CAMBRIDGE
UNIVERSITY PRESS

ARTICLE

What determines financial literacy in Japan?

Yoshihiko Kadoya* and Mostafa Saidur Rahim Khan

School of Economics, Hiroshima University, 1-2-1 Kagamiyama, Higashihiroshima, Japan
*Corresponding author. Email: ykadoya@hiroshima-u.ac.jp

Abstract

This study investigates the factors affecting financial literacy in Japan using data from Osaka University's Preference Parameter Study. We examine several demographic, socio-economic, and psychological variables drawn from the social learning, consumer socialization, and psychological theories of learning. The results indicate that the demographic factors of gender, age, and education; the socio-economic factors of income and occupation; and the psychological factor of perceptions of the future significantly affect the level of financial literacy. The results are robust to different measures of financial literacy and emphasize that social contact and people's future orientation can improve financial literacy levels in Japan.

Households now need more financial knowledge in their decision making because the current marketplace is riskier and more globalized than before (Lusardi and Mitchell, 2011*a*). Although social security and public health provisions are developing, people need financial literacy to determine their retirement savings and costs for healthcare and long-term care (Banks, 2010) and to improve the practicality and utility of savings, investment, retirement planning, wealth accumulation, and stock market participation decisions (Bernheim and Garrett, 2003; Lusardi and Mitchell, 2011*b*; Van Rooij *et al*., 2011, 2012; Sekita, 2013). Financial literacy improves retirement planning (Lusardi and Mitchell, 2011*b*), the ability to save and invest in complex financial assets (Van Rooij *et al*., 2011), and wealth accumulation through better retirement planning, savings plans, and stock market investments (Van Rooij *et al*., 2012). While most evidence comes from the American context, some research exists for the Netherlands (Alessie *et al*., 2011), Japan (Sekita, 2011, 2013), Canada (Boisclair *et al*., 2017), Switzerland (Brown and Graf, 2013), and Australia (Agnew *et al*., 2013). Although many previous studies have focused on the link between financial literacy and savings and investment decisions, relatively few examine the factors that affect financial literacy. Two recent studies of the intertemporal modeling of financial literacy provide additional insights into its determinants. Lusardi *et al*. (2017) developed an augmented stochastic life cycle model that explains the decision to acquire financial knowledge over the life cycle as well as evaluates the ability of financial knowledge to explain wealth inequality. The profile of optimal financial knowledge is found to be hump-shaped over the life cycle and to differ by educational groups because of differences in the life cycle income path. The authors also found that 30–40% of the United States' wealth inequality can be attributed to financial knowledge. Jappelli and Padula (2013) developed an intertemporal model of investment in financial literacy. They argued that investment in financial literacy increases the return on wealth. Moreover, financial literacy and wealth were found to be positively correlated over the life cycle. There are costs and benefits in the acquisition of financial literacy, based on which the optimal investment in financial literacy can be identified. The authors pointed out two

important determinants of financial literacy, mathematical skills acquired early in life and reforms associated with the deepening of the financial market (e.g., the creation of private pension funds).

Financial literacy means understanding the value of money and how to maximize the benefits of money utilization. Many institutions and authors have provided different definitions of financial literacy, but their inherent meanings are similar. The United States Financial Literacy and Education Commission of 2007 and Organization for Economic Co-operation and Development (OECD) summarized the previous definitions as the ability and awareness to use knowledge and skills to manage financial resources to achieve maximum financial well-being (United States Financial Literacy and Education Commission, 2007; OECD, 2013). Our study defines financial literacy as the ability to understand the implications of interest, inflation, risks, and diversification. This definition provides the benefit of measurability, which enables researchers to relate financial literacy to a country's demographic and socio-economic environment. Although financial literacy is an important issue that affects household decisions on savings and investment, there is still no nationwide comprehensive study of the determinants of financial literacy in Japan.

Several theories relate social learning, socialization, and behavior to financial knowledge. Social learning theory and the theory of consumer socialization grew from theories about learning processes in a society. Social learning theory argues that as social entities, people learn from observing the behaviors and actions of others (Bandura and Walters, 1977). Several studies have used social learning theory to investigate financial behavior (Hira, 1997; Martin and Bush, 2000). The theory of consumer socialization argues that children learn the consumption-related knowledge and skills required to live capably in society from parents, schools, the mass media, and peers (Ward, 1974; Moschis and Churchill, 1978). Some empirical evidence shows an important relationship between financial knowledge and behavior and social learning opportunities (Gutter *et al.*, 2010). Both theories emphasize that people learn financial skills from society and directly imply that the knowledge and attributes of the people with whom subjects live significantly affect financial literacy. Lachance and Choquette-Bernier (2004) found that observation, parental communication, and learning through error contribute to students' acquisition of financial knowledge. Koonce *et al.* (2008) showed that society, family, peers, and the media contribute to people's financial literacy. Haliassos *et al.* (2016) provided evidence of financial knowledge transfers through social interactions. They found that neighbors' financial knowledge had an important mediating effect on the financial behavior of a household. Economic and financial theories based on psychology and behavior emphasize that behavioral patterns affect financial decisions (Kahneman and Tversky, 1979). In a recent study, Gill and Prowse (2015) argued that learning is positively related to cognitive ability, agreeability, and emotional stability. Several studies have investigated the role of psychology in determining financial literacy and showed that confidence, trust, financial satisfaction, future orientation, anxiety about life in the future, and other factors shape the acquisition of financial knowledge (Murphy, 2013; Arellano *et al.*, 2014; Kadoya, 2016; Kadoya and Khan, 2017; Kadoya et al., 2018).

This study examines the determinants of financial literacy in Japan. We particularly emphasize psychological variables as determinants of financial literacy in addition to demographic and socio-economic variables. Although several studies have examined the demographic and socio-economic determinants of financial literacy worldwide, relatively few have analyzed the psychological factors affecting financial literacy and explained the endogenous relationship between certain variables and financial literacy. As a result, a comprehensive study of the determinants of financial literacy is needed.

Moreover, the analysis of the determinants of financial literacy in Japan is particularly important for several reasons. First, to the best of our knowledge, no study has thus far comprehensively examined the psychological factors affecting financial literacy in Japan after controlling for demographic and socio-economic determinants. Psychological factors are of vital importance because financial literacy is related to consumption, savings, and investment decisions, which are also affected by psychological factors. However, previous studies of financial literacy in Japan have focused on finding the demographic and socio-economic determinants (Yoshino *et al.*, 2017), examining its relationship with wealth accumulation (Sekita, 2013), and retirement planning (Sekita, 2011). Second, several

studies have found that Japan is culturally distinct from other countries and that Japanese people have different savings and investment behaviors (Chui *et al.*, 2010). In particular, they are characterized by risk aversion, passivity, collectivism, and low individualism, and research still needs to address the effects of these variables on financial literacy in Japan. For instance, Brown *et al.* (2017) documented that cultural differences have a significant effect on the attainment of financial literacy. As a result, the findings of other countries cannot be naively applied to Japan. Finally, rather than solely focusing on the determinants of financial literacy, we also examine the endogenous nature of two important explanatory variables, namely financial satisfaction and anxiety about life in old age. The present analysis thus explains the nature of the relationship between financial literacy and those endogenous variables.

The rest of the paper is organized as follows. The next section describes the data and methodology as well as defines the variables. The subsequent section reports the empirical results along with the results of the robustness tests. The paper then includes a discussion of the results in the context of existing research and the final section concludes.

1. Data and methodology

1.1 Data

We used micro data from the Preference Parameters Study of Osaka University's 21st Century Center of Excellence (COE) Program, 'Behavioral Macrodynamics Based on Surveys and Experiments' and its Global COE project, 'Human Behavior and Socioeconomic Dynamics.' The data were collected with a nationwide survey between December 2011 and May 2012 using visits and placement surveys. The study applied two-stage stratified random sampling of these data: first, we divided Japan's prefectures into ten regional blocks: Hokkaido, Tohoku, Kanto, Koshinetsu, Hokuriku, Tokai, Kinki, Chugoku, Shikoku, and Kyusyu. We then subdivided each region into four strata: government-designated major cities, cities with populations of more than 100,000, cities with populations of less than 100,000, and towns and villages. The response rate was 93.9%. The fact that the project was a panel survey explains the high response rate. The data on respondents' financial literacy and education were from waves 2010 and 2011, respectively because these questions were not asked in the 2012 wave. We selected subjects with no missing values for a sample of 3,905 respondents. We assumed that missing values are random in nature and their exclusion does not create a systematic effect on our results. Moreover, we measured the descriptive statistics for the excluded sample but did not find significant differences from the final sample statistics. The comparison of the descriptive statistics between the excluded and final samples suggested that the missing variables are indeed random in nature. However, this analysis is not reported here because of space considerations (available upon request).

