Revisiting financial fragility during the COVID-19 pandemic: Evidence from Taiwan

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ABSTRACT

This study explores the effects of self-control and financial literacy on financial fragility during the COVID-19 pandemic in Taiwan. The results indicate that cognitive (financial literacy) as well as non-cognitive/affective (self-control) factors are associated with individuals' financial fragility. However, the affective factor has a stronger impact on individuals' financial fragility than the cognitive factor. The magnitude of the effect of self-control is greater than that of financial literacy. Individuals with low self-control have significantly lower financial literacy than those with high self-control. Additionally, respondents with high self-control and high financial literacy experience the lowest probability of financial fragility. Our results are robust after assessing for omitted variables and endogeneity.

1. Introduction

The COVID-19 pandemic impacted economies around the world in 2020. To avoid the spread of infection, countries enacted economic restrictions, which led to a rise in the unemployment rate. In turn, this impacted the income of many individuals. Those without sufficient savings struggled to cover unexpected expenses, ultimately leading to financial fragility (Lusardi et al., 2011). There is a growing body of work exploring the impact of COVID-19 on financial fragility. Financial fragility threatens individual well-being (Bialowolski et al., 2021). Chhatwani and Mishra (2021a, b) show that consumers with higher financial confidence, optimism, and financial literacy were less financially fragile during the COVID-19 pandemic. Kleimeier et al. (2023) find that financial literacy, internal locus of control, and resilience can reduce financial fragility. Other studies, such as those of Clark et al. (2021) and Clark and Mitchell (2022), focus on the financial fragility of older adults between the ages of 45 and 75 years in the United States.

The above studies focus on developed countries with lower savings rates.[1] There exist relatively few studies on the financial fragility during COVID-19 among Asian countries with higher savings rates. Goyal et al. (2021) studied the epidemic's impact on personal finances in India. Taiwan's savings rate is 37.6%, higher than India's 30.2%. Coupled with Taiwan's well-established epidemic prevention mechanisms, the local pandemic did not emerge until the second quarter of 2022. This study uses survey evidence from Taiwan to examine the determinants of financial fragility of countries with high saving rates during the pandemic.

In this study, we attempt to explain individual financial fragility in terms of personal behavioral biases. Life challenges our self-control and willpower. Hofmann et al. (2009) discuss the conflict between impulsivity and self-control from a psychological perspective. In general, those with low self-control are more likely to engage in compulsive shopping (Achtziger et al., 2015), and as a result, households with self-control problems exhibit lower wealth accumulation (Biljanovska and Palligkinis, 2015). To resist temptation and choose more reasonable options, self-control is required. Brounen et al. (2016) find that respondents with strict household management and strong self-control are more likely to postpone current consumption for future needs. In contrast, Ballinger et al. (2011) find that self-control does not affect saving behavior when considering cognitive abilities (such as working memory). Therefore, the relationship between self-control and financial behavior remains unclear.

One related determinant of financial fragility is financial literacy, which is widely discussed in the literature. Financial literacy is closely related to retirement planning and wealth accumulation (Behrman et al., 2012). When individuals experience a major economic shock, financial fragility can be avoided if individuals possess sufficient savings or an appropriate retirement plan. Financially literate individuals can make informed financial decisions and are better able to achieve financial goals and reduce economic shocks (Lajuni et al., 2018). Thus, improved financial literacy

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[1] Gross national savings rates: Kleimeier et al. (2023) study Australia (26.1%), France (21.8%), Germany (26.2%), and South Africa (17.6%); Chhatwani and Mishra (2021a, b), Clark et al. (2021), and Clark and Mitchell (2022) study United States (18.2%). https://www.ceicdata.com/en/indicator/gross-savings-rate

enables individuals to cope with financial shocks (Klapper et al., 2013; Kaiser and Menkhoff, 2017). In addition, Angrisani et al. (2023) and Kleimeier et al. (2023) show an inverse relationship between financial literacy and financial fragility.

The contributions of this study are three-fold. First, we conducted an individual financial fragility questionnaire to assess the economic impact of the COVID-19 pandemic. Our measure of financial fragility is the same as that employed elsewhere in the literature,[2] based on Lusardi et al. (2011), which considers financial preparations for unexpected needs in the next month (we define this as emergency reserves). In addition, we directly ask whether expenditures related to the COVID-19 epidemic (we henceforth refer to this as COVID-19) are afforded. We predict that the responses will reflect actual and urgent financial needs and, therefore, capture incidences of financial fragility.

Second, few studies to date simultaneously consider the impact of financial literacy and self-control on savings or financial fragility. While Gathergood and Weber (2014) consider both financial literacy deficiencies and self-control, the study focuses on the co-holding behavior of households with savings, which maintain revolving consumer credit debt. Moreover, Mpaata et al. (2021) find that both financial literacy and self-control ability significantly predict saving behavior. Although Kleimeier et al. (2023) study the impact of financial literacy and locus of control on personal financial fragility simultaneously, their locus of control is a general questionnaire with no relationship to finance or consumption.[3]

Our self-control uses items commonly employed elsewhere in the literature, including impulsive consumption (Gathergood and Weber, 2014) and addiction, especially smoking (Gruber and Köszegi, 2001; Uhr et al., 2021). We envision that this study will contribute to the literature by capturing the impact of self-control on financial fragility. Our empirical results demonstrate that self-control and financial literacy simultaneously affect financial fragility. Individuals with self-control problem have a higher chance of being financially fragile compared with individuals of the same level of financial literacy. Individuals with high self-control and high financial literacy have the lowest probability of financial fragility.

Finally, our study helps to address a lack of research on financial fragility in Asian countries with higher saving rates during the COVID-19 period. Phung (2023) finds a positive relationship between Vietnamese parental dominance during the pandemic and the financial literacy and budgeting habits of students, though they do not examine financial fragility. Goyal et al. (2021) study the pandemic's impact on personal finances in India. They find that low-income groups and those with lower education levels are the most economically fragile; however, they do not study the effect of financial literacy or self-control on fragility.

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[2] Philippas and Avdoulas (2020), Chhatwani and Mishra (2021a, b), Kleimeier et al. (2023)
[3] Rosenbaum (1980) views self-mastery (i.e. locus of control) as one component of self-control more generally arguing that 'before a person applies any specific self-controlling skill he must believe that he can control his own behavior without outside help'.

The rest of this study is organized as follows. Section 2 reviews the literature on self-control and financial literacy as mitigators of financial fragility. Section 3 discusses our data and methodology. Section 4 presents the results. Section 5 concludes the paper and provides implications.

2. Literature review

2.1. Self-control

Shefrin and Thaler (1988) propose the Behavioral Life-Cycle Theory (BLCT), arguing that a savings model that ignores temptation is underspecified and that willpower represents the psychological costs associated with exercising self-control necessary to resist immediate gratification and achieve long-term savings goals. Based on the BLCT, individuals with high self-control are more likely to save money, exhibit better overall financial behavior (deliberative thinking, optimism), and feel less anxious about financial matters (Strömbäck et al., 2017).

