DISCUSSION PAPER SERIES

Financial Literacy and Household Consumption Behavior:

An Empirical Study during the COVID-19 Pandemic

Shizuka Sekita

No.2024-01

京都産業大学大学院経済学研究科
〒603-8555　京都市北区上賀茂本山

Graduate School of Economics
Kyoto Sangyo University
Motoyama-Kamigamo, Kita-ku, Kyoto,
603-8555, Japan

2024/08/26

Financial Literacy and Household Consumption Behavior:

An Empirical Study during the COVID-19 Pandemic

August 2024

Shizuka Sekita [1]

Abstract

The COVID-19 pandemic significantly impacted economic activity, leading to unexpected declines in income. Using the micro data collected in Japan, I test the full-insurance hypothesis and find that households whose incomes decreased tend to reduce consumption compared to those whose incomes did not decrease, indicating that the full-insurance hypothesis does not hold. However, there is no statistically significant difference in changes in consumption between households whose incomes did not decrease and those whose incomes decreased and who are financial literate, indicating that the full-insurance hypothesis holds for financial literate households. Furthermore, the type of financial literacy matters; while financial knowledge alone cannot insure consumption, behaviors such as financial management, life planning and utilizing external information are important for consumption smoothing.

Keywords : Financial literacy, full-insurance hypothesis, behavior changes

[1] Associate Professor, Faculty of Economics, Kyoto Sangyo University. E-mail address: sekita@cc.kyoto-su.ac.jp
I extend my gratitude to the following people for the valuable comments and advice they provided: Junya Hamaaki, Charles Yuji Horioka, Yoko Ibuka, Shinya Kajitani, Miki Kohara, Wataru Kureishi, Colin Mckenzie, Kaori Nakamura, Yoko Niimi, Fumio Ohtake, Yoko Shirasu, Shuntaro Tsukamoto, Masaki Tsumagari, Kiichi Ueohtani, Midori Wakabayashi, Ryusei Yoshida, and Naoyuki Yoshino. The Central Committee for Financial Services and Public Information of the Bank of Japan and the OECD-INFE Secretariat also provided useful comments. Please note that the views expressed in this paper are the author's own.

1 RESEARCH BACKGROUND

The COVID-19 outbreak took a toll on economic activity. In Japan, the real GDP growth rate for fiscal year 2020 saw a decline of -4.5% compared to the previous year, surpassing the -3.6% recorded during the fiscal year 2008 Lehman shock. Additionally, based on the Monthly Labor Survey 2020, the annual total salary for employees witnessed a 1.2% decrease (survey industry total). Although this doesn't exhibit as pronounced a fall as the 3.8% dip during the Lehman shock in 2009, the extent of the change varied across industries. Sectors such as the "food service industry (-5.9%)," "transportation and postal services (-4.8%)," and "manufacturing industry (-3.4%)" were notably affected.

In the event of such an unexpected decrease in income, the full insurance hypothesis[2] states that consumption fluctuations can be avoided if the insurance market in the broad sense is sufficiently developed. In this paper, I analyze how household consumption changed when their incomes fell due to the spread of COVID-19. For this analysis, the differences in financial literacy levels are taken into consideration. Since Bernheim (1995) pointed out the importance of financial literacy, research on the impact of financial literacy on household behaviors has been actively carried out. For example, it is known that people with a high level of financial literacy have more precautionary savings in preparation for future contingencies. In addition, because people with a high level of financial literacy have more assets, including real assets, it may be easier for them to pass loan screening when borrowing is needed. In other words, it is expected that people with a high level of financial literacy will be able to cope with a decline in income and avoid

[2] If households can buy insurance against various risks (e.g., unemployment, illness, accidents, etc.), then buying enough insurance would allow them to maintain a certain level of consumption regardless of what shocks may occur. Note that insurance here is not limited to insurance products traded as commodities in the market, but also includes informal insurance, such as financial assistance provided by family members, relatives, etc.

a decline in consumption.

The questionnaire used for the analysis is the "Survey on Household's Financial Behavior and Perception during the COVID-19 Pandemic"[3] conducted by the Financial Services Agency, which was conducted in March 2021 in response to the statement "Supporting the financial resilience of citizens through the COVID-19 crisis" issued by the OECD to the world in April 2020.

The composition of the paper is as follows. Chapter 2 introduces previous research on the full insurance hypothesis and on the impact of financial literacy on household behaviors and explains the contributions of this paper. Chapter 3 presents an overview of the micro data used in this paper. Chapter 4 presents descriptive statistics on changes in income and consumption. Chapter 5 presents a test of the full insurance hypothesis and analyzes the differences in the results by the level and types of financial literacy. Chapter 6 presents its conclusion.

2 PREVIOUS STUDIES

First, we introduce some previous studies on the formulation of the consumption function. The Keynesian consumption function is a model in which consumption becomes a linear function of income at the same point in time. However, it was shown that actual consumption cannot be explained by the Keynesian consumption function. Friedman (1957) and Modigliani and Brumberg (1954, 1980) developed the Life Cycle/Permanent Income Hypothesis. The Life Cycle/Permanent Income Hypothesis, in which consumption is determined by lifetime income rather than current income, has become

[3] See https://www.fsa.go.jp/frtc/seika/discussion/2022/DP2022-5betten.pdf for the survey report. Please note that only the Japanese version is available.

the standard for analyzing household consumption. However, the Life Cycle/Permanent Income Hypothesis model does not consider the insurance market for future income fluctuations. Many empirical studies have tested the full insurance hypothesis, which states that if households can buy insurance against various risks, they can avoid fluctuations in consumption by buying enough insurance. Mace (1991) is a pioneering study of testing the full insurance hypothesis. As a result of testing using the Consumer Expenditure Survey (CEX), the existence of the perfect insurance hypothesis cannot be denied because the null hypothesis cannot be rejected in many cases, such as total consumption and consumption items other than Nondurables and Clothing. Cochrane (1991), which treated the Panel Study of Income Dynamics (PSID) as cross-section data and estimated it using simple OLS, analyzed the correlation between changes in various risk indicators and changes in consumption. As a result, whether or not consumption is insured depends on the difference in the risk index. Another study using PSID was carried out by McCarthy (1995). This paper is the first to test the full insurance hypothesis in groups. Analysis using a sub-sample divided by asset level shows that the full insurance hypothesis is valid for households with abundant assets. The interpretation is that wealthy households are coping with falling incomes by having sufficient savings and borrowing. A previous study using data from Japan was conducted by Kohara (2001), who tested the full insurance hypothesis using the “The Japanese Panel Survey of Consumers (JPSC)” of the Institute for Research on Household Economics. The full insurance hypothesis is rejected when all samples are used and when samples are divided according to assets and educational background. However, when samples are divided according to city size,

