

The Impact of Financial Literacy Dimensions on Household Financial Vulnerability in China

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Abstract

The global economic downturn and instability in financial markets have significantly impacted the financial welfare of countless people. Moreover, COVID-19 has significantly impacted the financial of household in China and led to financial vulnerability. Addressing household financial vulnerability has become increasingly urgent. Grounded in family resource management theory, this study investigates the impact of financial literacy dimensions-namely, knowledge, attitudes, and skills-on household financial vulnerability within the Chinese context. Leveraging the robust database from the 2019 China Household Finance Survey (CHFS) and STATA statistical analysis software, this research reveal a negative association between financial literacy dimensions and household financial vulnerability. The study provides a basis for policymakers to optimize financial education programmes. Despite limitations, it identifies avenues for future research, ultimately enriching the comprehension of the causal links between financial literacy and household financial outcomes.

Keywords

Financial Literacy; Knowledge; Attitudes; Skills; Household Financial Vulnerability.

1. Introduction

After the outbreak of COVID-19, the economies of all countries in the world have been hit hard, with serious economic setbacks[7]. Specifically, in the micro household, a large number of the household labour force cannot find work, the unemployment rate has risen sharply, and the household income has fallen sharply [1]. The China Household Wealth Index Research Report (2020Q1) released by the China Household Finance Survey and Research Centre of Southwestern University of Finance and Economics shows that due to the impact of COVID-19, low-income groups and freelance groups have suffered a decline in job stability, a serious drop in wage income and a marked reduction in household wealth, with the proportion of households whose wealth has decreased considerably reaching 18.9 percent. The household risk resistance is greatly reduced, and the household very easy to fall into a high financial vulnerability predicament, bringing a lot of impact on the normal production of the household residents of life[2]. Good financial literacy has a significant positive impact on household financial decision-making and behaviour [11], including choices related to asset allocation, participation in financial markets, financial decision-making, investment diversification, reduction of over-indebtedness, and credit demand. Ultimately, it can enhance household financial well-being. This study aims to determine the association between financial literacy dimensions and household financial vulnerability. It not only enriches the field of household finance[13] research but also lays a micro-foundation for studying household financial vulnerability in China as a developing country.

2. Literature Review

In early times, the term "vulnerability" was applied to the study of meteorology, geology, hydrology and other natural aspects, and was gradually introduced into the fields of psychology, economics and finance[6]. The essence of vulnerability is risk, once the economy fluctuates, it will trigger a chain reaction of debt crunch, which will lead to a financial crisis. Since the end of the 20th century, financial vulnerability has gradually been used to analyze the health of household finances[3]. The influence of household financial risk on the macro-financial system has gradually been exposed since the subprime crisis of the U.S. in 2007, the government and financial institutions have started to Governments and financial institutions have begun to pay attention to financial risk issues, which has greatly promoted the attention and research of scholars on household financial vulnerability. Household financial vulnerability extends the perspective of vulnerability research to the household financial aspect, enriching the research framework of household finance and vulnerability. As the study of household financial vulnerability started relatively late, academics have yet to reach a consensus on the definition and measurement of household financial vulnerability.

2.1. Definition of Household Financial Vulnerability

Defining household financial vulnerability (HFV) is complex, lacking a universally accepted standard, though often associated with financial distress and over-indebtedness[19]. The concept traces its roots to Minsky's (1982) financial instability hypothesis, initially applied to corporate leverage, and later extended to the household level. Early household-focused research, such as Jappelli, Pagano, and Di Maggio (2013), defined HFV as the sensitivity of default risk to indebtedness, highlighting over-indebtedness as a critical dimension[15]. This liability-centric view, focusing on borrowing behavior and the inability to service debt, remains prevalent, particularly concerning low-income households[21]. However, this narrow debt-focused definition is critiqued for neglecting other determinants of financial instability. Consequently, broader perspectives incorporate household financial instability and liquidity deterioration. This view posits HFV as essentially a liquidity constraint, where households lack sufficient assets or income to manage debts or meet essential expenses during unexpected shocks[5]. A related consumption perspective emphasizes the impaired ability to maintain a basic standard of living or cope with unforeseen circumstances[16].

Synthesizing these views, a consensus emerges: HFV fundamentally represents the likelihood or risk of a household experiencing significant financial hardship when confronted with a financial shock. This implies an impaired capacity to absorb such shocks[20]. Crucially, this vulnerability is not exclusive to low-income groups; households across the wealth spectrum can be vulnerable [20]. Thus, HFV reflects the diminished stability or risk tolerance of household finances when exposed to uncertainty.

2.2. Measurement of Household Financial Vulnerability

At present, scholars have not formed a unified definition of household financial vulnerability, and therefore the indicators for measuring household financial vulnerability are not consistent. The existing literature mainly uses both objective and subjective indicators to measure household financial vulnerability[10]. Objective indicators are based on a household's ability to cope with unexpected risk shocks, focusing on the household's debt ratio, asset liquidity, income and expenditure, and other financial conditions directly related to the household's ability to cope with unforeseen events, while subjective indicators usually measure the household financial vulnerability based on the household's subjective evaluation of key financial indicators.

The use of objectives or subjective is still a debate as to the results produced by each of them differ slightly. This is because they analyse different aspects concerning financial vulnerability.

