
Original Research Article

Consumer informal financial education and retirement financial behaviors: Financial knowledge as a mediator

Abstract: Whether in developed or developing countries, the aging population has become a worldwide concern, and retirement financial behaviors also receive more attention. This study uses the data of American NFCS in 2018 to study the influence of consumer informal financial education on retirement financial behaviors. Moreover, financial knowledge is taken as a mediator variable to examine whether it will affect the mechanism of action. In addition, the empirical model is replaced, the outliers of income are removed, and heterogeneity analysis among different regions is conducted to ensure the robustness of the results. The empirical results show that consumer informal financial education positively contributes to retirement financial behaviors. Financial knowledge mediates the relationships between consumer informal financial education and retirement financial behaviors. Hence, to improve consumer financial wellbeing, it is necessary to increase financial education and pension publicity, employ various education methods for consumers of different age groups, enrich the variety of pension financial products, and promote scientific and reasonable pension plans.

Keywords: informal financial education; retirement financial behaviors; financial knowledge; mediating effect

1. Introduction

The aging trend of the population in the world is the most important in the change of population age structure. It is characterized by a relative decrease in the number of young people in the total population and a corresponding increase in the number of old people. The aging of the population has become a universal concern in both developed and developing countries. The aging of the population will bring about a series of problems, for example, it will increase the social burden, increase the elderly's demand for medical care, life services and weaken the family pension function, and so on. Even though the current retirement security has made some public pension plans, its actual replacement rate is not high, there are still some problems such as low actual replacement rate of pension, insufficient guarantee degree, excessive pressure of government financial expenditure, public pension plans have become increasingly difficult for growing elderly retirees for enough life safeguard. Therefore, having good retirement financial behaviors is becoming more and more important.

Retirement planning is a personalized arrangement of personal income and asset

management for people to have a good retirement life. This arrangement based on the life cycle is one of the most important financial decisions in life. The means to realize pension planning can be the pension insurance paid by the unit, the regular savings of individuals, the purchase of commercial pension insurance, long-term investment, etc., and the idea and behavior of these pension planning, to a large extent, depend on people's understanding of financial knowledge [1, 2]. Surveys in the United States have shown that individual financial knowledge has a significant positive correlation with retirement financial behaviors. The more financial knowledge consumers have, the more they will consider their retirement planning in the future [3]. However, at present, from a global perspective, individuals' understanding of financial knowledge is generally low, which will affect their final financial decisions. The failure of financial decisions will not only bring losses to individuals but also adversely affect the whole society at a macro level. Therefore, strengthening the education of financial knowledge is of great significance to both the society and individuals.

To make people understand more financial knowledge, the importance of financial education is increasingly prominent. Developing financial education has many meanings. First of all, it can improve people's financial literacy, enable them to master basic financial knowledge, understand how to use financial attack, enable them to have the ability of risk cognition and management, and improve their comprehensive literacy in participating in formal credit and other financial activities [4]. At the same time, strengthening financial education, enhancing people's risk awareness, and reducing speculative behaviors can not only ensure their personal and family financial security but also guarantee social stability and maintain economic order from the perspective of the whole society [5]. Financial education can improve people's financial literacy, and the improvement of financial literacy will have a positive impact on people's investment and financial management behaviors, improve scientific and diversified investment and financial management, and help them make better retirement plans. At the same time, some studies believe that informal financial education can enhance the effect of formal financial education so that people can learn more financial knowledge and help them have better retirement financial behaviors [6]. Therefore, the importance of informal financial education is becoming increasingly prominent.

It can be seen from previous studies that the relationship between financial education and retirement financial behaviors has been studied, but few previous studies have specifically discussed the role of informal financial education. Therefore, this study uses the national fiscal capacity research data of 2018 in the United States to test whether informal financial education can influence retirement financial behaviors to a certain extent. After that, this study examines whether financial knowledge plays a role in it. In this study, informal financial education is measured by "whether the employer has received financial education" in the questionnaire. Retirement financial behaviors are measured by whether or not you have a retirement account, whether or not you have an investable retirement account, whether or not you make regular contributions to retirement accounts, whether or not you think about saving for retirement, and whether or not you think about saving for retirement before retirement. Financial knowledge is

measured by six questions, including interest rate, inflation, bond price, risk, and repayment interest.

The main contents of the other chapters of this paper are arranged as follows: The second part is the literature review. Summarize important research results related to informal financial education and retirement financial behaviors. At the same time, it puts forward some hypotheses about the influence of informal financial education on retirement financial behaviors. In the third part, data sources and variable settings are explained, and a descriptive statistical analysis of variables is conducted to intuitively understand the sample characteristics of this paper. The fourth part empirically tests the hypotheses proposed in the second part and verifies the influence mechanism between informal financial education and retirement financial behaviors by using correlation analysis and probit model. And then concludes. At the same time, financial knowledge is taken as a mediating variable to test its mediating effect. Finally, a robustness test is performed to ensure that the estimated results are robust. The fifth part, based on the conclusion of this paper, puts forward a series of reasonable suggestions.

2. Literature review and research hypothesis

2.1 Previous Research on Consumer Informal Financial Education

In today's society, under the background of the aging population is growing, and people need more and more to do to solve their pension problem in the future, this needs property and money saving. With the development of the financial market, investors have more and more investment channels. Financial products such as stocks, bonds, funds, gold, and indexes gradually enter the financial market, expanding the channels for investors to choose. However, the current personal finance products are not personalized to the needs of customers. At the same time, there are many financial market products. Ricci and Caratelli (2017) indicated that most residents do not have enough professional financial knowledge, so when making decisions, they might tend to show blindness, follow, and impulsiveness [7]. These factors hinder the realization of residents' financial goals to some extent [8, 9]. Consumers' participation in the financial market also focuses on obtaining higher returns and maintaining and increasing their wealth, rather than planning based on the whole life cycle. Meanwhile, Poterba et al. (2013) argued that many consumers did not have enough professional financial knowledge, which would hinder them to achieve the goal of financial management, therefore, consumers need to receive relevant financial education [4]. Skimmyhorn (2016) believed that the cultivation of financial quality was not only the innate condition of individual family cultivation, but also related to their own acquired continuous learning, and people need to constantly summarize and learn in their life [10].