income shocks are pooled for people living in urban areas.[4] One possible reason is that people living in urban areas have easier access to insurance markets than people living in rural areas. As far as I know, only Zhang, Jia, and Chen (2021) have examined whether the full insurance hypothesis holds depending on the level of financial literacy. Using panel data from the China Household Finance Survey, this paper examines whether financial literacy reduced the negative impact of the sharp decline in Chinese stock prices in 2015 on household financial income and contributed to consumption smoothing. As a result, contrary to expectations, even among people with a high level of financial literacy, the loss of financial income from the stock market crash was not mitigated. As possible reasons, they said, diversification was not helpful because most stocks had fallen, and people with a high level of financial literacy tended to invest in risky assets, resulting in larger losses. Financial literacy, on the other hand, played an active role in smoothing consumption, and using a sample of people with a high level of financial literacy, there was no statistically significant difference in consumption before and after the stock market plunge. It suggests that financial literacy contributes to better coping with external shocks.

Many studies have demonstrated the benefits of financial literacy. For example, people with a high level of financial literacy are more likely to have precautionary savings (de Bassa Scheresberg (2013), Babiarz and Robb (2014))[5] and accumulate more assets,

[4] Other previous studies using data from Japan include Kohara, Ohtake, and Saito (2002). Using panel data from the Ministry of Internal Affairs and Communication's Family Income and Expenditure Survey, they tested the full insurance hypothesis. They concluded that the full insurance hypothesis is rejected, but idiosyncratic shocks are insured relatively well for the consumption of necessities. Also Sawada and Shimizutani (2007), using microdata from the "Research Report on Changes in Lifestyles and Consumption Behavior Following the Disaster," tested the full consumption insurance hypothesis and concluded that households affected by negative income shocks and damage to their homes and household goods tend to change their consumption behavior.

[5] Babiarz and Robb (2014) provide the following explanation of why financial literacy encourages people to build up precautionary savings: In theory, households should build up precautionary savings, preparing for unexpected or uninsured financial risks (Deaton (1992)). However, it is likely that precautionary savings are built up if households

including real assets (Behrman, Mitchell, Soo, and Bravo (2012), van Rooij, Lusardi, and Alessie (2012)[6] and Sekita (2020)). In other words, it is expected that people with a high level of financial literacy will be able to rely more on their savings. In addition, since people with a high level of financial literacy have more assets, including real assets, they may be more likely to pass loan screening if they need to borrow money. Therefore, people with a high level of financial literacy are more likely to mitigate income shocks and to avoid a decline in consumption than people with a low level of financial literacy.

The contributions of this paper are as follows. First, although many studies have tested full-insurance hypothesis, this paper is the first to my knowledge to consider differences in the level of financial literacy in terms of the impact of income shocks due to the spread of COVID-19 on changes in consumption[7].

Secondly, while empirical studies on financial literacy often use *Big3* (interest compounding, inflation, and risk diversification) as the standard indicator for financial literacy (Lusardi and Mitchell (2014)), this paper utilizes *Minimum Financial Literacy to be acquired* ("household financial management," "life planning," "financial knowledge, understanding of financial and economic conditions and appropriate use and selection of

---

are aware of the exact probability and severity of an emergency. Since people with a high level of financial literacy have a strong ability to identify and assess emergency savings needs, they are more likely to have precautionary savings, compared to people with a low level of financial literacy.

[6] van Rooij, Lusardi, and Alessie (2012) assume two channels through which financial literacy promotes asset accumulation. The first channel is through participation in the stock market. Individuals who are financially literate are more likely to invest in the stock market. Consequently, there is an opportunity to benefit from the equity premium, and assets are accumulated. The second path is through savings plan for post-retirement old age. If individuals are financial literate, they can make savings plans that require complex work, and accordingly they can accumulate more assets.

[7] There are some papers that analyze the relationship among financial literacy, COVID-19 and household behaviors, using the micro data in Japan. For example, Fujiki (2022) analyzes the relationship between the spread of the COVID-19 infection and the changes in financial services for households in Japan and finds that respondents who chose to increase demand for non-face-to-face financial services and cashless payments tended to have more financial assets and to be more financially literate. Ono et al. (2021) investigate how financial literacy, as a rational decision-making instrument, relates to peoples' exercise behavior in Japan and find that financial literacy is positively related with exercise behavior, meaning that financially literate people are more likely to exercise regularly. As the COVID-19 health pandemic seems to exacerbate peoples' physical inactivity, they recommend that governments implement a financial literacy improvement policy to alleviate the lack of exercise.

financial products," and "appropriate use of external knowledge.") described in "Financial Literacy Map[8]," which has been regarded as de facto National Strategy of Financial Education (NSFE) in Japan by OECD-INFE and its member countries. Although "Financial Literacy Map" was published in Japan in 2013, as far as I know, there are no papers that measure the effect of *Minimum Financial Literacy to be acquired* on household behaviors. It seems important to analyze the impact of people having *Minimum Financial Literacy to be acquired*. Of course, I also show the results that use *Big3*.

3 DATA

To analyze the impact of income reduction due to the spread of COVID-19 on changes in consumption, this paper uses the micro data from the "Survey on Household Financial Behavior and Perception during the COVID-19 Pandemic" (hereinafter referred to as the "FSA data"). This survey was commissioned to Macromill Inc. by the Financial Services Agency with the aim of analyzing how the COVID-19 had changed financial behavior and attitudes among households and individuals, and whether financial literacy had led to differences in responses to such changes. It also aims to promote financial literacy more effectively in the future. Responses to this survey were sought from men and women aged 18 to 79 nationwide who are monitors registered with Macromill Co., Ltd., with the goal of collecting a sample suitable for the population composition ratio obtained from the statistics bureau of the Ministry of Internal Affairs and Communications.[9] The survey

[8] For information on "Financial Literacy Map," see https://www.shiruporuto.jp/e/consumer/pdf/financial_literacy_map.pdf

[9] As for the actual surveying process, monitors were asked to complete the survey via random distribution with the goal of collecting 6,000 questionnaires. The monitors were able to respond to the survey when they logged in to

was conducted between 1 March and 4 March 2021,[10] and 6,217 samples were collected.