To be reassured on the representativeness of the data used in this study, we compared our data with the official statistics. The comparison reveals that the gender ratio, age, married respondents, average year of schooling, average asset holdings, and average income in our survey data are 0.469, 52.419 years, 0.815, 13.235 years, ¥12.09 million, and ¥5.81 million, respectively compared with the national statistics of 0.474, 50 years, 0.60, 15 years, ¥9.20, and ¥4.47 million, respectively (National Institute of Population and Social Security Research, 2012; OECD, 2012; United Nations Development Program, 2013). The gender and age structure of our sample are the same as the national figures, whereas the percentage of married people, average asset holdings, and average income are higher and the average years of schooling are lower in our survey than in the national statistics. This difference arises because we only selected adults as respondents of the survey. Considering the sample selection criteria, our sample data thus offer an adequate representation of the national demographic features.

Table 1 summarizes the descriptive statistics of the variables used in the study. The mean value of financial literacy was 0.47, indicating that respondents had a low ability to respond correctly to the financial literacy questions. On average, respondents could answer two of the four questions correctly. In terms of demographics, male respondents were somewhat higher in numeracy than female respondents were. Respondents were on average 52.4 years old, with a minimum age of 22 and a maximum age of 78. Most respondents were married. We measured respondents' socio-economic features using their level of

Table 1. Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Financial literacy	3,905	0.581	0.339	0	1
Gender	3,905	0.469	0.499	0	1
Age	3,905	52.419	12.702	22	78
Marital status	3,905	0.815	0.388	0	1
Education	3,905	13.235	2.119	9	21
Spouse education	3,179	13.092	2.156	9	21
Father's education	3,905	11.137	2.488	9	21
Mother's education	3,905	10.747	1.824	9	21
Household income	3,905	5,814.562	3,924.065	99	20,000
Household assets	3,905	12,092.840	17,557.880	99	100,000
Employment status	3,905	0.691	0.462	0	1
Occupation	3,905	0.023	0.150	0	1
Future orientation	3,905	2.736	0.851	1	5
Financial satisfaction	3,905	2.942	1.036	1	5
Anxiety	3,905	3.460	1.093	1	5

Authors' calculations.

education and that of their spouses and parents. Japan traditionally has a high level of education, which is reflected in our study. Respondents on average had more than 13 years of education, meaning that they attained an above college-level education. Respondents' spouses also attained similar levels of education. Respondents' parents attained an average of 10.9 years of education, with fathers' education levels slightly higher than that of mothers. Although high, household income and asset holdings showed some degree of disparity among respondents. Respondents' average income was ¥5,814,562 ($52,859.65), with a minimum income of ¥1,000,000 ($9,090.91) and a maximum income of ¥20,000,000 ($181,818.20).[1] Average asset holdings were ¥12,092,840 ($109,934.90), ranging from a minimum of ¥2,500,000 ($22,727.27) to a maximum of ¥100,000,000 ($909,090.90). In terms of psychological features, respondents were moderately fatalist, believing that the future is uncertain and that thinking about it is a waste of time. Respondents were also moderately satisfied with their current financial conditions. Finally, their mean anxiety was 3.46, which is moderately high on a five-point scale.

1.2 Variables and measurements

1.2.1 Dependent variable

The most important aspect of a study examining the determinants of financial literacy is the determination of an appropriate measure of financial literacy. Lusardi and Mitchell (2007, 2008) measured financial literacy using three questions, Van Rooij et al. (2011) used five questions, and Stango and Zinman (2009) used only one question. While the number of questions in each of these studies differs, most recent studies (e.g., Sekita, 2013) have followed Lusardi and Mitchell's (2007, 2008) methodology. In the current study, we measured financial literacy as respondents' ability to understand basic financial calculations, inflation, and the risks of financial securities from their answers to the following questions:

(1) Suppose you had ¥10,000 in a savings account, with an interest rate of 2% per year, and you never withdraw money or interest payments. After 5 years, how much would you have in this account?
☐ More than ¥10,200 ☐ Exactly ¥10,200 ☐ Less than ¥10,200 ☐ Do not know ☐ Refuse to answer

(2) Imagine that the interest rate on your savings account is 1% per year and inflation is 2% per year. After 1 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

---
[1]We use a ¥/$ conversion rate of 110.

(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

The first two questions measured respondents' ability to understand basic financial calculations and the last question was designed to measure respondents' ability to understand the risk of financial securities. Although we primarily measured financial literacy using these three conventional questions, we also used an advanced question to examine whether respondents' ability to understand complex questions affects the results. The fourth question was about the relationship between bond prices and interest rates, which is an advanced issue and deemed to be understood by respondents with sufficient financial knowledge.

(4) If the interest rate falls, what should happen to bond prices?
☐ Rise ☐ Fall ☐ Stay the same ☐ None of the above ☐ Do not know ☐ Refuse to answer

We assigned one point to each correct answer and did not deduct points for a wrong answer. We then used the number of correct answers as the respondent's level of financial literacy. This process for measuring financial literacy was unweighted and thus did not put place more weight on difficult questions. Our alternative measure of financial literacy assigned one point to each correct answer and deducted points for each wrong answer; it also placed more weight on the last two questions. Sekita (2013) also used both weighted and unweighted methods to examine the relationship between financial literacy and wealth accumulation, finding that both measures produce similar results. While measurement issues did not seem to affect the implications of the results, we used both measures of financial literacy to check the robustness of our findings.

Table 2 reports the distribution of the financial literacy scores by age, gender, and education. Financial literacy increased with age up to a certain level, after which it began to fall. Middle-aged respondents had the highest financial literacy, although older respondents had more financial literacy than younger respondents did. Male respondents were more financially literate than female respondents were. The level of financial literacy differed significantly depending on the level of education. More educated respondents had high financial literacy scores. We grouped education into three levels: up to college level (12 years of education), graduate level (16 years of education), and postgraduate level (more than 16 years of education). Financial literacy among postgraduate respondents was much higher than that for the other two groups.

1.2.2 Independent variables
To explain the determinants of financial literacy, we included variables related to demographic, socio-economic, and psychological background in line with the theories discussed in the Introduction. Table 3 reports the variables used in this study.

Several studies have found that financial literacy varies by gender (Lusardi and Mitchell, 2008; Sekita, 2011; Van Rooij et al., 2011; Atkinson and Messy, 2012; Hung et al., 2012; Alessie et al., 2013; Kadoya and Khan, 2017). Kadoya and Khan (2017) and Sekita (2011) reported that women in Japan have lower financial literacy. While women had nearly equivalent scores for the basic financial literacy questions, they scored significantly lower for the complex questions related to risk and diversification. However, it is difficult to explain these gender differences. The social learning process could partially explain women's lower financial literacy. Women, particularly married women, have less scope than men to learn socially and from experience, which could lead to difficulty in understanding financial issues. Nevertheless, this theory cannot explain why single educated women with opportunities for social learning have lower scores (Mahdavi and Horton, 2014). We thus included the gender variable in this study.

The intertemporal models of financial literacy proposed by Lusardi et al. (2017) and Jappelli and Padula (2013) argue that financial literacy changes over people's life cycle. As a result, age becomes an

Table 2. Distribution of financial literacy by age, gender, and education

Variable	Financial literacy
Age	
<30 years	0.491
31 to 44 years	0.504
45 to 64 years	0.616
>64 years	0.602
Gender	
Male	0.641
Female	0.528
Education	
<12 years	0.435
12 to 16 years	0.628
>16 years	0.805

Table 3. Variables and definitions

Variable	Definition
Dependent variable	
Financial literacy (fliteracy)	Financial literacy is measured by four questions related to basic financial calculation skills and financial instruments. The first question measures the understanding of compound interest, the second question measures the understanding of the effect of inflation, the third question measures the understanding of risk, and the fourth question measures the understanding of bond pricing behavior
Independent variables	
Gender (gender)	1 = male, 0 = female
Age (age)	Respondent's age
Education (educ)	Years of education
Spouse education (seduc)	Years of education of the spouse
Father's education (feduc)	Years of education of the respondent's father
Mother's education (meduc)	Years of education of the respondent's mother
Marital status (spouse)	1 = married, 0 = otherwise
Employment status (emplstatus)	1 = employed, 0 = otherwise
Occupation (occupation)	1 = working in finance and insurance, 0 = all other occupations
Household assets (asset)	Financial assets (savings, stocks, bonds, insurance, etc.) of the household
Household income (income)	Household income
Future orientation (future)	1 = respondents who consider the future to be uncertain, 0 = otherwise
Financial satisfaction (finsatisfaction)	Level of current satisfaction with the family's financial situation (minimum = 1; maximum = 5)
Anxiety (anxiety)	Level of anxiety about life during old age (minimum = 1; maximum = 5)

important factor behind the acquisition of financial literacy. The importance of age in explaining financial literacy is also emphasized by the fact that people learn from previous mistakes (Martin and Oliva, 2001; Lachance and Choquette-Bernier, 2004) and eventually become more knowledgeable over time. Lusardi *et al.* (2017) and Lusardi and Mitchell (2014) outlined a theoretical framework characterized by a hump-shaped life cycle of financial literacy. Other studies have also shown a non-linear relationship between age and financial literacy, as evidenced by the lower financial literacy among younger and older people (Lusardi *et al.*, 2010; Lusardi and Mitchell, 2011*b*). The initial increase in financial literacy could come from experience, while the subsequent decline could be due to a decrease in cognitive abilities (Agarwal *et al.*, 2009). We included the age variable in the proposed model to explore the relationship between age and financial literacy in Japan.

