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Financial literacy, housing value and household financial market participation: Evidence from urban China

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ABSTRACT

Using data from the 2012 consumer finance survey in China, we extend the literature on household finance by examining the effects of both financial literacy and housing value on household financial market participation, the role of which has been examined separately in the existing literature. The results show that financial literacy significantly improves the probability of household financial market participation, while the housing value has an obvious "crowding-out effect" on household financial market participation in urban China. Further research finds that the role of financial literacy in household financial market participation in households with a low housing value is stronger than that in households with a high housing value. Furthermore, the study of the regional differences shows that among households with a high housing value, financial literacy plays a more significant role in household bond market participation in less-developed cities. Among households with a low housing value, improvement in financial literacy plays a more significant role in household fund market participation in less-developed cities and under-developed cities. Our findings remain robust after alleviating potential bias due to endogenous problems by applying the instrumental variable (IV) method and propensity score matching (PSM) method. Finally, the paper proposes corresponding policy recommendations.

1. Introduction

Household finance has attracted increasing attention worldwide. Household financial market participation, household financial asset allocation and their influencing factors are the core issues investigated in household financial research (Campbell, 2006). In recent decades, numerous studies have explored the factors underlying household financial market participation, such as individual characteristics (Almenberg & Dreber, 2015; Campbell, 2006; Grinblatt, Keloharju, & Linnainmaa, 2011; Haliassos & Bertaut, 1995; Rosen & Wu, 2004); household characteristics (Alan, 2006; Betermier, Calvet, & Sodini, 2017; Fagereng, Gottlieb, & Guiso, 2017; Guiso, Jappelli, & Terlizzese, 1996; Guiso & Paiella, 2008; Heaton & Lucas, 2000); social interactions, trust and social capital (Balloch, Nicolae, & Philip, 2015; Brown, Ivković, Smith, & Weisbenner, 2008; Georgarakos & Pasini, 2011; Hong, Kubik, & Stein, 2004; Liu, Meng, You, & Zhao, 2013); emotions (Hurd, Van Rooij, & Winter, 2011; Rao, Mei, & Zhu, 2016); and culture (Grinblatt & Keloharju, 2001). Some recent works have emphasized the role of financial literacy (Arrondel, Debbich, & Savignac, 2015; Behrman, Mitchell, Soo, & Bravo, 2012; Guiso, Haliassos, & Jappelli, 2003; van Rooij, Lusardi, & Alessie, 2011; Yoong, 2011). In addition, some studies focus on the effect of housing (Cardak & Wilkins, 2009; Chen & Ji, 2017; Chetty, SÁndor, & Szeidl, 2017; Chetty & Szeidl, 2007; Fratantoni, 1998; Tobin, 1982) on household financial market participation. However, there are mixed findings in the

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literature regarding the effect of household property investment on financial market participation, including a wealth effect (Cardak & Wilkins, 2009; Cohn, Lewellen, Lease, & Schlarbaum, 1975; Fratantoni, 1998; Tobin, 1982), crowding-out effect (Chetty & Szeidl, 2007; Fratantoni, 1998; Grossman & Laroque, 1990; Yamashita, 2003) or both effects (Chetty et al., 2017). Furthermore, the above studies usually investigate financial literacy, housing and financial market participation separately but not in combination. In addition, most existing studies are based on cases in Western countries, and few cases are related to China. Therefore, it is particularly interesting to explore the results obtained using a new dataset, especially in China, given the statistics showing the importance of property investments in households for financial market participation and how such investments and financial literacy combined affect household financial market participation.

According to the China Household Finance Survey in 2011, the household financial market participation rate is 11.5%; of the overall participation in the market, the stock market participation rate among Chinese households is 8.8%, while the fund market participation rate among Chinese households is 4.2% (Gan, Yin, Jia, Xu, & Ma, 2012). These results indicate that Chinese household financial market participation is low. However, with the continuous development of China's financial market, financial products are becoming diverse and complex, and households are increasingly actively involved in the financial market. Meanwhile, the development of China's housing market over the past decades has added value to families' housing wealth. According to the China Household Finance Survey data, the proportion of household housing assets to total assets increased from 62% in 2011 to 66% in 2013, and China's per capita real estate wealth in 2016 was $13,100. Real estate plays a vital role in Chinese households' everyday investment decisions in most aspects, including those in the financial market (Chen & Ji, 2017). However, lacking financial knowledge, households do not know how to make investment decisions. Our goal in this paper is to fill the above gaps in the literature by examining how financial literacy and housing value jointly affect household financial market participation in urban China to provide important evidence and policy recommendations to policymakers and help residents improve their financial literacy and optimize their investment strategies. We set the study in urban China because the housing value is mainly reflected in urban housing, and rural housing could may not be accurately valued.

Our work contributes to the literature in two key respects. First, the specific advantage of our study is that the Chinese urban setting and our unique dataset enable us to explore the effects of both financial literacy and housing value on household financial market participation in Chinese cities, the role of which has been examined separately in the existing literature. The findings show that there is a significant positive association between financial literacy and household financial market participation, while the housing value has an obvious “crowding-out effect” on household financial market participation in urban China. Further research finds that the role of financial literacy in household financial market participation in households with a low housing value is stronger than that in households with a high housing value. Furthermore, the study of the regional differences shows that among households with high housing values, financial literacy plays a more significant role in household bond market participation in less-developed cities. Among households with low housing values, improvement in financial literacy plays a more significant role in household fund market participation in less-developed cities and under-developed cities.

Second, we use an instrumental variable (IV) estimation to assess the causal effect of financial literacy and housing value on household financial market participation. Finding appropriate instruments is a difficult task, and we do not claim that our instruments irrefutably establish a causal effect of financial literacy and housing value on household financial market participation. Therefore, we use the propensity score matching (PSM) method to control for sample selection bias, which is a robustness check to compensate for the deficiency of the IV probit model. Our work not only sheds light on China's policymaking but also provides a useful reference for other countries.

The remainder of this paper is arranged as follows. Section 2 reviews existing studies. Section 3 describes the research design. Our empirical findings and robustness checks are presented in Section 4. Section 5 presents an extension analysis of the regional differences. Section 6 provides the conclusion, a brief summary and policy implications.

2. Literature review

2.1. Previous studies investigating household financial market participation

In recent years, many studies have focused on the determinants of household financial market participation, especially stock market participation. A growing number of studies have noted that financial market participation is associated with personal characteristics, such as sex, education, occupation, IQ and health status. In general, male stock market participation is higher than female stock market participation (Almenberg & Dreber, 2015). Haliassos and Bertaut (1995) and Campbell (2006) reported that education is positively related to stock market participation and that highly educated people are more likely to own stocks than less educated people. In the interest of investment substitution and risk aversion, households that own businesses are less likely to participate in the financial market (Shum & Faig, 2006). Moreover, high-IQ investors are more likely to hold mutual funds and stocks (Grinblatt et al., 2011). Residents with poor health are less likely to hold risky financial assets (Rosen & Wu, 2004).

Other empirical studies have found associations between financial market participation and household characteristics, including household wealth and background income risk. Household wealth is positively associated with household financial market participation due to the presence of participation costs (Alan, 2006; Betermier et al., 2017; Fagereng et al., 2017; Guiso & Paiella, 2008). However, Guiso et al. (1996) proposed that uninsurable income risk and the expectation of future borrowing constraints are negatively related to household stock market participation. This finding was further confirmed by Heaton and Lucas (2000), who found that entrepreneurial income risk has a significant impact on financial market participation.

