Japanese Asset Formation and Financial Literacy*

SEKITA Shizuka

Associate Professor, the Faculty of Economics, Kyoto Sangyo University

Abstract

As the Japanese social security system is a pay-as-you-go system, it is an urgent challenge for Japan, a country experiencing an aging society with a low birthrate, to encourage asset accumulation by the people. This paper focuses on financial literacy, which is considered to be one of important factors for encouraging asset accumulation, analyzing its effects on asset accumulation, the paths of transmission of the effects, and its determinant factors. As a result of an empirical analysis conducted based on micro data from the Preference Parameters Study survey that was conducted in 2010, it was found that financial literacy has positive effects on asset accumulation and that its quantitative effects are substantial. The analysis results also indicated that financial literacy produces positive effects on asset accumulation by encouraging stockholding and developing savings plans. It was also found that people with low financial literacy typically have the following attributes: being young, being a woman, having poor academic achievement, having low grades in Japanese and mathematics, having low income, having many children, being over-confident, being risk-averse, having a high time discount rate, and being careless.

Keywords: financial literacy, asset accumulation, retirement planning, stockholding, financial education

JEL Classification: C26, D14, J26

I. Introduction

Japanese life expectancy is quite high. The average life expectancy in Japan is 81.09 years for men (3rd highest in the world) and 87.26 years for women (2nd highest in the world), according to the Abridged Life Table released by the Ministry of Health, Labour, and Welfare in 2017. Life expectancy in Japan is projected to increase every year. By 2065, the average life expectancy will likely reach 84.95 and 91.35 years for men and women, respectively, according to Table 4-2, Development of Life Expectancy at Birth by Sex (the

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medium mortality assumption), in the Population Projections for Japan (2017) released by the National Institute of Population and Social Security Research. Suppose that people retire at age 65 and that the average life expectancy is 85 and 91 years for men and women, respectively, men and women would live for 20 and 26 years, respectively, after retirement. Thus, they must have sufficient funds for long-term survival.

The 2018 Family Income and Expenditure Survey (Table 3-2, monthly income and expenditure per household by age group of the heads of households) shows the income and expenditure of senior citizens. The report states that households of two or more persons wherein all are unemployed, the average real income[1] of households wherein the head is 65 years or older is 224,063 yen (of which 191,872 yen comes from public pension payments), and their real average expenditure[2] is 267,171 yen. Thus, their household finances are, on average, in deficit, and it seems that many households must compensate for the shortfall with their savings. The Central Council for Financial Service Information in 2018 conducted a public opinion survey on household financial activities (targeting households with at least two members). The survey shows that 79.2% of the respondents said they were concerned about their old age (for senior citizens, their livelihood going forward). One of the most commonly cited reasons for their concerns was a lack of sufficient financial assets (69.0%).

Therefore, Japan must promote people's asset accumulation so that they can supplement their income in old age. Various factors may influence people's asset accumulation. Van Rooij, Lusardi, and Alessie (2012)[3] highlight that financial literacy is essential in promoting asset accumulation, suggesting two channels through which it could be promoted. The first channel is stock market participation. Financial literacy reduces the cost of collecting and processing information and lowers the barrier to stocks investing (Haliassos and Bertaut (1995), Vissing-Jorgenson (2004)). Thus, people with higher financial literacy are more likely to invest in the stock market (Van Rooij, Lusardi and Alessie (2011). Stock market investors would benefit from a stock premium and accumulated assets. The second channel is through the establishment of a savings plan for old age. If investors want to accumulate savings but lack the required self-discipline, a savings plan may help them control their spending (Ameriks, Caplin, and Leahy (2003)). However, establishing a savings plan is complex and involves collecting and processing various information, such as investment returns and pension benefits (Lusardi and Mitchell (2007)). People with high financial literacy would be able to perform such complex tasks easily. Hence, they are expected to establish a savings

[1] "Real income" refers to income before tax, a combination of the cash income of all household members. "Reception other than real income" (excluding money carried over) is, in a sense, income only in appearance. Although cash is made available, it is accompanied by a decline in assets or an increase in debt. "Money carried over" is cash-on-hand from the previous month.

[2] "Real expenditure" combines consumption expenditure and non-consumption expenditure. "Consumption expenditure" refers to living expenses, the amount paid for products and services necessary for daily living. "Non-consumption expenditure" is an expenditure that households cannot avoid, such as taxes and social insurance premiums. "Payments other than real expenditure" (excluding money carried forward) refers to, in a sense, an expenditure only in appearance. A decrease in cash-on-hand is accompanied by an increase in assets or a decrease in debt. "Money carried forward" refers to households' cash-on-hand at the end of each month.

[3] Van Rooij, Lusardi, and Alessie (2012) use micro data from the Annual De Nederlandsche Bank (DNB) Household Survey (DHS), a survey of Dutch households conducted from September 23 until 27, 2005.

plan and accumulate more assets. However, not everyone may agree with these channels. This is because those with low financial literacy may decide to purchase stocks without seriously considering the potential risks. Simultaneously, those with high financial literacy may be more cautious and avoid owning stocks precisely as they are aware of the potential risk of these assets. Furthermore, when it comes to the relationship between establishing a savings plan and asset accumulation, some people may be unable to estimate how much money they would need in their old age to establish a savings plan. Thus, they may become more concerned about their old age and accumulate more assets than those who established a savings plan. Therefore, whether financial literacy would promote asset accumulation may require empirical analysis.

This article uses data from Japan to examine whether people with higher financial literacy actually accumulate more assets. The article also analyzes whether the two channels through which financial literacy is said to promote asset accumulation are actually in effect and considers the attributes of people with lower financial literacy.

This article consists of five chapters. Chapter II provides an overview of the micro data used. Chapter III introduces the questions used to assess the survey participants' financial literacy and provides the ratio of correct answers. Chapter IV discusses the questions used to measure the participants' net assets and shows their asset distribution. Chapter V addresses the empirical results regarding the impact that financial literacy may have on people's asset accumulation, how assets are accumulated, and the determining factors of financial literacy. Chapter VI presents the conclusion.

