How Does Credit Availability Affect Households Holding Risky Assets? The Heterogeneous Roles of Household Income

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Abstract: As income levels increase, numerous households will consider investing in risky assets. Credit availability, especially for high-income households, is playing an increasingly important role in enhancing households holdings of risky assets (HHRA). The purpose of this study is to investigate the impact of credit availability on HHRA. In this study, the data from the China Household Finance Survey in 2017 is utilized, and the approach of logit regression is employed to produce more accurate estimates. Meanwhile, this study also explores the heterogeneous roles of household income. The results show that the impact of credit availability on HHRA varies by household income. As household income increases from low to high, the effect of credit availability on HHRA transfers from negative to positive. Besides, the results also suggest that for high-income households, credit availability moderated with the attention to financial and economic information positively contributes to HHRA. Thus, it implies that policymakers and financial institutions are encouraged to expand access for households to invest in risky assets, enhance households' availability of credit, and build more financing channels.

Keywords: Credit availability, Risky assets, Household income, Logit regression

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1. Introduction

The concept of household finance was first proposed by Harvard economist Campbell (Campbell, 2006). How households use various financial instruments to achieve their wealth goals in an uncertain environment has been highly highlighted. Household finance constitutes the main body by the collection of consumer financial behaviors within the family and pays attention to the impact of economic or financial behaviors of economic subjects on the entire family, and thereby affecting the household's economic or financial decision-making to realize the preservation and appreciation of the family wealth and the maximization of its utility. In developed countries, where household financial practices are relatively advanced, the selection and allocation of household assets present a relatively high level of financialization and risk.

Participation in financial markets involving the holding of risky assets plays a vital role in consumers' financial lives (Zimper, 2015). As households become more dominant in financial markets, so does the financialization of asset choice. In recent years, there has been a surge of interest in household finance, in which credit availability is considered as one of the important factors affecting households holding of risky assets (HHRA). Previous studies have explored substantial factors contributing to households' portfolio of risky assets, such as educational attainment (Keane & Wolpin, 2001), income (Mason & Jayadev, 2014), financial literacy (Bianchi, 2018), and the like. However, this study focuses on the nexus between credit availability and HHRA, especially under the heterogeneity of household income.

The availability of credit has a pivotal impact on the development of China's economy. For instance, rural credit has played a crucial role in increasing farmers' income and promoting the development of the rural economy (Liu et al., 2020). Besides, credit constraints are considered to significantly decrease the probabilities of households to start businesses by around 3% in general (Cai et

al., 2018). Several studies have investigated the importance of credit availability. For instance, Crossley and Low (2014) found direct evidence on credit constraints to verify the importance of improving households' consumption welfare. Besides, Abdallah and Lastrapes (2012) suggested that if households are credit-constrained, such an increase in credit availability will increase their spending. Additionally, Du et al. (2012) argued that access to bank loans is central to enhancing firms' financial performance. Unlike previous studies focusing on the importance of credit availability to society and the economy, this study aims to investigate the effects of credit availability on HHRA.

Chinese households primarily participate in the financial market by holding stocks and mutual funds. The amount of household risky assets is one of the important indicators to measure the level of economic development and wealth of residents in a country. According to data from the National Bureau of Statistics, in the total household assets of China, the proportion of financial assets is increasing year by year, from 34% in 2004 to 44% in 2016. With the expansion of financial assets, households' demand for diversified and specialized allocation of financial assets is growing, according to the China Household Finance Survey (CHFS) conducted in 2017, the proportions for investing in stocks and those for investing in mutual funds were 8.1% and 3.2%, respectively. By contrast, the proportions for investing in futures, gold, and non-RMB denominated assets were all less than 1%. Therefore, the participation of the households in the financial market investigated in this study as far as risky assets are concerned has primarily to do with investing in stocks and mutual funds.

The purpose of this study is to explore the associations between credit availability and HHRA. Prior research has shown that credit constraints are negatively associated with risky asset holdings. Households subject to low credit availability have a lower willingness to participate in investing in

risky assets and are only willing to allocate a fewer proportion of financial resources on risky assets (Cardak & Wilkins, 2009). Also, by examining the influence channels of different types of credit availability, the results suggest that compared with households subject to informal credit availability, formal credit availability has a more significant effect on households' participation in risky assets (Jimenez et al., 2011). Moreover, household income at different levels has various effects on HHRA under the influence of credit. To be more specific, disposable income is considered to be the main interesting variable and reduces the share of risky assets at a low level but increases the share at a high level (Palia et al., 2014). Moreover, most prior studies on HHRA have used data from the United States or European countries, as it is easier for developed countries to obtain microeconomic data of household finance. It is, however, vital to investigate the role played by Chinese financial market participation in HHRA, given that China is a large and rapidly developing country with the world's largest population and second-highest total volume of GDP. Hence, this study helps fill the gap in the literature regarding household income differentials about HHRA on the part of Chinese investors.