It is of great significance to strengthen financial education. First, there is a distinct lack of expertise and investment experience for people who have never had a financial education. By receiving financial education, they can initially master the necessary financial knowledge and practical methods, to choose appropriate financial products for investment, plan reasonable investment objectives, and effectively prevent risks according to their economic conditions and risk preferences [5, 6, 11]. Second, people

without financial education tend to have lower financial literacy, which can do badly to their spending plans. They often do not make a reasonable income and expenditure plan, and rarely carry out life cycle planning for the future, so their ability to resist risks is very poor. When faced with unexpected events such as failed investments and large expenditures, they can easily get into financial difficulties. Financial education can help them have a more comprehensive understanding of the financial market so that they can better participate in the financial market and make reasonable plans for their own and family wealth according to the life-cycle theory [12-14].

Previous studies have defined financial education. As early as 1974, Ward S explained financial education. In his opinion, consumers had a demand for financial management, but their relevant knowledge reserve and practical skills might not be sufficient, and financial education was to cultivate their skills, help them master more financial knowledge, and have higher financial literacy. At the same time, he also believed that human capital could be influenced by financial education because financial education could influence people's financial behavior. Therefore, when financial education was evaluated, its methodology was similar to that of human capital [15]. Prior studies imply that financial education in a broad sense referred to the universal financial knowledge education for ordinary financial consumers, whose purpose was to enable people to master basic financial knowledge and understand the basic laws of financial activities, to better conduct personal savings, insurance, financial management, investment and entrepreneurship and other activities [11, 16]. This determined that its content should not only conform to professional finance, but also be closely related to the life and career of ordinary people, and be easy to understand. Based on the literature review, this paper argues that financial education is a long-term rather than a short-term process. Its purpose is to help people master more financial knowledge, have a deeper understanding of financial products and financial instruments, and cultivate financial concepts so that they can better balance risks and make better choices when making financial management and investment decisions, to better manage their assets. This goal is mainly achieved through suggestions, media publicity, and scientific guidance.

Previous have shown that consumers could receive financial education through various channels, which could help them master more financial knowledge and skills. However, the learning of financial knowledge was a long-term process of accumulation, and consumers need to gradually accumulate financial experience by participating in financial practice and making decisions, and completing tasks [17-19]. The research results show that financial education plays a key role in improving family income and assisting consumers to acquire relevant financial knowledge under objective circumstances. Only by constantly adjusting and finding suitable courses for financial projects can consumers better learn more financial knowledge [11, 20-22].

Several studies have documented the content of financial education and analyzed consumer consumption level, consumption habits, and consumer education, believing that consumer financial literacy and practical ability would be affected by financial education [23, 24]. By summarizing previous literature, McCormick (2009) suggested that people who had participated in financial practice mastered more financial

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knowledge than those who had not, which indicated that the effect of informal financial education such as financial practice was better than that of learning theoretical knowledge only [25]. Existing studies believed that people need to learn financial knowledge, and only by diligently participating in relevant content learning, could their financial knowledge level be greatly improved. Meanwhile, relevant financial education also needs to be improved [26-29]. Some scholars believed that the mastery of financial knowledge and practical ability was not only related to the financial education they received but also related to when they received financial education. The earlier people received financial education, the higher their mastery of financial knowledge and skills would be, and it would be easier to accept new financial concepts [27, 30]. Mandell and Klein (2009) examined the roles of financial education in senior high schools and indicated that students who have received financial education have more financial knowledge and better financial behavior in terms of savings and financial management than students who have not received financial education. Moreover, this effect was influenced by the long-term effectiveness of financial education [6]. Fernandes et al. (2014) believed that the effect of financial education was affected by timeliness, that was, as time went by, the effect of financial education became less and less. Therefore, timely and temporary financial education should be conducted to ensure better results [11]. By examining students' financial education, Maldonado et al. (2022) found that students who received only formal financial education performed worse on tests because they were not influenced by the informal financial education brought by their parents. However, students who received informal financial education from their parents mastered more financial knowledge and had a better understanding of financial education, indicating that informal financial education could not only help people master more financial knowledge, but also have a positive impact on financial education [31].

2.2 Previous Research on Retirement Financial Behaviors

With the increasing degree of population aging, the burden of social pensions is gradually increasing. In addition, some studies indicate that good retirement financial behaviors could increase retirement satisfaction [32-34]. In this context, Kaschützke and Maurer (2016) argued that individuals must prepare for retirement in advance by making retirement plans and other ways [12]. Modigliani and Brumberg (1954) suggested that people should take immediate income, future income, expected expenditure, retirement time, and other factors into comprehensive consideration, to make a plan for consumption and saving, to ensure that their financial level could meet their needs in their lifetime [35]. A retirement plan cannot be completed without the medium of finance, so the concept of pension finance has been studied by scholars. Treynor (1977) studied the value of pension plans and retirement behaviors. He believed that pension finance and the financial industry played a mutually promoting role. Pension funds could provide capital for the financial industry and help the financial industry to make rational use of assets. The financial industry could help pension funds realize value appreciation through investment and financial management. Treynor J L believed that pension finance's investment in derivatives, real estate, and financial assets was the main research content of pension finance [36]. Adams and Rau

(2011) indicated that retirement plans not only included retirement financial behaviors, but also the willingness to have retirement plans. However, many people did not have the awareness of making retirement plans [13]. Moreover, scholars have not reached a unified conclusion on the concept of retirement financial behaviors. In this paper, retirement financial behaviors are considered from an economic perspective to meet the needs of consumers after retirement. Plan your wealth properly to achieve your retirement goals.