II. Data

This article uses micro data from *Kurashi no konomi to manzokudo* (Preference Parameters Study). The survey was conducted as part of the FY2003-2007 21st century COE Program *Anketo chosa to jikken ni yoru kodo makuro dogaku* (Behavioral Macrodynamics Based on Surveys and Experiments), the FY2008-2012 Global COE program *Ningen kodo to shakai keizai no dainamikusu* (Human Behavior and Socioeconomic Dynamics), and the FY2015-2019 Grant-in-Aid for Scientific Research (S) *Choki fukyo no kodo keizaigaku teki bunseki* (Behavioral Economic Analysis of Long-Run Stagnation). The survey began in 2003 and collected nationwide data from men and women between 20 and 69 by the self-administered placement method. It was a panel survey, wherein follow-up interviews were conducted multiple times, targeting the same individuals. Moreover, new samples were extracted in 2004, 2006, and 2009 and added to the list of survey subjects. This article focuses on financial literacy. Since questions regarding financial literacy were asked only in the 2010 survey, the article uses micro data basically from 2010[4]. In the 2010 survey, 5,386 people provided valid answers with an 88% response rate[5]. However, data on respondents who

[4] Participants were given gift certificates rewards. The amount, which varied annually, was 1,500 yen in 2010.

[5] For this panel survey, question sheets were sent to the same individuals who cooperated with the previous year's survey. Perhaps as a result of this, the response rate was extremely high.

had not provided the information for this analysis were omitted. Students were also removed from the sample as they had been instructed to state the income and assets of their parents and not their own. In addition, empirical analysis on assets is sensitive to outliers. For this reason, the data on those in both the top and bottom 1% in the distribution of net assets were also eliminated. The final sample comprised 2,726 people[6].

III. Assessment of financial literacy

In *Kurashi no konomi to manzokudo* (2010 Preference Parameters Study), the respondents were asked the following four questions to assess their financial literacy:

Calculation of compound interest—Suppose you have 10,000 yen in your savings account with 2% annual interest. Further, the money and interest are never withdrawn from the account. How much money will you have in your savings account after 5 years? Please choose one answer from the following five:

1 More than 10,200 yen (the correct answer)
2 Exactly 10,200 yen
3 Less than 10,200 yen
4 I don't know
5 I don't want to answer

Inflation—Suppose that the annual interest rate on your savings account is 1% and the annual inflation rate is 2%. How much do you think you can buy with the money in that account after 1 year? Please choose one answer from the following five:

1 More than today
2 Exactly the same
3 Less than today (the correct answer)
4 I don't know
5 I don't want to answer

Risk diversification—Do you think the following sentence is true? "Buying a single company's stock usually provides a safer return than a stock mutual fund." Please choose one answer from the following four:

1 True
2 False (the correct answer)
3 I don't know

[6] Sampling weights were used in the entire empirical analysis to ensure that the population would be well represented.

4 I don't want to answer

Bond prices—What will happen to bond prices if interest rates decline? Please choose one answer from the following six:

1 Rise (the correct answer)
2 Fall
3 Remain unchanged
4 Other than 1, 2, and 3
5 I don't know
6 I don't want to answer

Table 1 shows the ratios of answers to the above four questions. The question regarding compound interest is basic and relatively easy to answer. Thus, about 76% of the respondents chose the correct answer. However, the ratio of correct answers fell to 61% when it came to the question regarding inflation, with 28% of the respondents saying that they did not know the answer. As for the question regarding risk diversification, only about 44% of the respondents chose the correct answer, with an extremely high percentage of people – 54% – saying that they did not know the answer. The question regarding bond prices had the lowest rate of correct response, with only 13% choosing the correct answer. Thus, many people lack the adequate financial literacy. Therefore, it would be wrong to assume that everyone has financial literacy[7].

Table 1. Answers to questions regarding financial literacy (unit: %)

	Compound interest	Inflation	Risk diversification	Bond prices
Correct	75.80	60.82	43.50	12.94
Incorrect	14.12	11.55	2.99	42.70
Do not know	10.08	27.62	53.50	44.36

(Note) Calculated by the author using *Kurashi no konomi to manzokudo* (2010 Preference Parameters Study)

IV. Measurement of net assets

Kurashi no konomi to manzokudo (Preference Parameters Study) asked the following questions regarding assets and liabilities:

The amount of financial assets—What is the amount of financial assets (savings, stocks, in-

[7] As explained in the main text, only four questions were asked to assess the respondents' financial literacy. Due to this, the survey may not have grasped everything that must be known about their financial literacy. Moreover, since the survey was conducted by the self-administered placement method, the possibility of cheating cannot be eliminated. Therefore, in light of these circumstances, the results of the empirical studies should be interpreted with some latitude.

surance, etc.) for your entire household? (If you are a student, please provide the financial assets of your parents.) Please select the one that applies and encircle the number.

1 Less than 2.5 million yen
2 From 2.5 million yen to less than 5 million yen
3 From 5 million yen to less than 7.5 million yen
4 From 7.5 million yen to less than 10 million yen
5 From 10 million yen to less than 15 million yen
6 From 15 million yen to less than 20 million yen
7 From 20 million yen to less than 30 million yen
8 From 30 million yen to less than 50 million yen
9 From 50 million yen to less than 100 million yen
10 100 million yen or more

Appraised value of real assets—What is the current appraised value of the house(s) and the land that your entire household owns? (If you are a student, please provide an answer regarding the house(s) and the land that belong to your parents.) Select the one that applies to you and encircle the number.

1 I don't own a house and land
2 Less than 5 million yen
3 From 5 million yen to less than 10 million yen
4 From 10 million yen to less than 15 million yen
5 From 15 million yen to less than 20 million yen
6 From 20 million yen to less than 30 million yen
7 From 30 million yen to less than 40 million yen
8 From 40 million yen to less than 50 million yen
9 From 50 million yen to less than 100 million yen
10 100 million yen or more

Liabilities other than housing loans—Do you have any liabilities other than housing loans? Select the one that applies to you and encircle the number.