Everyday life presents many temptations that challenge our self-control and willpower. Low self-control is an aspect of personality revealed through observable characteristics such as smoking (Uhr et al., 2021) or impulsive consumption (Gathergood and Weber, 2014). The commonly used example of self-control failure in the literature is smoking (DellaVigna and Paserman, 2005; Gruber and Köszegi, 2001). Although smokers are aware of the health risks of smoking, most lack the self-control to quit smoking successfully.

In addition, Achtziger et al. (2015) find that those with low self-control are more likely to engage in compulsive shopping. Gathergood (2012) also discovered that people with financial self-control problems are more likely to suffer from reduced credit lines and unforeseen expenditures on durable goods, resulting in over-indebtedness. People's saving behavior may be affected by self-control, and Choi et al. (2011) find that those with poor self-control are less likely to save sufficient money for retirement. However, Ballinger et al. (2011) find that neither self-control nor different measures of impulsive behavior affect saving behavior when cognitive abilities are considered. Therefore, the relationship between self-control and financial behavior is ultimately an empirical one.

2.2. Financial literacy

Financial literacy refers to a person's ability to understand basic financial concepts and make prudent financial decisions (OECD, 2011). Acquiring additional financial literacy requires investment in human capital related to learning time and money (Lusardi et al., 2017). A lack of preparation for dealing with vast and unexpected expenses in the near future is a cause of financial fragility (Lusardi et al., 2011). Many structural factors contribute to high financial fragility, one of the most prominent being a lack of savings (OECD, 2014). Existing studies discuss how financial literacy can improve financial management and the tendency to save. Financial literacy leads individuals, businesses, and households to save prudently (Murendo and Mutsonziwa, 2017). Further, Lusardi and Mitchell (2017) and Hasler et al. (2023) find that financially literate

individuals tend to save more for retirement. Hasler and Lusardi (2019) show that financially fragile individuals are less likely to plan for retirement. Sang et al. (2014) find that although financial knowledge does not explicitly affect a person's financial decisions, having financial awareness does affect a person's attitude toward positive financial behaviors.

COVID-19 poses significant financial risks. Clark et al. (2021) show that among older respondents, those who are financially literate are better able to cope with an unexpected expense of $2,000 in the early months of the pandemic. In addition, Angrisani et al. (2023) studied the data of American adults from 2012 to 2018 and found that basic financial literacy has significant predictive power for future financial fragility. Hence, we believe that financial literacy can minimize the harmful effects of financial shocks caused by COVID-19. We expect that financial literacy is negatively associated with an individual's financial fragility.

3. Data and descriptive statistics

We collect data using a web-based survey administered by the market research firm TATOH[4]. The questionnaire mainly studies respondents' financial situation during the COVID-19 pandemic and the effect of control-self and financial literacy on financial fragility. This research was conducted from April 4 to 18, 2022, a period in which there was a local outbreak in Taiwan. Because the large-scale outbreak occurred later in Taiwan compared to other countries, the timing of our survey means we capture those who had the opportunity to accumulate personal experience related to the epidemic and understand its impact on financial fragility. A total of 1,062 completed questionnaires were collected and analyzed.

The questionnaire consists of four sections, each focusing on respondents' financial fragility, self-control, financial literacy, and socio-demographic information. We measure two types of financial fragility: one being "COVID-19," which does not cover ordinary living expenses due to the impact of COVID-19, and the other being "Emergency Reserve," which refers to those unable to afford emergency medical treatment within a week's notice. The definition of "Emergency Reserve" is based on Lusardi et al. (2011) and is used in other studies.[5] Self-control is measured by impulsive consumption (Gathergood and Weber, 2014) and smoking (Gruber and Köszegi, 2001; Uhr et al., 2021) in the questionnaire. The financial literacy measure is constructed as per Hsu (2022), involving the number of correct answers to questions on subjects including interest, inflation, risk diversification, and the riskiness associated with various financial products. The details of the measurement of these variables appear in Appendix A.

Descriptive statistics for our sample are provided in Table 1. In our study, only 21.9% of respondents exhibit financial fragility with COVID-19 and 17.6% exhibit emergency reserve problems.[6] Our sample's financial fragility level is lower than previous findings in other countries

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[4] TATOH Information Co., Ltd. https://www.tatoh.tw/questionnaire
[5] Please refer Philippas and Avdoulas (2020), Chhatwani and Mishra (2021a,b), and Kleimeier et al. (2023).
[6] According to the "2022 Taiwan Financial Life Survey" report of the Taiwan Financial Research Institute, nearly 20% of the respondents cannot raise NT$100,000 within a week to deal with emergencies. Once an unexpected shock occurs, the emergency fundraising capacity is insufficient. So, our measure of financial fragility is near the result of survey.

with lower savings rates. Hasler et al. (2018) report that one-third of American households are financially fragile, with Demertzis et al. (2020) reporting the same statistic for European households. Kleimeier et al. (2023) also find that 34.14% of respondents have an average level of objective financial fragility for Australia, France, Germany, and South Africa. Of the respondents in the sample, 31.4% exhibit low self-control. The average financial literacy score is 5.29 out of 8, with less than 1% answering all questions correctly. We define a financial literacy dummy as equal to one when its financial literacy score is larger than the median, and we find that 46.1% of respondents have a level of financial literacy above the midpoint of 5.

Respondents' socio-demographic characteristics include gender, age range, education, marital status, and income. Except for gender and marital status, we categorize each socio-demographic trait into three groups. Gender is almost equally split between male and female respondents. In our age distribution, roughly 31.4% of individuals are below 26 years old, 32.8% are aged between 27 and 42, and 35.9% are aged over 43 years. Most of the respondents (66.3%) have a bachelor's degree, while 17% and 16.7% have high school and master's degrees, respectively. Regarding income, 36.9% of individuals and 38.3% of households earn an annual income between NTD 350,001 and NTD 640,000 (income_middle).

< Table 1 is inserted here >

4. Empirical analysis

4.1. Univariate analysis

In addition to the descriptive statistics in Table 1, Table 2 provides the results of univariate analysis. We compare the mean characteristics of financially non-fragile and fragile individuals. The average financial literacy score for financial non-fragility is significantly higher than for financial fragility, with the financial literacy dummy also producing the same statistic. This finding is consistent with previous research in which financially literate individuals make more informed financial decisions and are better able to reduce economic shocks (Lajuni et al., 2018). Regarding self-control, the ratio of individuals with low self-control in the financial non-fragility group (22.7%) is substantially lower than in the financial fragility group (62.2%). The result suggests that people with high self-control are more likely to save money (Strömbäck et al., 2017) and thus have a propensity to be non-financially fragile.