It can be seen from the existing literature that to make retirement financial behaviors of consumers more reasonable, not only the government needs to play a role, but also individuals, families, and social organizations need to actively participate [37]. In countries with more mature development of the third pillar of endowment insurance, most citizens have realized the rational allocation of pension financial assets by participating in endowment insurance plans and establishing individual retirement accounts. The pension security system in the United States has undergone several reforms and is now relatively mature and sound. It consists of three pillars: the first pillar is a government-led, mandatory social pension system, the federal pension system; the second pillar is the enterprise supplementary endowment insurance system, namely the enterprise annuity plan, which is led by the enterprise and jointly funded by the employer and the employee.; the third pillar is the individual savings pension insurance system, which is responsible by individuals and voluntary participation, namely the individual pension plan [38, 39]. Some studies have suggested that as the United States entered an aging society, with the continuous growth of income and the continuous low savings rate of residents, the retirement plan was gradually transformed from defined benefit (DB) to defined contribution (DC). Based on the establishment of personal accounts, there is a greater incentive effect on employees [40, 41]. More and more people choose to make their retirement plans according to their risk preferences, economic conditions, and other factors [1, 2, 42]. Compared with the basic pension fund, the supplementary pension plan is more flexible and diverse, the most representative of which are the 401K plan, TSP plan, and IRA [37, 43, 44]. Among them, the American individual retirement account (IRA), established by the employee retirement income security act in 1974, has been continuously developing and improving for more than 40 years. By mid-2021, 47.7 million American families have participated in IRAs, accounting for 37% of the total number of American families. By the third quarter of 2021, assets in individual retirement accounts reached \$13.2 trillion, or 35%. Both in terms of coverage and asset scale, this reflects that individual retirement accounts play an extremely important role in the American pension security system [45]. Allen et al. (2016) believed that reasonable retirement financial behaviors could not only help people improve their quality of life after retirement, and improve their life satisfaction, but also improve the retirement and pension level of the whole society so that the pension problem of the society could be solved, and thus the financial burden of the government could be reduced [46]. However, Poterba et al. (2013) indicated that pension planning was a complex process, which was affected by many factors such as family economic characteristics and individual demographic characteristics. People had different levels of education and financial literacy, which

would also affect the quality of their retirement financial behaviors and have different impacts on their life after retirement [4]. Van Rooij et al. (2012) believed that retirement planning was a complex process, which was affected by a variety of factors, including the ability to collect information and judge the future trend, etc., which required individuals to master certain financial knowledge and skills, and financial knowledge also became an important indicator that affected retirement financial behaviors [14]. Many scholars also believed that health status, economic status, age, and other factors would affect retirement financial behaviors, and the understanding of retirement plans would change with age [13, 47, 48]. Therefore, to improve the quality of life and life satisfaction after retirement, people should try their best to make proper retirement plans.

2.3 Previous Research on Consumer Informal Financial Education and Retirement Financial Behaviors

The existing literature on financial education has been relatively sufficient. The existing literature has studied the impact of financial education from two aspects of property scale and financial behaviors and then discussed whether it would have an impact on retirement financial behavior. Lusardi and Mitchell (2007) argued that the less financial education people received, the lower their savings level would be [16]. Fernandes et al. (2014) and Xiao and O'Neill (2016) suggested that financial education could promote people's asset accumulation [11, 49]. Choi et al. (2011) tested whether financial education would have an impact on financial behavior by setting an experimental group and a control group respectively. One group received financial education and the other group did not. The results show that there is no difference between those who have received financial education and those who have not received financial education in making retirement plans and making retirement financial behaviors [50]. However, Lyons et al. (2006) believed that financial education had a positive impact on financial behavior [21]. Bernheim and Garrett (2003) believed that financial education could help people master more financial knowledge [18], and with the increase of people's financial knowledge reserve, their financial behavior would be more reasonable, thus having a positive impact on their retirement financial behaviors [44]. However, the consumers of retirement planning for the future were still inadequate, their assets could not meet the needs of their life after retirement, Lusardi and Mitchell (2007) argued that this phenomenon was related to people's level of financial literacy. People with little financial knowledge were constrained in making financial decisions. To solve this problem, many countries have strengthened financial education to help people master more financial knowledge. The results show that financial education can improve people's retirement financial behaviors [16].

There has been much literature on the impact of financial literacy on retirement financial behaviors. Previous studies have mainly studied the impact of financial literacy on people's investment and financial planning and retirement savings from the perspective of financial literacy, but there are few studies on retirement accounts. There is also literature on the impact of financial education on financial literacy, but few studies have looked at the impact of informal financial education on retirement financial behaviors. Informal financial education can enhance the effect of financial

education and improve people's financial literacy. Therefore, from the perspective of informal financial education, the paper studies its impact on retirement financial behaviors and uses financial knowledge as a mediator to test whether it will play a role in this mechanism. Based on the literature review, the hypotheses proposed in this study are as follows:

H1: Consumer informal financial education will have a positive influence on retirement financial behaviors.

H2: Financial knowledge will have a positive influence on retirement financial behaviors.

3. Method

3.1 Data

The data for this study comes from the 2018 National Financial Capability Study. The data is compiled by the Financial Industry Regulatory Authority Investor Education Foundation. The sample covers 51 states. For each state, the data are weighted by race, sex, age, and education. At the national level, the data are weighted by census information, age, race, education, and other measures, which are somewhat representative of the country as a whole. The data describes consumers' financial behavior in four aspects: planning, the balance of payments, financial knowledge management, financial products, and decision-making. Meanwhile, the data formulate standards to measure financial ability. Using this information, measure key indicators that influence consumers' financial ability and assess how these indicators change with attitudes, basic demographics, and so on.