1 I don't have any liabilities other than housing loans
2 From 10,000 yen to less than 500,000 yen
3 From 500,000 yen to less than 1 million yen
4 From 1 million yen to less than 2 million yen
5 From 2 million yen to less than 3 million yen
6 From 3 million yen to less than 5 million yen
7 From 5 million yen to less than 7.5 million yen
8 From 7.5 million yen to less than 10 million yen

9 10 million yen or more

The amount of housing loan—If you have housing loans, what is the current balance? Select the one that applies to you and encircle the number.

1 Less than 2.5 million yen
2 From 2.5 million yen to less than 5 million yen
3 From 5 million yen to less than 7.5 million yen
4 From 7.5 million yen to less than 10 million yen
5 From 10 million yen to less than 15 million yen
6 From 15 million yen to less than 20 million yen
7 From 20 million yen to less than 30 million yen
8 30 million yen or more
9 I don't have any housing loans

In this paper, "net financial assets" refers to the balance of financial assets after liabilities other than housing loans are excluded. "Net real assets" refers to the appraised value of real assets after housing loans are excluded, while "net assets" means a combination of net financial assets and net real assets. Since the survey asked multiple-choice questions, the lowest alternative was multiplied by 0.75, and the highest alternative by 1.25 when calculating assets and liabilities. The median value was used for other alternatives. For example, the balance of housing loans for respondents who chose alternative 1 was set at 1.875 million yen. The balance for those who chose alternative 2 was set at 3.75 million yen, while that for those who chose alternative 8 was set at 37.5 million yen.

Table 2 involves descriptive statistics of net assets, net financial assets, and net real assets. All variables contain considerable variation. For example, the average value of net assets is 22.46 million yen, while the standard deviation is 30.91 million yen.

Table 2. Descriptive statistics regarding net assets, net financial assets, and net real assets (unit: 10,000 yen)

	Mean	Median	Standard deviation
Net assets	2,246	1,250	3,091
Net financial assets	1,007	475	1,565
Net real assets	1,239	750	2,177

(Note) Calculated by the author using *Kurashi no konomi to manzokudo* (2010 Preference Parameters Study)

V. Empirical analysis regarding financial literacy and asset accumulation

This chapter discusses empirical results using micro data from *Kurashi no konomi to manzokudo* (2010 Preference Parameters Study). In V-1., the article presents an empirical analysis on the impact of financial literacy on asset accumulation and cites the determining

factors of financial literacy. The article then analyzes the impact of financial literacy on savings plans and stock ownership, which are regarded as channels through which financial literacy promotes asset accumulation.

V-1. Impact of financial literacy on asset accumulation

This chapter explores the relationship between financial literacy and asset accumulation. The simplest indicator for measuring people's financial literacy would be the number of correct answers to survey questions. While this indicator is easy to calculate, it also treats all questions equally, regardless of their level of difficulty or the nature of information. For this reason, the following empirical analysis uses a mechanism called PRIDIT[8] to construct a financial literacy indicator. This involves a two-step approach. In the first step, a respondent who provides a correct (incorrect) answer to an easy question would be given a small reward (a huge penalty). In addition, a respondent who provides a correct (incorrect) answer to a difficult question would be given a huge reward (a small penalty); for example, if a respondent provides a correct answer to a question on compound interest, he/she would receive a score of 0.24 (=1-0.758), since the ratio of correct responses is 75.8%. If the respondent provides an incorrect answer or chooses "I don't know," he or she would receive a score of -0.758. In the second step, a principle component analysis is conducted to calculate the weight of each question using the first eigenvalue and eigenvector. There are two criteria involved. 1) If an answer to a certain question is not closely correlated to their other answers, the question is considered "informative" and given a high weighting. 2) If the correct response ratio is neither zero, nor close to 1 but almost 50%, this question is confirmed "informative" and given a high weighting. Based on such calculations, the scores given to the questions regarding compound interest, inflation, risk diversification, and bond prices were 0.67, 0.72, 0.69, and 0.49, respectively. The weighting was small for the question concerning bond prices because the correct response ratio was extremely low at 13%, even though its correlation with other questions was low[9]. Finally, the four scores calculated in the first step were combined to determine the score for each respondent using weightings.

The average score was 0.0012, and the standard deviation was 0.0139. While the correlation between this score and the number of tabulated correct answers was extremely high at 0.9998, this article uses the PRIDIT scores that consider the difficulty of the questions and whether these questions were informative.

Table 3 shows the average and median values of the net assets of each group when people are divided into four groups in order of how high they scored, starting with those with the lowest scores. For example, the average value and the median value of net assets for

[8] It was also used by Behrman, Mitchell, Soo, and Bravo (2010) to calculate financial literacy scores. For details on how to calculate PRIDIT scores, see Brockett, Derrig, Golden, Levine, and Alpert (2002) and Lieberthal (2008).

[9] For example, a calculation was made for each correlation between answers to the question regarding bond prices and answers to other questions. Answers that had the lowest correlation with answers to the question about bond prices were those regarding compound interest, at 0.13. Those with the highest correlation were answers regarding risk diversification, at 0.20.

Table 3. Descriptive statistics regarding financial literacy and net assets (unit: 10,000 yen)

	Net assets	
	Mean	Median
Financial literacy		
1 (Low)	1,597	750
2	1,728	875
3	2,196	1,250
4 (High)	3,036	2,000

(Note) Calculated by the author using *Kurashi no konomi to manzokudo* (2010 Preference Parameters Study)

those in the group with the lowest score were 15.97 million yen and 7.5 million yen, respectively. In contrast, the average value and the median value of net assets for those in the group that had the highest score were 30.36 million yen and 20 million yen, respectively. Thus, as expected, the higher the level of financial literacy, the higher the average and median values of people's net assets. However, the results shown in Table 3 do not control for variables other than financial literacy. For this reason, the results do not indicate the pure impact of financial literacy on asset accumulation. The following empirical analysis controls for variables other than financial literacy to explore the impact of financial literacy on net assets.

