age	1501	53.0220	15.3673	20	98
Marital status	1501	0.6855	0.4645	0	1
Living with children	1501	0.3125	0.4637	0	1
Education	1501	13.9021	1.7684	9	18
Household income ($)	1501	70,562.96	47,000	5000	200,000
Household assets ($)	1501	218,729.20	276,334.10	12,500	1,000,000
Employment status	1501	0.6436	0.4791	0	1
Occupation	1501	0.0460	0.2095	0	1
Anxiety	1501	2.5237	1.2597	1	5
Future orientation	1501	2.2592	1.0615	1	5
Financial satisfaction	1501	3.3957	1.2228	1	5
Lack of trust	1501	2.7082	0.9260	1	5

Source: Authors.

Table 3 presents investment in financial markets according to respondents' financial literacy and demographic characteristics. Consistent with the hypothesis, respondents who scored highly on financial literacy also have higher investment in financial markets. Male respondents have higher investment in financial markets than female respondents do, and married respondents have higher investments in financial markets than unmarried respondents do. Respondents who are between 41 and 65 years of age have the highest investment in financial markets, and those who are younger than 40 years have the lowest investment. Respondents who are older than 65 years have more (less) investment in financial markets than younger (middle aged) respondents do. A classification of investment in financial markets on the basis of respondents' education shows that respondents with more than 16 years of education have the highest investment, those with 12 to 16 years of education have moderate investment, and those with less than 12 years of education have the lowest investment in financial markets.

Table 3. Investment in financial markets based on selected variables.

	Investment in Financial Markets
Financial Literacy	
<0.5	0.4637
≥0.5	0.6870
Gender	
Male	0.6667
Female	0.5931
Marital status	
Married	0.6550
Unmarried	0.5742
Age	
≤40	0.5189
41–65	0.6690
>65	0.6326
Education	
<12	0.4054
12–16	0.6115
>16	0.7655

Source: Authors.

3.2. Methodology

We used probit regression models to examine whether financial literacy is associated with investment in financial markets. In the models, the binary response of whether respondents have investments in financial markets, proxied by investment in assets such as stocks, investment trusts, futures/options, government bonds of foreign currency, corporate bonds, and foreign currency deposits, is used as the dependent variable. The binary dependent variable takes the value 1 when respondents have investment in any of the financial assets specified here and 0 otherwise. We used the probit regression models because the dependent variable is binary in nature. We used three probit regression models with the same dependent and independent variables, differentiated by control variables. In models 1.1, 1.2, and 1.3, we controlled demographic, demographic and socioeconomic, and demographic, socioeconomic, and behavioral factors, respectively. The reason for using three different models is to understand how financial literacy is associated with investment in financial markets when only demographic factors are controlled, demographic and socioeconomic factors are controlled, and demographic, socioeconomic, and psychological factors are controlled. The probit regression models are as follows:

$$\text{Investment in financial markets } (1 = \text{investment in financial markets,}$$
$$\text{and 0 otherwise}) = \alpha + \beta_1 \text{ financial literacy} + \beta_2 \text{ gender} + \beta_3 \text{ age} + \beta_4 \text{ age}^2 \qquad (1)$$
$$+ \beta_5 \text{ marital status} + \beta_6 \text{ living with children} + e_i$$

$$\text{Investment in financial markets } (1 = \text{investment in financial markets, and 0}$$
$$\text{otherwise}) = \alpha + \beta_1 \text{ financial literacy} + \beta_2 \text{ gender} + \beta_3 \text{ age} + \beta_4 \text{ age}^2 + \beta_5 \text{ marital status}$$
$$+ \beta_6 \text{ living with children} + \beta_7 \text{ education} + \beta_8 \text{ household income} + \beta_9 \text{ household} \qquad (2)$$
$$\text{assets} + \beta_{10} \text{ employment status} + \beta_{11} \text{ occupation} + e_i$$