This study aims to investigate the impact of credit availability on HHRA, especially from the heterogeneous roles of household income. First, Bivariate analysis is performed to examine the correlations between credit availability and HHRA. Second, this study utilizes the approaches of OLS and logit regressions to explore the effects of credit availability on HHRA, respectively. The remainder of this paper is structured as follows. Section 2 reviews the literature on the relationships between credit availability and HHRA and then presents the hypotheses. Section 3 introduces the sample data, variable measurements, and statistical description of the data. Section 4 presents the empirical results. Section 5 offers conclusions and implications.

2. Literature review and hypotheses

2.1 Previous studies on household credit availability

Access to finance has been proved to play an important role in improving household welfare, especially for households in developing countries and rural areas (Mookerjee & Kalipioni, 2010). Credit availability is considered to be an important issue in the field of household finance. Especially, with the development of the social economy, individuals increasingly regard credit as a basic human need, such as food, medical care, education, and the like. It has become a consensus that human beings have the right to access credit services and seize development opportunities. The concept of credit availability dates back to the 1950s when widespread inflation in western societies raised doubts about Keynesian deficit finance and spurred a re-discussion of the effectiveness of the monetary policy. Household credit availability mainly refers to the financial support that individuals or families apply for from commercial banks or other financial institutions because they are unable to bear too much pressure on current consumption or expenses. Nowadays, with the continuous development of China's economy, household credit availability plays an increasingly pivotal role in financial life. On the one hand, encouraging the development of household credit can stimulate household consumption and expand domestic demand (J. Li et al., 2021). On the other hand, the development of household credit availability is also beneficial to the diversification of the bank reform (Boustanifar, 2014).

In light of previous research, there are substantial factors influencing household credit availability. From a macroeconomic point of view, extant arguments suggest that residential house prices, upward movements in the prices of assets demanded by households, the income share of the top 1%, falling wages, the rolling back of the welfare state, the age structure of the population, and the short-term interest rate drive household indebtedness

(Moore & Stockhammer, 2018). From the perspective of the microeconomic subject, previous research reveals that credit market access is significantly influenced by the gender, household wealth, age, regional location, and urban or rural location (Okurut & Schoombee, 2007). The status of household credit availability in China is similar to that abroad, using 2013 China's Household Finance Survey data, Lin, Wang, Gan, Cohen, et al. (2019) utilized probit regression to investigate the effects of demographic factors on formal credit constraint and the household's decision to borrow from informal credit sources. The results suggest that the age, family size, annual household nonagricultural income, levels of education, and history of informal borrowing have a significant impact on credit availability.

Meanwhile, prior studies have indicated that both the characteristics of household heads and family members have played vital roles in the availability of household credit. From the viewpoint of householder characteristics, in particular, the age of householders negatively affects the households' decision to borrow from informal sources (Lin, Wang, Gan, & Nguyen, 2019). In addition, the education level of family members also affects credit availability. Chandio et al. (2021) claimed that individuals with higher education levels generally have better repayment ability and can better accept corresponding financial knowledge and credit consumption concept, so education level will positively contribute to credit availability. In terms of family characteristics, household income level, household size (Mumtaz & Smith, 2021), regional economic development level (Sierminska & Silber, 2020), and urban-rural development differences (Byun, 2020) all affect household credit availability. For instance, credit availability is related to a household's income level, relatively richer households in the census tract use more debt, and spend more on high-status cars (Bricker et al., 2021). Besides, household size reflects the burden on households, and the heavier the burden, the more anxious they are about

unpredictable events in the future, the more cautious they will be in spending (Lanjouw & Ravallion, 1995). Furthermore, it is generally believed that the more developed the regional economy is, the more perfect the financial system is, and thereby the more advanced the individual's consumption consciousness is, so it may play a positive role in promoting the household credit availability (Rodríguez-Fuentes, 2005). Considering the imbalance between urban and rural economic development, the characteristics of a dual economy have been very highlighted, and the urban-rural situation is listed as one of the influencing factors of household credit availability. For instance, Barslund and Tarp (2008) indicated that the credit market in rural areas is underdeveloped, and the problem of financial repression is more serious.

2.2 Prior research on households holding risky assets

Asset allocation, an important part of household finance, attracts increasing attention across countries. In recent years, with the stable development of the economy, the household disposable income increases, which becomes the reason for an increase in the scale of HHRA. Moreover, with the increasingly diversified investment channels, the market for risky asset investment has gradually matured as well. Nevertheless, individual participation in financial products such as stocks, funds, and options is not high, regardless in developed or developing countries.