First, an ordinary least squares (OLS) estimate is conducted to analyze the impact of financial literacy on net assets. For variables that may explain net assets other than financial literacy, this article considers dummies for respondents' educational attainments, dummies for "children's bank," a dummy for under-confidence, a dummy for over-confidence, dummies for age, a logarithm of income, a dummy for male, a dummy for those who are married, the number of children, a dummy for those who are retired, a dummy for bequest motives, changes in income, a dummy for those who are self-employed, health concerns, the degree of risk aversion, the time discount rate, carefulness, self-control, propensity to save, city dummies, and area dummies[10].

The results of the OLS estimation are shown in Model 1 of Table 5. As expected, financial literacy has significant positive impact on net assets. The size of the impact is also conspicuous. When the financial literacy score rises by 1 standard deviation point (equivalent to financial literacy rising from the average value to the 92nd percentile value), net assets increase from the average value by about 3 million yen (=242,827,618×0.0139). People's educational background also has significant positive impact on net assets. Those who graduated from high school or junior college have about 9 million yen more in net assets than junior-high-school graduates or those with lesser education. Moreover, those with four years of college education have about 16 million yen more in net assets. In addition, this article also includes a variable that indicates whether the elementary schools that their respondents at-

[10] See Table 4 for the definitions of explanatory variables.

Table 4. Definition of variables

Variables	Definition	Mean
Junior high school graduates	dummy for respondents who graduated from junior high school or those with lesser education	0.0573
High school graduates	dummy for high school graduates	0.4655
Junior college graduates	dummy for junior college graduates	0.1588
Four-years of college graduates	dummy for respondents who graduated from four years of college or those with higher education	0.3184
Children's bank (Yes)	dummy for respondents whose elementary school had children's bank	0.1215
Children's bank (No)	dummy for respondents whose elementary school did not have children's bank	0.7714
Children's bank (DK)	dummy for respondents who does not know if their elementary schools had children's bank or not	0.1071
Overconfident	dummy for respondents who are underconfident in their financial knowledge	0.3429
Underconfident	dummy for respondents who are overconfident in their financial knowledge	0.2894
Age20	dummy for respondents who are aged 20-29	0.1529
Age30	dummy for respondents who are aged 30-39	0.2511
Age40	dummy for respondents who are aged 40-49	0.2284
Age50	dummy for respondents who are aged 50-59	0.2029
Age60	dummy for respondents who are aged 60 or older	0.1648
Log(income)	logarithm of the annual earned income before taxes and with bonuses included of respondent's entire household for 2009	6.3213
Male	dummy for male	0.5327
Married	dummy for married respondents	0.7626
Children	number of children	1.6206
Retired	dummy for retired respondents	0.1711
Inheritance	regarding the statement "I want to leave my children as much of my inheritance as possible," if respondents choose "It is particularly true for you," they are set at 4, while if they choose "It doesn't hold true at all for you," they are set at 0 (2009 survey)	1.9930
Changes in income	regarding the question "How much did the annual earned gross income of your entire household change in 2009 as compared to 2008?," if respondents answer "increased by more than 9%," they are set at 11.25, if they answer "increased by 7-9%," they are set at 8, if they answer "increased by 5-7%," they are set at 6, if they answer "increased by 3-5%," they are set at 4, if they answer "increased by 1-3%," they are set at 2, if they answer "increased by less than 1%" or "decreased by less than 1%," they are set at 0, if they answer "decreased by 1-3%," they are set at -2, if they answer "decreased by 3-5%," they are set at -4, if they answer "decreased by 5-7%," they are set at -6, if they answer "decreased by 7-9%," they are set at -8, if they answer "decreased by more than 9%," they are set at -11.25	-1.7331
Self-employed	dummy for respondents who are self-employed or family business employee (in self-employed business)	0.1148
Health concerns	regarding the statement "I have anxieties about my health," if respondents choose "It is particularly true for you," they are set at 4, while if they choose "It doesn't hold true at all for you," they are set at 0	2.0969
Low risk aversion	dummy for respondents who choose "A job that has a 50% chance of the monthly income increasing by 30%, but also has a 50% chance of the monthly income decreasing by 10%" rather than "A job with which your monthly income is guaranteed to increase by 3%"	0.3059
Time preference	the annual interest rates are calculated at the time of choosing "to receive seven days later" in the question "you may choose optionA "to receive 10,000yen today" and optionB "to receive Xyen seven days later"	774.0915
Lack of alertness	When you usually go out, how high does the probability of rain have to be before you take an umbrealla?	49.7334
Self control	regarding the statement "If there is something that I want, I need to buy it," if respondents answer "It doesn't hold true at all for you," they are set at 4, while if they answer "It is particularly true for you," they are set at 0	2.2372
Saving preference	regarding the statement "Saving money is the objective of life," if respondents answer "It doesn't hold true at all for you," they are set at 0, while if they answer "It is particularly true for you," they are set at 4	1.3997

tended had a “children’s bank” as a factor that influences their net assets. Children’s banks (*kodomo ginko*) are, according to the Japanese edition of Encyclopedia Britannica, savings institutions modeled on banks or post offices. They are voluntarily operated by students as part of special activities of Japanese elementary schools and junior high schools under the schools’ supervision[11]. According to the Central Council for Financial Services Information[12], the first financial education ever conducted in Japan was through children’s banks. In elementary schools that have children’s banks, students are encouraged to make deposits regularly (e.g., twice a month). Such an experience may help students develop a habit of saving and prompt them to accumulate wealth[13]. The question regarding the availability of a children’s bank is as follows:

[11] The system, which began in Osaka in 1948, spread to many other prefectures after the director-general of the banking bureau of the Ministry of Finance and the director-general of the school education bureau of the Ministry of Education issued directives in April of that year to prefectural governors calling for the promotion of savings through educational institutions, according to the Japanese edition of Encyclopedia Britannica. In 1966, the previous directives were combined to create operational guidelines for children’ banks. In 1971, new operational guidelines were released along with a revision to school curriculum guidelines. As an overall trend, children’s banks have been in decline after they peaked around 1955, according to the article.