3.2 Model Specification and Variables

This paper mainly studies the influence of Consumer financial education on retirement financial behaviors. According to the survey data, the values of retirement financial behaviors are not continuous, so traditional OLS has some problems in accuracy and robustness. Therefore, the probit model is used for regression analysis in this study. In this study, consumer informal financial education is selected as the independent variable and retirement financial behaviors are selected as the independent variable. To verify the robustness of the regression results, this study replaced the estimation method, eliminated the income outliers, and conducted a heterogeneity analysis for different regions. Based on the research hypothesis, the baseline model proposed in this paper is as follows:

$$rfb_i = \alpha_0 + \beta * inf\ fe_i + \sum_{k=1}^N \gamma^* cv_{k,i} + \varepsilon_i \quad (1)$$

In equation (1), α is the constant term, β is the coefficient of the explanatory variable consumer financial education, γ is the coefficient of the control variables, and ε represents the random disturbance term. The subscript i represents the individual consumers to be sampled, and N represents the total number of samples.

The dependent variable of this study is retirement financial behaviors, which are measured by the following questions. The first question is from the perspective of whether consumers have retirement plans. "Do you [or your spouse/partner] have any retirement plans through a current or previous employer? Like a pension plan, [a Thrift

Savings Plan (TSP),] or a 401(k)?" . 1 represents that consumers have retirement plans, while 0 represents that consumers have no retirement plans. Having retirement plans represents that consumers have better retirement financial behaviors. The second question is that "Are any of these retirement plans the kind where you [or your spouse/partner] get to choose how the money is invested?" . 1 represents that consumers have investable retirement plans, while 0 represents that consumers have no investable retirement plans. Having investable retirement plans represents better retirement financial behaviors. The third and fourth questions examine whether consumers have good retirement financial behavior. Among them, The third question is "Do you [or your spouse/partner] contribute to a retirement account like a [Thrift Savings Plan (TSP),] 401 (k) or IRA?" . 1 means that consumers regularly send money to a Retirement account, while 0 means the opposite. The fourth question is, "Have you ever tried to figure out how much you need to save for retirement? "Before you [your spouse/partner] retired, did you try to figure out how much you needed to save for retirement?" If the consumer answers yes to both questions, the value is 1; otherwise, the value is 0. The fifth question is a combination of the third and fourth questions. If the value of the third and fourth questions is 1, the value of the fifth question is also 1. Otherwise, the value of the fifth question is 0. If the value is 1, consumers have good retirement financial behaviors.

The independent variable of this study is Consumer informal financial education, which is determined by "When did you receive that financial education?".If the answer is yes, the value is 1. After deleting the missing value, the remaining sample number is 16,547.

The control variables in this study include risk attitude (variable value ranges from 1 to 10 according to different risk attitudes), credit record rating, annual income (according to different income levels, variables range from 1 to 8), subjective math capacity (based on self-evaluation, variables range from 1 to 7), gender (male: 1, female: 0), marriage status (married: 1,others:0), age (18-24, 25-34, 35-44, 45-54, 55-64 and 65+), an education level (high school or lower, some college to bachelor's degree, post-graduate degree or higher), ethnicity (1 for white, 0 for others), number of financially depended children.

At the same time, this study uses financial knowledge as a mediator variable to conduct mechanism analysis. The mediating variable is measured by six questions, including interest rate, inflation, bond price, risk, and repayment interest. If the respondents answered correctly, they would get 1 point. If they answered incorrectly, they would not get any points. Finally, the scores of the six questions will be added up for a total score. Therefore, financial knowledge is a variable with a value ranging from 0 to 6.

Table 1. Variable specification

Variable	Attribute
Whether having retirement plans	Do you [or your spouse/partner] have any retirement plans through a current or previous employer, like a pension plan, [a Thrift Savings Plan (TSP),] or a 401(k)? 1-yes,0-no
Whether having	Are any of these retirement plans the kind where you [or your

investable retirement plans	spouse/partner] get to choose how the money is invested? 1-yes,0-no
Whether contributing to retirement accounts regularly	Do you [or your spouse/partner] regularly contribute to a retirement account like a [Thrift Savings Plan (TSP),] 401(k), or IRA? 1-yes,0-no
Whether Saving for retirement	Have you ever tried to figure out how much you need to save for retirement? Before you [your spouse/partner] retired, did you try to figure out how much you needed to save for retirement? 1-yes,0-no
Retirement financial behaviors	If whether contributing to retirement account regularly=1 and whether Saving for retirement=1, then the variable=1, otherwise, the variable=0
Informal financial education	When did you receive that financial education? 1-yes,0-no
Financial knowledge (The sum of correct responses to six financial knowledge test questions)	Suppose you had \$100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow? 1-true,0-false
	Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account? 1-true,0-false
	If interest rates rise, what will typically happen to bond prices? 1-true,0-false
	Suppose you owe \$1,000 on a loan and the interest rate you are charged is 20% per year compounded annually. If you didn't pay anything off, at this interest rate, how many years would it take for the amount you owe to double? 1-true,0-false
	A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less. 1-true,0-false
	Buying a single company's stock usually provides a safer return than a stock mutual fund. 1-true,0-false
Risk attitude	When thinking of your financial investments, how willing are you to take risks? 1-not at all willing,10-very willing
Credit record rating	How would you rate your current credit record? 1-very bad,5-very good
Annual income	1-less than \$15,000,2-\$15,000 to \$25,000,3- \$25,000 to \$35,000,4-\$35,000 to \$50,000,5-\$50,000 to \$75,000,6-\$75,000 to \$100,000,7-\$100,000 to \$150,000,8-more than \$150,000
Subjective math capability	How strongly do you agree or disagree with the following statements? - I am pretty good at math 1-strongly disagree,4-neither agree nor disagree,7-strongly agree

Gender	1-male,0-female
Age	1-18 to 24,2-25 to 34,3-35 to 44,4-45 to 54,5-55 to 64,6-greater than 65
Education status	high school graduate or lower 1-yes,0-no
	some colleges to bachelor's degree 1-yes,0-no
	postgraduate degree or higher 1-yes,0-no
Marital status	1-married,0-not married
Ethnicity	1-white,0-non-white
Child	number of financially dependent children

Note: The content is organized by the authors

3.3 Statistical Description

Table 2 shows the results of descriptive statistics, including the mean, standard deviation, maximum, and minimum values of all variables. Meanwhile, it can be seen from the table that there are a total of 16,433 observed values.