$$\begin{aligned}
\text{Investment in financial markets (1 = investment in financial markets, and 0} \\
\text{otherwise)} = \alpha + \beta_1 \text{ financial literacy} + \beta_2 \text{ gender} + \beta_3 \text{ age} + \beta_4 \text{ age}^2 + \beta_5 \text{ marital status} \\
+ \beta_6 \text{ living with children} + \beta_7 \text{ education} + \beta_8 \text{ household income} + \beta_9 \text{ household} \\
\text{assets} + \beta_{10} \text{ employment status} + \beta_{11} \text{ occupation} + \beta_{12} \text{ anxiety} + \beta_{13} \text{ future} \\
\text{orientation} + \beta_{14} \text{ financial satisfaction} + \beta_{15} \text{ lack of trust} + e_i
\end{aligned} \tag{3}$$

4. Empirical Findings

Table 4 shows the coefficients of the probit regression models. Models 1.1, 1.2, and 1.3 are differentiated using control variables. The reason for using three models is to ensure consistency of the relationship between investment in financial markets and financial literacy—namely, that the results of the three models can explain whether the association between investment in financial markets and financial literacy is consistent when different aspects of respondents' background and characteristics are controlled. The LR Chi^2 values and associated probabilities indicate that at least one of the predictors' regression coefficients is significantly different from zero. The pseudo R^2 values of the models indicate that the predictability of the models increases when socioeconomic and psychological variables are added with demographic variables. The results of model 1.1 show that financial literacy has a significantly positive association with the investment in financial markets. Moreover, gender, age, and marital status have a significantly positive association with investment in financial markets. The results of model 1.2 show that financial literacy has a significantly positive association with the investment in financial markets. Moreover, household income, household balance of financial assets, and employment status have a significantly positive association with the investment in financial markets. Finally, the results of model 1.3 show that financial literacy has a significantly positive association with the investment in financial markets. Moreover, household income, household balance of financial assets, employment status, and current level of financial satisfaction have a significantly positive effect, while lack of trust has a significantly negative association with the investment in financial markets.

Table 4. Estimation results.

	Model 1.1	Model 1.2	Model 1.3
Financial literacy	0.8471 (8.44) ***	0.4804 (4.34) ***	0.4634 (4.15) ***
Gender	0.1535 (2.26) **	0.0728 (0.99)	0.0823 (1.12)
Age	0.0240 (1.91) *	0.0138 (1.02)	0.0182 (1.32)
Age *	−0.0002 (−1.38)	−0.0001 (−0.40)	−0.0001 (−0.82)
Marital status	0.2019 (2.52) ***	0.0088 (0.10)	−0.0241 (−0.27)
Living with children	−0.0538 (−0.66)	−0.0315 (−0.36)	0.0224 (0.98)
Education		0.0241 (1.06)	0.0009 (0.01)
Household income		0.0541 (5.11) ***	0.0463 (4.30) ***
Household assets		0.0207 (9.35) ***	0.0194 (8.68) ***
Employment status		0.1649 (1.97) **	0.1659 (1.97) **
Occupation		−0.0899 (−0.49)	−0.0996 (−0.54)
Anxiety			0.0234 (0.77)
Future orientation			−0.0407 (−1.18)
Financial satisfaction			0.1080 (3.24) ***
Lack of trust			−0.0745 (−1.88) *
_cons	−1.2189 (−3.82) ***	−1.7371 (−3.84) ***	−1.8104 (−3.52) ***
Obs.	1501	1501	1501
Log likelihood	−934.9391	−812.2401	−803.5714
LR Chi^2	108.98 ***	354.37 ***	371.71 ***
Pseudo R^2	0.0551	0.1791	0.1878

Note: *z* values in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.
Source: Authors.

Overall, our results show that financial literacy has a consistent and significantly positive association with the investment in financial markets, meaning that financially literate people are more likely to invest in financial markets. We also found consistent evidence that respondents who have higher household income and balance of financial assets, are currently employed, are currently satisfied with their financial condition, and trust others are more likely to invest in financial markets. However, the evidence that males, married, and older respondents are more likely to invest in financial markets is not consistent because the significance of the association disappears when the socioeconomic and behavioral backgrounds of respondents are controlled.