Respondents' and their spouses' level of education has a direct impact on financial literacy. Because more educated people have more opportunities to take courses related to money management, they are more financially literate (Lusardi and Mitchell, 2011*b*, 2014). Psychological theories emphasizing cognitive ability could explain the empirically evident relationship between education and financial literacy (Lusardi *et al.*, 2010; Gill and Prowse, 2015). Danes and Haberman (2007) provided evidence

that taking a financial planning curriculum contributes positively to students' financial literacy. Social learning theories, on the contrary, could explain why the education level of a spouse and parents affects respondents' financial literacy. Empirical research shows that people learn from their surroundings, particularly from parents (Pinto *et al.*, 2005). People with educated parents and spouses could learn from their knowledge and experience (Mahdavi and Horton, 2014). Apart from the possibility of sharing knowledge with the spouse, spouses' education could also proxy for higher household income, which can motivate individuals to acquire financial knowledge for investment purposes. The influence of the spouse's education on financial literacy could also be explained from a different viewpoint. Similarly, parents' education could affect investment in financial literacy through a different channel. Parents' education also implies higher parental wealth and, consequently, higher expected inheritance, which could motivate individuals to acquire financial literacy. To accommodate these dimensions of education, we included respondents' education, the spouse's education, and parents' education in the proposed models.

The social learning process implies that having a spouse provides more opportunities to share and gather experiences, which could improve financial literacy. The influence of having a spouse on financial literacy could be interpreted through a different channel. A working spouse ensures additional income into the family and enables the counterpart to enjoy more leisure time, which could be invested in financial literacy. Therefore, we included the variable 'spouse' in the proposed models.

Social learning and consumer socialization theories imply that employment status significantly affects knowledge acquisition. People who are employed and have more opportunities to learn about financial issues from the workplace should be more financially literate. Lusardi and Mitchell (2011*a*) found that employed people have higher financial literacy worldwide. Occupation types could also significantly affect financial literacy. An occupation that requires an understanding of economic and financial aspects provides more scope for people to achieve financial literacy. Our study used 'finance and insurance' as the occupation that could positively affect financial literacy.

Previous studies also provide evidence that household income and financial assets are related to financial literacy (Guiso and Jappelli, 2008; Lusardi and Tufano, 2009). Economic factors create a link between income and financial assets. People who earn a higher income and hold more assets need to understand how to use money to maximize their future benefits. Thus, we included the income and asset variables and assume that respondents with a higher income and more assets are more financially literate.

In this study, we emphasized the predictive power of psychological factors for financial literacy controlling for conventionally used demographic and socio-economic factors. We assumed that people's outlook toward the future and concern for future well-being (given the current state of financial satisfaction) affect the acquisition of financial literacy. From this viewpoint, we included three psychological variables in our study: future orientation, current state of financial satisfaction, and anxiety about life in old age.

Future orientation measures how individuals view the future, which involves future expectations and fears (Nurmi, 1991; Seginer, 2009). Future orientation is influenced primarily by psychological features, culture, and social norms (Kluckhohn and Strodtbeck, 1961; Jones, 1988; Hershey and Mowen, 2000). Previous studies have provided evidence on the association of future orientation with behavioral outcomes (Jacobs-Lawson and Hershey, 2005; Alm, 2011) and financial decisions (Webley and Nyhus, 2006; Rabinovich and Webley, 2007; Howlett *et al.*, 2008). Individuals who emphasize the present have been found to have weak incentives to acquire financial literacy for maximizing future financial benefits. Further, there exist differences in the measurement of future orientation in the literature in terms of the number of items used (Ko and Gentry, 1991; Strathman *et al.*, 1994; Keough *et al.*, 1999; Bowen *et al.*, 2006). Most items used to measure future orientation focus on people's outlook toward an uncertain future. Since our dataset did not have multiple items on a respondent's outlook toward future uncertainty, we rather relied on a single affirmation that directly determines how respondents perceive future uncertainty: 'Since the future is uncertain, it is a waste to think about it.' While different results are typical because of the methodological diversity of measuring future orientation (Keough *et al.*, 1999), this question captured respondents' future orientation sufficiently.

Our second psychological variable, current state of financial satisfaction, could also affect financial literacy. Previous studies have mostly considered financial satisfaction to be an outcome of financial knowledge, suggesting that greater financial literacy improves financial satisfaction (Loibl and Hira, 2005; Ali et al., 2015). Murphy (2013) used financial satisfaction as a predictor of financial literacy in the United States, utilizing the present financial situation and difficulty of making monthly payments as measures of financial satisfaction. We measured financial satisfaction according to participants' responses to the following question: 'How satisfied are you with the current financial situation of your family?' This approach was in line with the definition of financial satisfaction provided by Joo (2008) and the measurement processes of Ali et al. (2015), Morgan (1992), and Murphy (2013). Although the wording and number of items vary in these previous studies, a rather similar question is used.

Finally, our third psychological variable, anxiety about life in old age, could also motivate people to acquire more financial knowledge, especially on savings and retirement plans to make life more secure in old age. Previous studies have found a linkage between anxiety about the current financial strain and better financial management (Walker, 1996). However, the role of anxiety about life in old age in the acquisition of financial literacy remains an unexplored issue. We measured anxiety about life in old age according to the evaluations of the affirmation 'I have anxieties about my life after I turn 65,' in line with the definition of anxiety by the American Psychological Association (2016). Similar to the previous psychological factors, the measures of anxiety differ among extant studies. However, Beck and Stanley (2001) argued that most self-reported anxiety measures work well.

1.3 Model

This study used a linear regression model to investigate the determinants of financial literacy in Japan. In the regression, financial literacy is the dependent variable, and there are 14 independent variables based on respondents' demographic, socio-economic, and psychological features. The regression equation is as follows:

$$
\begin{aligned}
\text{Financial\ literacy}_i\ (\text{fliteracy}) = {}& \alpha_0 + \beta_1 \text{age}_i + \beta_2 \text{gender}_i + \beta_3 \text{spouse}_i \\
& + \beta_4 \text{education}_{\text{respondents}_i}(\text{educ}) + \beta_5 \text{education}_{\text{spouse}_i}(\text{seduc}) \\
& + \beta_6 \text{education}_{\text{father}_i}(\text{feduc}) + \beta_7 \text{education}_{\text{mother}_i}(\text{meduc}) \\
& + \beta_8 \text{household\ income}_i + \beta_9 \text{household\ assets}_i \\
& + \beta_{10} \text{employment\ status}_i(\text{emplstatus}) + \beta_{11} \text{occupation}_i \\
& + \beta_{12} \text{future\ orientation}_i + \beta_{13} \text{financial\ satisfaction}_i(\text{finsatisfaction}) \\
& + \beta_{14} \text{anxiety}_i + \varepsilon_i
\end{aligned}
\tag{1}
$$

Since the distribution of financial literacy by age in Table 2 indicates a nonlinear relationship between financial literacy and age, we examined the relationship more closely by adding an age^2 variable into model 2. A positive (negative) coefficient of age would indicate a positive (nonlinear) relationship between age and financial literacy:

$$
\begin{aligned}
\text{Financial\ literacy}_i\ (\text{fliteracy}) = {}& \alpha_0 + \beta_1 \text{age}_i + \beta_2 \text{age}_i^2 + \beta_3 \text{gender}_i + \beta_4 \text{spouse}_i \\
& + \beta_5 \text{education}_{\text{respondents}_i}(\text{educ}) + \beta_6 \text{education}_{\text{spouse}_i}(\text{seduc}) \\
& + \beta_7 \text{education}_{\text{father}_i}(\text{feduc}) + \beta_8 \text{education}_{\text{mother}_i}(\text{meduc}) \\
& + \beta_9 \text{household\ income}_i + \beta_{10} \text{household\ assets}_i \\
& + \beta_{11} \text{employment\ status}_i(\text{emplstatus}) + \beta_{12} \text{occupation}_i \\
& + \beta_{13} \text{future\ orientation}_i + \beta_{14} \text{financial\ satisfaction}_i(\text{finsatisfaction}) \\
& + \beta_{15} \text{anxiety}_i + \varepsilon_i
\end{aligned}
\tag{2}
$$

In addition to the linear regression models, we also used a generalized linear model (GLM). The GLM, a flexible generalization of the ordinary linear regression, provides better estimates when the dependent variable is proportional in nature whose values fall between 0 and 1. Finally, we used a logit model after converting the dependent variable into a binary variable. To be fit for the logit model, we coded the dependent variable 1 when respondents could answer all questions correctly and 0 otherwise. The independent variables used in the GLM and probit models remained the same as in the linear regression models.