As for the dependent variable, 63% of respondents have retirement plans, but only 46% of respondents have investable retirement plans, indicating that most respondents do not have investable retirement plans. Only 42% of the respondents contribute to retirement accounts regularly, indicating that most of the respondents do not contribute to retirement accounts regularly. The proportion of respondents saving for retirement is higher, at 57%. Generally speaking, the average value of retirement financial behaviors is 67%, indicating that consumers have relatively good retirement financial behaviors. For independent variables, the average value of informal financial education is only 40%, which is a low level, indicating that the level of informal financial education of respondents is poor. As for the intermediary variable, the full score of financial knowledge is 6, but the mean value is only 3.59, which belongs to the medium level, indicating that the level of financial knowledge of respondents still needs to be improved. For control variables, the mean value of risk attitude is 5.47, which is at a medium level. The average value of credit record rating is 2.65, which also belongs to the medium level, indicating that respondents' credit evaluation of themselves is not high. The mean annual income is 4.75, indicating that the average annual income level of respondents is about \$35,000 to \$50,000. The average value of subjective math capability is as high as 5.95, indicating that the respondents think their mathematical skills are good. In terms of gender, it can be seen from the table that the proportion of males and females is the same. In terms of age, there is not a big difference among different age groups, with 15% of respondents aged 18 to 24, 19% aged 25 to 34, 16% aged 35 to 44, 18% aged 45 to 54, 16% aged 55 to 64 and 16% aged over 65. In terms of education, those with a bachelor's degree account for 47%, followed by those with a postgraduate degree or higher, accounting for 12%, and those with a high school graduate or lower account for only 10%. In terms of marriage, 55% of respondents are married. The survey also shows that the majority of respondents are white, accounting for 70% of respondents. The average value of the number of financially dependent children is 0.74, indicating that fewer children are not financially independent.

Table 2. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
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Whether having retirement plans	16,433	0.63	0.48	0	1
Whether having investable retirement plans	16,433	0.46	0.50	0	1
Whether contributing to retirement accounts regularly	16,433	0.42	0.49	0	1
Whether Saving for retirement	16,433	0.57	0.49	0	1
Retirement financial behaviors	16,433	0.67	0.47	0	1
Informal financial education	16,433	0.40	0.49	0	1
Financial knowledge	16,433	3.59	1.52	0	6
Risk attitude	16,433	5.47	2.66	0	10
Credit record rating	16,433	2.65	2.13	0	5
Annual income	16,433	4.75	2.09	1	8
Subjective math capability	16,433	5.95	1.49	0	7
Gender	16,433	0.50	0.50	0	1
Age 18 to 24	16,433	0.15	0.35	0	1
Age 25 to 34	16,433	0.19	0.39	0	1
Age 35 to 44	16,433	0.16	0.37	0	1
Age 45 to 54	16,433	0.18	0.38	0	1
Age 55 to 64	16,433	0.16	0.37	0	1
Age greater than 65	16,433	0.16	0.37	0	1
High school or lower	16,433	0.10	0.30	0	1
Some college to bachelor's degree	16,433	0.47	0.50	0	1
Postgraduate degree or higher	16,433	0.12	0.32	0	1
Marital status	16,433	0.55	0.50	0	1
Ethnicity	16,433	0.70	0.46	0	1
Child	16,433	0.74	1.09	0	4

Note: The content is organized by the authors

4. Empirical Results and Discussion

4.1 Results of Correlation Analysis

Table 3 reports the correlation between informal financial education, having retirement plans, having investable retirement plans, whether contributing to retirement accounts regularly, saving for retirement, retirement financial behaviors, risk attitude, credit record rating, annual income, and subjective math capability. The correlations between variables are rough as expected.

As can be seen from table 3, informal financial education is positively correlated with retirement financial behaviors. Specifically, The correlation coefficients between informal financial education and retirement financial behaviors, whether having retirement plans, whether having investable retirement plans, whether contributing to retirement accounts regularly and whether saving for retirement are 0.25, 0.22, 0.25, 0.18, and 0.24, with significance levels of 1%. Meanwhile, risk attitude, credit record rating, annual income, and subjective math capability are also positively correlated with retirement financial behaviors. The correlation coefficients are 0.26, 0.14, 0.44,

and 0.15, and the significance levels are 1%.