Comparing the distribution of financial fragility among different generations, the result shows that among Gen_X, aged above 43, a higher proportion exhibit non-fragility (0.388) versus fragility (0.253). On the contrary, among Gen_Z, aged below 26, a substantially higher proportion exhibit fragility (0.425) versus non-fragility (0.282). This may be related to work experience. More work experience is likely to result in higher wealth accumulation. Therefore, the proportion of people over 43 in the financially fragile group is significantly smaller. In addition, there is a considerably lower rate of financial fragility among groups with high individual annual income and high

household annual income. However, groups with low individual annual income, low household annual income, and lower education have significantly higher rates of financial fragility.

< Table 2 is inserted here >

4.2. Financial fragility and financial literacy differences in self-control

We test the dependencies between financial fragility and self-control using the statistical Chi-Square and Kolmogorov-Smirnov tests for independence. These tests of independence determine whether there is an association between the categorical variables (i.e., whether the variables are independent or related). From Panels A and B of Table 3, we observe significant financial fragility differences for low self-control for the sample from the first column.

Previous research indicates that financial literacy can affect financial fragility. We then divide the total sample into high and low financial literacy. Based on the second and third columns of Panel A and B, we find significant financial fragility differences according to low self-control, which has a more substantial impact on the low financial literacy group. Panel C clarifies how financial literacy scores relate to self-control. The results show a significantly lower financial literacy among the group with low self-control.

< Table 3 is inserted here >

4.3. Logistic regression results for financial fragility

Because of the binary nature of the dependent variable, we verify our results by performing multivariate logit regressions on financial fragility on COVID-19 (Table 4, Panel A) and emergency reserve (Table 4, Panel B) after controlling for age, education, individual annual income, household income, and marital status. In Panel A, Model (1) shows that the odds ratio of low self-control is significantly greater than one. These results reveal that respondents with low self-control have a higher possibility of being financially fragile than respondents with high self-control. This is similar to the findings of Kleimeier et al. (2023) that individuals' internal locus of control helps to counteract financial fragility.

Next, the results from Model (2) reveal the odds ratios of financial literacy to financial fragility are less than one and significant. These results suggest that respondents with high financial literacy are more likely to show low levels of financial fragility. Consistent with previous studies, we find a negative relationship between financial fragility and financial literacy (Kaiser and Menkhoff, 2017; Angrisani et al., 2023). Further, we define a financial literacy dummy as equal to one when its financial literacy score is larger than the median. Model (3) produces similar results. Model (4) and Model (5) simultaneously consider low self-control and financial literacy and obtain similar effects. We also evaluate the impact of low self-control and financial literacy on emergency reserves and find similar effects, as shown in Panel B.

Finally, our results in Table 4 indicate that respondents have different levels of financial fragility depending on their socio-demographics. Among independent variables, 'Gen_Z,'

'Household Annual Income_Middle,' and 'Household Annual Income_High' are four determinants of financial fragility that are statistically significant for COVID-19 and emergency reserves. The odds ratio for Gen_Z (aged below 26) is 2.28, showing that individuals who are younger have a higher propensity for financial fragility than Gen_X (aged above 43). Household annual income in the middle and high groups have odds ratios of 0.65 and 0.27, respectively, which means they are more likely to show low levels of financial fragility than those from the low household annual income group.

< Table 4 is inserted here >

4.4 Interaction effect for financial fragility

To examine the interaction effects between self-control and financial literacy on financial fragility, we used a logistic regression model, as per Kim (2009)[7], combined with a decision tree to investigate the interaction among explanatory variables. From Figure 1 (a) and (b), decision tree analysis shows an interaction between low self-control and financial literacy in their association with financial fragility. The Chi-square value is significant (132.2), with low self-control as a top layer, indicating low self-control is the most crucial factor relating to financial fragility.[8] Optimal trees are classified into four groups ("SC-High/FL-Low," "SC-High/FL-High," "SC-Low/FL-Low," and "SC-Low/FL-High"). From the bottom of the trees, results show the "SC-Low/FL-Low" (Node 5) group has the highest probability of financial fragility on COVID-19 and the emergency reserve.

< Figure 1 is inserted here >

We then conduct logistic regression analysis using an interacted variable of self-control and financial literacy in Table 5. For each of the four groups, we introduce a dummy variable, taking the value of one for those specified by the variable name and zero otherwise. Using the "SC-Low/FL-Low" as our base group, we compare the financial fragility of the other three groups. For financial fragility on COVID-19, the odds ratio of "SC-Low/FL-High" is found to be significantly smaller than one. This implies that high financial literacy respondents exhibit lower financial fragility than low financial literacy respondents in the same low self-control group. On the other hand, among those with high self-control, the low financial literacy group ("SC-High/FL-Low") is significantly associated with a higher chance of financial fragility compared to the high financial literacy group. Compared with other groups, the "SC-High/FL-High" has the smallest odds ratio and average marginal effect, suggesting those with high self-control and high financial literacy have the lowest probability of financial fragility. The third column of Table 5 uses the emergency reserve as the measure of financial fragility, producing similar results.

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[7] Kim (2009) suggests a logistic regression model combined with a decision tree for addressing a significant interaction effect between the explanatory variables. Kim also uses national pension data to illustrate better performances in the assessment of the predictive model than the logistic regression model or decision tree.
[8] We also force financial literacy to be at the top level, but Chi-square is significant with a minor value (39.971). Decision trees are available upon request.

In summary, self-control and financial literacy impact individuals' financial fragility. Respondents with low self-control and low financial literacy have a higher probability of financial fragility. Financial literacy reduces financial fragility, and self-control has a more significant impact.

< Table 5 is inserted here >

4.5 Propensity score matching

A potential endogeneity concern is that our models suffer from omitted variable bias, in which an omitted variable is correlated with financial literacy, self-control, and financial fragility. Furthermore, the measure of financial fragility may have nonlinear effects if the linear variables used in the model do not adequately account for differences between financial literacy and financial illiteracy. Hence, we use the Propensity Score Matching (PSM) method to control other variables to be equal or close when measuring samples with and without financial fragility to reduce or avoid the endogenous selection error of the sample (Dehejia and Wahba, 2002; Rosenbaum and Rubin, 1983).

Using a Conditional Logistic Regression model, we first regress the indicator variable for financial literacy on our previously used control variables and estimate the probability (i.e., the propensity score) that an individual has high financial literacy. Next, we pair each observation belonging to high financial literacy with the observation of low financial literacy that has the closest propensity score. The resulting sample consists of 490 respondents with high financial literacy, matched to 490 respondents with low financial literacy.

Table 6, Model (1) to Model (5), presents the results from our base logistic regressions in Table 3 and Table 4 using the matched sample. Also, Model (6) uses the matched sample to perform logistic regression with the same variables as Table 5. Consistent with earlier findings, the results show that respondents with lower financial literacy and low self-control have a high propensity to financial fragility. Together, the results from this analysis suggest that omitted variables related to our control variables are not likely to bias our findings.