In the end, most of the measurements used for financial vulnerability will be set forth according to the definition and limitations of the data obtained. This study considers that the objective household financial vulnerability indicator reflects the actual debt or income and expenditure risks faced by households and their ability to cope with risky shocks, which is a more reasonable measure of household financial vulnerability; whereas the subjective household financial vulnerability indicator expresses the financial risks faced by households from the perspective of their subjective evaluations, which may lead to a misalignment of the results of the measurement due to the subjective answers given by the interviewees, and does not reflect the financial vulnerability of the households very well.

2.3. The Relationship between Financial Literacy and Financial Vulnerability

Forward-looking individuals can use economic information to effectively build wealth throughout the life cycle. Groups with low levels of financial literacy are often unable to make effective decisions about financial markets, particularly in the areas of saving and investing, debt and mortgages, retirement planning and wealth accumulation[8], thus exacerbating the financial burden on households.

Although the relationship between financial literacy and vulnerability has not been extensively researched, it is necessary to emphasise the importance of financial literacy for household financial vulnerability. Financial literacy is believed to have a significant effect on people's financial well-being[9]. On the one hand, household financial literacy, as the special human capital of households, represents the financial knowledge reserves and the ability to manage household financial resources that households possess, which helps households to enhance their income; on the other hand, household financial literacy enhancement can reduce household debt as a proportion of household income by improving financial management skills[11], alleviating household over-indebtedness, and increasing emergency savings.

In terms of financial literacy enhancing household income, household financial literacy is about professional knowledge and skills about household financial and economic behaviours, which are an important part of household human capital, thus facilitating households to use the human capital they possess to enhance their household income[14]. Households with higher levels of financial literacy are likely to invest more smartly and earn good returns, thus improving their financial situation. In terms of financial literacy mitigating household over-indebtedness, scholarly research has produced richer findings. Studies have shown that households with lower levels of financial literacy tend to take on more costly mortgages. Those with higher levels of financial literacy tended to pay lower than average interest rates, suggesting that they were less financially burdened. In addition, heads of households with low levels of financial literacy tend to over-indebt their households due to a lack of ability to reasonably assess the size of household indebtedness[10], and increased levels of financial literacy have been effective in mitigating over-indebtedness behaviours mitigating the financial vulnerability of households[11].

Furthermore, groups with lower levels of financial literacy and less experience with the financial system are prone to a lack of general awareness of their financial obligations and a lack of preparedness for future financial shocks[20]; conversely, increased levels of financial literacy can enhance households' awareness of risk preparedness and risk diversification, and buffer the impacts of risky shocks on the household by setting aside contingency savings for unforeseen events. Lusardi (2011) found that respondents with higher financial literacy or training in economics and finance tended to have a higher ability to cope with risk shocks than the general group[16].

3. Hypotheses Formulation

People who lack financial knowledge tend to make decisions that are detrimental to them without adequate financial security. Moreover, a lack of basic financial calculation skills can lead investors to make sub-optimal financial decisions or even not make any investments, which can largely reduce their excess income and result in welfare losses. Financial attitudes focus on an individual's ability to exercise self-control by believing in the one thing that is perceived as good in managing money. Examples include believing that saving money is important, having a financial plan, being patient in the face of financial problems and finding ways to cope with them, tolerance for risk, and awareness of risks and rewards.

Residents' lack of basic financial knowledge, numeracy, and risk discernment greatly increases the likelihood that they will be misled into making rational investment decisions, and will fail to improve their economic situation or even mitigate their financial vulnerability. On the contrary, stronger financial literacy helps residents to understand the characteristics of financial markets and financial products, such as returns and risks, thus optimizing financial behaviours, increasing participation in financial markets, diversifying investment risks, and increasing wealth accumulation. Moreover, higher financial literacy enables households to make better decisions concerning saving, spending, and retirement, resulting in a higher level of financial security, a lower risk of financial vulnerability, and greater financial well-being. Therefore, the following research hypothesis is proposed:

H1: There is a negative relationship between financial knowledge and household financial vulnerability.

H2: There is a negative relationship between financial attitudes and household financial vulnerability.

H3: There is a negative relationship between financial skills and household financial vulnerability.

4. Methods

4.1. Data

This study uses the questionnaire data from the China Household Finance Survey and Research Centre of the Southwestern University of Finance and Economics, which was made publicly available on 31 December 2021 for a nationwide sample survey project in China (CHFS2019), as the initial data. The CHFS2019 survey covered 29 provinces (autonomous regions and municipalities directly under the central government), excluding Xinjiang, Xizang, Hong Kong, Macao and Taiwan, including 343 districts and counties, and 1,360 villages (neighborhood) committees in China. The survey sample has national and provincial city representativeness, comprehensively tracks dynamic household financial development, and fills the gap in China's household financial microdata. According to the content of this study, data cleaning and screening are mainly carried out in the two aspects. Firstly, data from the three databases of households, individual heads of households and cities in the CHFS2019 database are merged, and then only samples of households with complete personal information of the head of household and the age of the head of the household are greater than 16 years old are retained, and 34,643 household samples are obtained. Secondly, to avoid bias caused by missing values and unusual values, this study eliminates the missing values and outliers of all variables related to the problem and after 1 percent bilateral truncation based on variables such as total household income, total household assets, etc., the final effective sample size of 32,458 household samples is obtained for empirical research and analysis.