Prior studies have examined many factors influencing households risky asset allocation, such as age (Cardak & Wilkins, 2009), different income levels (Ochmann, 2014), risk preferences (Yilmazer & Lich, 2015), financial literacy (Lu et al., 2021) and wealth (Changwony et al., 2021). In terms of these studies, the basic determinants of financial market participation have been identified. For instance, financial literacy reflects individuals' mastery of basic economic knowledge, financial concepts, ability to use and manage funds, and skills to effectively allocate financial resources to achieve lifelong financial

security (Huston, 2010). Jia et al. (2019) examined the relationships between a household's portfolio choice and financial planning ability. Using data from the China Family Panel Studies survey (CFPS) in 2014, the results show that greater financial planning ability and a higher level of risk perception are more likely to invest in financial markets and hold a larger proportion of risky assets. Accordingly, based on the data from the CHFS in 2017 and 2019, Lu et al. (2021) suggested that the greater the household's financial literacy, the higher the household's score in the asset allocation evaluation. The results also reveal that the optimization effect of financial literacy on households asset allocation is greater in households that are wealthier, higher educated, and located in areas with better regional financial development. Besides, households with higher risk tolerance are more likely to invest in risky assets, and risk attitudes may indirectly affect portfolio outcomes by affecting households' responsiveness to changes in medical expenditure risk (Z. Li et al., 2021). Simultaneously, households' preference for risky assets is also affected by their bargaining power. Yilmazer and Lich (2015) claimed that the share of risky assets in portfolios of two-person households increases with the risk tolerance of the spouse who has more bargaining power. Moreover, the allocation of family risky assets is also affected by social capital. For instance, Guiso et al. (2004) showed that in high social-capital areas, households are more likely to use checks, invest less in cash and more in stocks, have higher access to institutional credit, and make less use of informal credit. Besides, Calvet and Sodini (2014) revealed that income is significantly and positively correlated with participation in the market of risky assets, which implies that the more the household income, the higher the proportion of risky assets held in total assets. Bonaparte et al. (2014) also suggested that families are increasingly inclined to choose risky assets with the increase of income, even though they face higher income risks.

2.3 Credit availability and households holding risky assets

Different assets have various risk levels, and the risk and the return on individual assets exhibit a proportional relationship (Campbell, 1996). For this reason, the risk level is considered to be a crucial factor affecting HHRA. Beyond the risk level, other factors have played vital roles in HHRA, such as the investments in health (Robert & House, 1996), home ownership (Fratantoni & Mae, 1998), wellbeing at retirement (Browning et al., 2016), political participation (Jha, 2015), financial literacy (Liao et al., 2017), and business formation (Holtz-Eakin et al., 1994).

A large number of prior studies have shed light on the role of credit availability in HHRA. For instance, most families at home and abroad hold real estate through housing loans. Pelizzon and Weber (2009) suggested that families allocate resources across time through financial intermediaries to achieve smooth consumption, and they also argued that if the housing mortgage is regarded as a choice of household financial liability, it has a great crowding out effect on other risky asset investments. Accordingly, Chetty et al. (2017) explored the impact of real estate on American households and indicated that house mortgages are positive to decrease HHRA. Besides, Haliassos and Michaelides (2003) established an infinite life cycle model under credit constraints and claimed that households under credit constraints tend to choose a lower proportion of risky assets and a higher proportion of risk-free assets, while households without credit constraints would choose the opposite. Simultaneously, Campbell and Cocco (2003) revealed that when investors are subjected to credit constraints, their choice of the investment portfolio is negatively affected by credit constraints. Furthermore, several previous studies have suggested that a variety of reasons for credit constraints can make household investment decisions vary widely. Paxson (1990) argued that when credit constraints are exogenous, high liquidity will force investors to

hold more low-risk assets; when credit constraints are endogenous, investors will hold more illiquid assets because they can be used as mortgage assets, and reduce the possibility of future credit constraints. However, Haliassos and Hassapis (2002) claimed that the availability of credit has a pivotal role in household portfolios, leading to a reduction in stock holdings when households cannot borrow at low-interest rates and invest in stocks with high expected returns. Thus, the hypothesis is put forward as follows:

H1: The impact of credit availability on HHRA varies by household income. That is, for high-income households, the higher the credit availability, the more risky assets they hold; for low-income households, the opposite is true.