< Table 6 is inserted here >

4.6 Instrumental variables regressions

While our previous analysis helps alleviate endogeneity concerns, it is still possible that endogeneity arises due to reverse causality. We proceed to examine the robustness of our main findings to control for endogeneity using an instrumental variables approach. This approach relies on our instrumental variables being correlated with our financial literacy measures but uncorrelated with the error terms.

Specifically, instrumental variables must satisfy two conditions to be considered valid instruments. First, the correlation condition requires that the instruments are related to our measure of financial literacy after controlling for a set of control variables in the main model. Second, the

exclusion restriction requires that conditional on the full set of control variables, these instruments are related to financial fragility only through their correlations with measures of financial literacy.

We reanalyze the interactive effect between financial literacy and financial literacy on financial fragility using place of residence as an instrumental variable. Lusardi and Mitchell(2014) studied American data and found that people with lower education levels have lower financial literacy. In addition, Lusardi et al. (2010) found that college students were more financially knowledgeable than high school students. While educational attainment does not necessarily equate to financial literacy, it can be inferred that individuals with higher educational attainment have a higher chance of attaining higher financial literacy. Based on the statistics of Dept. of Household Registration Affairs, in northern Taiwan, roughly 50% of people have a college degree or above. Thus, we assume that the proximity of a respondent's residence to the capital city would be positively correlated with financial literacy, yet importantly, not directly related to the exhibition of financial fragility. The results in Table 7 obtained through this instrumental variable approach are robust to potential endogeneity.

< Table 7 is inserted here >

5. Conclusion and discuss

To what extent do factors influence an individual's financial fragility, and why does financial fragility vary despite similar financial education? To shed more light on answering these questions, we used questionnaires to survey socio-demographic information, financial literacy, and self-control on financial fragility. To the best of our knowledge, this study is the first to examine the effect of self-control and financial literacy simultaneously on financial fragility using a sample of individuals in Asia countries with high saving rates during the COVID-19 period. Our results indicate that the financial fragility level (17.6% to 21.9%) is lower than that reported in other countries with lower saving rates (31.4% to 34.1%).

Financial literacy refers to the ability to understand and use financial information and concepts effectively to make informed financial decisions. Financially literate individuals tend to save more for retirement (Murendo and Mutsonziwa, 2017; Lusardi and Mitchell, 2017; Hasler et al., 2023). Respondents with financial literacy can minimize the harmful effects of economic shocks caused by COVID-19; thus, they are more likely to lower financial fragility. Our finding aligns with the previous studies (Chhatwani and Mishra, 2021a, b; Kleimeier et al., 2023).

Everyday life is filled with temptations that challenge our self-control or willpower. People with self-control problem are more likely to engage in impulsive shopping (Gathergood and Weber, 2014), making it impossible to save enough money for retirement (Choi et al., 2011). When individuals are faced with urgent needs or a significant impact of the epidemic, they may be unable to pay and become financially fragile. Hence, we investigated the role that self-control plays in modifying the relationship between financial literacy and financial fragility since it has been shown that individuals with low self-control in the same literacy group are more likely to be financially fragile.

Furthermore, we introduce financial literacy to study the effect of self-control on financial fragility. We find that individuals with low self-control exhibit stronger financial fragility and that financial literacy reduces the impact of self-control on financial fragility. Our study contributes to the literature by shedding additional light on financial fragility differences by simultaneously considering self-control and financial literacy.

Our findings should interpret with acknowledgement of the limitations of our data. First, our data do not allow us to compare the different effects of financial literacy and self-control on financial fragility before and after the COVID-19 pandemic. Second, while we acknowledge that the cross-sectional nature of our study does not allow us to draw conclusions about causality, we believe our survey data adds to the finance literature by providing a perspective on financial fragility during the COVID-19 pandemic.

Our research results indicate that cultivating financial literacy should not only be regarded as an essential means to reduce financial fragility. Reducing self-control issue by improving control is also an important way to reduce financial fragility. This is important for individuals and for policymakers. Thus far, significant policy attention has been targeted at fostering financial literacy, achieved mainly by educating and informing citizens. Our results show that improving self-control may be a more fruitful way to encourage a willingness to save and avoid financial fragility. Increasing self-control cannot be easily achieved by simply providing information about its benefits. Further research is needed to explore how policies can be designed to improve self-control.

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Table 1 Descriptive statistics

Variables	Mean	Median	Std.	Min	Max
Financial fragility - COVID-19	0.219	0	0.414	0	1
Financial fragility - Emergency reserve	0.176	0	0.381	0	1
Self-control	1.060	1	1.151	0	4
Low self-control	0.314	0	0.464	0	1
Financial literacy	5.289	5	1.241	1	8
Financial literacy dummy	0.461	0	0.499	0	1
Male	0.506	1	0.500	0	1
Gen_X (Age: 43 and above)	0.359	0	0.480	0	1
Gen_Y (Age: 27-42)	0.328	0	0.470	0	1
Gen_Z (Age: 26 and below)	0.314	0	0.464	0	1
Education: high school	0.170	0	0.376	0	1
Education: bachelor degree	0.663	1	0.473	0	1
Education: master degree	0.167	0	0.373	0	1
Individual Annual Income_Low	0.307	0	0.461	0	1
Individual Annual Income_Middle	0.369	0	0.483	0	1
Individual Annual Income_High	0.324	0	0.468	0	1
Household Annual Income_Low	0.272	0	0.445	0	1
Household Annual Income_Middle	0.383	0	0.486	0	1
Household Annual Income_High	0.345	0	0.475	0	1
Married	0.420	0	0.494	0	1
Observations	1,062				

Note: This table provides descriptive statistics for all variables. The details of the measurement of main variables (financial fragility, self-control, financial literacy) appear in Appendix A. Low annual income is at and under NT$350,000, middle yearly income is between NT$ NT$350,001 and NT$640,000, and high annual income is over NT$640,000.