4.2. Variables

4.2.1. Dependent Variables

Household financial vulnerability is the dependent variable in this study. There are no precise criteria for measuring the household's financial vulnerability. Household financial vulnerability in the established literature mainly consists of two scenarios, namely over-indebtedness and consumption arrears[20]. Over-indebtedness reflects the solvency of households, measures the level of household indebtedness, and examines the degree of household credit risk exposure, which can be expressed by the household debt-to-income ratio; consumption arrears reflect the household's ability to cope with shocks, and mainly examines the arrears of household consumption expenditures, which is expressed by using contingency savings in this study. The level of household indebtedness reflects current household financial vulnerability and contingency savings reflect potential household financial vulnerability[18].

The combination of over-indebtedness and contingency savings, which reflect the likelihood of a household's current and future financial crises[12], respectively, provides a more comprehensive picture of the extent of a household's financial vulnerability. An indicator of household financial vulnerability that combines over-indebtedness and contingency savings, with values ranging from 0 to 2. 0 indicates that the household is not over-indebted and has sufficient contingency savings, which is low vulnerability. 1 indicates that the household is over-indebted or has insufficient contingency savings, which is medium vulnerability. And 2 indicates that the household is not only over-indebted but also has insufficient contingency savings, which is high vulnerability.

4.2.2. Independent Variable

The study estimated the scores for financial knowledge (FK), financial attitudes (FA), and financial skills (FS) separately to understand the broader dimensions of financial literacy, which are the independent variables. Among them, financial knowledge reflects households' understanding of knowledge related to financial products, financial attitude reflects households' concern about financial knowledge and risk attitude, and financial skills reflect households' ability to apply financial knowledge[4]. CHFS2019 has set up a survey to examine financial literacy by asking questions on conceptual knowledge, numerical competence, financial attitudes and skills related to the daily financial decisions of households, to provide a comprehensive and intuitive picture of the financial situation of different households.

Financial knowledge is a fundamental component of financial literacy, reflecting the degree to which households have mastered the knowledge required to manage their finances[17]. The study obtained the level of financial knowledge of households from three questions on interest rates and inflation in the financial knowledge section of the CHFS2019, which assigns a score of 1 to correct responses and 0 to other responses.

Financial attitudes reflect the households' overall concern regarding the financial sector and their awareness of risk. This study obtains households' financial attitudes from four questions in CHFS2019, namely, attention to financial information, understanding of financial products, financial investment risk preference, and propensity to invest in financial products. Since the answers to the different questions measuring financial attitudes are assigned with different scores, this study uses the Min-max normalisation, which maps the four question scores were linearly transformed so that the score for each question was mapped between [0,1]. The equation used is as follows:

$$b_{ij} = \frac{a_{ij} - m_{ij}}{M_{ij} - m_{ij}} \quad (i = 1,2,3,4; j = 1) \quad (1)$$

$$b_i = \frac{\sum_{j=1}^m b_{ij}}{m} \quad (2)$$

$$FA = 1 - \sqrt{\frac{(1-b_1)^2 + (1-b_2)^2 + \dots + (1-b_n)^2}{n}} \quad (3)$$

Where FA is the financial attitude measured by a combination of the four indicators, a_{ij} represents the score of each interviewed household for each question, M_{ij} and m_{ij} represent the maximum and minimum scores for the problem, respectively, b_{ij} represents the use of the Min-max normalisation, which linearly varies the actual scores of the questions so that the scores are mapped between [0, 1], making the scores of the indicators comparable and additive, b_i ($i = 1, 2, 3, 4$) shows the four indicators that measure financial attitudes. The original data was obtained by assigning scores to the answers of questions, and then the scores were substituted into equation (1) for Min-max normalisation analysis. After that, substituting the results into equation (2), obtaining the scores of each of the four indicators. Finally, the scores of the four indicators are substituted into equation (3) to obtain the score of household financial attitudes. Financial skills mainly examine the practical ability of the interviewed households to acquire and apply financial knowledge. This study determines the financial skills of the interviewed households through four questions in CHFS2019, such as whether they can make a profit by investing in various financial products. If there is a profit, it is assigned as 1, and the others are assigned as 0.

4.2.3. Control Variables

This study uses variables related to the two aspects of household head characteristics and economic characteristics as control variables when analysing the impact of household financial vulnerability. The rationale for including characteristics such as age, gender and employment of the household head stems from the acknowledgement that in many cultures, especially within Chinese society, the head often dictates the household's financial decisions. Income and assets are integral to understanding the financial dynamics within a family. Income levels and asset bases directly determine a household's capacity to absorb financial shocks and thus its vulnerability. In the context of Chinese households, where familial ties and joint decision-making are prevalent, the collective characteristics of the household play a pivotal role in resource allocation and can significantly moderate financial outcomes.

4.3. Descriptive Statistics

Descriptive statistics were analyzed for the variables and the results were presented in Table 1.