Table 3. The results of the correlation

	Whether having retirement plans	Whether having investable retirement plans	Whether contributing to retirement accounts regularly	Whether Saving for retirement	Retirement financial behaviors	Informal financial education	Risk attitude	Credit record rating	Annual income	Subjective math capability
Whether having retirement plans	1									
Whether having investable retirement plans	0.70 ^{**}	1								
Whether contributing to retirement accounts regularly	0.53 ^{**}	0.68 ^{***}	1							
Whether Saving for retirement	0.35 ^{**}	0.36 ^{***}	0.33 ^{***}	1						
Retirement financial behaviors	0.49 ^{**}	0.53 ^{***}	0.59 ^{***}	0.81 ^{**}	1					
Informal financial education	0.22 ^{**}	0.25 ^{***}	0.18 ^{***}	0.24 ^{**}	0.25 ^{**}	1				
Risk attitude	0.20 ^{**}	0.27 ^{***}	0.30 ^{***}	0.23 ^{**}	0.26 ^{**}	0.12 ^{**}	1			
Credit record rating	0.15 ^{**}	0.15 ^{***}	0.13 ^{***}	0.13 ^{**}	0.14 ^{**}	0.04 ^{**}	0.13 [*]	1		

							**			
Annual income	0.50 ^{**}	0.46 ^{***}	0.44 ^{***}	0.36 [*]	0.44 [*]	0.25 [*]	0.27 ^{**}	0.19 ^{**}	1	
Subjective math capability	0.13 ^{**}	0.14 ^{***}	0.12 ^{***}	0.15 [*]	0.15 [*]	0.09 [*]	0.12 ^{**}	0.07 ^{**}	0.18 ^{***}	1

Note:***, **, and * represent significance levels of 1%, 5%, and 10%, respectively.

4.2 Informal Financial Education and Retirement Financial Behaviors

Table 4 reports the regression results between informal financial education and retirement financial behaviors, whether having retirement plans, whether having investable retirement plans, whether contributing to retirement accounts regularly, and whether saving for retirement. The estimation method for all columns is the probit regression. In the first column, control variables are estimated, and the independent variable of informal financial education is added in the second column and thereafter.

As can be seen from the first column, the regression results for most control variables are significant. The coefficients of risk attitude, credit record rating, and annual income are all positive and significant at the level of 1%, indicating that these three variables are positively correlated with whether having retirement plans. Meanwhile, it can be seen from the table that the coefficient of gender is not significant. In terms of age, the coefficients are positive for all ages, and their significance levels are 1%. At the same time, the older the age, the higher the coefficient value, the coefficient for 55 to 64-year-olds is 0.38, indicating that with the increase in age, the respondents are more inclined to make retirement plans. Moreover, education level is also related to whether there is a retirement plan. The coefficient of having a bachelor's degree is negative, indicating that respondents with a bachelor's degree tend to have no retirement plan. In terms of marriage, the coefficient of married is 0.34, which is significant at the significance level of 1%, indicating that married respondents are more willing to have a retirement plan. Meanwhile, the coefficient of subjective math capability is positive, indicating that people who have a high evaluation of their mathematical ability are more inclined to have retirement plans.

The results of the second column and the third column show that respondents with informal financial education tend to have retirement plans and investable retirement plans, this is because the coefficients of informal financial education on these two variables are positive, respectively 0.34 and 0.41, and are significant at the significance level of 1%. Meanwhile, it can be seen from the fourth and fifth columns that informal financial education can also promote consumers to regularly deposit money in retirement accounts and save money for retirement, because the coefficients of informal financial education on these two variables are positive, and they are significant at the level of 1%. The results of the sixth column indicate that informal financial education plays a positive role in promoting consumers to have better retirement financial

behaviors, with a coefficient of 0.47 and a significant level of 1%. The above results are consistent with the hypothesis of H1.

Table 4. The results of regressions of consumer informal financial education on retirement financial behaviors

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Having retirement plans	Having retirement plans	Having investable retirement plans	Contributing to retirement account regularly	Saving for retirement	Retirement financial behaviors
Informal financial education		0.34*** (0.03)	0.41*** (0.03)	0.23*** (0.03)	0.42*** (0.02)	0.47*** (0.02)
Risk attitude	0.04*** (0.00)	0.04*** (0.00)	0.08*** (0.00)	0.10*** (0.01)	0.08*** (0.01)	0.09*** (0.01)
Credit record rating	0.06*** (0.01)	0.06*** (0.01)	0.07*** (0.01)	0.06*** (0.01)	0.04*** (0.01)	0.05*** (0.01)
Annual income	0.28*** (0.01)	0.27*** (0.01)	0.25*** (0.01)	0.27*** (0.01)	0.16*** (0.01)	0.22*** (0.01)
Male	-0.04 (0.03)	-0.05* (0.03)	0.02 (0.03)	0.02 (0.03)	0.06*** (0.03)	0.05 (0.03)
Age 25 to 34	0.29*** (0.04)	0.31*** (0.04)	0.36*** (0.04)	0.76*** (0.04)	-0.09*** (0.03)	0.16*** (0.04)
Age 35 to 44	0.34*** (0.03)	0.35*** (0.03)	0.45*** (0.03)	0.82*** (0.04)	-0.11*** (0.04)	0.13*** (0.04)
Age 45 to 54	0.34*** (0.03)	0.35*** (0.03)	0.49*** (0.04)	0.84*** (0.03)	0.00 (0.03)	0.23*** (0.03)
Age 55 to 64	0.38*** (0.03)	0.36*** (0.03)	0.42*** (0.03)	0.57*** (0.04)	0.24*** (0.04)	0.32*** (0.04)
Some colleges to Bachelor's degree	-0.13*** (0.04)	-0.11*** (0.04)	-0.17*** (0.04)	-0.13*** (0.04)	-0.10*** (0.03)	-0.11*** (0.04)
Post-graduate degree or higher	0.00 (0.04)	0.02 (0.04)	-0.13*** (0.04)	-0.21*** (0.05)	0.07 (0.05)	0.06 (0.05)
Being married	0.34*** (0.03)	0.33*** (0.03)	0.13*** (0.03)	-0.00 (0.03)	0.13*** (0.03)	0.16*** (0.03)
Subjective math capability	0.03*** (0.01)	0.03*** (0.01)	0.04*** (0.01)	0.03*** (0.01)	0.06*** (0.01)	0.05*** (0.01)
White	0.02	0.03	-0.01	-0.08***	0.03	0.02

	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Number of financially dependent children	-0.00	-0.00	-0.01	0.03**	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	-1.76***	-1.78***	-2.68***	-3.01***	-1.51***	-1.59***
	(0.06)	(0.06)	(0.06)	(0.08)	(0.06)	(0.07)
State dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16433	16433	16433	16433	16433	16433
Pseudo R^2	0.24	0.25	0.23	0.25	0.15	0.22

Note: ***, **, and * represent significance levels of 1%, 5%, and 10%, respectively. The estimation method for all columns is probit regression. The reference group is 18-24 years old and has a high school education or below. The figures in brackets are robust clustered standard deviations.