Regarding social-interaction or social networks, compared with non-social households, social households who interact with their

neighbours or attend churches are more likely to participate in financial markets (Hong et al., 2004). Subsequently, Brown et al. (2008), Georgarakos and Pasini (2011) and Liu et al. (2013) also found that social interactions and social capital positively affect stock market participation.

Regarding the role of trust, Georgarakos and Pasini (2011) found that trust is positively associated with stock market participation, and sociality is likely to balance the barrier effect of low general trust in residential areas on shareholding, to some extent. These results were confirmed by Balloch et al. (2015), who also found that trusting households are more likely to participate in stock markets.

Regarding the role of emotion, Hurd et al. (2011) observed that optimistic beliefs based on past return data have a significant positive effect on stock market participation. In addition, household stock market and fund market participation are strongly associated with happiness. Compared with less happy people, happier people have more favourable attitudes towards risk-taking and may also prefer financial markets (Rao et al., 2016).

Furthermore, other factors influence household financial market participation. For instance, the influences of distance, language, and culture on the most investment-savvy institutions are less prominent than those among both households and less savvy institutions (Grinblatt & Keloharju, 2001). Certainly, financial literacy and housing are very important determinants of household financial market participation, which is discussed in the following section.

2.2. Financial literacy and financial market participation

Making family investment decisions is a complex process that requires much time and effort to search for and analyse information and then make decisions. During the process of information searching and analysis, financial literacy plays an important role. For example, using the 1995 and 1998 Bank of Italy Surveys of Household Income and Wealth, Guiso and Jappelli (2005) found that a lack of financial awareness among Italian households was the main reason for the limited participation. Some empirical studies have also shown that financial literacy plays a significant role in stock holding, and that both general knowledge and specialized knowledge contribute to financial decision making in countries such as Denmark, the Netherlands, and the US (Behrman et al., 2012; van Rooij et al., 2011). In addition, based on micro data from French households, Arrondel et al. (2015) found that financial literacy has a significant positive impact on stock market participation. Using a broad-based assessment of financial literacy administered to a sample of older American respondents in the RAND American Life Panel, Yoong (2011) found that the lack of stock market investment knowledge significantly reduces the probability of holding stocks.

A few studies have investigated the impact of financial literacy on household financial market participation in China. In a study conducted by Xia, Wang, and Li (2014), financial literacy overconfidence significantly increased household stock market participation. Financial availability, as measured by the amount of financial services available in the neighbourhood, investment experience, and financial literacy are all estimated to have significant positive effects on household' participation in the stock market (Yin, Yu, & Li, 2015).

2.3. Housing and financial market participation

The relationship between housing and household financial market participation is also an important topic in the field of household finance. Different opinions exist regarding the influence of housing on household financial market participation.

The first view is that the large wealth effect from housing asset appreciation allows households to hold more risky assets. Early studies indicated that as wealth increases, households place more wealth into riskier assets, such as stock investment (Cohn et al., 1975). The wealth effect of housing, which is a family's most important asset, cannot be ignored and can encourage families to hold riskier assets (Tobin, 1982). Moreover, households who own houses need to address price fluctuations and are thus more likely to hold more financial assets (Fratantoni, 1998). In more developed countries or regions, housing can be used as collateral to facilitate household investment in riskier assets (Cardak & Wilkins, 2009).

The second view is that higher housing values may discourage households from participating in financial markets. Fratantoni (1998) believed that owning a house creates a family price risk and committed expenditure risk, which could lead to a reduction in household participation in financial markets. Grossman and Laroque (1990) believed that durable consumer goods, such as higher value housing, increase the liquidity risk of households, and these authors draw the same conclusions. The liquidity constraints caused by homeownership can also discourage households from investing in risky assets (Flavin & Yamashita, 2002). Using SCF data from 1989, Yamashita (2003) found that the higher the proportion of housing constituting the total household assets, the lower the proportion of shares in household assets. In the case of income and net worth, higher housing values reduce the probability of households' participation in stock markets (Yao & Zhang, 2005). The house price risk can crowd out equity investments, and this effect is especially distinct among young and poor families (Cocco, 2005). Meanwhile, deterministic consumption, such as housing, may increase the risk aversion of ordinary citizens, thereby reducing their holdings of risky assets (Chetty & Szeidl, 2007).

The third view is that the impact of housing on household financial market participation is twofold. By using a survey of income and programme participation data from 1990 to 2001, Chetty et al. (2017) found that the wealth effect of housing could improve the probability of financial market participation, while housing mortgages could reduce the probability of financial market participation. In the US, the latter effect dominates, and housing generally reduces the holding of risky assets.

In China, the wealth effect dominates. For instance, with an increase in housing prices of one thousand RMB per square metre, the probability of participating in the stock market increases by 5.4% before controlling for the wealth effect and 2.84% after controlling for the wealth effect, highlighting the existence of the wealth effect (Chen & Ji, 2017). Chen, Shi, and Kown (2015) investigated the

impact of housing wealth on households' financial market participation and portfolio choice using China Household Finance Survey (CHFS) data and found that a higher level of housing wealth encourages household financial market participation.

2.4. Brief summary

In summary, the existing research has the following limitations. First, the measurements of financial literacy used in existing studies are often crude. For instance, Lusardi and Mitchell (2007a, 2007b) used only three questions to measure financial literacy. Moreover, surveys that provide more extensive information regarding financial literacy often have minimal or no data regarding wealth, saving, and other important economic outcomes (see, i.e., the NCEE survey). Even in a study conducted by van Rooij et al. (2011), the authors only used two types of questions to measure financial literacy, i.e., simple literacy questions (first 5 questions) and more advanced literacy questions (remaining 11 questions), and these authors divided the set of questions into two groups and performed a factor analysis of the two sets separately. However, factor analyses cannot directly reflect the variables; thus, there is a black box problem. Second, previous studies analysed the impact of financial literacy on household financial market participation while considering the impact of housing. To the best of our knowledge, no research has combined the three variables, especially in China. Third, some studies do not address the endogenous problems between financial literacy and financial market participation or between housing value and financial market participation.

Based on the above reasons, we overcome the shortcomings of some previous studies by using the weighted method to measure financial literacy both objectively and subjectively and apply the IV method to alleviate the endogenous problems between financial literacy and financial market participation and between housing value and financial market participation. Furthermore, we use PSM estimation, which is a robustness check to compensate for the deficiency of the IV method, to control for sample selection bias. Then, a heterogeneity analysis is carried out according to the regional differences.

3. Research design

3.1. Methodology

3.1.1. Benchmark model

First, we use a probit model to examine the impact of financial literacy and housing value on household financial market participation. Suppose that for household i, the decision Y_i to participate in the financial market can only assume two values, i.e., 0 or 1. Moreover, its value is determined by the latent variable Y_i^*. When $Y_i^* \geq 0$, $Y_i = 1$; when $Y_i^* < 0$, $Y_i = 0$. The latent variable Y_i^* is determined by financial literacy (Financial_literacy), the housing value (Housing_value), other control variables X_i and a random variable ε_i.

$$Y_i = 1(Y_i^* \geq 0) \tag{1}$$

$$Y_i^* = \alpha_1 Financial\_literacy_i + \alpha_2 Housing\_value_i + \beta_i X_i + \varepsilon_i \tag{2}$$

Here, α_1, α_2 and β_i are the parameters to be estimated.

Similarly, the benchmark models of stock market participation, fund market participation and bond market participation are the same as above.

3.1.2. Overcoming the endogenous problem

One important methodological challenge in this paper concerns endogenous problems, which may arise from the following aspects. (1) Other important variables affecting household financial market participation are omitted. (2) A reverse causation could result in biased estimates. For example, a person's financial literacy could have increased because he/she has already participated in the financial market due to unobserved factors, such as a peer effect; in addition, it is equally possible that the proportion of wealth that households allocate to financial assets influences the amount invested in housing. (3) There are sample selection errors.