To measure the accuracy of the estimation, we calculated the standard error of the regression and standard error of the coefficients. The standard error of the regression estimates the standard deviation of the error term and is denoted as 'Root MSE' in the regression output. Root MSE was measured as the square root after dividing the sum of the squares of the residual by its degrees of freedom. The standard errors of the coefficients were obtained by dividing the standard deviation of the error term by the sample standard deviation of the variable adjusted by the number of observations. Higher standard errors reduce the accuracy of the overall estimation model as well as the significance level of the regression coefficients.

2. Empirical results

Table 4 summarizes the findings on the determinants of financial literacy in Japan. The F statistic demonstrates the overall validity of the model. We use six models to examine the determinants of financial literacy in Japan. Model 1 considers all respondents, model 2 considers only married respondents, model 3 considers all respondents along with an additional variable (age^2) to understand the nature of the relationship between age and financial literacy more clearly, model 4 considers the financial literacy score by using an additional question on the pricing behavior of securities in addition to the three basic questions on financial literacy, model 5 is the GLM model, and model 6 is the probit model. Models 1–4 use ordinary least squares (OLS) to find the determinants of financial literacy. We show that demographic features such as gender, age, and education considerably affect financial literacy. Among these, gender appears to be the most significant, indicating that male respondents are significantly more financially literate than female respondents are, which is in line with the descriptive statistics in Table 1. For example, the OLS results show that when changing the respondent from female to male, the financial literacy score increases by 0.084. Age and education are also economically significant determinants of financial literacy in Japan. Both are positively related to financial literacy, indicating that younger and less educated respondents are less financially literate. For example, the OLS results show that a 1-year increase in age and an additional year of education increase the financial literacy scores by 0.005 and 0.035, respectively. However, age does not have a linear relationship with financial literacy, meaning that age is positively related to financial literacy up to a certain point, after which the relationship does not hold. Although marital status is not found to be economically significant in all the models, the spouse's education is positively related to financial literacy, suggesting that more educated spouses help their counterparts attain higher financial literacy. Here, the OLS results show that a one-year increase in the spouse's education increases the financial literacy score by 0.015. The education of respondents' parents does not affect financial literacy, contrary to our hypothesis. We use several economic variables to examine the link between economic conditions and financial literacy. As expected, both income and assets are positively related to financial literacy. The OLS results show that a ¥1,000 increase in income or assets increases the financial literacy scores by 0.0085 or 0.0015, respectively. Although respondents' employment status does not contribute to financial literacy, occupation is significantly positive. This result means that respondents exposed to a financial environment in the workplace tend to be more financially literate.

We use three psychological variables in our model, of which future orientation is negatively related to financial literacy. Future orientation is found to be statistically and economically significant in all the models, suggesting that people's outlook toward the future is an important predictor of financial

Table 4. Regression coefficients

Model 1		Model 2		Model 3	
fliteracy	Coef.	fliteracy	Coef.	fliteracy	Coef.
Gender	0.084 (8.13)***	Gender	0.083 (6.90)***	Gender	0.091 (8.64)***
Age	0.005 (10.42)***	Age	0.005 (9.15)***	Age	0.019 (5.89)***
Spouse	−0.014 (−1.02)	Spouse	0.091 (1.53)	Age²	0.000 (−4.34)***
educ	0.035 (12.71)***	educ	0.028 (8.43)***	Spouse	−0.028 (−2.04)**
feduc	0.003 (1.14)	seduc	0.015 (4.69)***	educ	0.034 (12.31)***
meduc	0.002 (0.60)	feduc	0.001 (0.39)	feduc	0.004 (1.31)
Income	0.000 (7.61)***	meduc	0.000 (0.09)	meduc	0.004 (1.00)
Asset	0.000 (4.33)***	Income	0.000 (5.90)***	Income	0.000 (7.13)***
emplstatus	−0.013 (−1.10)	Asset	0.000 (4.28)***	Asset	0.000 (4.40)***
Occupation	0.109 (3.24)***	emplstatus	−0.011 (−0.87)	emplstatus	−0.027 (−2.15)**
Future	−0.027 (−4.56)***	Occupation	0.104 (2.70)***	Occupation	0.108 (3.22)***
finsatisfaction	0.008 (1.50)	Future	−0.027 (−4.17)***	Future	−0.026 (−4.44)***
anxiety	0.001 (0.17)	finsatisfaction	0.009 (1.57)	finsatisfaction	0.011 (1.90)*
cons	−0.268 (−3.95)***	anxiety	0.001 (0.11)	Anxiety	−0.001 (−0.17)
		cons	−0.436 (−4.50)***	cons	−0.586 (−5.87)***
F	56.77***	F	41.54***	F	51.10***
Adj. R^2	14.63	Adj. R^2	15.15	Adj. R^2	15.23
Obs.	3,905	Obs.	3,179	Obs.	3,905

Model 4		Model 5 (GLM)		Model 6 (logit)	
fliteracy	Coef.	fliteracy	Coef.	fliteracy	Coef.
Gender	0.088 (10.04)***	Gender	0.091 (8.64)***	Gender	0.534 (7.21)***
Age	0.014 (5.23)***	Age	0.019 (5.89)***	Age	0.109 (4.77)***
Age²	0.000 (−3.77)***	Age²	0.000 (−4.34)***	Age²	−0.001 (−3.26)***
Spouse	−0.022 (−1.92)*	Spouse	−0.028 (−2.04)**	Spouse	−0.169 (−1.75)*
educ	0.030 (12.98)***	educ	0.034 (12.31)***	educ	0.213 (10.32)***
feduc	0.003 (1.17)	feduc	0.004 (1.31)	feduc	0.022 (1.13)
meduc	0.003 (1.06)	meduc	0.004 (1.00)	meduc	0.021 (0.77)
Income	0.000 (6.68)***	Income	0.000 (7.13)***	Income	0.000 (7.07)***
Asset	0.000 (5.54)***	Asset	0.000 (4.40)***	Asset	0.000 (3.79)***
emplstatus	−0.028 (−2.66)***	emplstatus	−0.027 (−2.15)**	emplstatus	−0.082 (−0.94)
Occupation	0.173 (6.18)***	Occupation	0.108 (3.22)***	Occupation	1.006 (3.32)***
Future	−0.024 (−4.91)***	Future	−0.026 (−4.44)***	Future	−0.132 (−3.12)***
finsatisfaction	0.010 (2.03)**	finsatisfaction	0.011 (1.90)*	finsatisfaction	0.047 (1.19)
Anxiety	0.000 (−0.11)	Anxiety	−0.001 (−0.17)	Anxiety	0.019 (0.51)
cons	−0.472 (−5.69)***	cons	−0.586 (−5.87)***	cons	−6.770 (−9.36)***
F	58.79***	Log likelihood	−989.051	Log likelihood	−2,328.02
Adj. R^2	17.17	AIC	0.514	LR χ^2	512.44***
Obs.	3,905	Obs.	3,905	Obs.	3,905

literacy. The coefficient indicates that respondents who consider thinking about the future to be a waste of time tend to be less financially literate. For example, the OLS results show that for a one-unit negative change in the scale of future orientation, the financial literacy score decreases by 0.027. Although the current state of financial satisfaction is found to be statistically significant in model 5 and model 6, it is not found to be economically significant considering its influence in the other models. However, we find no evidence that respondents' anxiety about life in old age influences financial literacy. The factors that affect financial literacy in Japan do not differ based on marital status, as the significance levels of the coefficients are the same in model 1 and model 2.