4.3 Mediating Effect Analysis

Prior studies have shown that financial knowledge has a significant influence on the retirement financial behaviors of consumers [7, 8]. This study concludes that the level of informal financial education of consumers can influence their financial knowledge, and thus affect the retirement financial behaviors of consumers. This study takes financial knowledge as an intermediary variable and carries out empirical analysis in three stages: The first part analyzes the regression of informal financial education to retirement financial behaviors and tests the significance of its regression coefficient. The second part analyzes the regression of informal financial education to financial knowledge and tests the significance of its regression coefficient. The third part analyzes the regression of informal financial education to retirement financial behaviors after financial knowledge is added. Probit regression is used for all the above estimation methods.

Table 5 shows the empirical results. Firstly, the influence of informal financial education on retirement financial behaviors is examined and informal financial education is taken as an independent variable. Retirement financial behaviors are taken as dependent variables, control variables are successively added, and the probit model is used for analysis. As can be seen from Table 5, the regression coefficient is positive and significant at the significance level of 1%, indicating that informal financial education has a positive influence on retirement financial behaviors, and the first link of the mediation effect is verified. Then, the influence of informal financial education on financial knowledge is examined and informal financial education is taken as an independent variable. Financial knowledge is used as a dependent variable for regression analysis. It can be seen that the regression coefficient is still positive and significant at the significance level of 5%, indicating that informal financial education has a positive promotion effect on consumers' financial knowledge, and the second link of the mediation effect has also been verified. Finally, if financial knowledge is added to the regression analysis of retirement financial behaviors by informal financial

education, it can be seen that the regression coefficient is still positive and significant at the significance level of 1%. This indicates that informal financial education can influence financial knowledge, and then influence retirement financial behaviors. Therefore, the hypothesis of H2 is verified.

Table 5. The results of mediating effect analysis

Variables	(1)	(2)	(3)
	Retirement financial behaviors	Financial knowledge	Retirement financial behaviors
Informal financial education	0.47***	0.12**	0.46***
	(0.02)	(0.05)	(0.02)
Financial knowledge			0.13***
			(0.01)
Risk attitude	0.09***	-0.00	0.09***
	(0.01)	(0.01)	(0.01)
Credit record rating	0.05***	0.01	0.05***
	(0.01)	(0.02)	(0.01)
Annual income	0.22***	0.06***	0.20***
	(0.01)	(0.01)	(0.01)
Male	0.05	0.22***	-0.01
	(0.03)	(0.05)	(0.03)
Age 25 to 34	0.16***	-0.10*	0.20***
	(0.04)	(0.06)	(0.04)
Age 35 to 44	0.13***	0.09	0.14***
	(0.04)	(0.08)	(0.04)
Age 45 to 54	0.23***	0.28***	0.22***
	(0.03)	(0.08)	(0.03)
Age 55 to 64	0.32***	0.30***	0.29***
	(0.04)	(0.08)	(0.04)
Some colleges to Bachelor's degree	-0.11***	-0.03	-0.15***
	(0.04)	(0.05)	(0.04)
Post-graduate degree or higher	0.06	-0.04	-0.03
	(0.05)	(0.09)	(0.05)
Being married	0.16***	0.17***	0.14***
	(0.03)	(0.05)	(0.03)
Subjective math capability	0.05***	0.12***	0.03***
	(0.01)	(0.01)	(0.01)
White	0.02	0.15***	-0.03
	(0.03)	(0.05)	(0.03)
Number of financially dependent children	-0.01	-0.04**	0.00
	(0.01)	(0.02)	(0.01)
Constant	-1.59***	0.72***	-1.76***
	(0.07)	(0.09)	(0.07)