As already mentioned, the FSA data are responses from monitors registered with Macromill Inc.,[11] and responses are made via the Internet. Therefore, it is difficult to say that they are precise representative samples of people living in Japan. To clarify the characteristics of the FSA data, I compared it with the "Population Census (15-79 years old)" as of 2015. There was no significant difference in the male ratio between the Population Census and the FSA data (49.47% and 50.64%, respectively). In terms of age, the national census shows that 18-29 years old account for 15.35% of the total, 30s 16.21%, 40s 19.10%, 50s 16.04%, 60s 18.79%, and 70s 14.51%, while the FSA data shows 18-29 years old account for 14.12%, 30s 15.51%, 40s 18.93%, 50s 16.09%, 60s 24.68%, and 70s 10.67%. In other words, there was no significant difference between the two surveys for people in their 20s and 50s. However, the FSA data shows that there were more people in their 60s and less people in their 70s.[12] A comparison of the educational background distribution between the 2017 Employment Status Survey (15-79 years old) and the FSA data was as follows. For the Employment Status Survey, 14.63% were junior high school graduates, 40.52% high school graduates, 11.60% vocational school graduates, 8.77% junior college/specialized vocational high school graduates, 22.21%

Macromill's "My Page," so they were able to respond at any time during the available response period. In addition, monitors are notified in advance of the name of the survey and the amount of the reward, so they are expected to select the survey to answer based on this information. Therefore, the specification is such that they do not know that this survey is an FSA project until they start answering. However, once you start answering, you will see a statement at the beginning of the survey form that says, "This survey is conducted at the request of the Financial Services Agency." This is the first time they will find out that the survey was created by the FSA. There is no reward for responding to this survey. The "FSA data" is data from respondents who answered all the questions; the response withdrawal rate is not disclosed, and the time between starting to answer and submitting a response is also unknown.

[10] It should be noted that the survey was conducted only about one year after the COVID-19 outbreak.

[11] Responses can be made on any computer, smartphone, or tablet.

[12] The survey conducted by Macromill basically aims to collect samples in accordance with the population composition ratios obtained from the data of the Statistics Bureau of the Ministry of Internal Affairs and Communications, but since the survey is conducted via the Internet, it is difficult to collect a sample of respondents in their 70s. Therefore, samples were collected for the 60s and 70s by treating them as the same age group, resulting in a sample with more people in their 60s and fewer people in their 70s compared to the Census.

university graduates, and 2.26% graduate school graduates. On the other hand, the FSA data shows 2.26% were junior high school graduates, 32.03% high school graduates, 11.26% vocational school graduates, 10.41% junior college/specialized vocational high school graduates, 40.10% university graduates, and 3.93% graduate school graduates. Since the percentage of people with a university degree or higher is higher in the FSA data, those in the FSA data seem more educated than those in the Employment Status Survey. Comparing "annual income and profits from major jobs" in the Employment Status Survey with "income including tax (including bonuses and business income)" in the FSA data, the distribution of income for each survey was as follows. In the Employment Status Survey, 17.04% were "less than one million yen," 17.87% were "from one million yen to less than two million yen," 32.72% were "from two million yen to less than four million yen," 17.08% were "from four million yen to less than six million yen," 8.33% were "from six million yen to less than eight million yen," 3.58% were "from eight million yen to less than 10 million yen," and 3.39% were "ten million yen or more." The FSA data shows 12.04% for "less than one million yen," 13.96% for "from one million yen to less than two million yen," 31.17% for "from two million yen to less than four million yen," 22.05% for "from four million yen to less than six million yen," 11.63% for "from six million yen to less than eight million yen," 4.90% for "from eight million yen to less than 10 million yen," and 4.25% for "ten million yen or more." Although the definitions of the two surveys do not completely coincide, the FSA data appear to have a higher percentage of high income.

Explaining the sample selection for the estimation, since I am interested in whether household behaviors vary according to the level of financial literacy, I omitted information on people who answered "I don't want to answer" to financial literacy

quizzes (= 377) and those who answered the same number to all financial literacy quizzes because such a response would be considered an inappropriate response (=3). In addition, since the FSA data are supposed to collect for 18 to 79 years of age, data are also omitted if the age of the response is not within the range of 18 to 79 (=3). Moreover, I also dropped information on people who chose "Other" when asked about their final education (=12) and those who answered "I don't want to answer" to cognitive test (=81) and to subjective assessment of their level of financial knowledge (=46). Finally, the FSA data ask the respondents who are household decision makers about household consumption, borrowing, savings and investment. I omitted information on respondents who were not decision makers (= 483). As a result, the number of samples used in the analysis was 5,212.

4 DESCRIPTIVE STATISTICS

This chapter presents descriptive statistics on the data used in the estimation. First, as shown in Table 1, with regard to changes in income of respondent households[13] due to the spread of COVID-19, households with no change were the largest (63% = 3,309/5,212), followed by decreasing households (34% = 1,786/5,212) and increasing households (2% = 117/5212).[14]

[Insert Table 1 here]

[13] The question regarding changes in income was "Has your household income changed as a result of the spread of COVID-19?" and the options were "increased," "decreased," and "remained the same." It is regrettable that there is no information on the amount of income change.

[14] Looking at responses related to unexpected events that occurred after the spread of COVID-19 infection other than income, most households had no unexpected events (85%). Regarding changes in employment, 4% of households had a person who resigned, 3% had a person who changed jobs, and 1% had a person who found a new job. Regarding changes in health status, 0.4% of households had a person whose health status had improved, and 5% had a person whose health status had worsened. The number of household members increased in 2% of households and decreased in 1% of households. And 0.4% of households had a person infected with COVID-19.

In addition, to investigate the characteristics of people whose income decreased, I conducted a simple regression analysis, in which a dependent variable is a dummy variable equal to one if household income decreased.