The study provides descriptive statistics for the explanatory variable household financial vulnerability, the explanatory variables financial knowledge, financial attitudes, and financial skills, and the control variables such as head of household characteristics and household characteristics, which can help the researcher to understand the distribution of the values of each variable. The maximum value of the explanatory variable sample household financial vulnerability is 2, the minimum value is 0, the mean is 1.367, and the standard deviation is 0.574, which shows that the sample households have a high degree of financial vulnerability, and most of the households are medium to high degree of financial vulnerability, and the degree of financial vulnerability varies greatly among the sample households.

Table 1. Descriptive statistics summary (CHFS, 2019).

Variable	Obs	Mean	SD	Min	Max
HFV	32458	1.367	0.574	0.000	2.000
FK	32458	0.733	0.945	0.000	3.000
FA	32458	0.637	0.640	0.000	4.000
FS	32458	3.017	0.279	0.000	4.000
age	32458	56.071	13.693	17.000	101.000
gender	32458	0.754	0.431	0.000	1.000
employment	32458	0.655	0.475	0.000	1.000
In_income	32458	10.619	1.514	0.000	16.311
In_asset	32458	12.805	1.693	2.398	21.465

Notes: Obs for observations, SD for Standard Deviation, Min for minimum, Max for maximum.

Source: CHFS2019.

The measurement of the explanatory variables in this study is obtained by directly summing up the scores assigned to the answers to the questions related to each dimension of financial literacy. The maximum value of the sample for financial knowledge is 3, the minimum value is 0, the mean value is 0.733, and the standard deviation is 0.945, which indicates that the mastery level of the sample households on financial knowledge is generally low and varies greatly. The maximum value of the sample for financial attitudes is 4, the minimum value is 0, the mean is 0.637, and the standard deviation is 0.640, indicating that the majority of the sample households have a very low level of concern about finance and a very conservative attitude towards investment risk. The maximum value of the sample for financial skills is 4 and the minimum value is 0. The mean value is 3.017 and the standard deviation is 0.279, which indicates that the sample households have strong financial practices and are investing profitably.

4.4. Measures

This study focused on the mechanisms of the three financial literacy dimensions of financial knowledge (FK), financial attitude (FA), and financial skills (FS) on household financial vulnerability (HFV). The household financial vulnerability variable is an ordered dependent variable that takes values between 0 and 2, and the larger the value, the higher the degree of household financial vulnerability, so the study adopts the Ordered Probit model. The Ordered Probit model is a statistical model purpose-built for analyzing ordered dependent variables. It assumes the existence of an unobservable, continuous latent variable that reflects the true underlying level of household financial vulnerability. The observed categorical values of 0, 1, and 2 are considered realizations of this latent variable being discretized into ordered categories. By introducing thresholds, the model effectively simulates this discretization process, thereby capitalizing on the ordered nature of the dependent variable to enable a more precise estimation of factors influencing the level of household financial vulnerability. The specific equation of the model is as follows:

$$HFV_i = \alpha_0 + \alpha_1 F_i + \alpha_2 X_i + \varepsilon_i \tag{4}$$

HFV_i represents the financial vulnerability of household i , F_i represents the household's financial knowledge (FK_i), financial attitudes (FA_i), and financial skills (FS_i), X_i represents the relevant control variables for the household, including age(age), gender(gender), employment(employment), households' annual income(In_income), households' total assets(In_asset). ε_i represents the random interference term.

5. Empirical Results

This section reports the data analysis and empirical results, particularly the parameter estimates of the Regression Model.

5.1. The Impact of FK, FA, FS on HFV

This study uses STATA 17.0 to conduct regression analyses of the relationship between financial knowledge, financial attitudes, financial skills and household financial vulnerability. Table 2 gives the results of the Ordered Probit model estimation of the impact of financial literacy, financial attitudes and financial skills on household financial vulnerability. Columns (1), (3) and (5) show the overall results of the effects of the independent variables on household financial vulnerability, while columns (2), (4) and (6) show the results of the marginal effects of the independent variables on household financial vulnerability with the inclusion of the control variables.

Table 2. The impact of FK, FA, FS on HFV

Variable	Dependent Variable: HFV					
	(1)	(2)	(3)	(4)	(5)	(6)
	HFV	HFV	HFV	HFV	HFV	HFV
FK	-0.023*** (-3.074)	-0.037*** (-4.689)				
FA			-0.200*** (-17.317)	-0.254*** (-20.011)		
FS					-0.057** (-2.022)	-0.054* (-1.879)
age		-0.012*** (-20.537)		-0.014*** (-23.153)		-0.012*** (-19.968)
gender		-0.152*** (-9.192)		-0.159*** (-9.630)		-0.152*** (-9.200)
employment		-0.419*** (-24.597)		-0.429*** (-25.089)		-0.415*** (-24.377)
In_income		-0.047*** (-9.187)		-0.034*** (-6.654)		-0.050*** (-9.827)
In_asset		0.006 (1.344)		0.028*** (5.964)		0.003 (0.554)
Prov	Yes	Yes	Yes	Yes	Yes	Yes
N	32458	32458	32458	32458	32458	32458

Note: t statistics in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% statistical levels, respectively. The model includes a province dummy variable to control for province-fixed effects.