A common method is to identify suitable instrumental variables to address the endogenous problems. Therefore, the IV method is utilized to improve the unbiasedness and accuracy of the estimation results in this paper. Following previous studies (Christelis, Jappelli, & Padula, 2010; van Rooij et al., 2011), the variable for representing whether it is necessary for households to receive financial education (financial_education) is used as an IV of financial literacy, which should be correlated with financial literacy but uncorrelated with financial market participation. Furthermore, drawing upon research conducted by Chen et al. (2015), the proportion of first home assets of the total household assets (firsthousing_ratio) is used as an IV of the housing value. The proportion of first housing assets of the total household assets could directly affect the housing value. First homes are generally used for self-occupancy and not for investment. Therefore, the proportion of total family assets attributed to the first home is less relevant to household financial market participation. In the following fourth section of this paper, we test the validity of the instrumental variables.

In addition, to control for sample selection bias, the PSM developed by Rosenbaum and Rubin (1983) is employed as a robustness check to compensate for the deficiency of the IV method. The main idea of this method is to build a counterfactual control group to examine the impact of the changes on key outcomes. Specifically, we use a logit model to estimate the regression coefficients of household explanatory variables on financial literacy and housing value and then estimate the propensity score (PS) value of households according to the regression coefficients obtained. Then, we employ three matching approaches, i.e., nearest neighbour

matching, radius matching and kernel matching, and examine the average effect of the treatment on the treated (ATT).

3.2. Data and variables

3.2.1. Data source

The data used in this paper are derived from the 2012 consumer finance survey in urban China. The survey is conducted by the financial research centre at Tsinghua University in China and is a part of the Survey of Consumer Finance (SCF) series,[1] which has been adopted in several countries since its first use in the United States. The survey covers basic household information, household financial education, household economic status, household financial behaviour, financial consumer protection, financial knowledge, consumer habits and attitudes towards life for a total of seven parts. The sample data include 3122 households in 24 cities in China. Among the households, 1180 households are located in the eastern region, 992 households are located in the central region, and 950 households are located in the western region, accounting for 9690 residents.

According to the difference in the city scale and economic development level, these cities included in the survey are divided into the following three categories: first-category cities (developed cities), second-category cities (less-developed cities) and third-category cities (under-developed cities). Considering the imbalance of economic development across different regions, this survey divides the cities (except for Hong Kong, Macao and Taiwan) into the following seven regions: Northeast, North, East, South, Central, Southwest and Northwest China. The sample number of households is distributed proportionally among the different regions according to the number of households. Except for two cities in each category in East China, one city in each category is selected in the other regions. In total, 24 cities in China are surveyed, as shown in Fig. 1.

The sample families are obtained by random sampling. Thus, after the investigators enter the residential areas, the interviewed families are randomly selected according to the right-hand rule. The data obtained from the survey basically meet the requirements of randomness. Meanwhile, we require the interviewees to be familiar with the family's economic situation and be the main decision maker for regarding family economic activities to ensure that the data obtained accurately reflect all types of family information. Therefore, the sample has good representativeness.

3.2.2. Variable selection

The dependent variables include household financial market participation, stock market participation, fund market participation and bond market participation. According to the survey data and following Yin et al. (2015), the risk assets mainly consist of stocks, funds and bonds. “Financial market participation” reflects whether a family holds risky assets in the financial market. If a family holds risky assets, this variable assumes a value of 1; otherwise, this variable assumes a value of 0. Similarly, “Stock market participation” reflects whether a household holds stocks. If a household holds stocks, this variable takes a value of 1; otherwise, this variable assumes a value of 0. “Fund market participation” reflects whether a household holds funds. If a household holds funds, this variable assumes a value of 1; otherwise, this variable assumes a value of 0. “Bond market participation” reflects whether a family holds bonds. If a family holds bonds, this variable assumes a value of 1; otherwise, this variable assumes a value of 0.

The core explanatory variables include financial literacy and housing value. Following previous studies (Huston, 2010; Lusardi & Mitchell, 2007a; Xia et al., 2014), in the questionnaire, objective financial literacy is measured by objective questions, including questions regarding China's banking management system, compound interest, diversification of investment, stock knowledge, inflation and the exchange rate. If the respondents answered correctly, the answer value is recorded as 1; otherwise, the value is recorded as 0. Then, the scores are summed. Subjective financial literacy refers to consumers' subjective judgement of their financial literacy level. We use the following items in the questionnaire to measure subjective literacy: Do you or your family understand the investment patterns of the following financial products? The specific financial products include stocks, funds and bonds. The possible answers include “do not understand at all,” “do not understand well,” “understand a little,” “understand fairly well,” “understand very well,” with corresponding scores ranging from 1 to 5. Then, we add the scores provided for each financial product, i.e., stocks, funds and bonds, to reflect overall subjective financial literacy. Finally, financial literacy is obtained by adding in equal weight objective financial literacy and subjective financial literacy. The detailed questions regarding financial literacy are shown in Appendix Table A1.

In addition, in contrast to the research conducted by Chen et al. (2015), which used the total value of the property owned by each family to measure the household's housing wealth, in our paper, the housing value is measured by the proportion of total household assets attributed to property owned by the household in 2012. We believe that this relative ratio can reflect the housing value more accurately. In addition, the housing owned by the household is the estimated value by the respondents according to the market price when the survey was conducted.

Following previous studies, we construct a series of control variables. First, similar to previous studies (Almenberg & Dreber, 2015; Campbell, 2006; Haliassos & Bertaut, 1995; Rosen & Wu, 2004), the individual characteristics of the householder can affect household financial market participation, and we control for the following variables: sex, age, education, and marital status of the householder; whether the householder is a private owner; and householder health status. Additionally, household characteristics may

[1] The survey of Consumer Finance was conducted with joint funding from the Federal Reserve and Treasury Department of the United States. This survey has been implemented since 1961. Since 1983, the survey has included a nationwide survey of household consumption and finances every three years. The survey covers household assets and liabilities, income, consumption, investments, other financial management behaviors, and household demographic characteristics.

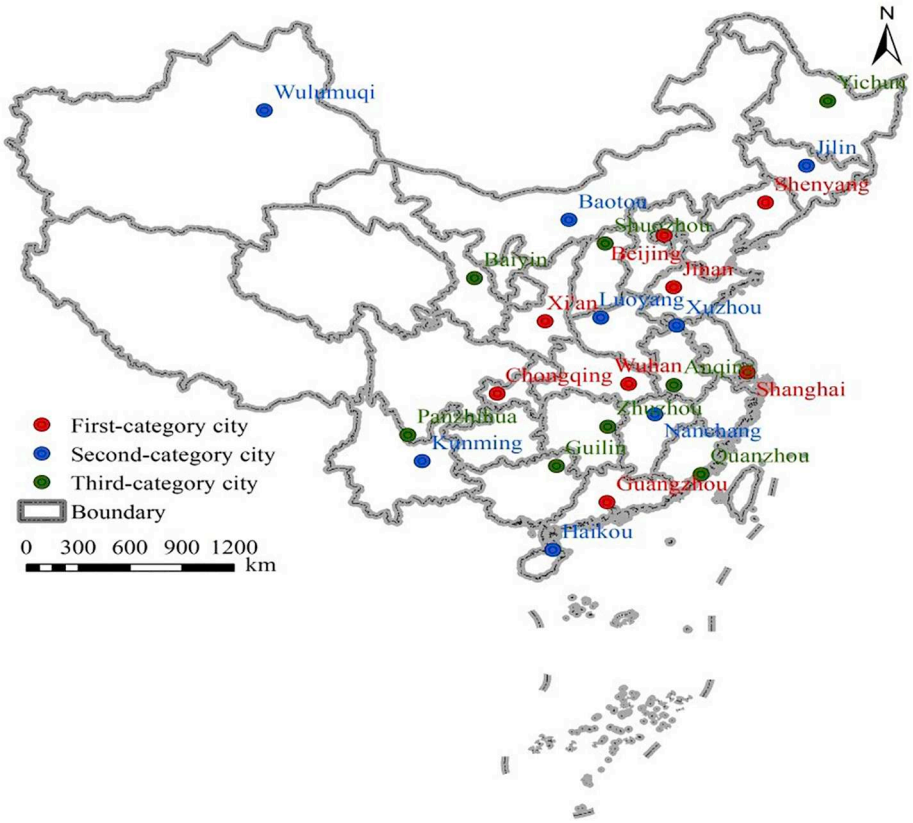

Fig. 1. Investigated cities.

also affect household financial market participation. Therefore, we control for the household income level, household income stability and number of children.