Table 2 Univariate Result of financial fragility

Variables	Financial fragility - COVID-19				Financial fragility - Emergency Reserve			
	non-fragility	fragility			non-fragility	fragility		
	Mean	Mean	Diff.	T-value	Mean	Mean	Diff.	T-value
Low self-control	0.227	0.622	-0.396	-12.28 ***	0.270	0.519	-0.249	-6.80 ***
Financial literacy	5.460	4.682	0.777	8.74 ***	5.415	4.701	0.714	7.32 ***
Financial literacy dummy	0.513	0.279	0.234	6.44 ***	0.506	0.251	0.255	6.47 ***
Male	0.491	0.558	-0.067	-1.81 *	0.513	0.471	0.043	1.06
Gen_X (Age: 43 and above)	0.388	0.253	0.135	3.82 ***	0.391	0.209	0.182	4.76 ***
Gen_Y (Age: 27-42)	0.329	0.322	0.007	0.21	0.338	0.278	0.060	1.59
Gen_Z (Age: 26 and below)	0.282	0.425	-0.143	-4.18 ***	0.271	0.513	-0.243	-6.61 ***
Education: high school	0.158	0.215	-0.057	-2.03 **	0.147	0.278	-0.131	-4.35 ***
Education: bachelor degree	0.667	0.648	0.019	0.54	0.673	0.615	0.058	1.53
Education: master degree	0.175	0.137	0.038	1.36	0.179	0.107	0.072	2.42 **
Individual Annual Income_Low	0.271	0.433	-0.162	-4.79 ***	0.242	0.610	-0.367	-10.36 ***
Individual Annual Income_Middle	0.364	0.386	-0.022	-0.61	0.390	0.273	0.117	3.02 ***
Individual Annual Income_High	0.364	0.180	0.184	5.37 ***	0.368	0.118	0.250	6.78 ***
Household Annual Income_Low	0.224	0.442	-0.218	-6.73 ***	0.217	0.529	-0.312	-9.03 ***
Household Annual Income_Middle	0.379	0.399	-0.020	-0.56	0.397	0.321	0.076	1.93
Household Annual Income_High	0.397	0.159	0.238	6.90 ***	0.386	0.150	0.237	6.29 ***
Married	0.429	0.386	0.043	1.18	0.454	0.262	0.192	4.87 ***
Observations	829	233			875	187		

Note: Table 2 compares the mean of two groups of respondents: respondents without financial fragility during the pandemic versus respondents with financial fragility during the pandemic. Significance at the 0.01, 0.05, and 0.10 levels is indicated by ***, **, and *, respectively.

Table 3 Financial fragility and financial literacy in low self-control

Financial fragility	Whole	High financial literacy	Low financial literacy	
Panel A: Chi-square test				
COVID-19	132.203 (0.000)***	29.352 (0.000)***	79.971 (0.000)***	
Emergency reserve	44.382 (0.000)***	10.525 (0.001)***	20.365 (0.000)***	
Panel B: Kolmogorov-Smirnov test				
COVID-19	4.758 (0.000)***	1.838 (0.000)***	4.073 (0.000)***	
Emergency reserve	2.537 (0.000)***	0.955 (0.002)***	1.940 (0.000)***	
Panel C: T-test				
	Low self-control	High self-control	Difference	P_value
Financial literacy	4.86	5.49	-0.63	(0.000)***

Note: We test the dependencies between financial fragility and self-control using the statistical Chi-Square and Kolmogorov-Smirnov tests for independence. The number in parentheses is the exact p-value. In Panel B, the number is the D statistics. Significance at the 0.01 level is indicated by ***.

Table 4 Logistic regression results for financial fragility

Variables	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Panel A: COVID-19					
Low self-control	5.142 ***			4.426 ***	4.721 ***
	(95.12)			(74.94)	(83.37)
Financial literacy		0.643 ***		0.711 ***	
		(44.65)		(24.11)	
Financial literacy dummy			0.435 ***		0.537 ***
			(24.33)		(12.25)
Male	1.310	1.646 ***	1.630 ***	1.337 *	1.319
	(2.44)	(8.95)	(8.85)	(2.74)	(2.54)
Gen_Y (Age: 27-42)	1.705 **	1.670 **	1.701 **	1.590 **	1.612 **
	(5.76)	(5.55)	(6.06)	(4.26)	(4.55)
Gen_Z (Age: 26 and below)	2.281 ***	2.181 ***	2.261 ***	2.097 ***	2.164 ***
	(12.76)	(12.06)	(13.45)	(10.10)	(11.11)
Education: bachelor degree	1.042	1.018	0.969	1.157	1.121
	(0.03)	(0.01)	(0.02)	(0.41)	(0.25)
Education: master degree	1.321	1.165	1.131	1.398	1.383
	(0.82)	(0.27)	(0.18)	(1.15)	(1.10)
Individual Annual Income_Middle	0.811	0.899	0.857	0.839	0.814
	(0.93)	(0.26)	(0.58)	(0.64)	(0.89)
Individual Annual Income_High	0.611	0.687	0.655	0.630	0.615
	(2.69)	(1.72)	(2.24)	(2.33)	(2.60)
Household Annual Income_Middle	0.654 **	0.617 **	0.596 ***	0.692 *	0.676 *
	(4.00)	(5.69)	(6.69)	(2.91)	(3.34)
Household Annual Income_High	0.275 ***	0.264 ***	0.259 ***	0.299 ***	0.294 ***
	(19.93)	(23.30)	(24.70)	(16.96)	(17.64)
Married	1.428 *	1.540 **	1.510 **	1.439 *	1.408 *
	(3.36)	(5.20)	(4.83)	(3.43)	(3.06)
Intercept	0.129 ***	2.123 *	0.337 ***	0.706	0.163 ***
	(51.03)	(3.51)	(16.83)	(0.62)	(38.29)
Nagelkerke R^2	0.256	0.192	0.164	0.286	0.271
Observations	1,062	1,062	1,062	1,062	1,062

Table 4 (Cont.)

Variables	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Panel B: emergency reserve					
Low self-control	2.725 ***			2.341 ***	2.404 ***
	(29.75)			(20.24)	(21.92)
Financial literacy		0.705 ***		0.754 ***	
		(23.85)		(14.75)	
Financial literacy dummy			0.386 ***		0.441 ***
			(24.00)		(16.98)
Male	0.989	1.146	1.139	1.011	0.999
	(0.00)	(0.56)	(0.51)	(0.00)	(0.00)
Gen_Y (Age: 27-42)	1.506	1.452	1.436	1.403	1.380
	(2.57)	(2.11)	(2.00)	(1.73)	(1.56)
Gen_Z (Age: 26 and below)	2.490 ***	2.419 ***	2.452 ***	2.331 ***	2.341 ***
	(13.10)	(12.33)	(12.80)	(11.20)	(11.36)
Education: bachelor degree	0.650 *	0.652 *	0.646 *	0.699	0.699
	(3.61)	(3.60)	(3.79)	(2.45)	(2.44)
Education: master degree	0.658	0.645	0.641	0.689	0.686
	(1.55)	(1.75)	(1.82)	(1.21)	(1.24)
Individual Annual Income_Middle	0.417 ***	0.443 ***	0.429 ***	0.420 ***	0.410 ***
	(15.40)	(13.84)	(14.91)	(14.96)	(15.76)
Individual Annual Income_High	0.319 ***	0.347 ***	0.333 ***	0.321 ***	0.312 ***
	(12.18)	(10.81)	(11.73)	(11.96)	(12.57)
Household Annual Income_Middle	0.624 **	0.600 **	0.593 **	0.654 *	0.651 *
	(4.60)	(5.50)	(5.74)	(3.65)	(3.71)
Household Annual Income_High	0.419 ***	0.408 ***	0.410 ***	0.462 ***	0.468 **
	(8.81)	(9.66)	(9.59)	(6.82)	(6.55)
Married	0.799	0.830	0.812	0.791	0.770
	(1.05)	(0.73)	(0.91)	(1.14)	(1.41)
Intercept	0.360 ***	2.875 **	0.726	1.509	0.499 **
	(12.76)	(5.77)	(1.29)	(0.77)	(5.45)
Nagelkerke R^2	0.244	0.237	0.239	0.264	0.268
Observations	1,062	1,062	1,062	1,062	1,062

Note: This table reports Logistic regression results. Results are given as odds ratios. The number in parentheses is the Wald test value. The base group for age is Gen_X, which is over 43 years old; for education is high school and under; for annual income is low yearly income, which is under NT$350,000. Significance at the 0.01, 0.05, and 0.10 levels is indicated by ***, **, and *, respectively. Nagelkerke (1991) measure the proportion of the variance that the model is able to explain. The *denotes a p-value < 0.1; **denotes a p-value < 0.05; and the ***denotes a p-value < 0.01.