2.1 Robustness checks

We check the robustness of the results using an alternative measure of financial literacy that places more weight on the questions on risk diversification and pricing behavior. The term 'weighted financial literacy' (fliteracy_w) denotes financial literacy measured by this alternative method with the same

Table 5. Regression coefficients using alternative measures of financial literacy

Model 1		Model 3		Model 4	
fliteracy_w	Coef.	fliteracy_w	Coef.	fliteracy_w	Coef.
Gender	0.258 (8.13)***	Gender	0.276 (8.64)***	Gender	0.352 (10.04)***
Age	0.016 (10.42)***	Age	0.058 (5.89)***	Age	0.057 (5.23)***
Spouse	−0.042 (−1.02)	Age^2	0.000 (−4.34)***	Age^2	0.000 (−3.77)***
educ	1.06 (12.71)***	Spouse	−0.086 (−2.04)**	Spouse	−0.089 (−1.92)
feduc	0.009 (1.14)	educ	0.103 (12.31)***	educ	0.119 (12.98)***
meduc	0.007 (0.60)	feduc	0.011 (1.31)	feduc	0.011 (1.17)
Income	0.000 (7.61)***	meduc	0.012 (1.00)	meduc	0.013 (1.06)
Asset	0.000 (4.33)***	Income	0.000 (7.13)***	Income	0.000 (6.68)***
emplstatus	−0.041 (−1.10)	Asset	0.000 (4.40)***	Asset	0.000 (5.54)***
Occupation	0.331 (3.24)***	emplstatus	−0.082 (−2.15)**	emplstatus	−0.111 (−2.66)***
Future	−0.083 (−4.56)***	Occupation	0.328 (3.22)***	Occupation	0.691 (6.18)***
finsatisfaction	0.026 (1.50)	Future	−0.080 (−4.44)***	Future	−0.097 (−4.91)***
Anxiety	0.003 (0.17)	finsatisfaction	0.033 (1.90)*	finsatisfaction	0.038 (2.03)**
cons	−2.981 (−14.51)***	Anxiety	−0.003 (−0.17)	Anxiety	−0.002 (−0.11)
		cons	−3.945 (−13.06)***	cons	−4.548 (−13.70)***
F	53.34***	F	51.10***	F	58.79***
Adj. R^2	14.84	Adj. R^2	15.23	Adj. R^2	17.17
Obs.	3,905	Obs.	3,905	Obs.	3,905

linear regression model. The results in Table 5 show that as for the unweighted measure of financial literacy, the weighted measure is also affected by factors such as gender, age, respondents' and spouses' education, income, assets, occupation, and future orientation. Since the effect and statistical significance of the variables are similar for both the weighted and unweighted measures of financial literacy, we conclude that issues related to measuring financial literacy do not create biases in the estimation.

Endogeneity could have affected the OLS regression coefficients in Table 4, likely due to the asset variable. Asset holdings may increase financial literacy or financial literacy may increase asset holdings. To control for this reverse causality between assets and financial literacy, we use asset inheritance from parents as an instrument for assets. Asset inheritance is a dummy variable equal to 1 if respondents received at least ¥5 million from their parents and 0 otherwise. Table 6 reports the regression coefficients for models 3 and 4, which show that the positive effect of assets on financial literacy no longer exists using this instrument. However, the effect of the other variables remains almost the same, although the weak evidence of financial satisfaction disappears. We also use the generalized structural equation modeling (GSEM) to control for the endogeneity issue in the logit model results in Table 6. The results show that the positive effect of assets on financial literacy remains significant but that the effect of financial satisfaction on financial literacy disappears. In a test unreported because of space considerations (available on request), we also test the endogeneity of the three psychological factors by observing whether they are significantly related to the predicted value of the residual. The test results confirm that these psychological variables do not have endogeneity bias.

3. Discussion

Previous studies have investigated the need for financial literacy to improve household decisions such as savings, retirement planning, and investments (Bernheim and Garrett, 2003; Lusardi and Mitchell, 2011*a*; 2011*b*; Van Rooij *et al.*, 2011; 2012; Sekita, 2013; Boisclair *et al.*, 2017). However, few studies examine what determines financial literacy or what motivates people to acquire financial knowledge. Our study provides evidence of the determinants of financial literacy in Japan. We based the study on three theories related to the learning process: social learning theory, consumer socialization theory, and psychological theory. We identified 14 variables that could affect financial literacy and grouped them into demographic, socio-economic, and psychological factors.

Table 6. Regression coefficients after controlling for endogeneity bias

Model 3		Model 4		Model 5 (GSEM)	
fliteracy	Coef.	fliteracy	Coef.	fliteracy	Coef.
Gender	0.092 (8.54)***	Gender	0.088 (9.86)***	Gender	0.534 (7.21)***
Age	0.019 (5.70)***	Age	0.014 (5.12)***	Age	0.109 (4.77)***
Age^2	0.000 (−4.36)***	Age^2	0.000 (−3.76)***	Age^2	−0.001 (−3.26)***
Spouse	−0.023 (−1.30)	Spouse	−0.021 (−1.44)	Spouse	−0.169 (−1.75)*
educ	0.033 (10.33)***	educ	0.030 (11.11)***	educ	0.213 (10.32)***
feduc	0.004 (1.31)	feduc	0.002 (1.17)	feduc	0.022 (1.13)
meduc	0.003 (0.88)	meduc	0.003 (1.02)	meduc	0.021 (0.77)
Income	0.000 (3.13)***	Income	0.000 (3.24)***	Income	0.000 (7.07)***
Asset	0.000 (1.02)	Asset	0.000 (0.79)	Asset	0.000 (3.79)***
emplstatus	−0.024 (−1.64)	emplstatus	−0.027 (−2.27)***	emplstatus	−0.082 (−0.94)
Occupation	0.107 (3.18)***	Occupation	0.173 (6.15)***	Occupation	1.006 (3.32)***
Future	−0.025 (−4.04)***	Future	−0.024 (−4.62)***	Future	−0.132 (−3.12)***
finsatisfaction	0.007 (0.78)	finsatisfaction	0.009 (1.16)	finsatisfaction	0.047 (1.19)
Anxiety	0.001 (0.11)	Anxiety	0.000 (−0.04)	Anxiety	0.019 (0.51)
cons	−0.565 (−5.16)***	cons	−0.468 (−5.15)***	cons	−6.770 (−9.36)***
F	49.61***	F	56.64***	Log likelihood	−2,328.02
Adj. R^2	14.91	Adj. R^2	17.15		
Obs.	3,905	Obs.	3,905	Obs.	3,905

3.1 Demographic and socio-economic factors

This study reconfirms the influence of several demographic and socio-economic factors on financial literacy. Among the demographic factors, we found that gender, age, and education significantly affect financial literacy in Japan. Our finding that male respondents are more financially literate than female respondents is also supported by previous studies (Lusardi and Mitchell, 2008; Sekita, 2011; Atkinson and Messy, 2012; Hung et al., 2012; Kadoya and Khan, 2017). Fonseca et al. (2010) argued that the gender gap in financial literacy cannot be explained by the characteristics of men and women but rather by how literacy is produced. Apart from gender, age is also positively related to financial literacy. However, we found that the relationship is not monotonous; rather, financial literacy peaks in middle age and begins to decline thereafter. Although previous studies show that people that learn through mistakes and over time become more knowledgeable (Martin and Oliva, 2001; Lachance and Choquette-Bernier, 2004), Lusardi and Mitchell (2014) argued that the relationship is not so linear. Lusardi and Mitchell (2011b) and Lusardi et al. (2010) also found a nonlinear relationship between age and financial literacy. Education is an important variable with the most direct influence on financial literacy, which is supported by psychological theory that emphasizes cognitive ability (Lusardi et al., 2010; Gill and Prowse, 2015), while the influence of spouses' and parents' education is supported by social learning theory (Pinto et al., 2005; Mahdavi and Horton, 2014). We found that respondents' and spouses' education have a positive impact on financial literacy, while parents' education does not. Although our findings related to respondents and their spouse's education are supported by theory and empirical evidence, the insignificant impact of parents' education is contrary to our hypothesis. We argue that the age structure of respondents and their parents could explain this finding. Since the average age of the respondents in this sample is more than 52 years, they could have less interaction with their parents. Moreover, parents from the older generations are themselves less financially educated, which gave their children fewer opportunities to learn through socialization. Among the demographic variables, marital status does not influence financial literacy, although the spouse's education does, which implies that social learning theory works only when respondents have capable spouses.