In addition, other control factors, such as the latter's financial education capital input and financial education time input, are included. Following a study conducted by Hu and Zang (2016), financial education capital input is measured by the following item on the questionnaire: "How much does your family spend on financial education?" If capital input exists, the answer value is 1; otherwise, the value is 0. Financial education time input is measured by the following item on the questionnaire: "The amount of time you spend on financial knowledge every week." Similarly, if there is a time input, the answer value is 1; otherwise, the value is 0. Whether a family prefers risk or is risk-averse is also controlled for. According to the research conducted by Chetty et al. (2017), the role of housing wealth in asset allocation largely depends on whether housing is purchased through loans. Meanwhile, based on the research conducted by Yin et al. (2015) and Chen et al. (2015), we control for two variables that reflect whether the household owns two or more housing units and whether the household has outstanding housing loans. In addition, according to Yin et al. (2015), the peer effect, supply of financial services, and local economic development could affect household financial market participation. Therefore, we also control for the peer effect. Moreover, city dummy variables are added to control for city-level variations, including variations in the level of economic development, financial services, and housing prices, in different cities.

3.2.3. Descriptive statistics

Table 1 presents the descriptive statistics of the variables used in this paper. The household financial market participation rate is approximately 51%, and the highest participation rate is observed in the stock market (40.6%), followed by the fund market (38.7%), and the lowest participation rate is observed in the bond market (20.2%).

Among the core explanatory variables, the score of financial literacy is higher than the median (5.75). In addition, the results show that the housing value is approximately 67.2%, indicating that housing accounts for a high proportion of household assets.

4. Empirical results and analysis

4.1. Benchmark regression results

First, we introduce financial literacy and housing value to the benchmark models separately, and then both variables are introduced into the models simultaneously. Moreover, we control for other variables, such as individual characteristics, family

Table 1
Descriptive statistics of the variables.

Variables	Definitions	Mean	SD.
Finance_market	1 = Participation in financial markets, 0 = Non-participation in financial markets	0.510	0.500
Stock_market	1 = Participation in stock markets, 0 = Non-participation in stock markets	0.406	0.491
Fund_market	1 = Participation in fund markets, 0 = Non-participation in fund markets	0.387	0.487
Bond_market	1 = Participation in bond markets, 0 = Non-participation in bond markets	0.202	0.402
Financial_literacy	Sum of subjective financial literacy and objective financial literacy in equal weights.	6.079	1.479
Housing_value	Proportion of property owned by households of the total household assets in 2012	0.672	0.154
Female	1 = Female, 0 = Male	0.290	0.454
Age	Between 25 and 35 years	0.580	0.494
	Between 35 and 45 years	0.329	0.470
	Between 45 and 55 years	0.065	0.247
	Over 55 years	0.026	0.159
Education	Junior high school or below	0.015	0.122
	High school/technical secondary school/ technical school	0.108	0.310
	College/junior college	0.760	0.427
	Masters or above	0.117	0.321
Married	1 = Married, 0 = Unmarried	0.840	0.367
Private_owner	1 = Private owner, 0 = Other	0.075	0.263
Health	1 = Healthy, 0 = Unhealthy	0.981	0.136
Children	Number of children in the family	0.495	0.610
Income_level[a]	Household income degree (1–13 levels)	8.172	2.213
Income_stab	Household income stability (1 = most unstable, 10 = most stable)	5.415	2.656
Capital_input	1 = Capital input in financial education, 0 = Other	0.805	0.397
Time_input	1 = Time input in financial education, 0 = Other	0.916	0.277
Risk attitude[b]			
Risk_neutral	1 = Risk neutral, 0 = Other	0.401	0.490
Risk_preference	1 = Risk preference, 0 = Other	0.270	0.444
Risk_aversion	1 = Risk aversion, 0 = Other	0.329	0.470
Peer_effect	1 = Acquires financial knowledge through the experience of colleagues, relatives or family members, 0 = Other	0.534	0.499
Two_house	1 = Household owns two or more housing units, 0 = Other	0.405	0.491
House_debt	1 = Household has outstanding housing loans,0 = Other	0.500	0.500

[a] The question about the household income degree on the questionnaire is as follows: What is your family's monthly income? The answers are as follows: 1. 1001–1500, 2. 1501–2000, 3. 2001–2500, 4. 2501–3000, 5. 3001–4000, 6. 4001–5000, 7. 5001–6000, 8. 6001–10,000, 9. 10,001–15,000, 10. 15,001–20,000, 11. 20,001–30,000, 12. 30,001–50,000, and 13. > 50,000.

[b] The question about risk attitude on the questionnaire is as follows: What type of risk is your family willing to take when investing? The answers are as follows: 1. high risks to obtain high returns, 2. higher risks to obtain higher returns, 3. only average risk to obtain average returns, 4. only lower risks to accept lower returns; and 5. unwilling to have any investment risk. Referring to a study conducted by Yin et al. (2015), this paper defines 1 and 2 as risk preference, 3 as risk neutrality, and 4 and 5 as risk aversion. Considering risk neutrality the reference group, risk preference and risk aversion are introduced as dummy variables.

Table 2
Benchmark regression results (1).

Results of the effects of financial literacy on household financial market participation and sub-market participation								
Variables	Probit	Margins	Probit	Margins	Probit	Margins	Probit	Margins
	(1)		(2)		(3)		(4)	
	Finance_market		Stock_market		Fund_market		Bond_market	
Financial_literacy	0.280***	0.086***	0.302***	0.090***	0.235***	0.074***	0.221***	0.052***
	(0.021)	(0.006)	(0.022)	(0.006)	(0.020)	(0.006)	(0.024)	(0.005)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	−3.197***		−4.314***		−3.508***		−3.809***	
	(0.373)		(0.440)		(0.391)		(0.490)	
Pseudo R2	0.22		0.2253		0.1687		0.1667	
Observations	3122	3122	3122	3122	3122	3122	3122	3122
Results of the effect of housing value on household financial market participation and sub-market participation								
Housing_value	−2.185***	−0.669***	−2.115***	−0.654***	−2.109***	−0.655***	−1.990***	−0.481***
	(0.198)	(0.057)	(0.196)	(0.057)	(0.196)	(0.057)	(0.214)	(0.050)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	−0.843*		−1.433***		−1.454***		−1.361**	
	(0.452)		(0.494)		(0.484)		(0.540)	
Pseudo R2	0.2202		0.2021		0.182		0.1646	
Observations	2825	2825	2825	2825	2825	2825	2825	2825

Note: ***,** and * represent significance at the 1%, 5% and 10% levels, respectively; standard errors are shown in parentheses.