[Insert Table 2 here]

As shown in Table 2, income tends not to decline for people aged 60 or over. This is probably because many of them are living on pensions. Looking at the coefficients of income dummies, it appears that those with higher incomes are less likely to experience a decrease in income due to the spread of COVID-19. The income of self-employed people tends to decrease, compared to that of company employees, public servants, business owners, and executives. Looking at the results across different industries, people working in travel, hotel, laundry, hairdressing, beauty and bath, restaurants, other lifestyle-related services, transportation and mail industry, manufacturing, and other professional and technical services tend to experience a decrease in income. On the other hand, those who work in the take-home and delivery services are less likely to experience a decrease in income, suggesting that the pandemic had led people to refrain from eating out and choose to eat at home.

Looking back to Table 1 and looking at changes in consumption[15] after the spread of COVID-19, 58% (= 3,010/5,212) of households showed no change, followed by 28% (= 1,435/5,212) showing a decrease and 15% (= 767/5,212) showing an increase.

Furthermore, Table 1 shows a relationship between changes in income and changes in consumption. Among households with decreased income, those with decreased consumption accounted for the largest share (44% = 792/1,786). As far as descriptive

[15] The question about changes in consumption was “Has there been a change in consumption in your household since the spread of COVID-19?” and the options are “increased,” “decreased,” and “unchanged. It is regrettable that there is no information on the change in consumption by amount or by consumption item.

statistics are concerned, the full insurance hypothesis does not seem to hold. Consumption may also be changing, even if incomes remain the same, as the spread of COVID-19 has made it harder for consumers to eat out and travel. In terms of households with no change in income, 19% (= 613/3,309) experienced a decrease in consumption, while 70% (= 2,314/3,309) did not experience changes in consumption and only 12% (= 382/3,309) of households experienced an increase in consumption.

5 EMPIRICAL ANALYSIS

In this chapter, I analyze the impact of income reduction on changes in consumption and consider how the impact differs according to the level and types of financial literacy.

5.1 The impact of income reduction on changes in consumption

Section 5.1 presents an empirical analysis of the impact of income reduction on changes in consumption. Specifically, referring to Sawada and Shimizutani (2007), who tested the full insurance hypothesis, I estimated the following equation.

$$\Delta c_i = \alpha + \beta_1(Income\ reduction_i) + S_i\gamma + \sum_{k=1}^{K} \delta_k R_k^a + u_i \qquad (1)$$

In equation (1), c denotes household consumption, while Δ denotes the difference operator, and i denotes the ith household. FSA data do not include data on numerical changes in consumption. Instead, they include a questionnaire asking whether consumption has increased, remained unchanged, or declined among respondents' households since the spread of COVID-19. Therefore, I define that Δc takes a value of one if consumption increases, zero if consumption remains unchanged, and minus one if

consumption decreases. *Income reduction* is one if the income of the respondent's household decreased due to the spread of COVID-19, and zero if it did not[16]. If the full insurance hypothesis holds, the coefficient of *Income reduction* should not be statistically significant because consumption should not change even if income decreases. The matrix *S* represents dummies for the shock of the COVID-19 outbreak such as the increase in household members dummy, decrease in household members dummy, divorced/widowed dummy, married dummy, health improvement dummy, health deterioration dummy, and COVID-19 infection dummy. k is a dummy variable identifying the regional insurance network, and R^a is a dummy variable equal to one if the *i*th household resides in the *k* region and is used to control the average change in consumption. *u* is the error term. Equation (1) was estimated by the Ordinary Least Squares.

[Insert Table 4 here]

The estimation results are shown in Table 4. The coefficient of *Income reduction* is negative and statistically significant, indicating that households with reducing incomes are more likely to consume less than those without reducing incomes. As for the coefficients of other explanatory variables, the coefficient of *Increase in household members* is significantly positive, meaning that households with an increase in the number of household members increased their consumption compared to households with the same number of household members. Looking at coefficients of regional dummies with the Kanto region as the default, only the coefficient for the Tohoku region was statistically significantly positive. The Tohoku region had a relatively low ratio of infection cases to population and was not subject to the declaration of emergency

[16] Only 2% of households' incomes increased by COVID-19. Thus, I did not add a dummy for household whose income increased in explanatory variables in equation (1).

situations or quasi-state of emergency,[17] which may have led to an increase in consumption compared to people living in the Kanto region.

Although the results were not consistent with the full insurance hypothesis when analyzing equation (1), people with a high level of financial literacy may be able to avoid a decline in consumption when their income declines. Therefore, I estimate the following equation, adding the interaction term between *Income reduction* and a financial literacy variable.[18]

$$\Delta c_i = \alpha + \beta_1(Income\ reduction_i) + \beta_2(Income\ reduction_i * Minimum\ Financial\ Litracy\ to\ be\ Acquired_i) + S_i\gamma + \sum_{k=1}^{K}\delta_k R_k^a + u_i \quad (2)$$

Although various indicators of financial literacy have been used in previous studies, this paper defines financial literacy based on the *Minimum Financial Literacy to be acquired* described in the "Report of the Study Group on Financial and Economic Education"[19] published in April 2013 by the Study Group on Financial and Economic Education established in the Financial Services Agency's Financial Research Center. *Minimum Financial Literacy to be acquired* is divided into four areas: "household financial

[17] Using data on the cumulative number of positive cases as of February 28, 2021, and the population as of October 1, 2020, the percentage of cumulative positive cases by prefecture was calculated to be 0.52% for the Kanto region, while it was as low as 0.09% for the Tohoku region. As a result, the Tohoku region was rarely a target area for the declaration of a state of emergency. In 2020, the Tohoku region was covered only from April 16 to May 14. In 2021, only Miyagi Prefecture was declared an emergency zone from August 15 to September 9.

[18] It is possible that people's level of financial literacy may have changed through the spread of the COVID-19 infection. Yamori and Ueyama (2021) administered a financial literacy test (three questions on compound interest calculation, understanding inflation, and understanding diversified investments) to the same individuals in 2019 and 2021, and using the Bowker test, they analyzed the differences between the options for each question and found no statistically significant differences. The average number of correct answers was 1.58 in 2019 and 1.51 in 2021, which is lower than the number in 2019, at the 10% level, by the Wilcoxon test, but the difference is slight. Thus, while changes in financial literacy before and after the spread of COVID-19 infection cannot be ruled out, the change in the level of financial literacy does not seem to be remarkable.