3. Methodology

3.1 Data

The data used in this study is from the China Household Finance Survey (CHFS) in 2017, which is conducted by the Survey and Research Center for China Household Finance (SRCCHF) at the Southwestern University of Finance and Economics. For more details on the data, it can be referred to Gan et al. (2014). The survey incorporates a large number of questions about the individuals' credit availability, risk attitude, risky assets holdings, and demographic characteristics. All data and codebooks are available from the SRCCHF. Except for Xinjiang and Tibet, the samples cover 29 provinces in China, which is nationally representative. For some questions regarding the household member demographic characteristics, the responses given by the household head are considered to be those of the household's representative. As for the sample selection, only household heads that provided specific answers to several scale questions, such as credit availability and HHRA, are incorporated, while samples with missing information are excluded. To

confirm that the respondents' answers are acceptable and robust, samples for household heads under the age of 18 and above the age of 65 are dropped as well. Thus, the final sample size employed in this study is 30,096.

3.2 Variables

In this study, the dependent variable is HHRA, measured using a 5-point scale. Respondents are asked, "Does your family own the following risky assets: Stocks, funds, Internet financial products, bonds, financial derivatives, gold, non-RMB assets, and other financial products?" If they have any of these assets, the variable is encoded 1, 0 otherwise. The independent variable of credit availability is measured by the question "Does your household have outstanding debts for the following usages: Agricultural production, business operations, rental or purchase of housing, car purchases, education loans, medical loans, credit card consumption, durable goods consumption, luxury goods consumption, investment in financial assets, or other liabilities?" If they have any of these outstanding debts, the variable is encoded 1, otherwise 0.

Following the specifications of previous studies (Brown et al., 2021; Cardak & Wilkins, 2009; Fontes & Kelly, 2013; Lu et al., 2021; Ochmann, 2014; Xu & Liu, 2021; Zhang et al., 2018), several demographic variables are included in this study as control variables, such as the gender, age, education, marital status, and the like. To address the associations between credit availability and HHRA, two types of asset holding behaviors are incorporated, having a private business and having a house. In addition, the control variables also include financial knowledge, subjective financial knowledge, risk attitude, and urban hukou. The variable for household consumption expenditure is taken in natural logarithmic form. The specification of all variables is presented in Table 1.

Table 1 Variable specification

Variables	Attribute
Households holding risky assets	"Does your family own the following risky assets: Stocks, funds, Internet financial products, bonds, financial derivatives, gold, non-RMB assets, and other financial products?" 1 = yes, 0 = no
Credit availability	"Does your household have outstanding debts for the following usages: Agricultural production, business operations, rental or purchase of housing, car purchases, education loans, medical loans, credit card consumption, durable goods consumption, luxury goods consumption, investment in financial assets, or other liabilities?" 1 = yes, 0 = no
Gender	1 = male, 0 = female
Age	The age of the household head
Age2	Age*age/100
Edu1	Junior high school or lower
Edu2	High school, technical secondary school, or some college
Edu3	Bachelor's degree or higher
Marriage	1 = married, 0 = not married
Have a house	1 = have a house, 0 = have no house
Have a business	1=have a business, 0 = have no business
Financial knowledge	Range from 1 (low) to 9 (high)
Subjective financial knowledge	Range from 1 (low) to 5 (high)
Risk attitude	"Do you think it is true that high return projects are usually accompanied by high risk?" 1 = yes,0 = no
Urban hukou	1 = urban hukou, 0 = rural hukou
Lnconsump	Lnconsump = log(0.0001+ household consumption expenditure)

Note: The content is arranged by the authors.

3.3 Statistical description

Table 2 displays the results of the descriptive statistics. HHRA and credit availability are coded as a binary variables, with 1 referring to having performed the activity and 0 otherwise. For the dependent variable of HHRA, less than 20% of the households currently or ever hold risky assets with a mean value of 0.187. The mean value of the variable of credit availability is 0.401, which implies that more than 40% of the household currently or ever borrow money from the formal or informal credit markets. For the educational

level, more than half of the household heads had a junior high school education or lower, which indicates that most household heads' overall education level is not high. Besides, the mean value of the marriage is 0.879, indicating that most respondents are married. As for having a house and having a business, most households have a house, however, less than 20% of the household have a business with a mean value of 0.175. In addition, the mean value of the age is 49.258 years old, and hence, most household heads are in their middle age. For the risk attitude, the mean value is 0.741, which suggests that most household heads are risk-taking. Also, more than half of the household heads are from urban areas. For the financial knowledge, it ranges from 0 to 8 with a mean value of 1.736, which indicates that most respondents have low level of financial knowledge. Accordingly, subjective financial knowledge ranges from 0 to 5 with a mean value of 0.262. To eliminate estimation bias, the variable of household consumption expenditure is taken in natural logarithmic form.