Table 3
Benchmark regression results (2).

Variables	Probit	Margins	Probit	Margins	Probit	Margins	Probit	Margins
	(1)		(2)		(3)		(4)	
	Finance_market		Stock_market		Fund_market		Bond_market	
Financial_literacy	0.283***	0.081***	0.293***	0.085***	0.232***	0.069***	0.202***	0.047***
	(0.023)	(0.006)	(0.023)	(0.006)	(0.022)	(0.006)	(0.025)	(0.006)
Housing_value	−2.044***	−0.589***	−1.970***	−0.572***	−1.984***	−0.591***	−1.881***	−0.441***
	(0.202)	(0.055)	(0.200)	(0.055)	(0.199)	(0.056)	(0.217)	(0.049)
Female	0.068	0.020	−0.015	−0.004	0.015	0.005	0.000	0.000
	(0.060)	(0.017)	(0.060)	(0.018)	(0.059)	(0.018)	(0.066)	(0.015)
Age								
Between 25 and 35 years (ref.)								
Between 35 and 45 years	−0.029	−0.008	−0.124**	−0.036**	0.047	0.014	0.004	0.001
	(0.062)	(0.018)	(0.062)	(0.018)	(0.061)	(0.018)	(0.067)	(0.016)
Between 45 and 55 years	−0.006	−0.002	−0.067	−0.019	0.060	0.018	−0.133	−0.031
	(0.115)	(0.033)	(0.117)	(0.034)	(0.114)	(0.034)	(0.134)	(0.031)
Over 55 years	−0.102	−0.029	0.132	0.038	0.057	0.017	0.164	0.038
	(0.172)	(0.050)	(0.172)	(0.050)	(0.175)	(0.052)	(0.193)	(0.045)
Education								
Junior high school or below (ref.)								
High school/technical secondary school/technical school	−0.095	−0.027	0.103	0.030	−0.002	−0.001	−0.137	−0.032
	(0.321)	(0.092)	(0.382)	(0.111)	(0.360)	(0.107)	(0.406)	(0.095)
College/junior college	−0.052	−0.015	0.144	0.042	0.039	0.012	−0.288	−0.068
	(0.312)	(0.090)	(0.374)	(0.109)	(0.352)	(0.105)	(0.396)	(0.093)
Masters or above	0.078	0.022	0.076	0.022	0.180	0.054	−0.248	−0.058
	(0.324)	(0.093)	(0.383)	(0.111)	(0.361)	(0.108)	(0.404)	(0.095)
Married	−0.053	−0.015	0.010	0.003	0.027	0.008	−0.061	−0.014
	(0.082)	(0.024)	(0.084)	(0.024)	(0.084)	(0.025)	(0.094)	(0.022)
Private_owner	−0.199*	−0.057*	−0.199*	−0.058*	−0.141	−0.042	−0.115	−0.027
	(0.107)	(0.031)	(0.106)	(0.031)	(0.107)	(0.032)	(0.116)	(0.027)
Health	0.214	0.062	0.484*	0.141*	0.213	0.063	−0.071	−0.017
	(0.243)	(0.070)	(0.250)	(0.073)	(0.238)	(0.071)	(0.256)	(0.060)
Children	0.395***	0.114***	0.381***	0.111***	0.209***	0.062***	0.266***	0.062***
	(0.052)	(0.015)	(0.051)	(0.014)	(0.050)	(0.015)	(0.054)	(0.012)
Income_level	0.031*	0.009*	0.011	0.003	0.056***	0.017***	0.073***	0.017***
	(0.017)	(0.005)	(0.017)	(0.005)	(0.017)	(0.005)	(0.018)	(0.004)
Income_stab	0.027***	0.008***	0.023**	0.007**	0.029***	0.009***	0.024**	0.006**
	(0.010)	(0.003)	(0.010)	(0.003)	(0.010)	(0.003)	(0.011)	(0.003)
Capital_input	0.435***	0.125***	0.361***	0.105***	0.429***	0.128***	0.432***	0.101***
	(0.080)	(0.023)	(0.084)	(0.024)	(0.085)	(0.025)	(0.105)	(0.024)
Time_input	0.495***	0.143***	0.528***	0.154***	0.383***	0.114***	0.352**	0.082**
	(0.129)	(0.037)	(0.143)	(0.041)	(0.138)	(0.041)	(0.177)	(0.041)
Risk attitude								
Risk_neutral (ref.)								
Risk_preference	0.190***	0.055***	0.301***	0.087***	0.081	0.024	−0.002	−0.001
	(0.067)	(0.019)	(0.065)	(0.019)	(0.064)	(0.019)	(0.069)	(0.016)
Risk_aversion	−0.379***	−0.109***	−0.440***	−0.128***	−0.336***	−0.100***	−0.309***	−0.072***
	(0.065)	(0.018)	(0.067)	(0.019)	(0.067)	(0.020)	(0.077)	(0.018)
Peer_effect	0.104*	0.030*	0.028	0.008	0.032	0.009	−0.007	−0.002
	(0.055)	(0.016)	(0.055)	(0.016)	(0.054)	(0.016)	(0.060)	(0.014)
Two_house	0.250***	0.072***	0.200***	0.058***	0.248***	0.074***	0.176***	0.041***
	(0.063)	(0.018)	(0.062)	(0.018)	(0.061)	(0.018)	(0.066)	(0.015)
House_debt	0.199***	0.057***	0.236***	0.068***	0.248***	0.074***	0.198***	0.046***
	(0.059)	(0.017)	(0.059)	(0.017)	(0.059)	(0.017)	(0.065)	(0.015)
City dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	−2.018***		−2.709***		−2.415***		−2.159***	
	(0.474)		(0.527)		(0.506)		(0.561)	
Pseudo R2	0.2637		0.2479		0.2123		0.1877	
Observations	2825	2825	2825	2825	2825	2825	2825	2825

Note: ***,** and * represent significance at the 1%, 5% and 10% levels, respectively; standard errors are shown in parentheses.

characteristics, housing characteristics and city dummies. The standard regression results and marginal effects are shown in Table 2 and Table 3.

As shown in Table 2, we find that financial literacy is positively associated with the household participation rate in the financial market and its sub-markets, while the housing value is negatively correlated with household financial market participation and its sub-market participation. After entering financial literacy and the housing value into the same models, the results are consistent with

those shown in Table 2 and are showed in Table 3. The results of model 1 in Table 3 show that the marginal effect of financial literacy is significantly positive at the 1% level after controlling for various control variables. The value of the marginal effect is 0.081, indicating that if the financial literacy increases by a sample standard deviation (1.479), the probability of household financial market participation increases by 11.98%. However, the marginal effect of the housing value is significantly negative; thus, an increase in the housing value could reduce the probability of household participation in the financial market, confirming the "crowding-out effect" of housing value. The marginal effect is −0.589, indicating that if the housing value increases by a sample standard deviation (0.154), the probability of household financial market participation decreases by 9.07%. In our sample, household financial market participation is 51.0%. Therefore, the household financial market participation caused by a change in financial literacy and housing value with a standard deviation is not negligible in the economic sense.

Similarly, we examine the impact of financial literacy and housing value on participation in various financial markets, such as stock markets, fund markets and bond markets. If financial literacy increases by a sample standard deviation (1.479), the probabilities of household participation in the stock market, fund market and bond market increase by 12,57%, 10.21%, and 6.95%, respectively. Moreover, the results show that if the housing value increases by a sample standard deviation (0.154), the probabilities of household participation in the stock market, fund market and bond market decrease by 8.81%, 9.10%, and 6.79%, respectively. Compared with the probability of stock market participation (40.6%), fund market participation (38.7%) and bond market participation (20.2%), these values are also more significant in the economic sense.