[19] For more information, visit https://www.fsa.go.jp/news/24/sonota/20130430-5/01.pdf, please be noted that the report is in Japanese.

management," "life planning," "financial knowledge, understanding of financial and economic conditions and appropriate use and selection of financial products," and "appropriate use of external knowledge." In equation (2), *Minimum Financial Literacy to be Acquired* is a dummy variable, which is defined as one if respondents have acquired all four types of financial literacy and zero otherwise[20]. The definitions of four types of financial literacy are as follows.

First, regarding "household financial management," in response to the question of "Do you have a custom of using a household account book in your household?" I defined *Financially managed* to be one if a person chose the answer "Yes, even before the spread of COVID-19," and zero otherwise.

Next, regarding "life planning," in response to the question of "Do you have a financial plan for your post-retirement old age? (if you are already in post-retirement old age, please tell us whether you have a financial plan for your life going forward), I defined *Having a life planning* to be one if a person chose the answer "I had a plan even before COVID-19 spread," and zero otherwise.

Regarding "financial knowledge, understanding of financial and economic conditions and appropriate use and selection of financial products,"[21] I defined *Having financial knowledge* to be one if five or more of eight economic and financial related quizzes were answered correctly, and zero otherwise.

[20] For specific questions, see Appendix "Questions Used to Define Financia Literacy."

[21] The "Minimum Financial Literacy to be Acquired" defined by the Study Group on Financial and Economic Education includes 12 items in the area of financial knowledge, understanding of financial and economic conditions, and appropriate use and selection of financial products. However, the eight-question quiz used in this paper to define financial literacy does not cover all 12 items. To more accurately determine whether respondents have acquired literacy of "financial knowledge, understanding of financial and economic conditions, and appropriate use and selection of financial products," it would be more appropriate to ask questions on each of the 12 items.

Lastly, with regard to "appropriate use of external knowledge,"[22] in response to the question of "Have you collected information on finance, investment, savings, etc. since the spread of COVID-19?" I defined *Utilizing external knowledge* to be one if a respondent chose the answer "Yes, even since before the spread of COVID-19," and zero otherwise.[23]

[Insert Table 5 here]

Table 5(1) extracts only the coefficients on income reduction and financial literacy variables from the estimation results of equation (2). The coefficient of *Income reduction* is negative, and the coefficient of the interaction term between *Income reduction* and *Minimum Financial Literacy to be Acquired* is also negative, indicating that even if people are equipped with a high level of financial literacy, they cannot avoid a decline in consumption when their incomes reduce. However, there is a possibility that the error term and *Minimum Financial Literacy to be Acquired* correlates and the coefficient of the interaction term between *Income reduction* and *Minimum Financial Literacy to be Acquired* is biased. Therefore, I added household characteristics which seem to affect both consumption and financial literacy (age, male, education, income, self-employed, cognitive test, risk aversion, myopic, self-control and over-confidence) to equation (2). The result is shown in Table5(2). As you can see, controlling household characteristics which seem to affect both consumption and financial literacy, the coefficient of the interaction term between *Income reduction* and *Minimum Financial Literacy to be*

[22] To determine whether the respondents have acquired literacy of "making appropriate use of external knowledge," we should observe data on their responses to questions that would allow us to determine whether they are making appropriate use of knowledge obtained from outside sources. Unfortunately, however, such a question has not been asked, so this paper uses data from responses to the question, "Do you collect information on finance, investment, savings, etc.?" to define this question.

[23] Because the average number of correct answers in the 8 financial literacy quizzes was 4.15, we defined people who answered at least five questions correctly as having financial knowledge.

Acquired Having all 4 types of financial literacy becomes insignificant, indicating that we cannot reject there is no statistically significant difference in changes in consumption between people whose income did not reduce and those whose income reduced and who have *Minimum Financial Literacy to be Acquired*.[24] In addition, the following equation were also estimated to confirm the impact of each of the four types of *Minimum Financial Literacy to be Acquired*.

$$\Delta c_i = \alpha + \beta_1(Income\ reduction_i) + \beta_2(Income\ reduction_i * Financially\ managed_i) + \beta_3(Income\ reduction_i * Having\ a\ life\ planning_i) + \beta_4(Income\ reduction_i * Having\ financial\ knowledge_i) + \beta_5(Income\ reduction_i * Utilizing\ external\ knowledge_i) + S_i\gamma + \sum_{k=1}^{K} \delta_k R_k^a + u_i \quad (3)$$

The estimation result of equation (3) is shown in Table 5(3). This result indicates that *Financially managed, Having a life planning, and Utilizing external knowledge* seem to contribute notably to keeping consumption unchanged even if income declines. On the other hand, the coefficient of *Income reduction*Having financial knowledge* is significantly negative, implying that even people with sufficient financial knowledge tend to consume less when their incomes decline, compared to those whose incomes did not decline. However, we have to notice that financial knowledge still contributes to consumption smoothing. Comparing the coefficient of *Income reduction* with the

[24] Even if household characteristics are added in equation (2), financial literacy variables may be endogenous. In order to check the possibility, I conducted Wu-Hausman F test and Durbin-Wu-Hausman chi-sq test using two instrumental variables (*Income reduction*Average of *Minimum Financial Literacy to be Acquired* by prefecture and *Income reduction*University graduate father) and found that the null hypothesis that the *Income reduction** *Minimum Financial Literacy to be Acquired* is exogenous was not rejected.

coefficient of *Income reduction*Having financial knowledge*, the coefficient of *Income reduction*Having financial knowledge* is much smaller in absolute value. This means that consumption is less likely to decrease for those with sufficient financial knowledge than for those without sufficient financial knowledge. Moreover, I replaced *Having financial knowledge* with *Big3* (answers on interest compounding, inflation and risk diversification questions are all correct), which is frequently used in financial literacy research, and found that the coefficient of *Income reduction*Big3* is statistically significantly negative (see Table 5(4)). Financial knowledge alone does not appear to be enough to smooth consumption when incomes decline.