In terms of socio-economic background, both income and assets have significantly positive effects on financial literacy, in line with previous studies (Guiso and Jappelli, 2008; Lusardi and Tufano, 2009; Yoshino et al., 2017). We also examined employment status and occupation type to understand

whether work experience is related to financial literacy. Although employment status does not have an effect, occupation has a significant impact. Respondents with working experience in the finance area are more financially literate than others. While Lusardi and Mitchell (2011*b*) reported that financial literacy is higher among employed respondents in their sample, our findings suggest that employment status itself does not enhance financial knowledge; rather, work experience in a relevant field improves financial literacy.

3.2 Psychological factors

The process of integrating and expanding the intellectual horizon is known as cognitive development. While developing cognition, the psychological structure of humans is affected by a number of stimuli from the surrounding environment. The complex interactions between environmental stimuli and human cognition affect the acquisition of knowledge. We thus examined psychological factors to investigate whether respondents' psychological features influence their financial literacy.

Our first psychological variable, future orientation, has a similar meaning to time preference, level of patience, planning horizon, and people's time myopia. Future orientation measured the extent to which people emphasize the future compared with the present or past. Several studies have provided evidence that future orientation is positively related to planning for retirement (Hershey and Mowen, 2000; Howlett *et al.*, 2008) and net worth and income from savings at retirement (Burtless, 1999; Lusardi and Mitchell, 2007). On the basis that future orientation influences people's savings behavior, we assume that it also affects people's acquisition of financial knowledge. Those who consider thinking about the future to be a waste of time are less likely to acquire financial knowledge. Our study finds a significant negative relationship between less emphasis on the future and financial literacy, suggesting that people who weigh more on the future compared with the past or present are more financially literate. This result is robust to the measurement of financial literacy and endogeneity issues. Although we provide new evidence on the relationship between future orientation and financial literacy, our finding is in line with the relationship between future orientation and financial behavior established by the existing literature.

The second psychological variable, financial satisfaction, affects people's quality of life (Mugenda *et al.*, 1990) and is related to their financial behavior (Falahati *et al.*, 2012; Ünal and Düger, 2015). Although most previous studies have used financial satisfaction as an outcome variable, we consider it to be a predictor of financial literacy because some research also attributes financial dissatisfaction to academic failure (Joo *et al.*, 2008; Trombitas, 2012), negative financial practices (Hayhoe *et al.*, 2000), and individual behavior such as the erosion of feelings of control and self-worth (Krause *et al.*, 1991). On the basis that financial dissatisfaction causes a psychological disturbance, people have incentives to acquire financial literacy to improve their financial conditions. However, a positive association between financial satisfaction and the acquisition of financial knowledge can also be drawn from the literature on the grounds that affluent people acquire more financial knowledge (Kim and Sherraden, 2011). This strand of the literature has emphasized the effect of household income and wealth on the attainment of education. Our study provides weak evidence that the current state of financial satisfaction is positively related to the acquisition of financial literacy. We found a positive impact of financial satisfaction on financial literacy in the majority of our models, but the effect disappears when endogeneity issues are taken into account.

The third psychological variable is anxiety about life in old age. The American Psychological Association (2016) described anxiety as an emotion characterized by feelings of tension and worried thoughts. Hofmann *et al.* (2010) also defined anxiety as the sense of tension and troubled thoughts, which can substantially hamper the well-being of people and negatively affect their quality of life. Several studies have provided evidence that anxiety affects people's financial behavior. Hayhoe *et al.* (2012) found that people with low anxiety tend to engage in more recommended financial management behavior. However, in this study, we examined how anxiety about life in old age affects financial literacy, which is an unexplored issue that fundamentally differs from the current level of stress.

Table 7. Coefficients of the determinants of financial satisfaction and anxiety about life in old age

finsatisfaction	Coef.	Anxiety	Coef.
fliteracy	0.082 (1.52)	fliteracy	0.007 (0.13)
Gender	−0.087 (−2.42)**	Gender	−0.044 (1.21)
Age	0.005 (2.81)***	Age	−0.007 (−4.26)***
Spouse	−0.026 (−0.57)	Spouse	−0.144 (−3.10)***
educ	0.003 (0.33)	educ	−0.011 (−1.11)
feduc	0.011 (1.14)	feduc	−0.009 (−0.98)
meduc	0.010 (0.74)	meduc	0.002 (0.17)
Income	0.000 (10.90)***	Income	0.000 (−1.12)
Asset	0.000 (10.40)***	Asset	0.000 (−4.26)
Emplstatus	−1.09 (−2.64)***	emplstatus	0.061 (1.47)
Occupation	0.088 (0.77)	Occupation	0.022 (0.20)
Future	−0.014 (−0.69)	Future	0.002 (0.11)
Anxiety	−0.417 (−24.49)***	finsatisfaction	−0.463 (−24.81)***
/cut 1	−2.173	/cut 1	−4.001
/cut 2	−1.167	/cut 2	−3.112
/cut 3	0.028	/cut 3	−2.241
/cut 4	1.249	/cut 4	−1.061
LR χ^2	1,206.73***	LR χ^2	935.45***
Pseudo R^2	0.108	Pseudo R^2	0.082
Obs.	3,905	Obs.	3,905

Anxiety about life in old age is related to financial preparedness for old age and thus financial literacy. From this viewpoint, we expected a positive relationship between anxiety about life in old age and the acquisition of financial literacy. However, our results showed that anxiety about life in old age is not significantly related to financial literacy in any of our regression models, suggesting that, after controlling for all the other factors, people's anxiety about life in the future does not affect their acquisition of financial literacy. The results also imply that people's concern for their future life is not reflected in their educational preparedness. Our result is consistent with the findings of Schonwetter *et al.* (1995) that a high level of test-related anxiety reduces students' learning capacity and negatively affects the learning environment.

The results did not change when we checked their robustness in two ways: (i) using an additional question to measure financial literacy and (ii) using a weighted financial literacy score instead of the original unweighted score. We also addressed endogeneity problems from the perspective of the potential reverse causality of the asset variable. Using an instrumental variable regression model, we found that the positive effect of assets on financial literacy disappears, while the effect of the other variables remains significant. However, when we controlled for the endogeneity problem using a GSEM model in the logit form, the positive effect of assets on financial literacy remained significant.

Several studies use financial satisfaction as an outcome variable of financial knowledge along with other demographic and socio-economic variables. However, the effect of financial knowledge on financial satisfaction is not uniformly captured. Loibl and Hira (2005) found a positive effect of financial knowledge on financial satisfaction, Mugenda *et al.* (1990) found a negative effect, and Godwin (1994), Hira *et al.* (1992), and Parrotta and Johnson (1998) did not find any significant effect. Although our primary objective was to use financial satisfaction as a predictor of financial literacy, we also used it as a function of financial literacy along with the other demographic, socio-economic, and psychological variables to address the general relationship between financial satisfaction and financial literacy.

Table 7 reports the regression coefficients when financial satisfaction was used as a dependent variable and financial literacy as an independent variable, controlling for the demographic, socio-economic, and psychological features of respondents. The results show that financial literacy does not significantly affect financial satisfaction. Among the control variables, anxiety about life in old age, employment status, and gender are negatively related to financial satisfaction, whereas income and assets are positively related to financial satisfaction. Our results support the findings of the majority of the literature that financial knowledge is unrelated to financial satisfaction.

Although we used anxiety about life in old age as an explanatory variable of financial literacy, we also used the same variable as an outcome variable to better address the relationship between anxiety about life in old age and financial literacy. Table 7 also reports the regression coefficients when anxiety about life in old age was used as a dependent variable and financial literacy as an independent variable, controlling for the demographic, socio-economic, and psychological features of respondents. The results show that financial literacy does not significantly affect anxiety about life in old age. Among the control variables, financial satisfaction, spouse, and age are found to be negatively related to anxiety about life in old age. Our result supports the finding of Kadoya and Khan (2017), confirming that financial literacy does not have any direct effect on anxiety about future life.

4. Conclusion

This study sought to determine the factors affecting financial literacy in Japan using data from Osaka University's Preference Parameter Study. Although we examined several variables related to respondents' demographic, socio-economic, and psychological backgrounds drawn from social learning, consumer socialization, and psychological theories of learning, we emphasized the psychological factors affecting financial literacy in response to the lack of evidence provided in previous studies. We found that the demographic factors of gender, age, and education; the socio-economic factors of income and occupation; and the psychological factor of perceptions about the future significantly affect financial literacy. Among the factors found to be related to financial literacy, occupation, and future orientation are of particular interest because the other factors are somewhat related to the attainment of education in general. Having an occupation in the field of finance and insurance is helpful for attaining financial literacy because of the knowledge gained through working with financial matters. Future orientation is also a financial literacy specific factor because people tend to want to make better financial decisions when they place more importance on the future. We checked the robustness of the results using a different measure of financial literacy, which also confirmed our findings. The results emphasize the need for a formal financial education and social contact to boost financial literacy levels in Japan.