[12] *Kinyu kyoiku no susume (4) kaigai jirei o sanko ni* (Recommendations for financial education (4) referring to overseas cases) https://www.shiruporuto.jp/public/family/training/susume/susume401.html

[13] No taxes were imposed on interest income from deposits at children’s banks.

Was there a children's bank (a system for depositing and withdrawing money in school) in the elementary school that you attended?

1 Yes
2 No
3 I don't know

Using answers to this question, an estimate was made by adding to explanatory variables a dummy variable that becomes 1 when a respondent chooses "Yes." This variable is called the "children's bank (Yes) dummy." Another dummy variable, the "children's bank (DK) dummy" was also added. It becomes 1 when a respondent chooses "I don't know." The results were unexpected in that the coefficients of the two dummy variables were not statistically significant. The availability of a children's bank did not seem to have influenced the respondents' wealth accumulation as adults[14].

Van Rooij et al. (2012) posited that whether people were overconfident or underconfident about their own financial knowledge would influence their asset accumulation. Those who are underconfident may have small assets as they would not attempt to buy new financial products to make profits. Those who are overconfident may have seen their assets decline after purchasing financial products that they did not fully understand. To examine this issue, a variable has been created to assess whether people's confidence about their own financial knowledge (hereinafter "subjective financial literacy") matches their objective financial literacy. In the questionnaire survey, respondents were asked to rate the statement, "I'm knowledgeable about finance" on a scale of 1 to 5 relative to how applicable the statement was to them. (For example, respondents were asked to choose "1" if the statement was perfectly applicable and "5" if it was not applicable at all.) This was considered the measure of subjective financial literacy. For objective financial literacy, the variables introduced earlier as PRIDIT scores were used. The respondents were then placed in different groups – with objective financial literacy and subjective financial literacy each forming one set of groups. As a result, four groups were created for objective financial literacy and subjective financial literacy, respectively with each group containing roughly the same number of people. If a person was ranked higher in a subjective financial literacy group than in an objective financial literacy group, that person was regarded as "overconfident." If a person was ranked lower in a subjective financial literacy group than in an objective financial literacy group, the person was regarded as "underconfident." The empirical analysis demonstrated that people who were underconfident, as expected, had smaller net assets than those who correctly evaluated their own financial knowledge. Those who were overconfident, contrary to expectations, had larger net assets. It may be that underconfident people did not benefit because they had established a conservative portfolio and that overconfident people benefitted be-

[14] The availability of a children's bank may have a correlation with the saving propensity variable. However, even after the saving propensity was removed from explanatory variables, the significance of the coefficient of children's banks remained unchanged.

cause they had a more active portfolio that contributed to an increase in assets.

Explanatory variables other than those mentioned above also had a significant impact on net assets. Those who were older, had higher income, were female and unmarried, had fewer children, were retired, had an intention to leave an inheritance to children, were self-employed, and had fewer health concerns belonged to households with larger net assets.

Thus, the OLS estimation indicates that financial literacy promotes asset accumulation. However, financial literacy may have endogeneity problems. For example, those who have larger assets may have acquired more financial knowledge by investing in risky assets. If that is the case, the coefficient for financial literacy has an upward bias (simultaneity). Moreover, financial literacy may be related to unobservable variables that influence asset accumulation (omitted variables). For example, "abilities" that cannot be observed may not only have a positive impact on assets but also influence financial literacy. In such a case, the coefficient for financial literacy has an upward bias. Furthermore, the financial literacy variables defined in this article may have tainted the respondents' actual financial knowledge. If so, the coefficient for financial literacy has a bias toward zero (measurement errors). Therefore, the direction of a bias involving the financial literacy coefficient cannot be predicted beforehand.

To solve this endogeneity problem, this article uses, as instrumental variables for financial literacy, the respondents' grades in Japanese and mathematics classes when they were in the third year of junior high school. This is because people who possess the reading comprehension abilities required in Japanese classes and the calculation abilities required in math classes may have higher financial literacy. In addition, it is inconceivable that their grades in Japanese or math classes directly influence their asset accumulation other than through financial literacy. These variables were created using the following question:

What do you think your class grades were when you were in the third year of junior high school?

Your grade in Japanese ( ) Your grade in mathematics ( )

1 Among the bottom
2 Somewhat toward the bottom
3 Middle
4 Somewhat toward the top
5 Among the top

For grades in Japanese and math classes, dummy variables were each created to become 1 when respondents choose "somewhat toward the top" or "among the top." They were used as instrumental variables.

Model 2-2 of Table 5 shows the results of a generalized method of moments (GMM) estimation using the above instrumental variables. Even when the endogeneity problems are

Table 5. Impact of financial literacy on net assets, and determining factors of financial literacy