5.2 Robustness check

The estimation results in Table 5 show that people who have *Minimum Financial Literacy to be Acquired* can smooth consumption even when their incomes reduce. One possible reason is that since people with a high level of financial literacy are expected to be able to accumulate more assets (Behrman, Mitchell, Soo, and Bravo (2012), van Rooij, Lusardi, and Alessie (2012), and Sekita (2020)), they can rely more on their savings and are more likely to pass loan screening if they need to borrow money. To check if people with a high level of financial literacy can accumulate more assets using FSA data, I analyzed how *Minimum Financial Literacy to be Acquired* affects household net wealth (the amount of financial assets + real assets appraised value - liabilities balance), estimating by the Ordinary Least Squares. Looking at the results in Table 6, the coefficients of *Having a life planning*, *Having financial knowledge*, and *Utilizing external knowledge* are all positive and statistically significant. Thus, these three types of financial literacy increase household wealth. However, contrary to expectation, the coefficient of

Financially managed is not significant. There are two possible reasons why *Financially managed* contributes to consumption smoothing but does not affect net wealth. First, *Financially managed* may have an effect on net wealth through *Having a life planning*. Although *Financially managed*, which means that households keep track of income and expenditure, is essential for *Having a life planning*, the coefficient of *Financially managed* was not significant because *Financially managed* alone cannot affect net wealth. Secondly, they may not have reduced consumption for reasons other than dissaving and borrowing. Few people could have predicted at the time of the survey (March 2021) how long the income reduction due to the spread of COVID-19 would last. However, those who regularly observe their income and expenditures and manage their household finances may have been calmer about the income decline caused by COVID-19 than those who do not and may have judged that this decline in income caused bey COVID-19 would be temporary and decided not to reduce their consumption.

6 CONCLUSION

In this paper, I analyzed the impact of income reduction caused by the influence of COVID-19 on changes in consumption and investigated the difference in the impact by the level and types of financial literacy, using FSA data. As a result, those whose incomes were reduced by COVID-19 tended to consume less, but those with *Minimum Financial Literacy to be Acquired* did not consume less, even if their incomes declined. Financial literacy seems to help consumption smoothing.

Although financial literacy is considered to be important for household well-being, in fact, people have not fully acquired financial literacy. Specifically, as Table 2 shows, 42% of people manage their household finances, 42% have a life plan, 48% have financial

knowledge, 36% utilize external knowledge, and only 11% have all four of these financial literacy.

Increasing financial knowledge may be feasible through education in schools and workplaces more effectively. The problem is how to achieve behavior change, such as financial management, having a life plan, and utilizing external knowledge. Ohtake (2019, p.66) discusses the decision making, bottleneck and nudges for retirement saving. Referring to Ohtake (2019) and considering the bottlenecks of financial management, having a life plan, and utilizing external knowledge, one possible reason why people do not take such action is that they do not fully understand its importance. Thus, It may be necessary to show the difference in future financial well-being between those who manage their household finances, have a life plan, and utilize external knowledge and those who do not take such action, and to convey the benefits of financially literate behaviors on a broad scale.

REFERENCES

Babiarz, P. and Robb, C. A. (2014), "Financial Literacy and Emergency Saving," Journal of Family and Economic Issues, Vol. 35, pp. 40-50

Behrman, J. R., Mitchell, O. S., Soo, C. K., and Bravo, D. (2012), "How Financial Literacy Affects Household Wealth Accumulation," American Economic Review, Volume 102, Number 3, pp. 300-304

Bernheim, B. D. (1995), "Do Households Appreciate Their Financial Vulnerabilities? An Analysis of Actions, Perceptions, and Public Policy," In Tax Policy and Economic Growth, pp. 1-30, Washington, DC: American Council for Capital Formation

Cochrane, J. H. (1991), "A Simple Test of Consumption Insurance," Journal of Political Economy, Volume 99, Number 5, pp. 957-976

Deaton, A. (1992), "Understanding Consumption," New York: Oxford University Press.

de Bassa Scheresberg, C. (2013), "Financial Literacy and Financial Behavior among Young Adults: Evidence and Implications," Numeracy, Volume 6, Issue 2, Article 5. DOI: http://dx.doi.org/10.5038/1936-4660.6.2.5

Friedman, M. (1957), A Theory of the Consumption Function, Princeton and Oxford: Princeton University Press

Fujiki, H. (2022), "Household Financial Services, Financial Literacy, and COVID-19 Pandemic," Applied Economics Letters, Vol. 29, Issue 7, pp. 615-618.

Kohara, M. (2001), "Consumption Insurance between Japanese Households," Applied Economics, Volume 33, pp. 791-800

Kohara, M., Ohtake, F., and Saito, M. (2002), "A Test of the Full Insurance Hypothesis: The Case of Japan," Journal of the Japanese and International Economies, Volume 16, pp. 335-352

Lusardi, A. and Mitchell, O. S. (2014) “The Economic Importance of Financial Literacy: Theory and Evidence.” *Journal of Economic Literature*, vol. 52, no. 1, pp. 5–44.

Mace, B. J. (1991), “Full Insurance in the Presence of Aggregate Uncertainty,” Journal of Political Economy, Volume 99, Number 5, pp. 928-956

McCarthy, J. (1995), “Imperfect Insurance and Differing Propensities to Consume across Households,” Journal of Monetary Economics, Volume 36, pp. 301-327

Modigliani, F. and Brumberg, R. (1954), “Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data,” In Post Keynesian Economics. Kenneth K. Kurihara ed., pp.388-436. New Brunswick: Rutgers University Press

Modigliani, F. and Brumberg, R. (1980), “Utility Analysis and the Consumption Function: An Attempt at Integration,” In The Collected Papers of Franco Modigliani: The Life Cycle Hypothesis of Saving, Vol. 2, Andrew Abel ed., pp.128-197. Cambridge and London: Cambridge University Press.

Ohtake, F. (2019), “Kodo Keizaigaku no Tsukaikata (How to use behavioral economics),” Iwanami Shoten (in Japanese)

Ono, S., Yuktadatta, P., Taniguchi, T., Iitsuka, T., Noguchi, M., Tanaka, S., Ito, H., Nakamura, K., Yasuhara, N., Miyawaki, C., Mikura, K., Khan, M. S. R., and Kadoya, Y. (2021), “Financial Literacy and Exercise Behavior: Evidence from Japan,” Sustainability, Vol. 13, Issue 8, 4189; https://doi.org/10.3390/su13084189

Sawada, Y. and Shimizutani, S. (2007), “Consumption Insurance Against Natural Disasters: Evidence from the Great Hanshin-Awaji (Kobe) Earthquake,” Applied Economics Letters, Vol. 14, pp. 303-306