We conducted a distinct analysis on how financial literacy is associated with investment in bonds and foreign currencies to confirm that the positive association between financial literacy and investment in financial markets is not driven by investment in stocks. As in the original model, we used the same probit regression model, where the binary response of whether respondents have investments in government bonds of foreign currency, corporate bonds, and foreign currency deposits is used as the dependent variable. Table 5 shows the coefficients of the probit regression models. The results of models 2.1, 2.2, and 2.3 show that financial literacy has a significantly positive relationship with investment in bonds and foreign currencies, implying that financially literate people are more likely to invest in bonds and foreign currencies. Moreover, household income, household balance of financial assets, and current level of financial satisfaction have a significantly positive association with investment in bonds and foreign currencies, while occupation and lack of trust have a significantly negative association with this. In general, the results are similar to the original models except for the association of respondents' occupations in the finance and investment sectors, which is positive with investment in financial markets but negative with investment in bonds and foreign currencies. The results suggest that respondents employed in the finance and insurance sectors are more likely to invest in stocks and, thus, are less likely to invest in bonds and foreign currencies.

Table 5. Estimation results using investment in bonds and foreign currencies as the dependent variable.

	Model 2.1	Model 2.2	Model 2.3
Financial literacy	0.6024 (5.56) ***	0.3293 (2.83) ***	0.3185 (2.71) ***
Gender	−0.0370 (−0.53)	−0.1207 (−1.66) *	−0.1045 (1.43)
Age	0.0037 (0.28)	−0.0053 (−0.39)	−0.0015 (−0.11)
Age2	0.0000 (0.15)	0.0001 (0.76)	0.0000 (0.32)
Marital status	0.1413 (1.71) *	0.0103 (0.12)	−0.0213 (−0.24)
Living with children	−0.0339 (−0.41)	0.0001 (0.00)	0.0268 (0.30)
Education		0.0115 (0.53)	0.0108 (0.49)
Household income		0.0347 (3.73) ***	0.0290 (3.06) ***
Household assets		0.0108 (7.35) ***	0.0099 (6.61) ***
Employment status		0.0513 (0.61)	0.0491 (0.58)
Occupation		−0.3137 (−1.76) *	0.3261 (−1.82) *
Anxiety			0.0292 (0.95)
Future orientation			−0.0074 (−0.21)
Financial satisfaction			0.0978 (2.83) ***
Lack of trust			−0.1260 (−3.06) ***
_cons	−1.3104 (−3.87) ***	−1.4502 (−3.20) ***	−1.4601 (−2.85) ***
Obs.	1501	1501	1501
Log likelihood	−877.9746	−815.9088	−805.6087
LR Chi^2	43.97 ***	168.10 ***	188.70 ***
Pseudo R^2	0.0244	0.0934	0.1048

Note: *z* values in parentheses. ***, and * represent significance at the 1%, and 10% levels, respectively. Source: Authors.

We check the robustness of the results using "percentage of respondents' total assets invested in securities of financial markets" as an alternative proxy for the investment in financial markets. This alternative dependent variable measures the magnitude of willingness to invest in financial markets. Thus, the alternative measure of investment in financial markets helps us to understand the

association of financial literacy not only with respondents' participation but also with the magnitude of participation in the financial markets. Since the dependent variable is a ratio, we used the generalized linear model (GLM) to examine the association between investment in financial markets and financial literacy after controlling the same demographic, socioeconomic, and behavioral factors. The reason for using the GLM model is that it is a generalization of an ordinary linear regression model and fits well for a ratio-type dependent variable. We used three GLM regression models, which were differentiated using control variables. Table 6 shows the regression coefficients of the GLM models. The results show that financial literacy has a consistent and significantly positive association with investment in financial markets, meaning that financially literate respondents invest more in financial markets. Moreover, respondents who are males, are older, have more household income and larger balance of financial assets, and trust others tend to have invested more in financial markets. Our results show that age has a non-linear, positive relationship with investment in financial markets, meaning that middle-aged respondents tend to invest more in financial markets than do younger and older respondents.