Table 2 Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Households holding risky assets	30,096	0.187	0.390	0	1
Credit availability	30,096	0.401	0.490	0	1
Gender	30,096	0.812	0.391	0	1
Age	30,096	49.258	10.554	18	65
Age2	30,096	25.377	9.921	3.240	42.250
Edu1	30,096	0.604	0.489	0	1
Edu2	30,096	0.299	0.458	0	1
Edu3	30,096	0.097	0.296	0	1
Marriage	30,096	0.879	0.326	0	1
Have a house	30,096	0.843	0.364	0	1
Have a business	30,096	0.175	0.380	0	1
Financial knowledge	30,096	1.736	1.154	0	8
Subjective financial knowledge	30,096	0.262	0.718	0	5
Risk attitude	30,096	0.741	0.438	0	1
Urban hukou	30,096	0.686	0.464	0	1
Lnconsump	30,096	10.734	0.823	6.736	13.816

Source: The results of descriptive statistics are from the dataset of the CHFS in 2017.

4. Empirical Results

4.1 Results of bivariate analysis

Table3 presents the results of correlation analysis of HHRA specific to the credit availability, gender, age, education, having a house, having a business, financial knowledge, subjective financial knowledge, risk attitude, urban hukou, and household consumption expenditure. In Columns (1) to (3), the correlated coefficients of HHRA with credit availability and other control variables for the full samples, top 25% household income samples, and top 10% household income samples are presented, respectively. For full samples, the results show that there is no correlation between credit availability and HHRA. For the correlation between education and HHRA, it shows that the low education level is negatively correlated with HHRA, while the results suggest a position association between HHRA and high education level. As for other control variables, most correlations are as expected. For instance, financial knowledge, subjective financial knowledge, risk attitude, and household consumption expenditure are positively associated with HHRA. Accordingly, gender, age, marriage, and having a house are negatively correlated with HHRA.

To investigate the impact of credit availability on HHRA under different levels of household income. In Columns (2) and (3), the results show that credit availability is positive to HHRA in the top 25% and top 10% income groups, which indicates that for high-income households, credit availability is positively correlated to HHRA.

Table 3 Results of correlation analysis

Variables	(1)	(2)	(3)
	Full sample	The top 25% of the income samples	The top 10% of the income samples
Credit availability	-0.001	0.038***	0.054***
Gender	-0.068***	-0.091***	-0.055***
Age	-0.166***	-0.135***	-0.103***
Edu1	-0.344***	-0.309***	-0.318***
Edu2	0.165***	0.073***	0.013
Edu3	0.313***	0.254***	0.285***
Marriage	-0.013	-0.041***	-0.027
Have a house	-0.048***	-0.054***	-0.062***
Have a business	0.052***	-0.080***	-0.164***
Financial knowledge	0.267***	0.244***	0.226***
Subjective financial knowledge	0.114***	0.088***	0.092***
Risk attitude	0.180***	0.185***	0.178***
Urban hukou	0.273***	0.268***	0.282***
Lnconsump	0.347***	0.245***	0.209***
Observations	30,096	7,524	3,009

Notes: The sample size is 30,096, and the unweighted sample is employed. Besides, ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

4.2 Results of multiple OLS regression and logit regression

Table 4 reports the baseline regression results of credit availability on HHRA. In Columns (1) and (3), only the control variables are entered. In Columns (2), (4), and (5), the independent variable of credit availability is incorporated simultaneously. In Columns (1) and (2), the approach of OLS regression is utilized and the Adjusted R^2 is accordingly reported, and in Columns (3) to (5), the logit regressions are further performed and the Pseudo R^2 is accordingly presented. In Columns (1) to (4), full samples are incorporated in the regressions, and in Column (5), only the samples with the top 10% of household income are included. In addition, to eliminate the estimation bias caused by provincial differences, the province dummies are entered in all estimates.