Sekita, S. (2020), “Japanese Asset Formation and Financial Literacy,” Public Policy Review, Policy Research Institute, Ministry of Finance Japan, Volume 16, pp. 1-19

van Rooij, M. C. J., Lusardi, A., and Alessie, R. J. M. (2012), “Financial Literacy, Retirement Planning and Household Wealth,” Economic Journal, Volume 122, Number 560, pp. 449-478

Yamori, N. and Ueyama, H. (2021), “Koronaka no Koreisha no Kinyu Kodo eno Eikyo to Kinyu Riterashi—2019 nen Chosa to 2021 nen Chosa no Hikaku- (Impact of COVID-19 Pandemic on Financial Behavior of Elderly People and Financial Literacy - Comparison between the 2019 and 2021 Surveys),” RIEB Discussion Paper Series, 2021-J13, Kobe Daigaku. Keizai Keiei Kenkyujo (in Japanese)

Zhang, Y., Jia, Q., and Chen, C. (2021), “Risk Attitude, Financial Literacy and Household Consumption: Evidence from Stock Market Crash in China,” Economic Modelling, Vol. 94, pp. 995-1006

TABLE 1
Changes in income and consumption

		Changes in consumption			
		Decrease	Unchanged	Increase	
Changes in income	Decrease	792	641	353	1,786
	Unchanged	613	2,314	382	3,309
	Increase	30	55	32	117
		1,435	3,010	767	5,212

Note: Calculated by the author using the FSA data.

TABLE 2
Determinants of income reduction

	Decrease in Income
Age 30-39	0.0040
	(0.0237)
Age 40-49	-0.0135
	(0.0233)
Age 50-59	-0.0189
	(0.0243)
Age 60-64	-0.0601**
	(0.0247)
Age 65 or over	-0.1700***
	(0.0229)
Male	-0.0003
	(0.0149)
Vocational school or junior college graduates	0.0138
	(0.0180)
Graduates of university or higher degree	-0.0009
	(0.0154)
Income200-400	-0.0570***
	(0.0186)
Income400 or over	-0.0808***
	(0.0212)
Self-enmployed	0.2341***
	(0.0309)

Contract, temporary, part-time workers and other	0.0059
	(0.0223)
Homemakers, students, and unemployed	0.0154
	(0.0344)
Agriculture, forestry, fishery, and mining industry	0.0047
	(0.0938)
Construction industry	0.0435
	(0.0442)
Manufacturing industry	0.1720***
	(0.0347)
Electricity, gas, heat supply, and water industry	0.1291*
	(0.0741)
Information and communication industry	0.0174
	(0.0463)
Transportation and mail industry	0.2099***
	(0.0493)
Wholesale and retail industry	0.1129***
	(0.0371)
Finance and insurance industry	-0.0227
	(0.0465)
Real estate industry	-0.0310
	(0.0579)

Leasing industry	-0.1139
	(0.1432)
Academic and development research institution	0.2712
	(0.1830)
Professional and technical services	0.1439**
	(0.0584)
Advertisement industry	0.1556
	(0.1961)
Hotel industry	0.4719***
	(0.0961)
Restaurants	0.2608***
	(0.0576)
Take-home and delivery services	-0.2950***
	(0.0475)
Laundry, hairdressing, beauty and bath industry	0.3813***
	(0.0991)
Travel industry	0.5000***
	(0.0794)
Other lifestyle-related services	0.2381***
	(0.0644)
Entertainment industry	0.2269
	(0.1383)
Education and learning support industry	0.0409
	(0.0479)

Medical and welfare industry	-0.0095
	(0.0369)
Post office	-0.1034
	(0.1608)
Cooperative association	-0.0751
	(0.0915)
Other services	0.0998***
	(0.0384)
Others	0.1519***
	(0.0516)
Constant	0.3394***
	(0.0374)
No. of observation	5212
R-squared	0.0807

Note: Robust standard errors in parentheses. ***: Significant at the 1% level. **: Significant at the 5% level. *: Significant at the 10% level.

TABLE 3
Descriptive Statistics

Variables	Observations	Mean	SD	Min.	Max.
Changes in consumption	5212	-0.1282	0.6373	-1	1
Income reduction	5212	0.3427	0.4746	0	1
Shocks caused by the spread of COVID-19					
Increase in household members	5212	0.0150	0.1214	0	1
Decrease in household members	5212	0.0140	0.1175	0	1
Divorced/widowed	5212	0.0027	0.0518	0	1
Married	5212	0.0084	0.0915	0	1
Health improvement	5212	0.0038	0.0618	0	1
Health deterioration	5212	0.0528	0.2236	0	1
COVID-19 infection	5212	0.0038	0.0618	0	1
Financial literacy					
Minimum Financial Literacy to be Acquired	5212	0.1071	0.3092	0	1
1) Financially managed	5212	0.4240	0.4942	0	1
2) Having a life planning	5212	0.4204	0.4937	0	1
3) Having financial knowledge	5212	0.4814	0.4997	0	1
4) Utilizing external knowledge	5212	0.3599	0.4800	0	1

Note: Calculated by the author using the FSA data.

TABLE 4
Income reduction and changes in consumption

	Changes in consumption
Income reduction	-0.1877***
	(0.0207)
Increase in household members	0.2276**
	(0.0955)
Decrease in household members	0.0240
	(0.0878)
Divorced/widowed	-0.0948
	(0.2117)
Married	0.0492
	(0.0971)
Health improvement	-0.0617
	(0.2015)
Health deterioration	0.0679
	(0.0501)
COVID-19 infection	0.1494
	(0.1749)
Hokkaido	0.0577
	(0.0452)
Tohoku	0.0897***
	(0.0347)
Chubu	-0.0029
	(0.0253)
Kinki	0.0408
	(0.0264)
Chugoku	-0.0417
	(0.0369)
Shikoku	-0.0048
	(0.0540)
Kyushu	0.0054
	(0.0304)
Constant	-0.0824***
	(0.0162)
No. of observations	5,212
R-squared	0.0229

Note: Robust standard errors in parentheses. ***: Significant at the 1% level. **: Significant at the 5% level. *: Significant at the 10% level.