Our study has some limitations that affect the interpretations of our results and open avenues for future research. First, although we checked the robustness of our findings using a weighted measure of financial literacy, there is no consensus on how to measure financial literacy. Previous studies report that financial literacy scores vary depending on the questions in the questionnaire (Moore, 2003; Mandell, 2007; Hung *et al.*, 2009). Second, although we used respondents' education, we could not use their area of education because of the unavailability of data. Third, self-reported subjective anxiety and financial satisfaction levels might be somewhat misleading. Some people tend to make extreme choices (i.e., choosing 1 or 5 on a five-point scale), while others prefer to make moderate choices (i.e., 3), which affects our results.

Overall, the results of our study suggest that socialization and future orientation have a profound impact on the acquisition of financial literacy in Japan, which could improve residents' savings, retirement planning, and investment decisions. In view of the specialty of financial literacy, policymakers could consider promotion through special programs. As Yoshino and Yamori (2016) pointed out, financial education programs at the school level are not well organized and are not taught by specially trained teachers. Therefore, more focus on financial education in schools is needed. The socialization of financial education through television programs, training programs, and newspaper articles could also help people learn about finance. Well-trained people from financial institutions could be invited to deliver lectures on financial issues in schools, colleges, and on television programs, focusing on the need for financial education and investment management. Future orientation is an inherent psychological characteristic of humans that tends to change little. However, awareness of the need for precaution in the early stages of life could ensure that people place more importance on the future.

References

Agarwal S, Driscoll JC, Gabaix X and Laibson D (2009) The age of reason: financial decisions over the lifecycle. *Brookings Papers on Economic Activity* 2009, 51–117.

Agnew JR, Bateman H and Thorp S (2013) Financial literacy and retirement planning in Australia. *Numeracy* **6**, 7.

Alessie R, Van Rooij M and Lusardi A (2011) Financial literacy and retirement preparation in the Netherlands. *Journal of Pension Economics and Finance* **10**, 527–546.

Alessie R, Bucher-Koenen T, Lusardi A and van Rooij M (2013) Gender, Confidence and Financial Literacy. *Neuro Psycho Economics Conference Proceedings*.

Ali A, Abd Rahman MS and Bakar A (2015) Financial satisfaction and the influence of financial literacy in Malaysia. *Social Indicators Research* **120**, 137–156.

Alm S (2011) The worried, the competitive and the indifferent: approaches to the future in youth, their structural roots and outcomes in adult life. *Futures* **43**, 552–562.

American Psychological Association (2016). http://www.apa.org/topics/anxiety/index.aspx.

Arellano A, Cámara N and Tuesta D (2014) The Effect of Self-Confidence on Financial Literacy. BBVA Research WP, 14/28.

Atkinson A and Messy F-A (2012) Measuring Financial Literacy: Results of the OECD/International Network on Financial Education (INFE) Pilot Study. OECD Working Papers on Finance, Insurance, and Private Pensions, 15.

Bandura A and Walters RH (1977) *Social Learning Theory.* New York: General Learning Press.

Banks J (2010) Cognitive function, financial literacy and financial outcomes at older ages: introduction. *The Economic Journal* **120**, F357–F362.

Beck JG and Stanley MA (2001) Assessment of anxiety disorders in older adults: Current concerns, future prospects. In Antony MM, Orsollio SM and Roemer L (eds), *Practitioners Guide to Empirically Based Measures of Anxiety.* New York: Kluwer Academic/Plenum Publishers, pp. 43–48.

Bernheim BD and Garrett DM (2003) The effects of financial education in the workplace: evidence from a survey of households. *Journal of Public Economics* **87**, 1487–1519.

Boisclair D, Lusardi A and Michaud P-C (2017) Financial literacy and retirement planning in Canada. *Journal of Pension Economics and Finance* **16**, 277–296. DOI: http://dx.doi.org/10.1017/S1474747215000311.

Bowen GL, Rose RA and Bowen WB (2006) The reliability and validity of the school success profile learning organization measure. *Evaluation and Program Planning* **29**, 97–104.

Brown M and Graf R (2013) Financial literacy and retirement planning in Switzerland. *Numeracy* **6**, 6.

Brown M, Henchoz C and Spycher T (2017) Culture and financial literacy. University of St. Gallen, School of Finance Research Paper No. 2017/03.

Burtless G (1999) An economic view of retirement. In Aaron HJ (ed.), *Behavioral Dimensions of Retirement.* Washington, DC: Brookings Institution Press, pp. 7–42.

Chui ACW, Titman S and John Wei KC (2010) Individualism and momentum around the world. *The Journal of Finance* **65**, 361–392.

Danes SM and Haberman H (2007) Teen financial knowledge, self-efficacy, and behavior: a gendered view. *Journal of Financial Counselling and Planning* **18**, 48–60.

Falahati L, Fazli Sabri M and Paim LHJ (2012) Assessment a model of financial satisfaction predictors: examining the mediate effect of financial behaviour and financial strain. *World Applied Sciences Journal* **20**, 190–197.

Fonseca R, Mullen KJ, Zamarro G and Zissimopoulos J (2010) What Explains the Gender Gap in Financial Literacy? The Role of Household Decision-Making. Rand Corporation WP WR-762.

Gill D and Prowse VL (2015) Cognitive Ability, Character Skills, and Learning to Play Equilibrium: A Level-*k* Analysis. http://ssrn.com/abstract=2448144.

Godwin DD (1994) Antecedents and consequences of newlyweds' cash flow management. *Financial Counseling and Planning* **5**, 161–190.

Guiso L and Jappelli T (2008) Financial Literacy and Portfolio Diversification. EUI WP ECO 2008/31.

Gutter MS, Garrison S and Copur Z (2010) Social learning opportunities and the financial behaviors of college students. *Family and Consumer Sciences Research Journal* **38**, 387–404.

Haliassos M, Jansson T and Karabut Y (2016) Financial Literacy Externalities. Sveriges Riksbank Working Paper Series 333.

Hayhoe CR, Leach LJ, Turner PR, Bruin MJ and Lawrence FC (2000) Differences in spending habits and credit use of college students. *Journal of Consumer Affairs* **34**, 113–133.

Hayhoe CR, Cho SH, DeVaney SA, Worthy SL and Kim J (2012) How do distrust and anxiety affect saving behavior? *Family & Consumer Sciences* **41**, 69–85.

Hershey DA and Mowen JC (2000) Psychological determinants of financial preparedness for retirement. *The Gerontologist* **40**, 687–697.

Hira TK (1997) Financial attitudes, beliefs, and behaviours: differences by age. *Journal of Consumer Studies and Home Economics* **21**, 271–290.

Hira TK, Fanslow AM and Vogelsang R (1992) Determinants of satisfaction with preparation for financial emergencies. *Financial Counseling and Planning* **3**, 43–62.

Hofmann SG, Asnaani A and Hinton DE (2010) Cultural aspects in social anxiety and social anxiety disorder. *Depression and Anxiety* **27**, 1117–1127.

Howlett E, Kees J and Kemp E (2008) The role of self-regulation, future orientation, and financial knowledge in long-term decisions. *Journal of Consumer Affairs* **42**, 223–242.

Hung A, Parker AM and Yoong J (2009) Defining and measuring financial literacy. RAND Labor and Population Working Paper, WR-708.

Hung A, Yoong J and Brown E (2012) Empowering Women Through Financial Awareness and Education. OECD Working Papers on Finance, Insurance and Private Pensions, No. 14.

Jacobs-Lawson JM and Hershey DA (2005) Influence of future time perspective, financial knowledge, and financial risk tolerance on retirement saving behaviors. *Financial Services Review* **14**, 331–344.

Jappelli T and Padula M (2013) Investment in financial literacy and saving decision. *Journal of Banking and Finance* **37**, 2779–2792.

Jones JM (1988) Cultural differences in temporal perspectives: Instrumental and expressive behaviors in time. In McGrath JE (ed.), *The Social Psychology of Time: New Perspectives*. Newbury, CA: Sage, pp. 21–38.

Joo S-H (2008) Personal financial wellness. In Xiao JJ (ed.), *Handbook of Consumer Finance Research*. New York, NY: Springer Science + Business Media, pp. 21–33.

Joo SH, Durband DB and Grable J (2008) The academic impact of financial stress on college students. *Journal of College Student Retention* **10**, 287–305.