	Model 1	Model 2-1	Model 2-2
	Net assets	Financial literacy (1st step)	Net assets (2nd step)
	OLS	OLS	GMM
Financial literacy	24,282.7618***		61,927.0797**
	(5,576.7466)		(30,450.1384)
High school graduates	931.9198***	0.0023**	829.5401***
	(178.5400)	(0.0011)	(203.5667)
Junior college graduates	901.1501***	0.0021*	783.9670***
	(211.9353)	(0.0012)	(234.0505)
Four-years of college graduates	1,593.6249***	0.0047***	1,369.9178***
	(206.9682)	(0.0012)	(293.4841)
Children's bank (Yes)	17.4701	0.0003	-37.3245
	(148.2917)	(0.0006)	(148.9605)
Children's bank (DK)	28.1029	-0.0013*	99.6770
	(162.9023)	(0.0008)	(169.7879)
Underconfident	-358.3132**	0.0121***	-814.3146**
	(164.3772)	(0.0006)	(397.9050)
Overconfident	219.1363*	-0.0052***	411.4947**
	(127.5132)	(0.0006)	(204.2727)
Age30	404.9280**	0.0022**	317.5287
	(205.5677)	(0.0011)	(214.3369)
Age40	968.1932***	0.0043***	813.2593***
	(207.9686)	(0.0011)	(240.5869)
Age50	2,028.0975***	0.0048***	1,901.0548***
	(221.8102)	(0.0011)	(265.5091)
Age60	3,996.9232***	0.0067***	3,760.7998***
	(238.9349)	(0.0012)	(323.1827)
Log(income)	1,376.5722***	0.0020***	1,295.7656***
	(106.5528)	(0.0004)	(131.1356)
Male	-483.0052***	0.0045***	-645.2736***
	(129.7177)	(0.0005)	(186.0731)
Married	-1,184.6709***	0.0001	-1,220.3324***
	(166.4435)	(0.0007)	(170.1511)
Children	-115.9086**	-0.0005**	-94.1334
	(55.2154)	(0.0003)	(59.5468)
Retired	565.2099***	0.0007	537.3327***
	(157.2329)	(0.0006)	(162.8658)
Inheritance	282.4862***	-0.0001	296.5649***
	(58.3201)	(0.0002)	(58.9257)
Changes in income	-1.5621	-0.0001	3.0788
	(11.3600)	(0.0001)	(11.8042)
Self-employed	669.4797***	0.0004	687.0512***
	(174.8401)	(0.0006)	(177.4945)
Health concerns	-145.1722***	-0.0001	-137.9195**
	(53.6612)	(0.0002)	(54.9896)
Low risk aversion	-192.7916	0.0022***	-292.3405**
	(120.5119)	(0.0005)	(146.7888)
Time preference	-0.0381	-0.0000***	-0.0230
	(0.0336)	(0.0000)	(0.0381)
Lack of alertness	-3.8362	-0.0000***	-1.9139
	(3.0237)	(0.0000)	(3.3439)
Self control	-20.2136	0.0004	-39.9139
	(50.1820)	(0.0002)	(51.9984)
Saving preference	34.2958	-0.0002	48.1594
	(66.3390)	(0.0003)	(67.1676)
Grades in Japanese		0.0017***	
		(0.0005)	
Grades in Mathematics		0.0031***	
		(0.0005)	
Constant	-7,511.6739***	-0.0229***	-6,713.6294***
	(683.2735)	(0.0035)	(979.0124)
No. of observation	2,726	2,687	2,687
R-squared	0.2949	0.4778	0.2827
F-value of the excluded instruments			30.258
P-value of Hansen's OIR test			0.6513

(Note 1) Figures in parentheses are robust standard errors

(Note 2) *, **, and *** indicate that they are each significant at 10%, 5%, and 1%, respectively

(Note 3) Explanatory variables include three city-scale dummy variables and nine regional dummy variables. However, their coefficients are not shown.

considered, financial literacy has a positive impact on asset accumulation; in fact, its impact becomes even greater. When the financial literacy score rises by 1 standard deviation point (equivalent to financial literacy rising from the average value to the 92nd percentile value), net assets increase from the average value by about 8.6 million yen (=619,270,797×0.0139). The estimated impact of financial literacy in this case is greater than in the case of the OLS estimate. It is thus possible that measurement errors involving financial literacy may serve as a major endogenous factor. Meanwhile, the sign and the significance of the coefficients of explanatory variables other than financial literacy were the same as those in the OLS estimation.

The GMM estimation also shows the effects of household characteristics on financial literacy in the first step. The results indicate that people who had less education, were overconfident about their financial knowledge, were younger, female, and highly risk-averse, had lower income, many children, high time-discount rate, lacked alertness and poor grades in Japanese or mathematics tend to have lower financial literacy.

Finally, Table 6 shows the results of a robustness check conducted regarding the impact of financial literacy on net assets. Model 3 uses, as a variable for financial literacy, the number of correct answers to the four questions designed to measure financial literacy, rather than using PRIDIT scores. Model 4 is an estimate that only uses data on respondents who had not yet retired. Model 5 uses data on those who were married and were the primary decision makers in savings and investments. Model 6 and Model 7 use net financial assets and net physical assets, respectively, as dependent variables. In all cases, the coefficients of financial literacy are significantly positive. The results indicated that financial literacy promotes asset accumulation seem to be robust.

Table 6. Robustness check

	Model 3	Model 4	Model 5	Model 6	Model 7
Dependent variables	Net assets	Net assets	Net assets	Net financial assets	Net real assets
Estimation method	GMM	GMM	GMM	GMM	GMM
Coefficients of financial literacy	758.6392**	59,089.0900*	53,083.4600*	36,556.1100**	26,181.5600
	(373.0803)	(31,661.7300)	(32,219.1600)	(16,228.73)	(21,570.3300)
No. of observation	2,687	2113	1,232	2687	2,687
R-squared	0.2828	0.2579	0.3137	0.2006	0.2086
F-value of the excluded instruments	30.1025	26.9191	23.7936	30.2580	30.2580
P-value of Hansen's OIR test	0.6531	0.7711	0.8319	0.3180	0.9928
	Finanical literacy is defined as the number of correct answers	Keep the observations on non-retired respondents	Keep the observations on respondents who are married and the primary decision makers in savings and investments	Dependent variable is net financial assets	Dependent variable is net real assets

(Note 1) Figures in parentheses are robust standard errors
(Note 2) *, **, and *** indicate that they are each significant at 10%, 5%, and 1%, respectively

V-2. Stockholdings, saving plans and financial literacy

This chapter considers the channels through which financial literacy promotes asset accumulation. To explain that financial literacy promotes asset accumulation, Van Rooij, Lusardi, and Alessie (2012) proposed a channel through which greater wealth will be accumulated, as financial literacy promotes stockholdings. Thus, this section examines whether people with higher financial literacy do, in fact, tend to own more stocks. Such analysis is possible because *Kurashi no konomi to manzokudo* (Preference Parameters Study) has a section asking respondents about their financial assets, and "stocks" is mentioned as an option. The variables in Table 5 that explain net assets are used here as variables to explain stockholdings. Model 8-1 and Model 8-2 of Table 7 show the results of OLS and GMM estimates using the variable[15]. Financial literacy, as expected, has a positive impact on stockholdings for both models. Model 8-2, for example, shows that an increase in the financial literacy score by 1 standard deviation point (equivalent to financial literacy rising from the average value to the 92nd percentile value) raises the ratio of stockholdings by about 0.18 points (=12.6532×0.0139). Considering that the stockholdings is about 19%, increased financial literacy will have a strong impact on the probability of stockholdings.