Table 2 shows the results of the logistic regression models validating H1, H2 and H3. This study analyses the regression results of financial knowledge (FK), financial attitudes (FA) and financial skills (FS) on household financial vulnerability (HFV) from both the unadded control variables and the added control variables, respectively. In addition, it is important to note that by controlling for the province dummy variable, this study can eliminate the interference of unobservable province characteristics on the results, thus better analysing the impact of the remaining variables on the dependent variable.

Column (1) shows that a unit increase in financial knowledge score might result in decreased household financial vulnerability by a 2.3 percent, which is significantly negative at the 1 percent statistical level. Column (2) shows that for each unit increase in financial literacy scores at the 1 percent statistical level, household financial vulnerability may decrease by a 3.7 percent, after adding control variables such as age, gender, employment status, total household income, and total household assets. In other words, the empirical data support H1, that improving financial knowledge significantly reduces household financial vulnerability. Individuals who have financial knowledge will produce individuals who have good financial behavior in financial control, paying bills on time, financial planning, meeting needs, setting aside funds for savings and insurance.

Column (3) shows that a unit increase in financial attitudes score might result in decreased household financial vulnerability by a 20.0 percent, which is significantly negative at the 1 percent statistical level. Moreover, column (4) shows that with the inclusion of control variables such as age, gender, employment status, total household income, and total household assets, household financial vulnerability may decrease by a 25.4 percent for each unit increase in the financial attitude score at the 1 percent statistical level, which supports H2. The result implies that positive financial attitudes can significantly reduce household financial vulnerability. This is aligned with Sabri et al. (2020) that there is a significant relationship between financial attitudes and financial vulnerability. Working adults with attitudes such as tolerance of risk and preference for risk-taking are more likely to be less vulnerable financially [18].

Column (5) shows that a unit increase in financial skills score might result in decreased household financial vulnerability by a 5.7 percent, which is significantly negative at the 5 percent statistical level. And column (6) shows that with the inclusion of control variables such as age, gender, employment status, total household income, and total household assets, household financial vulnerability may decrease by a 5.4 percent for each unit increase in the financial attitude score at the 10 percent statistical level, which supports H3. This implies that increasing financial skills can significantly reduce household financial vulnerability. The results show that financial attitudes have the greatest mitigating effect on household financial vulnerability, followed by financial skills and finally financial knowledge. Positive financial attitudes help people to spend prudently by budgeting and planning for future financial needs. A person with a positive attitude can manage their money wisely. The more attention a household pays to the financial sector, the greater its awareness of risk prevention and the more active its willingness to invest in risk, which means that it has a more active and quicker means of raising funds when it faces sudden risk shocks.

Financial skills mitigate the vulnerability of households to financial risks by enabling them to quickly convert their liquid financial assets into cash, hence enhancing their capacity to generate funds. Moreover, as households gain experience, those with proficient financial skills are more adept at making a range of decisions regarding financial management and effectively distributing their financial assets. This leads to higher financial returns and decreased financial vulnerability.

Although financial knowledge has a significant effect on reducing financial vulnerability, this effect is lower than that of financial attitudes and skills, because only theoretical financial knowledge without positive risk attitudes and skills experience does not allow for efficient and rational allocation of assets, and savings can only be used to cope with risk. China households face the challenge of managing unpredictable future expenses, such as healthcare and retirement, as well as expected expenses like schooling and buying a home. This makes it challenging for savings to handle unexpected and significant financial setbacks, particularly substantial ones.

Overall, the empirical data show that whether or not the relevant control variables are included, the increase in the level of financial knowledge, financial attitudes, and financial skills can

significantly alleviate the financial vulnerability of households, which is in line with the theoretical analyses in the previous section.

From the regression of the control variables related to the characteristics of the household head, the impact of the age of the household head on the household's financial vulnerability is significantly negative at the 1 percent statistical level, and an increase in the age of the household head can reduce the household financial vulnerability, which may be due to the fact that as the age of the household head grows, the household's income will gradually tend to be more stable and achieve a certain degree of accumulation of wealth. At the same time, with the accumulation of investment experience and knowledge of the head of household, the ability of the household to withstand internal and external risks will be improved, reducing the possibility of falling into financial vulnerability after being exposed to risks in the future. The negative correlation between gender and household financial vulnerability indicates that households headed by men are less financially vulnerable relative to women, which may stem from previous literature showing that men tend to deliberately find ways to increase their financial performance and productivity, thus bringing more benefits to the household and mitigating household financial vulnerability. The fact that the household head is employed can also greatly mitigate the household financial vulnerability. Households with an unemployed reference person tend to be vulnerable.

From the regressions of the control variables related to household characteristics, the effect of total annual household income on household financial vulnerability is significantly negative at the 1 percent statistical level, which is consistent with the findings of numerous previous studies in the literature that an increase in income reduces household financial vulnerability. The regression coefficients for total household assets are insignificant in columns (1) and (3), while they are significantly positive at the 1 percent statistical level in column (2), which indicates that the higher the total household assets, the higher the level of household financial vulnerability. This is contrary to the mainstream view that household ownership of fixed assets such as housing reduces household financial vulnerability[20].