Table 5 Logistic regression results with interaction effects

	COVID-19		Average Marginal Effect	Emergency reserve		Average Marginal Effect
SC-Low/FL-High	0.475	***	-0.085***	0.519	**	-0.058**
	(7.93)			(4.34)		
SC-High/FL-Low	0.196	***	-0.192***	0.448	***	-0.078***
	(60.48)			(13.40)		
SC-High/FL-High	0.117	***	-0.256***	0.179	***	-0.161***
	(84.47)			(43.23)		
Male	1.315		0.038	1.003		0.000
	(2.47)			(0.00)		
Gen_Y (Age: 27-42)	1.606	**	0.070**	1.386		0.036
	(4.47)			(1.61)		
Gen_Z (Age: 26 and below)	2.146	***	0.117***	2.365	***	0.105***
	(10.81)			(11.59)		
Education: bachelor degree	1.127		0.016	0.697		-0.040
	(0.27)			(2.48)		
Education: master degree	1.384		0.049	0.688		-0.036
	(1.10)			(1.23)		
Individual Annual Income_Middle	0.813		-0.028	0.409	***	-0.089***
	(0.90)			(15.78)		
Individual Annual Income_High	0.616		-0.064*	0.311	***	-0.109***
	(2.58)			(12.65)		
Household Annual Income_Middle	0.675	*	-0.053*	0.653	*	-0.044*
	(3.37)			(3.65)		
Household Annual Income_High	0.293	***	-0.153***	0.472	**	-0.074***
	(17.77)			(6.38)		
Married	1.411	*	0.049*	0.770		-0.028
	(3.10)			(1.41)		
Intercept	0.799			1.145		
	(0.58)			(0.19)		
Nagelkerke R^2	0.271			0.268		
Observations	1,062			1,062		

Note: This table reports the interaction effect of self-control and financial literacy. *SC-Low/FL-High* refers to respondents with low self-control and literacy scores above the median; *SC-High/FL-Low* refers to respondents with high self-control and literacy scores below and equal to the median; *SC-High/FL-High* refers to respondents with high self-control and literacy scores above and equal to the median. The base group *SC-Low/FL-Low* that refers to respondents with low self-control and literacy scores below the median. Results are given as odds ratios. The number in parentheses is the Wald test value. Significance at the 0.01, 0.05, and 0.10 levels is indicated by ***, **, and *, respectively.

Table 6 Propensity score matched sample analysis

Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Panel A: Logistic results - COVID-19						
Low self-control	3.331 ***			3.347 ***	3.498 ***	
	(37.44)			(36.05)	(38.64)	
Financial literacy		0.684 ***		0.681 ***		
		(25.48)		(23.96)		
Financial literacy dummy			0.425 ***		0.404 ***	
			(22.04)		(23.29)	
SC-Low/FL-High						0.493 **
						(4.88)
SC-High/FL-Low						0.327 ***
						(17.89)
SC-High/FL-High						0.119 ***
						(52.66)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Nagelkerke R^2	0.239	0.224	0.219	0.274	0.273	0.273
Observations	980	980	980	980	980	980
Panel B: Logistic results - emergency reserve						
Low self-control	2.767 ***			2.719 ***	2.935 ***	
	(19.24)			(17.26)	(20.19)	
Financial literacy		0.587 ***		0.590 ***		
		(35.72)		(33.59)		
Financial literacy dummy			0.329 ***		0.316 ***	
			(26.41)		(27.25)	
SC-Low/FL-High						0.323 ***
						(8.41)
SC-High/FL-Low						0.345 ***
						(12.03)
SC-High/FL-High						0.108 ***
						(42.11)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Nagelkerke R^2	0.335	0.363	0.349	0.387	0.377	0.377
Observations	980	980	980	980	980	980

Note: This table reported Logistic regression results using a matched sample, which is based on the propensity score matching. In Model (6), *SC-Low/FL-High* refers to respondents with low self-control and literacy scores above the median; *SC-High/FL-Low* refers to respondents with high self-control and literacy scores below and equal to the median; *SC-High/FL-High* refers to respondents with high self-control and literacy scores above and equal to the median. The base group *SC-Low/FL-Low* that refers to respondents with low self-control and literacy scores below the median. Results are given as odds ratios. The number in parentheses is the Wald test value. Significance at the 0.01, 0.05, and 0.10 levels is indicated by ***, **, and *, respectively.