The positive effect of financial literacy on household financial market participation is consistent with the studies conducted by van Rooij et al. (2011) and Arrondel et al. (2015). The higher one's financial literacy is, the stronger the ability to learn and analyse financial markets, and the more confident one is in participating in financial markets. Furthermore, the negative effect of housing value on household financial market participation is consistent with the studies conducted by Fratantoni (1998), Grossman and Laroque (1990), Yamashita (2003) and Yao and Zhang (2005). A high housing value may introduce a household price risk and committed expenditure risk, which could lead to a reduction in the probability of holding risky assets. Additionally, a high housing value may increase the risk aversion of ordinary citizens, thereby reducing their holdings of risky assets (Chetty & Szeidl, 2007).

In addition, according to the regression results, we can observe the impact of the other control variables on participation in the financial market and sub-markets. First, private_owner has a significant negative impact on participation in the financial market and stock market. This finding is consistent with previous research (Shum & Faig, 2006). For the purposes of investment substitution and risk aversion, households that are sole proprietors are less likely to participate in the financial market. Second, the number of children in the family has a significant positive impact on financial market participation and sub-market participation likely because the more children there are in a family, the greater the financial pressure. Therefore, families are more inclined to invest in high-risk assets to obtain high returns to ease their financial burden. Meanwhile, the effects of income and income stability on participation in the financial market and sub-markets are significantly positive because of the presence of participation costs (Alan, 2006; Betermier et al., 2017; Fagereng et al., 2017; Guiso & Paiella, 2008), except for the association between income and stock market participation, which is not significant. Compared with risk-neutral households, risk-preferring households have a higher probability of participating in the financial market and stock market, while risk-averse households have a lower probability of participating in the financial market and sub-markets, which is consistent with existing research (Guiso & Paiella, 2008; Hong et al., 2004). In addition, financial education capital input and time input significantly increase the probability of household financial market participation and sub-market participation. This finding is consistent with research conducted by Hu and Zang (2016), who also find that financial investment in education is significantly positively associated with household financial market participation.

Furthermore, the peer effect has a significant positive effect on financial market participation. This finding is consistent with the results reported by Hong et al. (2004). The effects of whether a household owns two or more housing units on household financial market participation and sub-market participation are significantly positive, which is likely related to loans, as a household who owns two or more housing units may have better loans. The variable that reflects whether households have outstanding mortgages has a significant positive effect on financial market participation and sub-market participation due to following possible two reasons: on the one hand, households who have outstanding loans will invest their money in risky assets to obtain high returns to repay the loans; on the other hand, although households with housing loans need to repay their loans, they still have more liquid assets relative to households that made a one-time payment for their housing loans. By placing available assets in financial markets, these households believe that they can diversify their risk.

4.2. Treatment of endogenous problems

Although the benchmark regression results show that financial literacy significantly improves household financial market participation and sub-market participation, the housing value has a significant "crowding-out effect" on household financial market participation and sub-market participation, and the above conclusions are disturbed by endogenous problems. Therefore, we use an IV probit model and the PSM method to alleviate these problems.

4.2.1. IV probit estimation results

The IV probit estimation results are shown in Table 4. To test the validity of the instruments, we use some proper techniques. First, we test the correlation between the instrument variables and explanatory variables. The regression coefficient of financial_education in the first stage is 0.241, and that of firsthousing_ratio is 0.915, both of which are significant. Thus, the instrumental variables are related to the explanatory variables. Meanwhile, the F statistics of the first-stage estimation are 17.43 and 274.55, which are clearly above the 10 value that is often recommended as a rule of thumb to avoid the problem of weak instruments (Staiger & Stock, 1997).

Table 4
IV probit estimation results.

Results of the effect of financial literacy on household financial market participation				
Variables	IV Probit	IV Probit	IV Probit	IV Probit
	(1)	(2)	(3)	(4)
	Finance_market	Stock_market	Fund_market	Bond_market
Financial_literacy	0.096	0.003	0.151**	0.060
	(0.088)	(0.105)	(0.062)	(0.092)
Housing_value	−0.566***	−0.642***	−0.430**	−0.428***
	(0.155)	(0.066)	(0.185)	(0.109)
Control variables	Yes	Yes	Yes	Yes
Wald test of exogeneity	0.03	0.66	1.02	0.02
(*P* value)	(0.8707)	(0.4175)	(0.3136)	(0.8924)
First-stage regression results: Financial literacy				
Financial_education	0.241***	0.241***	0.241***	0.241***
	(0.075)	(0.074)	(0.074)	(0.074)
Control variables	Yes	Yes	Yes	Yes
F-statistic	17.43	17.43	17.43	17.43
(P value)	(0.000)	(0.000)	(0.000)	(0.000)
Results of the effect of housing value on household financial market participation				
Variables	IV Probit	IV Probit	IV Probit	IV Probit
	(1)	(2)	(3)	(4)
	Finance_market	Stock_market	Fund_market	Bond_market
Housing_value	−0.551***	−0.573***	−0.531***	−0.396***
	(0.063)	(0.063)	(0.065)	(0.058)
Financial_literacy	0.082***	0.085***	0.070***	0.048***
	(0.006)	(0.006)	(0.006)	(0.006)
Control variables	Yes	Yes	Yes	Yes
Wald test of exogeneity	1.64	0.00	3.62	2.21
(P value)	(0.1997)	(0.9757)	(0.0573)	(0.1373)
First-stage regression results: Housing value				
Firsthousing_ratio	0.915***	0.915***	0.915***	0.915***
	(0.010)	(0.010)	(0.010)	(0.010)
Control variables	Yes	Yes	Yes	Yes
F-statistic	274.55	274.55	274.55	274.55
(P value)	(0.000)	(0.000)	(0.000)	(0.000)

Note: ***,** and * represent significance at the 1%, 5% and 10% levels, respectively; standard errors are shown in parentheses.

Therefore, there is no weak instrumental variable problem. It is appropriate to use the variable reflecting whether it is necessary for families to receive financial education as an instrumental variable representing financial literacy and the variable reflecting the proportion of family assets dedicated to a first home as an instrumental variable representing the housing value.

Second, to test whether financial literacy and housing value are endogenous, we employed the Wald test of endogeneity. The Wald Test results show that except for the *P*-value of the fourth column in the lower part, which is < 10%, the other *P*-values are > 10%. Therefore, no endogenous problem was noted, except for between the housing value and household fund market participation. Accordingly, the results of the previous probit estimation are reliable. Meanwhile, the IV probit results are basically consistent with the probit estimation results, although the impacts of financial literacy on household financial market participation, stock and bond market participation are not significant.

4.2.2. PSM estimation results

Furthermore, we use the propensity score matching method to control for sample selection bias, which is a robustness check to compensate for the deficiency of the IV probit model.

The first step in performing the PSM analysis is to estimate propensity scores. Consistent with previous studies (Becker & Ichino, 2002; Dehejia & Wahba, 2002), we estimate the logit model to obtain the PS values. To test the rationality of the matching variables and the matching process, we conduct both a balanced hypothesis test and a common support hypothesis test. Three approaches are used to estimate ATT, i.e., the nearest neighbour matching, radius matching and kernel matching approaches, as a robustness check. Due to space constraints, only the results of the ATT are reported here (Table 5). Compared with households with low financial literacy, those with high financial literacy are associated with a significantly higher participation rate in the financial market and sub-markets. However, compared with households with a low housing value, those with a high housing value are associated with a significantly lower participation rate in the financial market and sub-markets.

In conclusion, financial literacy can significantly improve the probability of household participation in the financial market and sub-markets, while the housing value has a significant “crowding-out effect” on household participation in the financial market and sub-markets.