Table 4 Results of regressions on HHRA

Variables	(1)	(2)	(3)	(4)	(5)
Credit availability		-0.002		-0.086*	0.258**
		(0.005)		(0.048)	(0.109)
Gender	-0.015**	-0.015**	-0.081**	-0.080**	0.018
	(0.005)	(0.005)	(0.039)	(0.039)	(0.091)
Age	-0.002	-0.002	0.005	0.006	0.026
	(0.002)	(0.002)	(0.015)	(0.015)	(0.029)
Age2	0.001	0.001	-0.007	-0.009	-0.016
	(0.002)	(0.002)	(0.016)	(0.017)	(0.031)
Edu2	0.114***	0.114***	0.901***	0.899***	0.771***
	(0.007)	(0.007)	(0.050)	(0.050)	(0.137)
Edu3	0.309***	0.309***	1.591***	1.596***	1.355***
	(0.012)	(0.012)	(0.064)	(0.064)	(0.113)
Marriage	-0.010	-0.010	-0.087	-0.083	-0.244*
	(0.008)	(0.008)	(0.080)	(0.080)	(0.147)
Have a house	0.031***	0.031***	0.232***	0.237***	-0.167
	(0.008)	(0.008)	(0.056)	(0.057)	(0.121)
Have a business	0.002	0.003	0.016	0.031	-0.480***
	(0.007)	(0.007)	(0.051)	(0.052)	(0.106)
Financial knowledge	0.031***	0.031***	0.210***	0.210***	0.166***
	(0.003)	(0.003)	(0.020)	(0.020)	(0.050)
Subjective financial knowledge	0.045***	0.045***	0.223***	0.222***	0.178***
	(0.005)	(0.005)	(0.030)	(0.030)	(0.047)
Risk attitude	0.022***	0.022***	0.562***	0.561***	0.673***
	(0.008)	(0.008)	(0.056)	(0.055)	(0.141)
Urban hukou	0.068***	0.068***	1.352***	1.346***	1.104***
	(0.007)	(0.007)	(0.145)	(0.146)	(0.226)
Lnconsump	0.078***	0.078***	0.774***	0.779***	0.353***
	(0.007)	(0.007)	(0.036)	(0.037)	(0.067)
Constant	-0.842***	-0.842***	-13.241***	-13.267***	-8.134***
	(0.098)	(0.098)	(0.559)	(0.561)	(0.894)
Province dummies	Yes	Yes	Yes	Yes	Yes
N	30,096	30,096	30,096	30,096	3,009
Adj. R^2	0.252	0.252			
Pseudo R^2			0.282	0.282	0.191

Notes: The unweighted samples are utilized. In addition, ***, **, and * represent 1%, 5%, and 10% significance levels, respectively, and the data in parentheses are robust standard errors.

In Columns (1) and (3), most coefficients are as expected, which is also consistent with the results of correlation analysis. In Columns (2) and (4), the independent variable of credit availability is added, suggesting an insignificant or statistically negative association between credit availability and HHRA. However, in Column (5), if only the samples of the top 10% of household income are considered, the credit availability coefficient becomes positive at 5% significance. In light of H1, the impact of credit availability on HHRA is assumed to be heterogeneous for households with different levels of income. More specifically, credit availability contributes positively to HHRA for high-income households, while the opposite is true for low-income households. Together with the results presented in Column (4), the results in Column (5) are aligned with H1.

4.3 Results of the heterogeneous roles of household income

To address the heterogeneous roles of household income in affecting the impact of credit availability on HHRA, this study performs regressions on the bottom 10%, bottom 50%, top 50%, top 25%, top 10%, and top 5% household income groups, respectively. Table 5 presents the results of the estimates of household income heterogeneity. In the sample group with the lowest 10% of household income, the coefficient of credit availability on HHRA is statistically negative, indicating that among lower household income groups, even when credit is available, they will not borrow money to invest in risky assets, instead, they are more likely to sell risky assets due to credit constraints. Accordingly, for the bottom 50% and the top 50% household income groups, the impact of credit availability on HHRA is negative but is not statistically significant. However, for the top 10% and the top 5% household income groups, the results suggest a significant and positive association between credit availability and HHRA, which indicates that the enhancement of credit availability allows high-income households to invest more in risky assets. Together with the

Table 5 Results of the heterogeneous roles of household income

Variables	(1) Bottom 10%	(2) Bottom 50%	(3) Top 50%	(4) Top 25%	(5) Top 10%	(6) Top 5%
Credit availability	-0.390**	-0.121	-0.040	0.090	0.258**	0.344**
	(0.171)	(0.103)	(0.052)	(0.070)	(0.109)	(0.145)
Gender	0.122	-0.089	-0.106**	-0.148**	0.018	-0.110
	(0.242)	(0.090)	(0.044)	(0.067)	(0.091)	(0.131)
Age	0.045	0.010	0.015	0.022	0.026	0.080
	(0.051)	(0.018)	(0.020)	(0.031)	(0.029)	(0.049)
Age2	-0.058	-0.019	-0.017	-0.023	-0.016	-0.076
	(0.056)	(0.020)	(0.021)	(0.033)	(0.031)	(0.055)
Edu2	1.114***	0.811***	0.803***	0.827***	0.771***	0.842***
	(0.168)	(0.093)	(0.048)	(0.058)	(0.137)	(0.215)
Edu3	1.793***	1.654***	1.386***	1.252***	1.355***	1.461***
	(0.390)	(0.138)	(0.069)	(0.082)	(0.113)	(0.193)
Marriage	-0.401	-0.367***	-0.189*	-0.183	-0.244*	-0.683***
	(0.252)	(0.120)	(0.101)	(0.121)	(0.147)	(0.210)
Have a house	0.282	0.176*	0.175***	0.073	-0.167	0.025
	(0.241)	(0.099)	(0.062)	(0.091)	(0.121)	(0.126)
Have a business	0.336	0.350***	-0.048	-0.268***	-0.480***	-0.520***
	(0.272)	(0.086)	(0.055)	(0.066)	(0.106)	(0.156)
Financial knowledge	0.157	0.236***	0.195***	0.179***	0.166***	0.123
	(0.109)	(0.040)	(0.019)	(0.034)	(0.050)	(0.078)
Subjective financial knowledge	0.383**	0.368***	0.178***	0.143***	0.178***	0.099
	(0.164)	(0.046)	(0.025)	(0.032)	(0.047)	(0.083)
Risk attitude	1.165***	0.559***	0.517***	0.649***	0.673***	0.666***
	(0.330)	(0.119)	(0.061)	(0.100)	(0.141)	(0.256)
Urban hukou	1.494***	1.282***	1.197***	1.171***	1.104***	1.316***
	(0.305)	(0.157)	(0.157)	(0.211)	(0.226)	(0.343)
Lnconsump	0.858***	0.812***	0.577***	0.448***	0.353***	0.358***
	(0.099)	(0.035)	(0.050)	(0.053)	(0.067)	(0.099)
Constant	-29.185***	-13.934***	-10.463***	-9.066***	-8.134***	-9.135***
	(2.352)	(0.620)	(0.722)	(0.903)	(0.894)	(1.195)
Province dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	2845	15048	15048	7524	3009	1504
Pseudo R^2	0.389	0.253	0.197	0.181	0.191	0.222