Table 7 Instrumental variables regressions

Variables	1st stage Financial literacy	2nd stage Model (1)	2nd stage Model (2)	2nd stage Model (3)	2nd stage Model (4)	2nd stage Model (5)
Panel A: Two stage least squares regressions - COVID-19						
Low self-control					5.092 ***	
					(92.94)	
Financial literacy		0.051 ***		4.998 ***		
		(12.03)		(90.86)		
Financial literacy dummy			0.393 ***	0.086 ***	0.419 ***	
			(9.70)	(7.17)	(7.39)	
SC-Low/FL-High						0.492 *
						(3.56)
SC-High/FL-Low						0.242 ***
						(20.80)
SC-High/FL-High						0.089 ***
						(41.62)
Male	-0.036	1.522 **	1.566 ***	1.248	1.267	1.269
	(-0.46)	(6.50)	(7.53)	(1.61)	(1.86)	(1.88)
Gen_Y (Age: 27-42)	-0.176 *	1.083	1.621 **	1.100	1.534 *	1.540 *
	(-1.90)	(0.09)	(4.98)	(0.12)	(3.59)	(3.64)
Gen_Z (Age: 26 and below)	-0.228 **	1.144	1.892 ***	1.228	1.847 **	1.851 **
	(-2.14)	(0.19)	(7.38)	(0.39)	(6.30)	(6.34)
Education: bachelor degree	0.350 ***	2.404 **	1.336	2.395 **	1.550	1.510
	(3.53)	(5.99)	(1.32)	(5.17)	(2.59)	(2.31)
Education: master degree	0.273 *	2.306 **	1.528	2.551 **	1.907 *	1.868 *
	(1.94)	(5.16)	(1.81)	(5.63)	(3.61)	(3.41)
Individual Annual Income_Middle	0.112	1.222	1.020	1.089	0.961	0.953
	(1.06)	(0.77)	(0.01)	(0.12)	(0.03)	(0.04)
Individual Annual Income_High	0.110	0.930	0.738	0.814	0.687	0.677
	(0.88)	(0.06)	(1.12)	(0.41)	(1.49)	(1.59)
Household Annual Income_Middle	0.286 ***	1.340	0.852	1.338	0.955	0.959
	(2.63)	(0.84)	(0.44)	(0.73)	(0.03)	(0.03)
Household Annual Income_High	0.430 ***	0.876	0.360 ***	0.834	0.412 ***	0.414 ***
	(3.60)	(0.08)	(10.98)	(0.13)	(7.27)	(7.15)
Married	-0.052	1.290	1.504 **	1.201	1.373	1.373
	(-0.62)	(1.69)	(4.78)	(0.79)	(2.62)	(2.62)
Residential	0.186 **					
	(2.38)					
constant	4.728 ***	13.094 ***	0.304 ***	9.829 **	0.147 ***	0.684
	(34.16)	(9.90)	(20.60)	(4.91)	(43.35)	(1.51)
Nagelkerke R²	0.057	0.146	0.143	0.265	0.265	0.266
Observations	1062	1062	1062	1062	1062	1062

Table 7 (Cont.)

Variables	2nd stage Model (1)	2nd stage Model (2)	2nd stage Model (3)	2nd stage Model (4)	2nd stage Model (5)
Panel B: Two stage least squares regressions - emergency reserve					
Low self-control				2.778 ***	
				(30.65)	
Financial literacy	0.048 ***		2.633 ***		
	(9.94)		(27.32)		
Financial literacy dummy		0.164 **	0.068 ***	0.151 **	
		(5.82)	(7.46)	(6.36)	
SC-Low/FL-High					0.154 *
					(3.20)
SC-High/FL-Low					0.360 ***
					(30.09)
SC-High/FL-High					0.053 ***
					(8.00)
Male	1.062	1.122	0.932	0.963	0.963
	(0.11)	(0.41)	(0.14)	(0.04)	(0.04)
Gen_Y (Age: 27-42)	0.917	1.367	0.922	1.265	1.265
	(0.08)	(1.47)	(0.07)	(0.81)	(0.81)
Gen_Z (Age: 26 and below)	1.216	2.135 ***	1.254	1.969 ***	1.969 ***
	(0.32)	(8.77)	(0.41)	(6.80)	(6.80)
Education: bachelor degree	1.637	0.643 **	1.611	0.717	0.717
	(1.59)	(4.04)	(1.41)	(2.17)	(2.18)
Education: master degree	1.352	0.588	1.366	0.644	0.644
	(0.53)	(2.67)	(0.53)	(1.73)	(1.73)
Individual Annual Income_Middle	0.629 *	0.455 ***	0.572 **	0.433 ***	0.433 ***
	(3.61)	(13.46)	(4.97)	(14.26)	(14.25)
Individual Annual Income_High	0.487 **	0.398 ***	0.433 **	0.372 ***	0.372 ***
	(4.47)	(8.36)	(5.81)	(9.16)	(9.16)
Household Annual Income_Middle	1.345	0.564 ***	1.362	0.643 **	0.643 **
	(0.71)	(7.25)	(0.73)	(4.06)	(4.06)
Household Annual Income_High	1.372	0.425 ***	1.416	0.521 **	0.521 **
	(0.37)	(8.89)	(0.43)	(4.81)	(4.82)
Married	0.703	0.808	0.662 *	0.734	0.734
	(2.40)	(0.96)	(3.19)	(1.96)	(1.96)
constant	14.029 ***	0.584 **	11.989 **	0.402 ***	1.115
	(9.08)	(4.03)	(6.32)	(10.40)	(0.13)
Nagelkerke R^2	0.218	0.217	0.254	0.258	0.258
Observations	1062	1062	1062	1062	1062

Note: This table reported the results of two stage least squares regressions. The first stage results show in the Panle A. *SC-Low/FL-High* refers to respondents with low self-control and literacy scores above the median; *SC-High/FL-Low* refers to respondents with high self-control and literacy scores below and equal to the median; *SC-High/FL-High* refers to respondents with high self-control and literacy scores above and equal to the median. The base group *SC-Low/FL-Low* that refers to respondents with low self-control and literacy scores below the median. Results are given as odds ratios. The number in parentheses is the Wald test value. Significance at the 0.01, 0.05, and 0.10 levels is indicated by ***, **, and *, respectively.
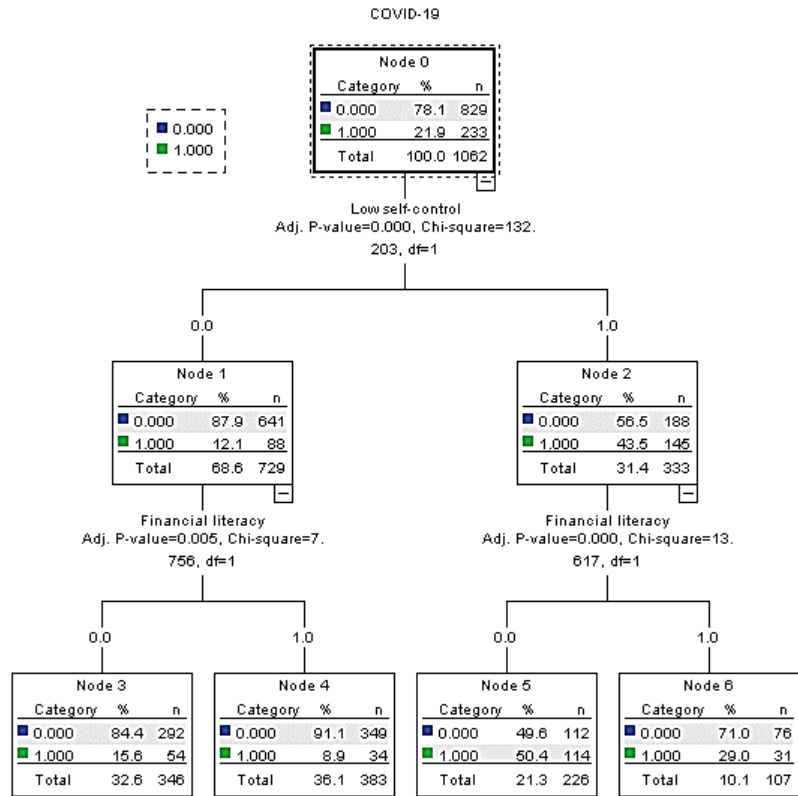
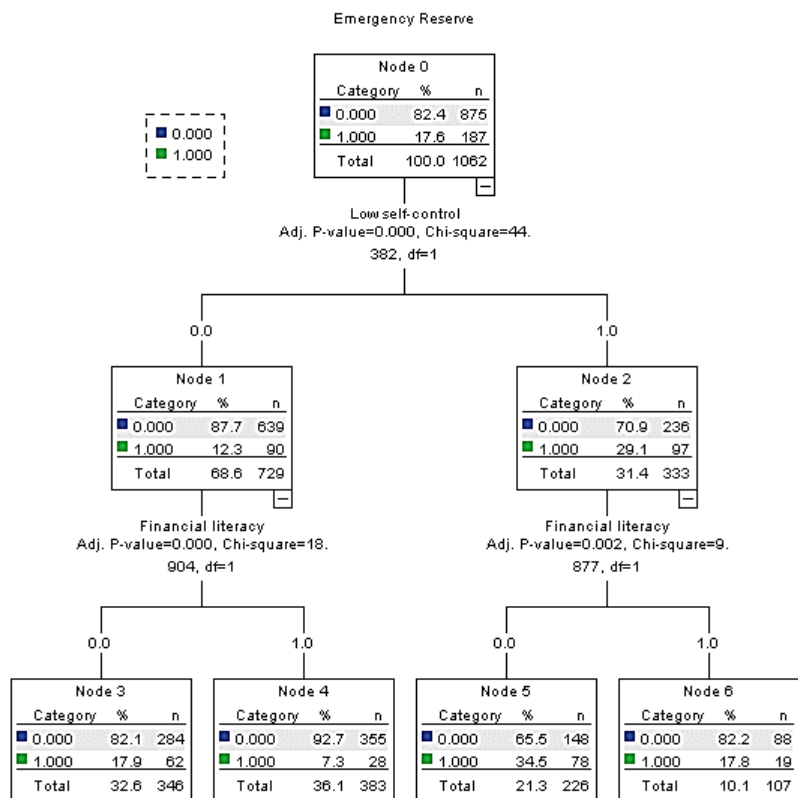Figure 1 (a) Results of decision tree analysis on financial fragility – COVID