Table 5
PSM estimation results.

Dependent variables	Independent variables	Nearest neighbour matching	Radius matching	Kernel matching
Finance_market	Financial_literacy	0.155 ***	0.161***	0.162***
Stock_market		0.164***	0.169***	0.169***
Fund_market		0.152***	0.159***	0.162***
Bond_market		0.134***	0.126***	0.130***
Finance_market	Housing_value	−0.219***	−0.212***	−0.218***
Stock_market		−0.219***	−0.212***	−0.220***
Fund_market		−0.208***	−0.206***	−0.211***
Bond_market		−0.132***	−0.135***	−0.136***

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

4.3. Impact of financial literacy on household financial market participation under different housing values

This paper finds that there is a significant negative correlation between financial literacy and the housing value, and the correlation coefficient is −0.1634. Therefore, we attempt to examine the impact of financial literacy on household financial market participation under different housing values. We compare the housing value with the local average housing value. If the housing value is higher than the average value, the variable value is recorded as 1, i.e., the high housing value group; otherwise, the variable value is recorded as 0, i.e., the low housing value group. Here, we use a probit model and the PSM method to estimate the results of the impact of financial literacy on household financial market and sub-market participation under different housing values as shown in Table 6 and Table 7. The results of the two different methods show that regardless of households have a high housing value or a low housing value, financial literacy has a significant positive impact on household financial market and sub-market participation. However, we also find that the marginal effects of financial literacy on household financial market and sub-market participation in households with a low housing value are larger than those in households with a high housing value. Thus, the role of financial literacy in household financial market and sub-market participation is stronger among households with a low housing value.

5. Extension analysis of regional differences

To study the regional differences in the impact of financial literacy on household financial market participation under different housing values, according to the original division of the cities in the questionnaire (including developed cities, less-developed cities and under-developed cities), by considering the developed cities as the reference group, we added an interaction term between financial literacy and the dummy variable of less-developed cities and an interaction term between financial literacy and the dummy variable of under-developed cities into the estimations. The results are shown in Table 8.

In households with a high housing value, compared with households in developed cities, the marginal effect of less-developed cities on household financial market participation is negative, especially in bond market participation. This finding indirectly confirms the “crowding-out effect” of housing values. The housing prices in developed cities and less-developed cities are generally higher than those in under-developed cities. Having higher housing values increases out participation in the financial market. The sixth column in Table 8 shows that the interaction coefficient between financial literacy and less-developed cities is significantly positive, indicating that in households with a high housing value, financial literacy plays a more significant role in household bond market participation in less-developed cities.

However, in households with a low housing value, compared with households in developed cities, the marginal effects of less-developed cities and under-developed cities on household financial market participation are negative, especially in fund market participation. In the fifth column in Table 8, the interaction coefficients between financial literacy and less-developed cities and between financial literacy and under-developed cities are significantly positive, indicating that in households with low housing values, the effects of financial literacy on fund market participation in less-developed cities and under-developed cities are more obvious.

6. Conclusions

Using data from the 2012 consumer finance survey in China, we extend the literature on household finance by examining the impact of both financial literacy and housing value on household financial market participation. The results show that financial literacy has a significant positive effect on household financial market participation, while the housing value has a significant negative effect on household financial market participation. Further research finds that the role of financial literacy in household financial market participation in households with a low housing value is stronger than that in households with a high housing value. Furthermore, the study of the regional differences shows that among households with a high housing value, financial literacy plays a more significant role in household bond market participation in less-developed cities. Among the households with a low housing value, financial literacy plays more significant roles in household fund market participation in less-developed cities and under-developed cities. Our findings remain robust even when the IV probit and propensity score matching (PSM) methods are used.

Thus, the findings of this paper carry far-reaching policy implications. The enhancement of financial literacy at both the

Table 6
Probit estimation results under different housing values.

	Low housing value				High housing value			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	Finance_market	Stock_market	Fund_market	Bond_market	Finance_market	Stock_market	Fund_market	Bond_market
Financial_literacy	0.093***	0.098***	0.096***	0.066***	0.073***	0.074***	0.051***	0.037***
	(0.009)	(0.009)	(0.009)	(0.010)	(0.008)	(0.007)	(0.008)	(0.006)
Female	0.023	−0.004	0.016	−0.005	0.009	−0.015	−0.008	−0.007
	(0.025)	(0.027)	(0.027)	(0.027)	(0.023)	(0.021)	(0.022)	(0.016)
Age								
Between 25 and 35 years (ref.)								
Between 35 and 45 years	−0.034	−0.070***	0.024	0.022	−0.013	−0.003	−0.033	−0.017
	(0.025)	(0.027)	(0.027)	(0.026)	(0.024)	(0.022)	(0.023)	(0.018)
Between 45 and 55 years	−0.046	−0.091	−0.060	−0.061	0.030	0.060	0.037	0.004
	(0.051)	(0.055)	(0.055)	(0.056)	(0.042)	(0.038)	(0.041)	(0.031)
Over 55 years	−0.112	0.004	−0.129	−0.027	−0.020	0.057	0.025	0.037
	(0.071)	(0.079)	(0.086)	(0.085)	(0.069)	(0.062)	(0.065)	(0.047)
Education								
Junior high school or below (ref.)								
High school/technical secondary school/ technical school	−0.239**	−0.076	−0.077	−0.171	0.069	0.159	0.020	0.789
	(0.115)	(0.154)	(0.165)	(0.145)	(0.099)	(0.124)	(0.095)	(27.481)
College/junior college	−0.157	−0.013	−0.022	−0.192	0.034	0.143	0.009	0.774
	(0.111)	(0.150)	(0.160)	(0.140)	(0.096)	(0.121)	(0.091)	(27.481)
Masters or above	−0.081	−0.052	0.042	−0.154	0.046	0.140	0.043	0.771
	(0.116)	(0.154)	(0.163)	(0.143)	(0.101)	(0.124)	(0.096)	(27.481)
Married	0.033	0.024	0.023	−0.019	−0.050*	−0.015	0.001	−0.011
	(0.035)	(0.038)	(0.039)	(0.039)	(0.029)	(0.027)	(0.028)	(0.022)
Private_owner	−0.035	−0.034	−0.027	−0.021	−0.036	−0.059	−0.035	−0.054
	(0.040)	(0.042)	(0.043)	(0.041)	(0.045)	(0.044)	(0.044)	(0.036)
Children	0.127***	0.119***	0.065***	0.081***	0.096***	0.100***	0.053***	0.047***
	(0.021)	(0.022)	(0.023)	(0.022)	(0.020)	(0.018)	(0.019)	(0.014)
Income_level	0.005	0.002	0.015**	0.018***	0.021***	0.021***	0.019***	0.025***
	(0.006)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.005)
Income_stab	0.003	0.002	0.007	0.003	0.010**	0.008**	0.009**	0.007**
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
Health	0.219*	0.252**	0.331***	0.059	−0.022	0.013	−0.029	−0.071
	(0.117)	(0.123)	(0.124)	(0.112)	(0.071)	(0.069)	(0.068)	(0.050)
Risk attitude								
Risk_neutral (ref.)								
Risk_preference	0.037	0.089***	0.006	0.005	0.034	0.067***	0.009	−0.016
	(0.027)	(0.028)	(0.029)	(0.027)	(0.026)	(0.023)	(0.025)	(0.018)
Risk_aversion	−0.077***	−0.133***	−0.062**	−0.064**	−0.139***	−0.124***	−0.114***	−0.080***
	(0.027)	(0.029)	(0.031)	(0.031)	(0.024)	(0.023)	(0.024)	(0.019)
Captial_input	0.108***	0.113***	0.132***	0.107**	0.130***	0.102***	0.100***	0.082***
	(0.033)	(0.038)	(0.038)	(0.042)	(0.029)	(0.028)	(0.029)	(0.025)
Time_input	0.190***	0.198***	0.211***	0.097	0.108**	0.104**	0.067	0.028
	(0.054)	(0.065)	(0.068)	(0.069)	(0.044)	(0.046)	(0.044)	(0.040)
Peer_effect	0.014	−0.023	−0.007	−0.025	0.041**	0.037*	0.018	0.016
	(0.023)	(0.024)	(0.025)	(0.024)	(0.021)	(0.019)	(0.020)	(0.015)
Two_house	0.093***	0.063**	0.140***	0.085***	0.076***	0.013	0.079***	−0.001
	(0.027)	(0.028)	(0.028)	(0.027)	(0.021)	(0.020)	(0.021)	(0.016)
House_debt	0.045*	0.096***	0.053**	0.069***	0.006	0.030	0.007	−0.008
	(0.024)	(0.025)	(0.026)	(0.025)	(0.022)	(0.020)	(0.021)	(0.015)
City dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R2	0.2702	0.231	0.2271	0.1489	0.1812	0.2052	0.125	0.1835
Observations	1284	1284	1284	1284	1838	1838	1838	1838