Moreover, to explain why financial literacy promotes asset accumulation, Van Rooij, Lusardi, and Alessie (2012) promoted a channel through which people with higher financial literacy can build a savings plan and accumulate more wealth. Thus, this section examines whether people with higher financial literacy are more likely to establish a savings plan. *Kurashi no konomi to manzokudo* (2010 Preference Parameters Study) has two questions related to savings plans. These questions will be used here to analyze the impact that financial literacy may have on savings. Here is one of the questions:

Do you have a savings plan for the retirement of the head of your household? (If the head of your household has already retired, do you have a savings plan for your future)? Please choose one from the following four options:

1 Have a specific plan
2 Have a rough plan
3 I don't have any plan now, but I will have one in the future
4 I don't have any plan now, and I will not have one in the future

The dummy variable that becomes 1 when "1" or "2" is chosen from the above alternatives will be called the "savings plan" dummy. The other question is as follows:

How much have you thought about retirement? Please choose one from the following four

[15] Instrumental variables are also the same as those used in Table 5.

Table 7. Impact of financial literacy on stockholdings and savings plans

	Model 8-1	Model 8-2	Model 9-1	Model 9-2	Model 10-1	Model 10-2
Dependent variables	Stockholdings	Stockholdings	Have a savings plan	Have a savings plan	Have thought about retirement	Have thought about retirement
	OLS	GMM	OLS	GMM	OLS	GMM
Financial literacy	7.6583***	12.6532***	7.2471***	21.6573***	3.0844***	15.3440**
	(0.7548)	(4.2055)	(1.0465)	(8.0330)	(0.8287)	(6.9774)
High school graduates	0.0796***	0.0621**	-0.0096	-0.0558	0.0005	-0.0393
	(0.0240)	(0.0281)	(0.0455)	(0.0523)	(0.0351)	(0.0472)
Junior college graduates	0.0944***	0.0768**	-0.0101	-0.0604	-0.0069	-0.0497
	(0.0286)	(0.0328)	(0.0510)	(0.0584)	(0.0411)	(0.0532)
Four-years of college graduates	0.1711***	0.1355***	0.0065	-0.0954	0.0039	-0.0831
	(0.0285)	(0.0415)	(0.0510)	(0.0760)	(0.0407)	(0.0692)
Children's bank (Yes)	0.0169	0.0146	0.0689**	0.0639*	-0.0086	-0.0128
	(0.0222)	(0.0223)	(0.0310)	(0.0339)	(0.0207)	(0.0215)
Children's bank (DK)	0.0028	0.0089	-0.0427	-0.0219	-0.0232	-0.0064
	(0.0217)	(0.0229)	(0.0331)	(0.0348)	(0.0288)	(0.0312)
Underconfident	-0.0880***	-0.1475***	-0.1473***	-0.3247***	-0.0754***	-0.2257**
	(0.0217)	(0.0553)	(0.0277)	(0.0999)	(0.0236)	(0.0880)
Overconfident	0.0640***	0.0941***	0.0509*	0.1218**	0.0441**	0.1057**
	(0.0191)	(0.0287)	(0.0265)	(0.0510)	(0.0204)	(0.0413)
Age30	0.0590**	0.0450	0.0261	-0.0043	0.0857**	0.0602
	(0.0267)	(0.0290)	(0.0443)	(0.0500)	(0.0415)	(0.0429)
Age40	0.0801***	0.0571*	0.0308	-0.0330	0.1435***	0.0890*
	(0.0272)	(0.0337)	(0.0459)	(0.0607)	(0.0406)	(0.0481)
Age50	0.1308***	0.1056***	0.1014**	0.0290	0.1809***	0.1190**
	(0.0290)	(0.0371)	(0.0477)	(0.0648)	(0.0411)	(0.0504)
Age60	0.2026***	0.1633***	0.2433***	0.1336	0.2229***	0.1292**
	(0.0316)	(0.0450)	(0.0512)	(0.0817)	(0.0423)	(0.0636)
Log(income)	0.0536***	0.0423***	0.0869***	0.0561**	-0.0114	-0.0374
	(0.0126)	(0.0153)	(0.0193)	(0.0259)	(0.0169)	(0.0230)
Male	0.0242	0.0038	-0.0238	-0.0853**	-0.0598***	-0.1114***
	(0.0157)	(0.0231)	(0.0232)	(0.0424)	(0.0195)	(0.0362)
Married	0.0579***	0.0557**	0.0184	0.0153	0.0737***	0.0704***
	(0.0220)	(0.0225)	(0.0324)	(0.0352)	(0.0258)	(0.0272)
Children	-0.0218**	-0.0190**	-0.0100	-0.0025	-0.0134	-0.0071
	(0.0085)	(0.0086)	(0.0117)	(0.0131)	(0.0083)	(0.0094)
Retired	0.0626***	0.0611***	0.0385	0.0275	-0.0025	-0.0108
	(0.0222)	(0.0228)	(0.0288)	(0.0310)	(0.0196)	(0.0215)
Inheritance	0.0026	0.0028	0.0108	0.0106	0.0081	0.0078
	(0.0074)	(0.0075)	(0.0107)	(0.0115)	(0.0082)	(0.0088)
Changes in income	0.0002	0.0006	0.0055**	0.0068***	0.0009	0.0018
	(0.0017)	(0.0017)	(0.0022)	(0.0024)	(0.0019)	(0.0019)
Self-employed	0.0121	0.0105	0.0371	0.0321	-0.0041	-0.0084
	(0.0223)	(0.0222)	(0.0295)	(0.0299)	(0.0239)	(0.0252)
Health concerns	-0.0044	-0.0042	0.0120	0.0142	0.0236***	0.0256***
	(0.0077)	(0.0078)	(0.0103)	(0.0105)	(0.0085)	(0.0087)
Low risk aversion	0.0075	-0.0030	-0.0052	-0.0413	-0.0024	-0.0334
	(0.0173)	(0.0199)	(0.0227)	(0.0305)	(0.0194)	(0.0276)
Time preference	-0.0000**	-0.0000*	-0.0000	0.0000	-0.0000*	-0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Lack of alertness	-0.0001	0.0002	0.0003	0.0009	0.0007	0.0012**
	(0.0004)	(0.0004)	(0.0005)	(0.0007)	(0.0005)	(0.0006)
Self control	-0.0045	-0.0068	0.0174*	0.0113	0.0144*	0.0093
	(0.0070)	(0.0072)	(0.0100)	(0.0109)	(0.0086)	(0.0091)
Saving preference	0.0076	0.0085	0.0076	0.0146	0.0297***	0.0352***
	(0.0096)	(0.0099)	(0.0134)	(0.0143)	(0.0112)	(0.0122)
Constant	-0.3615***	-0.2427*	-0.2643*	0.0624	0.6984***	0.9761***
	(0.0934)	(0.1310)	(0.1562)	(0.2355)	(0.1261)	(0.2049)
No. of observation	2,687	2,687	2,670	2,670	2,685	2,685
R-squared	0.1598	0.1431	0.1042	0.0135	0.1024	
F-value of the excluded instruments		30.2580		13.9439		14.1860
P-value of Hansen's OIR test		0.1357		0.9929		0.7267