Kadoya Y (2016) What makes people anxious about life after the age of 65? Evidence from international survey research in Japan, the United States, China, and India. *Review of Economics of the Household* **14**, 443–461.

Kadoya Y, Khan MSR, Hamada T and Dominguez A (2018) Financial literacy and anxiety about life in old age: evidence from the USA. *Review of Economics of the Household* **16**, 859–878.

Kadoya Y and Khan MSR (2017) Can Financial Literacy Reduce Anxiety About Life at the Old Age? *Journal of Risk Research.* http://dx.doi.org/10.1080/13669877.2017.1313760

Kahneman D and Tversky A (1979) Prospect theory: an analysis of decision under risk. *Econometrica* **47**, 263–291.

Keough KA, Zimbardo PG and Boyd JN (1999) Who is smoking, drinking and using drugs? Time perspective as a predictor of substance use. *Basic and Applied Social Psychology* **21**, 149–164.

Kim Y and Sherraden M (2011) Do parental assets matter for children's educational attainment? Evidence from mediation tests. *Children and Youth Services Review* **33**, 969–979.

Kluckhohn FR and Strodtbeck FL (1961) *Variations in Value Orientations*. Evanston, IL: Row and Peterson.

Ko G and Gentry JW (1991) The development of time orientation measures for Use in cross-cultural research. In Holman RH and Solomon MR (eds), *NA – Advances in Consumer Research*. Provo, UT: Association for Consumer Research, pp. 135–142.

Koonce JC, Mimura Y, Mauldin TA, Michael Rupured A and Jordan J (2008) Financial information: is it related to savings and investing knowledge and financial behavior of teenagers? *Journal of Financial Counseling and Planning* **19**, 19–28.

Krause N, Jay G and Liang J (1991) Financial strain and psychological well-being among the American and Japanese elderly. *Psychology and Aging* **6**, 170–181.

Lachance MJ and Choquette-Bernier N (2004) College students' consumer competence: a qualitative exploration. *International Journal of Consumer Studies* **28**, 433–442.

Loibl C and Hira TK (2005) Self-directed financial learning and financial satisfaction. *Journal of Financial Counselling and Planning* **16**, 11–21.

Lusardi A and Mitchell OS (2007) Financial literacy and retirement preparedness: evidence and implications for financial education. *Business Economics* **42**, 35–44.

Lusardi A and Mitchell OS (2008) Planning and financial literacy: how do women fare? *American Economic Review* **98**, 413–417.

Lusardi A and Mitchell OS (2011a) Financial literacy around the world: an overview. *Journal of Pension Economics and Finance* **10**, 497–508.

Lusardi A and Mitchell OS (2011b) Financial literacy and retirement planning in the United States. *Journal of Pension Economics and Finance* **10**, 509–525.

Lusardi A and Mitchell OS (2014) The economic importance of financial literacy: theory and evidence. *Journal of Economic Literature* **52**, 5–44.

Lusardi A and Tufano P (2009) Debt Literacy, Financial Experiences, and Overindebtedness. NBER WP 14808.

Lusardi A, Mitchell OS and Curto V (2010) Financial literacy among the young: evidence and implications for consumer policy. *The Journal of Consumer Affairs* 44, 358–380.

Lusardi A, Michaud P-C and Mitchell OS (2017) Optimal financial knowledge and wealth inequality. *Journal of Political Economy* 125, 431–477.

Mahdavi M and Horton NJ (2014) Financial knowledge among educated women: room for improvement. *Journal of Consumer Affairs* 48, 403–417.

Mandell L (2007) Financial literacy of high school students. In Xiao JJ (ed.), *Handbook of Consumer Finance Research*. New York, NY: Springer, pp. 163–183.

Martin CA and Bush AJ (2000) Do role models influence teenagers' purchase intentions and behavior? *Journal of Consumer Marketing* 17, 441–454.

Martin A and Oliva JC (2001) Applications of social learning and cognitive learning developmental theories. *Journal of Family and Consumer Sciences* 93, 26–29.

Moore DL (2003) *Survey of Financial Literacy in Washington State: Knowledge, Behavior, Attitudes and Experiences* (Technical Report 03-39). Social and Economic Sciences Research Center, Washington State University.

Morgan JN (1992) Health, work, economic Status, and happiness. In Cutler NE, Gregg DW, and Lawton MP (eds), *Aging, Money, and Life Satisfaction: Aspects of Financial Gerontology*. New York: Springer, pp. 101–133.

Moschis GP and Churchill GA (1978) Consumer socialization: a theoretical and empirical analysis. *Journal of Marketing Research* 15, 599–609.

Mugenda OM, Hira TK and Fanslow AM (1990) Assessing the causal relationship among communication, money management practices, satisfaction with financial Status, and satisfaction with quality of life. *Journal of Family and Economic Issues* 11, 343–360.

Murphy JL (2013) Psychological factors and financial literacy. *Social Security Bulletin* 73, 73–81.

National Institute of Population and Social Security Research (2012). Population Statistics of Japan. http://www.ipss.go.jp/p-info/e/psj2012/PSJ2012.asp.

Nurmi J-E (1991) How do adolescents See their future? A review of the development of future orientation and planning. *Developmental Review* 11, 1–59.

OECD (2012) Household Accounts. https://data.oecd.org/hha/household-disposable-income.htm#indicator-chart.

OECD (2013) Financial literacy framework. In OECD (eds), *PISA 2012 Assessment and Analytical Framework: Mathematics, Reading, Science, Problem Solving and Financial Literacy*. Paris: OECD Publishing, pp. 139–165.

Parrotta JL and Johnson PJ (1998) The impact of financial attitudes and knowledge on financial management and satisfaction of recently married individuals. *Financial Counseling and Planning* 9, 59–75.

Pinto MB, Parente DH and Mansfield PM (2005) Information learned from socialization agents: its relationship to credit card Use. *Family and Consumer Sciences Research Journal* 33, 357–367.

Rabinovich A and Webley P (2007) Filling the gap between feeling and doing: psychological factors involved in the successful implementation of saving intention. *Journal of Economic Psychology* 28, 444–461.

Schonwetter DJ, Ward Struthers C and Perry RP (1995) An Empirical Investigation of Effective College Teaching Behaviors and Student Differences: Lecture Organization and Test Anxiety. Research Reports, Paper presented at the annual meeting of American Educational Research Association, CA: San Francisco.

Seginer R (2009) *Future Orientation: Developmental and Ecological Perspectives*. New York, NY: Springer Science.

Sekita S (2011) Financial literacy and retirement planning in Japan. *Journal of Pension Economics and Finance* 10, 637–656.

Sekita S (2013) Financial Literacy and Wealth Accumulation: Evidence from Japan. Discussion Paper No. 2013-01, Kyoto, Japan: Graduate School of Economics, Kyoto Sangyo University.

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

Strathman A, Gleicher F, Boninger DS and Scott EC (1994) The consideration of future consequences: weighting immediate and distant outcomes of behavior. *Journal of Personality and Social Psychology* 66, 742–752.

Trombitas K (2012) *Financial Stress: An Everyday Reality for College Students*. NE, Lincoln: White Paper, Inceptia.

Ünal S and Düger YS (2015) An empirical analysis on the relation between academics' financial well-being and financial behavior. *The International Journal of Economic and Social Research* 11, 213–227.

United Nations Development Program (2013) Human Development Reports. http://hdr.undp.org/en/content/expected-years-schooling-males-years.

United States Financial Literacy and Education Commission (2007) Taking Ownership of the Future: The National Strategy for Financial Literacy. https://www.treasury.gov/about/organizational-structure/offices/Domestic-Finance/Documents/Strategyeng.pdf.

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

Van Rooij M, Lusardi A and Alessie R (2012) Financial literacy, retirement planning and household wealth. *The Economic Journal* 122, 449–478.

Walker CM (1996) Financial management, coping and debt in households under financial strain. *Journal of Economic Psychology* **17**, 789–807.

Ward S (1974) Consumer socialization. *Journal of Consumer Research* **1**, 1–16.

Webley P and Nyhus EK (2006) Parents' influence on children's future orientation and saving. *Journal of Economic Psychology* **27**, 140–164.

Yoshino N and Yamori N (2016) Financial education in Japan. In Yoshino N, Messy F-A and Morgan PJ (eds), *Promoting Better Lifetime Planning Through Financial Education*. Singapore: World Scientific Publishing Co., pp. 98–103.

Yoshino N, Morgan PJ and Trinh LQ (2017) Financial Literacy in Japan: Determinants and Impacts. ADBI Working Paper 796. Tokyo: Asian Development Bank Institute.