Note: ***,** and * represent significance at the 1%, 5% and 10% levels, respectively; standard errors are shown in parentheses. The results reported in the Table are marginal effects.

individual and country levels is crucial for ensuring higher participation in financial markets. Therefore, the Chinese government and relevant departments need to promote the popularization of financial knowledge and enhance residents' financial literacy, especially among households with low housing values. For example, the government can increase the public supply of financial education, promulgate relevant laws and regulations, and focus on protecting the rights and interests of these groups. In addition, according to different regions, governments need to popularize different types of financial knowledge. For instance, the government and related departments should focus on popularizing financial knowledge related to funds and bonds in less-developed cities and under-

Table 7
ATT estimations under different housing values.

Housing value	Dependent variables	Independent variables	Nearest neighbour matching	Radius matching	Kernel matching
High	Finance_market	Financial_ literacy	0.138***	0.145***	0.153 ***
	Stock_market		0.157***	0.154***	0.162 ***
	Fund_market		0.083***	0.099 ***	0.104 ***
	Bond_market		0.104 ***	0.097 ***	0.099 ***
Low	Finance_market	Financial_ literacy	0.167***	0.163***	0.167 ***
	Stock_market		0.165***	0.164***	0.174 ***
	Fund_market		0.215***	0.201***	0.205 ***
	Bond_market		0.146 ***	0.155***	0.154***

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

Table 8
Regional differences.

Housing value	Variables	Finance_market	Stock_market	Fund_market	Bond_market
High	Financial_literacy	0.062***	0.075***	0.043***	0.029***
		(0.010)	(0.010)	(0.010)	(0.008)
	Region				
	CityD1 (ref.)				
	CityD2	−0.198*	−0.047	−0.128	−0.168*
		(0.117)	(0.116)	(0.114)	(0.097)
	CityD3	−0.093	0.085	−0.108	−0.071
		(0.128)	(0.128)	(0.125)	(0.109)
	Literacy_cityD				
	Literacy_cityD1(ref.)				
	Literacy_cityD2	0.030	0.008	0.019	0.029**
		(0.019)	(0.018)	(0.018)	(0.015)
	Literacy_cityD3	0.018	−0.011	0.022	0.013
		(0.021)	(0.020)	(0.020)	(0.017)
	Control variables	Yes	Yes	Yes	Yes
	Pseudo R^2	0.1739	0.1951	0.1163	0.1605
	Observations	1838	1838	1838	1838
Low	Financial_literacy	0.091***	0.110***	0.072***	0.056***
		(0.012)	(0.014)	(0.013)	(0.013)
	Region				
	CityD1(ref.)				
	CityD2	−0.066	0.118	−0.388**	−0.089
		(0.139)	(0.153)	(0.159)	(0.155)
	CityD3	−0.057	0.151	−0.430**	−0.217
		(0.156)	(0.167)	(0.182)	(0.174)
	Literacy_cityD				
	Literacy_cityD1(ref.)				
	Literacy_cityD2	0.004	−0.020	0.048**	0.011
		(0.022)	(0.023)	(0.024)	(0.023)
	Literacy_cityD3	0.009	−0.025	0.060**	0.033
		(0.025)	(0.026)	(0.028)	(0.026)
	Control variables	Yes	Yes	Yes	Yes
	Pseudo R^2	0.2556	0.2217	0.2150	0.1353
	Observations	1284	1284	1284	1284

Note: ***,** and * represent significance at the 1%, 5% and 10% levels, respectively; standard errors are shown in parentheses. The results reported in the table are marginal effects.

developed cities. Furthermore, it is necessary to take measures to regulate and reform China's real estate market to ensure that families' housing values are within a reasonable range. For instance, China should insist on a basic policy that houses are intended for living in, effectively curbing speculative investment, promoting real estate tax legislation, and encouraging the development of the rental market.

This study enriches the literature on household finance by highlighting the importance of both financial literacy and housing value in influencing household financial market participation. However, this study has some limitations. First, this research is based on cross-sectional data; longitudinal data are needed to further understand the causal and temporal relationships among financial literacy, housing value and household financial market participation. Second, due to data constraints, we are unable to find other, more appropriate instrumental variables to validate this conclusion. Finally, in our paper, we analyse only the influencing factors of the household financial market participation rate and do not investigate the depth of household financial market participation, that is, household asset choices.

Therefore, this study can be extended in the future to conduct 1- and 2-year follow-up interviews with the respondents to explore

the dynamics of the relationship. In this paper, we find not only that financial literacy affects household financial market participation but also that financial education capital input and time input play significant roles in household financial market participation, which may be a future research direction. Furthermore, we may consider household asset choices in future research.

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Appendix A. Appendix

Table A1
Financial literacy questionnaire.

No.	Questions	Options
	Objective financial literacy	
1	Which of the following banks has management functions in the financial system?	a. Bank of China b. Industrial and Commercial Bank of China (ICBC) c. People's Bank of China d. China Construction Bank e. I don't know
2	If the deposit reserve ratio of commercial banks is lowered, what do you think of the amount of money in the economy overall?	a. Decrease b. Increase c. I don't know
3	Can decentralized investment reduce risks?	a. Yes b. No c. I don't know
4	If you own shares in a company, then	a. Whether it's short-term holdings or long-term holdings, you actually lend money to the company. b. Whether it's short-term holdings or long-term holdings, you're actually a shareholder in the company. c. When it's long-term holdings, you are the shareholder of the company; when it's short-term holdings, you actually lend money to the company. d. I don't know
5	What do you think will happen to the price of bonds if the interest rates fall?	a. Decrease b. Increase c. I don't know
6	The foreign exchange quotation of RMB against the US dollar is 6.3215–6.3220 yuan/US dollar at the bank's business outlet. What do you think is the purchase price of a US dollar?	a. 6.3215 b. 6.3220 c. I don't know
	Subjective financial literacy	
7	Do you or your family understand the investment patterns of stock products?	a. Do not understand at all b. Do not understand well c. Understand a little d. Understand fairly well e. Understand very well
8	Do you or your family understand the investment patterns of fund products?	a. Do not understand at all b. Do not understand well c. Understand a little d. Understand fairly well e. Understand very well
9	Do you or your family understand the investment patterns of the bond products?	a. Do not understand at all b. Do not understand well c. Understand a little d. Understand fairly well e. Understand very well

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