Notes: The data in parentheses are robust standard errors. Moreover, ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

aforementioned discussions, the results are as hypothesized in H1.

4.4 Robustness and endogeneity check

To verify the robustness of the estimates, a comprehensive check is conducted. Firstly, an alternative approach of the probit regression is utilized to perform re-estimates. The results are displayed in Columns (1) and (2) in Table 6. Secondly, this study also drops the samples with the top 1% and bottom 1% household assets, which is positive to eliminate the estimation bias caused by outliers. Accordingly, the results are reported in Columns (3) and (4) in Table 6. In terms of the re-estimation results, for full samples, credit availability is still negatively associated with HHRA, and for the samples with the top 10% household income, the results keep unchanged. In Columns (3) and (4), after dropping the outliers of the top 1% and bottom 1% household assets, the coefficients of credit availability are statistically negative and positive, respectively. Thus, the results of the robustness check endorse H1 as well.

Table 6 Results of robustness check

Variables	(1)	(2)	(3)	(4)
	Full sample	Top 10%	Full sample	Top 10%
Credit availability	-0.052*	0.146**	-0.089*	0.257**
	(0.027)	(0.064)	(0.049)	(0.117)
Gender	-0.048**	0.005	-0.085**	0.000
	(0.022)	(0.056)	(0.039)	(0.105)
Age	0.002	0.016	0.001	0.021
	(0.008)	(0.018)	(0.015)	(0.030)
Age2	-0.004	-0.011	-0.004	-0.011
	(0.009)	(0.019)	(0.016)	(0.032)
Edu2	0.501***	0.470***	0.904***	0.789***
	(0.025)	(0.082)	(0.049)	(0.138)
Edu3	0.927***	0.814***	1.588***	1.361***
	(0.036)	(0.070)	(0.068)	(0.108)
Marriage	-0.048	-0.145	-0.088	-0.219
	(0.043)	(0.092)	(0.080)	(0.153)

Have a house	0.133***	-0.098	0.208***	-0.244**
	(0.032)	(0.072)	(0.058)	(0.124)
Have a business	0.021	-0.288***	0.040	-0.452***
	(0.029)	(0.063)	(0.052)	(0.111)
Financial knowledge	0.120***	0.096***	0.207***	0.155***
	(0.011)	(0.029)	(0.021)	(0.053)
Subjective financial knowledge	0.134***	0.103***	0.229***	0.194***
	(0.017)	(0.028)	(0.029)	(0.045)
Risk attitude	0.290***	0.404***	0.556***	0.689***
	(0.031)	(0.086)	(0.054)	(0.155)
Urban hukou	0.664***	0.646***	1.340***	1.064***
	(0.062)	(0.123)	(0.146)	(0.228)
Lnconsump	0.444***	0.209***	0.767***	0.321***
	(0.021)	(0.040)	(0.037)	(0.068)
Constant	-7.366***	-4.798***	-12.971***	-7.556***
	(0.304)	(0.538)	(0.551)	(0.933)
Province dummies	Yes	Yes	Yes	Yes
N	30,096	3,009	29,495	2,793
Pseudo R^2	0.283	0.190	0.273	0.185

Notes: The data in parentheses are robust standard errors. Also, ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