Table 6. Estimation results using an alternative proxy for investment in financial markets.

	Model 3.1	Model 3.2	Model 3.3
Financial literacy	0.2291 (8.65) ***	0.1297 (4.94) ***	0.1247 (4.73) ***
Gender	0.0655 (3.68) ***	0.0431 (2.55) **	0.0447 (2.65) ***
Age	0.0146 (4.40) ***	0.0119 (3.78) ***	0.0125 (3.91) ***
Age *	−0.0001 (−3.92) ***	−0.0001 (−3.30) ***	−0.0001 (−3.48) ***
Marital status	0.0399 (1.89) *	0.0021 (0.10)	−0.0018 (−0.09)
Living with children	−0.0145 (−0.68)	−0.0054 (−0.26)	−0.0021 (−0.10)
Education		0.0084 (1.64)	0.0072 (1.40)
Household income		0.0092 (4.11) ***	0.0082 (3.65) ***
Household assets		0.0034 (9.51) ***	0.0033 (9.09) ***
Employment status		0.0260 (1.34)	0.0267 (1.38)
Occupation		−0.0132 (−0.33)	−0.0159 (−0.39)
Anxiety			−0.0041 (−0.58)
Future orientation			−0.0112 (−1.39)
Financial satisfaction			0.0062 (0.80)
Lack of trust			−0.0238 (−2.58) ***
_cons	−0.2427 (−2.87) ***	−0.3417 (−3.27) ***	−0.2432 (−2.05) **
Obs.	1501	1501	1501
Log likelihood	−519.8271	−423.8629	−418.3469
AIC	0.7020	0.5808	0.5787
BIC	−10,751.27	−10,735.79	−10,707.66

Note: z values in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively. Source: Authors.

5. Discussion

Lack of investment in financial markets is a long-standing puzzle in empirical finance. Recent studies have explained the phenomenon partially by associating financial literacy with lack of investment in stocks [1–3]. However, the lack of investment in other securities in financial markets remains unexplained. To fill this gap, we investigated how financial literacy is associated with investment in financial markets. We used investment in stocks, investment trusts, futures/options, U.S. government bonds, government bonds of foreign countries, corporate bonds, and foreign currency deposits as a proxy for investment in financial markets. Our main contribution to the existing literature is to provide evidence on how investments in bonds and foreign currencies are associated with financial literacy.

Our results show that financially literate people are more likely to invest in financial markets in the United States. Moreover, financially literate people tend to invest a higher percentage of their total assets in financial markets. The findings of our study are consistent with previous studies providing evidence that financial literacy is positively associated with stock market participation [1–3].

However, we provide evidence that financial literacy is associated not only with investment in stocks but also in other securities of financial markets. To confirm the evidence, we run a separate regression analysis to observe whether financial literacy is associated with investment in bonds and foreign currency deposits. The results show that financially literate people are more likely to invest in bonds and foreign currency deposits. Thus, the positive association of financial literacy is not only evident with equity securities but also with other financial assets. We argue that financially literate people are more knowledgeable about financial markets and portfolio selection. Financial knowledge also allows them to minimize trading costs compared to those who are financially less literate. Moreover, financial literacy improves peoples' cognitive ability, which results in more investment in financial markets [34]. A reduction in information asymmetry is another channel through which financial literacy enables greater investment in financial markets. Asymmetric information means a gap in information between buyers and sellers of financial securities, which appears as a barrier to financial market participation [35,36]. An adverse selection problem arises when lenders fail to understand the true level of risks of financial securities and a moral hazard problem arises when lenders fail to properly understand the motives of borrowers. In both situations, lenders run the risk of losing money and, thus, could be demotivated to invest in financial markets. One way to mitigate the asymmetric information problem is to have access to information related to financial securities. Kadoya and Khan [18] provide evidence of a significant association between financial literacy and the acquisition of financial information for decision making. Financial literacy enhances peoples' abilities to delve deeper into financial contracts to understand the risks of the securities and enable them to monitor the activities of borrowers. Financially literate people are more likely to mitigate adverse selection and moral hazard problems than their less financially literate counterparts. Thus, information asymmetry is less likely to create barriers that keep financially literate people from investing in financial markets.