TABLE 5
Income reduction, financial literacy and changes in consumption

Changes in consumption	(1)	(2)	(3)	(4)
Income reduction	-0.1775***	-0.1825***	-0.1592***	0.1694***
	(0.0214)	(0.0217)	(0.0312)	(0.0286)
Income reduction* Minimum Financial Literacy to be Acquired	-0.1139*	-0.0699		
	(0.0633)	(0.0640)		
Income reduction *Financially managed			-0.0353	-0.0349
			(0.0382)	(0.0381)
Income reduction *Having a life planning			0.0193	0.0167
			(0.0422)	(0.0420)
Income reduction*Having financial knowledge			-0.0783**	
			(0.0385)	
Income reduction*Utilizing external knowledge			0.0407	0.0447
			(0.0447)	(0.0445)
Income reduction*Big3				-0.1241***
				(0.0450)
Controlled household characteristics	No	Yes	Yes	Yes
No. of observations	5,212	5,212	5,212	5,212
R-squared	0.0238	0.0380	0.0391	0.0399

Note: Robust standard errors in parentheses. ***: Significant at the 1% level. **: Significant at the 5% level. *: Significant at the 10% level.

TABLE 6
Financial literacy and household net wealth

	Net wealth
Financially managed	-111.4206
	(86.5243)
Having a life planning	905.6334***
	(93.5946)
Having financial knowledge	451.9773***
	(90.8521)
Utilizing external knowledge	864.1752***
	(106.0418)
Age 30-39	68.9450
	(112.3122)
Age 40-49	339.4864***
	(115.3740)
Age 50-59	1,073.7936***
	(126.5923)
Age 60-64	2,142.0065***
	(158.4733)
Age 65 or over	2,408.0982***
	(171.6402)
Male	-341.7105***
	(95.4125)
Vocational school or junior college graduates	279.9694***
	(97.7499)
Graduates of university or higher degree	666.3155***
	(97.7534)
Before-tax income	2.6836***
	(0.2705)
Self-employed	806.2383***
	(190.7824)
Contract, temporary, part-time workers or other	524.5127***
	(131.9976)
Homemakers, students, or unemployed	1,234.0910***
	(148.0743)
Married	-258.9566***
	(96.6130)
No. of children	-301.5138***
	(50.8463)
No. of household members	335.1031***
	(41.7907)
Retired	75.4613
	(188.5085)

Cognitive test	134.4823***
	(41.3866)
Risk averse	-65.5283**
	(30.6222)
Myopic	-118.3637***
	(25.6339)
Self-control	131.7495***
	(45.7362)
Over-confidence	142.7063
	(130.7516)
Constant	-1,959.7162***
	(197.5998)
No. of observation	5212
R-squared	0.2759

Note: Robust standard errors in parentheses. ***: Significant at the 1% level. **: Significant at the 5% level. *: Significant at the 10% level.

APPENDIX

Questions used to define financial literacy[25]

Financial managed

Q. 40: “Do you have a custom of using a household account book in your household?”

1. Yes, even before the spread of COVID-19
2. Not before COVID-19 spread, but we started to use one after it spread.
3. Not before or even now, but we plan to use one in the future.
4. Not before or now, and we will not use on in the future either.

Having a life planning

Q38 : “Do you have a financial plan for your post-retirement old age? (If you are already in post-retirement old age, please tell us whether you have a financial plan for your life going forward.)”

1. I had a plan even before COVID-19 spread.
2. I didn’t have a plan before COVID-19 spread, but I made one after the spread.
3. I didn’t have a plan before COVID-19 spread and I don’t have one now, but I will make one in the future.
4. I didn't have a plan before COVID-19 spread, and I don’t plan to have one in the future.

[25] It is important to note that a high percentage of correct answers to financial literacy questions does not necessarily mean that financial competency is present. For example, it is not enough just to have the habit of keeping a household account book, but it will be necessary to keep a household account book to manage income and expenditure, and then work to eliminate deficits and secure surpluses. It should be noted that there are other items to be measured in terms of knowledge, behavior, and attitude in addition to the questions in 7.1 in order to measure financial competency.

Having financial knowledge

For all the questions below, the following instructions were presented in advance: “This is a question to confirm your general level of understanding, so please answer without any outside references or consultation,” and, “Even if you don’t answer correctly, there will be no impact on the reward or future questionnaire distribution.“ The survey was setup such that it is not possible to return to the previous questions and re-do them.

Q. 16: “Suppose you have 10,000 yen in your bank account and the interest rate is 2% per year. Also, the deposited money and interest will never be withdrawn from your account. How much money will be in your savings account in a year? (Please assume that there is no tax.) Please choose one of the following answers.

1) Over 10,200 yen

2) Just 10,200 yen (correct)

3) Less than 10,200 yen

4) I don’t know.

5) I don’t want to answer.

Q. 17: “Suppose you have 10,000 yen in your bank account and the interest rate is 2% per year. Also, the deposited money and interest will never be withdrawn from your account. How much money will be in your savings account in 5 years? (Please assume that there is no tax.) Please choose one of the following answers.

1) Over 11,000 yen (correct)

2) Just 11,000 yen

3) Less than 11,000 yen

4) I don’t know.

5) I don’t want to answer.

Q. 18: “Suppose the interest rate on your deposit account is 1% per year and the inflation rate is 2% per year. How much do you think you will be able to buy with the money in that account in a year? Please choose one of the following answers.’"

1) I can buy more things than today

2) I can buy exactly the same things as today.

3) I can buy less than today (correct)

4) I don’t know.

5) I don’t want to answer.

Q. 19: “Do you think the following sentence is correct?” Please choose one of the following answers.

<Item list>

1. “Buying stock of a company usually yields more reliable returns than buying a stock mutual fund” (the correct answer is “wrong”).

2. “Stocks are usually more risky than bonds” (the correct answer is “correct”)

3. “Investments that are expected to deliver high returns usually have high risks” (the correct answer is “correct”)

4. “There is no need to buy insurance for an event with a very low probability of occurrence” (correct answer is “wrong”)

<Choice List>

1. Correct

2. Wrong
3. I don’t know.
4. I don’t want to answer.

Q. 20: “What do you think will happen to bond prices when interest rates fall?” Please choose one of the following answers.

1) Go up (correct)
2) Go down
3) Unchanged
4) Other than 1-3
5) I don’t know.
6) I don’t want to answer.

Utilizing external knowledge

Q. 42: Have you collected information on finance, investment, savings, etc. since the spread of COVID-19?

1) Yes, even since before the spread of COVID-19
2) I didn’t before the spread of COVID-19 but started to after the spread.
3) I didn’t do it before or now, but I will in the future.
4) I didn’t do it before or now, and I won’t in the future.