(Note 1) Figures in parentheses are robust standard errors
(Note 2) *, **, and *** indicate that they are each significant at 10%, 5%, and 1%, respectively
(Note 3) Explanatory variables include three city-scale dummy variables and nine regional dummy variables. However, their coefficients are not shown.

options:

1 A lot
2 To a certain extent

3 A little
4 Rarely

The dummy variable that becomes 1 when "1," "2," or "3" is chosen from the above alternatives will be called the "thought about old age" dummy.

The variables for explaining whether there is a savings plan are the same used in Table 5 to explain net assets. Models 9-1 through 10-2 in Table 7 show the results of OLS and GMM estimates using the variable[16]. Every model suggests that financial literacy raises the likelihood of a person establishing a savings plan. For example, Model 9-2 shows that an increase of 1 standard deviation point in financial literacy score (equivalent to financial literacy rising from average to 92nd percentile value) raises the likelihood of establishing a savings plan by about 0.30 points (=21.6573×0.0139). Considering that the ratio of people who have a savings plan is about 38% of the total, an increase in financial literacy has significant impact on the likelihood of establishing a savings plan. Moreover, Model 10-2 shows that an increase in financial literacy score by 1 standard deviation point (equivalent to financial literacy rising from the average to the 92nd percentile value) raises the likelihood that people have thought about their old age by about 0.21 points (=15.3440×0.0139). The ratio of those who have thought about their old age is already high – at around 85% of the total. However, if financial literacy is raised by 1 standard deviation point, more people will start thinking about their old age.

Thus, as expected, people with high financial literacy are highly likely to own stocks or establish a savings plan. This may lead them to accumulate even more assets.

VI. Conclusion

Japanese people have a long life expectancy, and many in their old age are concerned about their finances. Thus, a measure is needed to help people accumulate wealth so that they can reach old age with peace of mind. Our analysis states that most Japanese people do not have excellent financial literacy. However, if their financial literacy is raised, they can accumulate more wealth through stockholdings or establishing savings plans.

[16] As instrumental valuables, this article uses grades in Japanese classes (used in Table 5), as well as grades in "Japanese A" in junior high school for each prefecture in *Zenkoku Gakuryoku Gakushu Jokyo Chosa Hokoku*, a report on a nationwide school achievement survey conducted in the fiscal FY2010 (https://www.nier.go.jp/10chousakekkahoukoku/index.htm). Of the two instrumental variables, the former represents the respondents' own grades in Japanese, while the latter indicates the average grade for junior high school students living in the same prefecture as the respondents. People with a high level of Japanese-language abilities are expected to have a high level of financial literacy. Therefore, it is expected that the respondents' Japanese-language skills may reflect the overall financial literacy of the people who live in the same prefecture. The average grade was used as an instrumental variable assuming that a respondent would be influenced by people around him/her and that the respondent's financial literacy would be high if people around him/her also have high financial literacy. The FY2010 school achievement survey includes the following question for Japanese classes in junior high schools: "The total number of books checked out from the library was 108, 121, 132, and 153 for April, May, June, and July, respectively. The library committee stated that this information proved that the number of people borrowing books was increasing. However, this information alone does not necessarily reveal that more people are borrowing books. Choose the reason why this is the case among the options below." Such a question requires the ability to decipher and examine the text and the information contained there.

To raise people's financial literacy, considering the target, duration, and content of financial education is necessary. This article demonstrates that financial literacy is particularly low among women, younger people, people with little education, and people with low incomes. Therefore, providing financial education to targeting these demographics crucial. Moreover, providing a single, one-time training session may not lead to an increase in financial literacy or improvement in people's financial activities. Thus, establishing a mechanism or an environment for continuous education through schools, workplaces, and regional communities is necessary. The content of financial education will differ depending on the peoples' life stage, income, and assets. Thus, providing content suitable for individuals' specific situation is crucial.

However, raising people's financial literacy takes time. Moreover, there is also a limit to what can be accomplished. Thus, even as efforts are made to improve people's financial literacy, financial institutions should further strengthen their goal to offer better customer-oriented services. Financial institutions may need to provide tailor-made services by offering information regarding the establishment of a savings plan and develop various savings and investment products as the nation seeks to facilitate people's asset formation.

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