Our study provides robust and consistent evidence that respondents who have higher household income, have higher balance of financial assets, and trust others are more likely to invest in financial markets. We argue that households with higher asset ownership and who earn more have a higher tendency to invest in financial market securities because of their higher economic capacity. Our results are consistent with previous studies providing evidence that wealth has a positive relationship with investment in financial market securities [4,31,32]. In addition to economic reasons, reliability and trust are found to be important considerations in deciding whether to invest in financial markets. We argue that the higher the level of trust people have, the more financial market securities they will acquire. The finding of Guiso et al. [12] is consistent with our results and argument. Although previous studies find that males and middle-aged, married, employed, and financially satisfied people are more likely to invest in financial markets [13,29–31,37,38], they are not found to be consistent and robust in our study. Moreover, unlike previous studies, we do not find an association between education, living with children, future orientation, or anxiety about life in old age with investment in financial markets.

6. Conclusions

Investment in financial markets is important for maximizing return on investment. Although several studies have attributed the lack of investment in stocks to financial literacy, it is still unknown why people do not invest in other securities of financial markets. This study examines whether financial literacy is associated with investment in financial markets in the United States. We used investment in stocks, investment trusts, futures/options, U.S. government bonds, government bonds of foreign countries, corporate bonds, and foreign currency deposits as a proxy for investment in financial markets. Using data from Osaka University's Preference Parameter study, we provide evidence that financial literacy is positively associated with financial market participation, meaning that financially literate people are more likely to invest in financial markets. Among control variables, household income, household assets, and trust are found to have consistent and significant relationships with investment in financial markets. Although gender, age, marital status, employment status, and the current level of financial satisfaction are found to be associated with investment in financial markets,

they are not consistent. We checked the robustness of our results by applying an alternative proxy for investment in financial markets—the percentage of respondents' total assets invested in securities of financial markets. The findings of this study suggest that investment in financial markets could be increased by making people more financially literate, which, in turn, could maximize the wealth of households. Our results on the association between financial literacy and investment in financial markets contribute to sustainable development as well. Investment in financial markets helps to accumulate the capital funds required for productive economic activities in a country. Thus, peoples' optimal investment in financial markets through enhanced financial literacy will ultimately contribute to the sustainable development of the country.

Our study has important policy implications. Since financial literacy is significantly associated with investment in financial markets, policy makers could think of implementing financial education programs in the academic curriculum. Early-stage education on financial issues could interest more people in investing in financial markets. Special programs that educate people on financial topics could be helpful as well for those who do not attend educational institutions. In this regard, authorities could consider arranging training programs for prospective investors and promoting financial literacy through electronic, print, and social media to make people aware of financial matters.

Our study has some limitations that should be considered while interpreting the results. Firstly, data used in this study are from the 2012 wave of the PPS, but financial literacy and education data are from the 2010 and 2011 waves, respectively. Although respondents were identical in all waves, we cannot reject the possibility that a time difference could have influenced the results of the study. However, we believe that this limitation would not significantly affect the implications of the results as the demographic, socioeconomic, and psychological backgrounds of the respondents remained largely the same in the adjacent years. Secondly, the self-reported psychological variables might not measure respondents' behavior and psychology accurately as some people tend to make extreme choices (i.e., choosing 1 or 5 on a 5-point scale), whereas others could make moderate choices (i.e., choosing 3). Future research should avoid these limitations to provide more accurate findings on the role of financial literacy in investment in financial markets. Future research could also be directed at how financial behavior and financial attitude, in addition to financial literacy, are associated with investment in financial markets.

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