5.2. Endogeneity Test

The problem of endogeneity in household microdata is more common, which can have the consequence of inconsistent vulnerability estimates. Considering the possible endogeneity problem of the impact of financial literacy dimensions on household financial vulnerability, this paper attempts to mitigate the endogeneity of the model by finding suitable instrumental variables.

The IV-Probit model with instrumental variables was selected for estimation in this study. The instrumental variables method is a common approach to endogeneity testing of explanatory variables, and the selection of instrumental variables requires that they be highly correlated with the endogenous variables and unrelated to the disturbance terms. This study selects the average financial knowledge (mean_fk), average financial attitudes (mean_fa), and average financial skills (mean_fs) of households in the same province other than their households as instrumental variables for validation, the main reason is that the level of financial literacy is high in the same region, and the household head can improve financial literacy by interacting with people in the same region to exchanges to gain more financial knowledge, thus increasing the level of financial literacy. At the same time, the financial literacy level of other households in the same region does not affect the financial literacy level of one's household, which is in line with the correlation and exogenous selection criteria for instrumental variables.

This study uses two-stage least square (2SLS) estimation, which means doing two regressions. The first stage is the regression of the endogenous variables on the instrumental variables, which produces the fitted values; the second stage is the regression of the dependent variable

on the fitted values obtained in the previous stage. Table 3 shows the regression results for the instrumental variables.

Table 3. FK, FA, FS on HFV (2SLS Estimation Results)

Variable	First-stage Regression			Second-stage Regression		
	FK	FA	FS	HFV	HFV	HFV
mean_fk	0.461*** (6.990)					
mean_fa		0.393*** (6.219)				
mean_fs			0.801*** (9.385)			
FK				-2.308*** (-11.469)		
FA					-3.540*** (-11.469)	
FS						-4.240*** (-11.469)
age	-0.013*** (-29.904)	-0.008*** (-28.688)	0.000** (1.986)	-0.042*** (-15.797)	-0.040*** (-16.068)	-0.011*** (-17.737)
gender	0.005 (0.415)	-0.020** (-2.446)	-0.000 (-0.074)	-0.140*** (-8.512)	-0.221*** (-12.460)	-0.153*** (-9.269)
employment	-0.114*** (-9.562)	-0.036*** (-4.656)	-0.003 (-0.807)	-0.678*** (-23.587)	-0.543*** (-26.516)	-0.427*** (-25.015)
In_income	0.084*** (24.106)	0.061*** (26.433)	0.004*** (4.411)	0.144*** (8.075)	0.167*** (8.458)	-0.032*** (-5.966)
In_asset	0.116*** (35.951)	0.101*** (46.139)	0.012*** (12.310)	0.270*** (10.986)	0.360*** (11.136)	0.054*** (7.757)
Prov	Yes	Yes	Yes	Yes	Yes	Yes
N	32458	32458	32458	32458	32458	32458
F	206.452	204.266	13.074			

Note: t statistics in parentheses. ***, ** denote significance at the 1% and 5% statistical levels, respectively. The model includes a province dummy variable to control for province-fixed effects.

Table 3 shows the final results, the estimated coefficients of the instrumental variables in the first stage regression are significantly different from 0. The F-values are 206.452, 204.266, and 13.074, respectively, which are all greater than the critical value of 10, which suggests that the instrumental variables are strongly correlated with the endogenous variables, and can explain the endogenous variables very well and that there is no problem of weak instrumental variables, which likewise suggests that the results of the test using this instrumental variable for the test is reliable. The results of the two-stage regression show that the effect of financial knowledge, financial attitudes and financial skills on household financial vulnerability is significantly negative at the 1 percent statistical level after using instrumental variables. The estimation results demonstrate that the impact of financial literacy dimensions on household financial vulnerability still holds after accounting for endogeneity and the empirical results of this study are robust.

5.3. Robustness Test

Through the regression and endogeneity test, this study can preliminarily determine the direction and effect of financial literacy dimensions acting on household financial vulnerability. To avoid the chance of the empirical results and verify the reliability of the regression results of financial knowledge, financial attitudes, and financial skills in mitigating household financial vulnerability, this study adopts the variable substitution method, excludes part of the samples, and replaces the econometric model to conduct the robustness test respectively, to ensure that the empirical results are credible and reliable.

In empirical analyses, many studies often choose their most familiar or preferred methods to measure variables, while there are many ways to measure variables, and the measurement methods we choose based on previous literature studies or according to our data availability often do not guarantee the reliability of the conclusions. Therefore, many scholars in the literature use the variable substitution method as one of the methods of robustness testing. In this study, the robustness test is conducted by replacing the dependent variable.

This study redefines household financial vulnerability, the "financial margin" is introduced to measure household financial vulnerability as in equation (5):

$$FM_i = IA_i + LA_i - EE_i - UE_i \tag{5}$$

Table 4. FK, FA, FS on HFV (Other definition of HFV)

Variable	Dependent Variable: HFV		
	(1)	(2)	(3)
FK	-0.054*		
	(-1.932)		
FA		-0.122***	
		(-3.010)	
FS			-0.210***
			(-3.048)
age	-0.044***	-0.045***	-0.043***
	(-20.129)	(-20.350)	(-20.185)
gender	0.328***	0.325***	0.329***
	(4.907)	(4.854)	(4.913)
employment	0.176**	0.178**	0.182**
	(2.367)	(2.400)	(2.449)
ln_income	-0.200***	-0.198***	-0.203***
	(-14.862)	(-14.666)	(-15.317)
ln_asset	0.436***	0.445***	0.430***
	(21.901)	(21.565)	(22.298)
Prov	Yes	Yes	Yes
N	32458	32458	32458

Note: t statistics in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% statistical levels, respectively. The model includes a province dummy variable to control for province-fixed effects.