Figure 1 (b) Results of decision tree analysis on financial fragility – emergency reserve

Appendix A: Variable definitions, measurement, and data sources

This Appendix A provides information on variable definitions, measurement, and data sources. Unless otherwise indicated, all data mentioned are obtained from our survey.

Financial fragility

1. COVID-19

"COVID-19" reflect the ability to cover ordinary living expenses due to the impact of COVID-19. Respondent's answer to the question "May I ask if you have not been able to pay your account due to the impact of the COVID-19 epidemic? What are some of them? (Multiple choice)" Respondents who answer (1) indicate that they do not have financial fragility and are assigned to "0", and those who answer the other options indicate they are financially fragile and are assigned to "1".

    (1) no
    (2) Yes, basic living expenses
    (3) Yes, child education expenses
    (4) Yes, nursing or foster care expenses
    (5) Yes, rent and mortgage
    (6) Yes, loans other than mortgages (such as car loans, credit cards)
    (7) Yes, insurance premium
    (8) Yes, tax
    (9) Yes, payment
    (10) Others

2. Emergency Reserve

"Emergency Reserve" reflects the ability to come up with a certain amount of funds for emergency medical treatment in one week. Respondent's answer to the question, "If you need money in an emergency (for example, emergency medical treatment, car repairs), do you think you can raise NT$100,000 within a week?" Respondents who answer "(1) No" indicate that they are financially fragile and are assigned to "1", and those who answer "(2) Yes, basic living expenses" suggest that they do not have financial fragility and are assigned to "0". The definition of "Emergency Reserve" is based on Lusardi, Schneider, and Tufano (2011), which is also used in other literature (Philippas and Avdoulas, 2020; Chhatwani and Mishra, 2021a,b; Kleimeier et al., 2023).

Self-control

We include impulsive consumption (Gathergood and Weber, 2014) and smoking (Gruber and Köszegi, 2001; Uhr et al., 2021) to measure self-control in the questionnaire. First, we calculate the number of answers to "one" for all questions. Then, we use the score median to separate the sample into low self-control and high self-control groups. If the self-control score exceeds the median, we set it as low self-control; otherwise, we set it as high self-control.

No	Question	Option	Code
1	Before you buy something, do you think carefully about whether you can afford it?	Not at all	1
		Less likely	1

		Sometimes	1
		Most of the time	0
		Always will	0
2	Even if I can't afford certain items, I will still buy them.	Disagree strongly	0
		Tend to disagree	0
		Neither agree nor disagree	1
		Tend to agree	1
		Agree strongly	1
3	When I spend money, I only think about the present and rarely the future.	Tend to disagree	0
		Neither agree nor disagree	1
		Tend to agree	1
		Agree strongly	1
4	Do you smoke?	Yes	1
		No	0
		Used to be but not now	0
		Ineligible	0

Financial literacy

The financial literacy measure is constructed as in Calcagno and Monticone (2015) and Hsu (2022). The financial literacy score is calculated by the number of correct answers to questions on subjects including interest, inflation, risk diversification, and the riskiness associated with various financial products.

1. Interest

Imagine you know with certainty that in six months the interest rates will rise. Do you think you should buy fixed rate bonds today? (correct answer is b)

   (a) Yes
   (b) No
   (c) Do not know

2. Inflation

Imagine an account yields 2% yearly (net of costs and taxes). With inflation at 2% per year, how much do you think you will be able to buy after two years (without moving funds in the account)? (correct answer is c)

   (a) More than what I could buy today
   (b) Less than what I could buy today
   (c) The same as what I could buy today
   (d) I do not know

3. Risk diversification 1

What do you think having correctly diversified investments mean? (correct answer is d)

   (a) Having in one's own portfolio both bonds and stocks
   (b) Do not hold same asset for too long
   (c) Invest in as many assets as possible
   (d) Invest in more assets to limit risk exposure of single ones
   (e) Do not invest in very risky assets
   (f) Do not know

4. Risk diversification 1

Which of these portfolios is better diversified? (correct answer is b)

(a) 70% T-bills, 15% Equity funds, 15% in 2–3 stocks
(b) 70% T-bills, 30% Equity funds
(c) 70% T-bills, 30% in 2–3 stocks
(d) 70% T-bills, 30% in stocks of companies I know well

5. Riskiness

Four indicators are based on the question: ''How risky do you think these products are?'' The products include private bonds, government bonds, stocks, stock mutual funds, bond mutual funds, deposits, and housing. Each statement can be assessed from 1 (Not risky at all) to 5 (Very risky). One point is given if the respondent can correctly state that:

(1) Private bonds are at least as risky as deposits
(2) Stocks are at least as risky as government bonds
(3) Stock mutual funds are at least as risky as bond mutual funds
(4) Housing is at least as risky as deposits