	behaviors	behaviors	behaviors	behaviors	behaviors	behaviors
Informal financial education	0.80*** (0.04)	0.46*** (0.02)	0.56*** (0.05)	0.47*** (0.06)	0.46*** (0.02)	0.43*** (0.05)
Risk attitude	0.15*** (0.01)	0.08*** (0.01)	0.08*** (0.02)	0.10*** (0.01)	0.07*** (0.01)	0.09*** (0.01)
Credit record rating	0.08*** (0.01)	0.05*** (0.01)	0.06*** (0.01)	0.04*** (0.01)	0.07*** (0.01)	0.03* (0.02)
Annual income	0.36*** (0.01)	0.21*** (0.01)	0.19*** (0.02)	0.23*** (0.01)	0.22*** (0.01)	0.21*** (0.01)
Male	0.08 (0.05)	0.06* (0.03)	0.09 (0.10)	0.05 (0.08)	0.05 (0.05)	0.00 (0.05)
Age 25 to 34	0.26*** (0.06)	0.16*** (0.04)	0.24** (0.11)	0.15*** (0.05)	0.19*** (0.06)	0.09 (0.07)
Age 35 to 44	0.22*** (0.06)	0.15*** (0.04)	0.21** (0.09)	0.02 (0.09)	0.16** (0.06)	0.15** (0.07)
Age 45 to 54	0.38*** (0.06)	0.24*** (0.04)	0.15* (0.09)	0.35*** (0.07)	0.26*** (0.05)	0.16** (0.07)
Age 55 to 64	0.54*** (0.07)	0.34*** (0.04)	0.34*** (0.09)	0.30*** (0.06)	0.23*** (0.07)	0.42*** (0.08)
Some colleges to Bachelor's degree	-0.17*** (0.06)	-0.09* (0.04)	-0.24** (0.10)	0.01 (0.05)	-0.17*** (0.06)	-0.05 (0.08)
Post-graduate degree or higher	0.15* (0.08)	0.09* (0.05)	0.13 (0.09)	0.20** (0.08)	-0.04 (0.08)	0.05 (0.09)
Being married	0.27*** (0.05)	0.12*** (0.03)	0.19** (0.09)	0.21*** (0.04)	0.09* (0.05)	0.18*** (0.05)
Subjective math capability	0.09*** (0.01)	0.06*** (0.01)	0.07*** (0.02)	0.07*** (0.01)	0.04*** (0.01)	0.04*** (0.02)
White	0.03 (0.05)	0.04 (0.03)	-0.07 (0.07)	0.08* (0.04)	0.05 (0.05)	-0.02 (0.07)
Number of financially dependent children	-0.02 (0.02)	-0.02 (0.01)	-0.01 (0.03)	-0.02 (0.03)	0.01 (0.03)	-0.03* (0.01)
Constant	-2.65*** (0.11)	-1.61*** (0.08)	-1.80*** (0.20)	-2.15*** (0.09)	-1.72*** (0.10)	-1.47*** (0.13)
State dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	16433	13348	2716	3819	5267	4631
Pseudo R ²	0.22	0.16	0.24	0.25	0.21	0.20

Note: ***, **, and * represent significance levels of 1%, 5%, and 10%, respectively. The reference group is 18-24 years old and has a high school education or below. The figures in brackets are robust clustered standard deviations.

5. Conclusions and Implications

As the aging of the population expansion and the emergence of the internet financial and other new business, consumer participation in the breadth, depth, and frequency of financial activities are growing, and the pension system also gradually changes, for retirement planning becomes more and more important, but the consumers' financial education and financial knowledge level limits their full access to financial services and the ability of the rational use of financial services. This requires consumers to improve the level of informal financial education, and then learn more financial knowledge so that they can make reasonable planning for retirement.

Based on existing research results and related theories, this paper puts forward hypotheses on the influence of informal financial education and retirement financial behaviors. Based on the data of NFCS in 2018, this paper studies the influence of informal financial education on retirement financial behaviors, and then introduces financial knowledge indicators. The mediating effect of financial knowledge is studied by constructing the mediating effect model. The probit model is used for regression analysis, and the logit model and method of eliminating outliers are used to further test the robustness. The following conclusions can be drawn: Firstly, informal financial education has a positive influence on retirement financial behaviors, which is statistically significant. In other words, consumers receiving informal financial education are more likely to have the idea of saving for retirement. It also encourages them to have retirement accounts and make regular contributions to them. Secondly, financial knowledge also has a positive influence on retirement financial behaviors, that is, the more financial knowledge consumers know, the more likely they are to have the idea of saving for retirement and the more likely they are to have retirement accounts and make regular deposits into them. The more informal financial education consumers receive, the more financial knowledge they will have, and the more they will have a better understanding of the concepts related to the financial market, thus promoting their cognition and participation in the pension plan, a major financial decision.

This study also has some limitations. First of all, there is no panel data in the data related to this study, so the data of NFCS in 2018 used in this study are cross-sectional data. However, panel data has two dimensions, namely cross-section and time, and can provide dynamic information, which cannot be solved by cross-section data. Therefore, the dynamic relationship between informal financial education and retirement financial behaviors cannot be observed. At the same time, the two-dimensional data greatly increases the panel sample size, which can significantly improve the accuracy of estimation, which is also the deficiency of sectional data. Therefore, the robustness test is used in this study to ensure the robustness of the estimated results by logit model and eliminating outliers. Secondly, limited by data, this study only adopts the probit model. If relevant data can be improved in the future, more models and methods will be adopted.

Based on the above conclusions, this study puts forward the following implications: First, society should strengthen financial education and pension publicity

to encourage people to accumulate enough financial assets for their life after retirement; financial education in financial planning and other aspects should be carried out for consumers, to enhance their pension awareness. Retirement plans should be formulated and assets should be rationally allocated to achieve retirement financial goals. Second, we should adopt a variety of education methods for different age groups. For teenagers, financial education can be integrated into teaching by setting up financial courses, organizing financial practices, and hiring financial teachers, to cultivate their financial awareness. For adults, appropriate popularization methods should be adopted according to different job nature, income levels, and education levels, so that the financial literacy of all kinds of people can be improved. For the elderly, financial institutions and relevant social departments can go into the elderly's life circle and popularize financial knowledge to them by holding lectures and distributing brochures. Third, enrich the variety of pension financial products to meet the diversified needs of investors. With the rapid development of the financial market, various financial institutions should make innovations and promote pension financial products through their strong asset management capabilities. Various financial institutions should strengthen cooperation. They can not only jointly design and develop innovative personal pension products but also promote these pension products through cross-sales or combination sales. In the design of pension financial products, financial institutions should comprehensively consider personal investment style and pension needs, enrich the variety of personal pension financial products, and expand the space for customers to choose. Fourth, enhance public awareness of old-age care, and promote scientific and reasonable old-age plans. First of all, social media should play a propaganda role to make the public aware of the importance of pension plans. Secondly, banks, insurance, and other financial institutions should launch more diversified pension products and actively promote them to ordinary people so that more people can plan for the elderly scientifically and reasonably. Finally, in the context of an increasingly prominent aging population, the government should continue to deepen the reform of the pension system, promote diversified investment, improve the social pension model supported by a variety of security, and relieve the pressure of the current social pension as much as possible.

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