Where FM_i denotes the financial margin, IA_i denotes total household income, including household members' wage income, productive income, financial income, asset income and household transfer income, and LA_i denotes liquid assets that can be liquidated quickly, being

the sum of the household's time deposits, demand deposits and cash, EE_i denotes expected expenditures that can be successfully paid by the assets, which are daily household consumption expenditures, mortgage, car loan and other loan expenditures, UE_i denotes unanticipated expenditures, including sudden household medical expenditures, transfer expenditures. i denotes the household, and household financial vulnerability is determined by FMA_i when the household experiences an uncertainty shock. Households are financially vulnerable when $FMA_i < 0$ and household financial vulnerability takes the value of 1, when $FMA_i \geq 0$ household financial vulnerability takes the value of 0. The regression results show that increased levels of financial knowledge, financial attitudes, and financial skills have a significant dampening effect on household financial vulnerability, supporting the baseline regression results as shown in Table 4.

To test the robustness of the empirical results, this study also employs a different range of sample data to verify the impact of financial knowledge, financial attitudes and financial skills on household financial vulnerability. If there is a financial industry practitioner in the household, the level of each dimension of household financial literacy may be higher than that of other households, which may result in biased results of the impact of each dimension of financial literacy on the reduction of household financial vulnerability. Therefore, this study excludes the sample of financial industry practitioners in the households and obtains a sample of 31,784 households. Table 5 gives the results of the robustness test for excluding the sample of households with financial industry practitioners. From the regression results, it can be seen that the presence of financial sector practitioners in the household does not affect the significant role of financial knowledge, financial attitude and financial skills in reducing household financial vulnerability.

Table 5. Robustness Tests for the Sample of Financial Industry Practitioners in Excluded Households

Variable	Dependent Variable: HFV		
	(1)	(2)	(3)
FK	-0.037*** (-4.575)		
FA		-0.256*** (-19.545)	
FS			-0.069** (-2.334)
age	-0.012*** (-20.116)	-0.014*** (-22.637)	-0.012*** (-19.557)
gender	-0.157*** (-9.388)	-0.163*** (-9.757)	-0.157*** (-9.405)
employment	-0.423*** (-24.570)	-0.433*** (-25.129)	-0.418*** (-24.348)
In_income	-0.047*** (-9.172)	-0.035*** (-6.811)	-0.050*** (-9.770)
In_asset	0.005 (1.097)	0.026*** (5.519)	0.002 (0.370)
Prov	Yes	Yes	Yes
N	31784	31784	31784

Note: t statistics in parentheses. ***, ** denote significance at the 1% and 5% statistical levels, respectively. The model includes a province dummy variable to control for province-fixed effects.

To ensure the robustness of the empirical methodology, the state of whether or not a household has financial vulnerability is considered a discrete choice faced by the household, and to improve the reliability of the estimation results, the bias in the estimation results of the Ordered Probit model is corrected and replaced with the Logit model for the regression analysis. The regression results in Table 6 show that financial knowledge, financial attitudes and financial skills have a significantly negative impact on household financial vulnerability, indicating that an increase in the level of financial literacy dimensions has a significant inhibitory effect on household financial vulnerability, which supports the regression results.

Table 6. FK, FA, FS on HFV (Logit Model)

Variable	Dependent Variable: HFV		
	(1)	(2)	(3)
FK	-0.243*** (-8.972)		
FA		-0.860*** (-23.753)	
FS			-0.296*** (-3.090)
age	-0.025*** (-9.745)	-0.030*** (-11.449)	-0.022*** (-8.432)
gender	-0.137** (-2.060)	-0.174** (-2.567)	-0.144** (-2.161)
employment	-0.557*** (-7.172)	-0.594*** (-7.562)	-0.524*** (-6.796)
ln_income	-0.121*** (-4.568)	-0.052** (-2.108)	-0.145*** (-5.409)
ln_asset	-0.399*** (-18.036)	-0.282*** (-13.224)	-0.429*** (-19.121)
Prov	Yes	Yes	Yes
N	32458	32458	32458

Note: t statistics in parentheses. ***, ** denote significance at the 1% and 5% statistical levels, respectively. The model includes a province dummy variable to control for province-fixed effects.

To sum up, whether replacing the explanatory variables, replacing the survey sample, or changing the method of econometric analysis, the effects of financial knowledge, financial attitudes, and financial skills on household financial vulnerability are consistent with the baseline regression, and the results of empirical analyses in this study are robust.

6. Conclusion

The empirical part of the study uses the ordered Probit model to verify the effect of financial literacy dimensions on household financial vulnerability, and endogeneity and robustness tests are conducted using the IV-Probit model, substitution variables, deletion of part of the sample, and substitution of measurements, respectively. Based on the consideration of endogeneity and robustness tests, the regression results of this study remain robust, and the empirical results verify the research hypotheses H1, H2, and H3, and conclude that financial literacy dimensions significantly impact household financial vulnerability. The financial attitudes having the highest impact, financial skills having the second highest impact, and financial knowledge having the lowest impact on household financial vulnerability. These findings expand the body of

knowledge for further research on the antecedents of household financial vulnerability and provide ideas on how China households can mitigate financial vulnerability effectively.

Households with positive financial attitudes tend to have stronger willingness to invest and risk attitudes. When households are faced with sudden risk shocks, they can adopt financing instruments more actively and quickly to cope with the challenges. In addition, households with good financial management skills are better able to make rational financial decisions and rationally allocate financial assets in the process of accumulating experience, thereby increasing financial returns and reducing financial vulnerability. While the level of financial literacy has a role to play in reducing financial vulnerability, its role is relatively low because households have only theoretical financial knowledge and lack the positive risk attitudes and skills and experience to effectively and rationally cope with risks and expand returns.

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References

- [1] Alhenawi, Y., & Yazdanparast, A. Households' intentions under financial vulnerability conditions: is it likely for the COVID-19 pandemic to leave a permanent scar?. *International Journal of Bank Marketing*. 2022, 40(3):425-457.
- [2] Ampudia M, Van Vlokhoven H, Żochowski D. Financial fragility of euro area households[J]. *Journal of Financial Stability*, 2016, 27: 250-262.
- [3] Andersen, S., Campbell, J. Y., Nielsen, K. M., & Ramadorai, T. Sources of inaction in household finance: Evidence from the Danish mortgage market. *American Economic Review*, 2020, 110(10), 3184-3230.
- [4] Borden L. M., et al. Changing college students financial knowledge, attitudes, and behavior through seminar family participation[J]. *Journal of Family and Economic Issues*, 2008, 29(1): 23-40.
- [5] Brunetti, M, Giarda, E, & Torricelli, C. Is Financial Fragility a Matter of Illiquidity? An Appraisal for Italian Households. *Review of Income and Wealth*. 2016, 62(4):628-649.
- [6] Campbell J Y. Household finance[J]. *The journal of finance*, 2006, 61(4): 1553-1604.
- [7] Clark, R. L., Lusardi, A., & Mitchell, O. S. Financial fragility during the COVID-19 Pandemic. In *AEA Papers and Proceedings*. 2021, 111:292-96.
- [8] Dewi, V., Febrian, E., Effendi, N., & Anwar, M. Financial literacy among the millennial generation: Relationships between knowledge, skills, attitude, and behavior. *Australasian Accounting, Business and Finance Journal*. 2020, 14(4): 24-37.
- [9] Erdem, D., & Rojahn, J. The influence of financial literacy on financial resilience–New evidence from Europe during the COVID-19 crisis. *Managerial Finance*, 2022, 48(9/10):1453-1471.
- [10] Fernández-López, S., Álvarez-Espiño, M., Castro-González, S., & Rey-Ares, L. Financial capability and households' financial vulnerability: evidence for the Spanish case. *Managerial Finance*, 2023, 49(4), 679-702.
- [11] French D., Mckillop D. Financial Literacy and Over-Indebtedness In Low-Income Households[J]. *International Review of Financial Analysis*, 2016, 48: 1-23.
- [12] Greenwood, R., Hanson, S. G., Shleifer, A., & Sørensen, J. A. Predictable financial crises. *The Journal of Finance*. 2022, 77(2): 863-921.
- [13] Guiso L., Sodini P. Household Finance:An Emerging Field[J]. *Handbook of the Economics of Finance*: 2012: 1397-1533.
- [14] Huston S. The concept and measurement of financial literacy: preliminary results from a new survey on financial literacy assessment[J]. 2009.

- [15] Jappelli, T, Pagano, M., & Di Maggio, M. Households' Indebtedness and Financial Fragility. *Journal of Financial Management, Markets and Institutions*. 2013, 1(1):23-46.
- [16] Lusardi A, Mitchell O S. Financial literacy around the world: an overview[J]. *Journal of pension economics & finance*, 2011, 10(4): 497-508.-
- [17] Lusardi Annamaria, Michaud Pierre-Carl, Mitchell Olivia S., Optimal Financial Knowledge and Wealth Inequality[J]. *The Journal of Political Economy*, 2017, 125(2): 431-477.
- [18] Loke, Y. J. Financial Vulnerability of Working Adults in Malaysia. *Contemporary Economics*. 2017, 11(2):205-218.
- [19] Lusardi, A., Mitchell, O. S., & Oggero, N. Debt and financial vulnerability on the verge of retirement. *Journal of Money, Credit and Banking*. 2020, 52(5):1005-1034.
- [20] O'Connor, G. E., Newmeyer, C. E., Wong, N. Y. C., Bayuk, J. B., Cook, L. A., Komarova, Y., & Warmath, D. 2019. Conceptualizing the multiple dimensions of consumer financial vulnerability. *Journal of Business Research*. 100: 421-430.
- [21] Pak T. Financial Literacy and High-Cost Borrowing: Exploring the Mechanism[J]. *International Journal of Consumer Studies*, 2018, 42(3): 283-294.