This study also realizes that the problem of endogeneity may apply to the above regressions since the coefficients cannot determine the causality between credit availability and HHRA. Therefore, the potential endogeneity of credit availability must be treated with care. This study employs the following instrument variables and conducts conditional mixed process regressions to eliminate the impacts of endogeneity on the estimation results. In this study, a household's social income in the last year is served as an instrumental variable. Since if a household can receive more social income from non-family members, it means that this family has higher credit availability. Therefore, the variable of social income is correlated to credit availability. Simultaneously, the social income in last year is exogenous to the current HHRA. Thus, social income is appropriate to work as an instrumental variable in this study. According

to CHFS in 2017, there is a question that respondents are asked, "Did your family receive 100 yuan or more in cash or non-cash income from a non-family member last year?", which is utilized to measure the variable of social income. Furthermore, it is re-coded to a binary variable with 1 meaning having performed the behavior and 0 otherwise.

Table 7 exhibits the results of the endogeneity test. Similarly, to investigate the heterogenous roles of household income, this study also conducts regressions on the bottom 10%, bottom 50%, top 50%, top 25%, top 10%, and top 5% household income groups, respectively. Except for the bottom 10% household group, all coefficients of credit availability are statistically positive, which implies that after controlling the heterogeneity, credit availability positively and significantly contributes to HHRA. Compared with the coefficients in various regressions, the higher the household income, the larger the coefficients corresponding to credit availability. Thus, the results of the endogeneity test are also consistent with H1.

Table 7 Results of the endogeneity test

Variables	(1) Bottom 10%	(2) Bottom 50%	(3) Top 50%	(4) Top 25%	(5) Top 10%	(6) Top 5%
Credit availability	0.246	0.578**	1.058***	1.171***	1.449***	1.452***
	(0.706)	(0.291)	(0.107)	(0.126)	(0.083)	(0.145)
Gender	0.076	-0.042	-0.055**	-0.071**	0.009	-0.029
	(0.118)	(0.045)	(0.026)	(0.033)	(0.045)	(0.071)
Age	0.019	-0.001	0.008	0.012	0.013	0.035
	(0.031)	(0.012)	(0.008)	(0.010)	(0.014)	(0.023)
Age2	-0.027	-0.004	-0.009	-0.012	-0.008	-0.032
	(0.035)	(0.014)	(0.009)	(0.011)	(0.016)	(0.026)
Edu2	0.575***	0.396***	0.402***	0.409***	0.324***	0.371***
	(0.115)	(0.043)	(0.028)	(0.041)	(0.056)	(0.085)
Edu3	0.950***	0.854***	0.707***	0.626***	0.572***	0.648***
	(0.192)	(0.084)	(0.042)	(0.054)	(0.074)	(0.109)

Marriage	-0.209	-0.192***	-0.103***	-0.093*	-0.112	-0.308**
	(0.144)	(0.052)	(0.039)	(0.053)	(0.076)	(0.121)
Have a house	0.156	0.083*	0.084***	0.031	-0.072	0.006
	(0.123)	(0.047)	(0.029)	(0.038)	(0.054)	(0.083)
Have a business	0.181	0.176***	-0.020	-0.128***	-0.207***	-0.233***
	(0.113)	(0.046)	(0.026)	(0.033)	(0.044)	(0.068)
Financial knowledge	0.085*	0.124***	0.097***	0.087***	0.069***	0.054**
	(0.050)	(0.020)	(0.011)	(0.014)	(0.019)	(0.027)
Subjective financial knowledge	0.193***	0.201***	0.091***	0.073***	0.076***	0.045
	(0.067)	(0.028)	(0.014)	(0.017)	(0.022)	(0.031)
Risk attitude	0.502***	0.229***	0.247***	0.318***	0.287***	0.286***
	(0.158)	(0.057)	(0.034)	(0.048)	(0.066)	(0.101)
Urban hukou	0.621***	0.533***	0.547***	0.547***	0.466***	0.572***
	(0.143)	(0.056)	(0.043)	(0.061)	(0.077)	(0.119)
Lnconsump	0.443***	0.406***	0.283***	0.214***	0.139***	0.143***
	(0.077)	(0.034)	(0.020)	(0.025)	(0.029)	(0.045)
Constant	-12.939	-7.003***	-5.524***	-4.855***	-4.074***	-4.595***
	(1050.485)	(0.476)	(0.312)	(0.412)	(0.557)	(0.846)
Province dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	3,009	15,048	15,048	7,524	3,009	1,504
LR	548.690	1913.920	3779.560	1901.910	817.700	469.480
Prob.>*Chi*^{2}	0.000	0.000	0.000	0.000	0.000	0.000

Notes: The data in parentheses are robust standard errors. Besides, ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

4.5 Further discussion on the moderating effects of the attention to financial and economic information

To investigate the indirect impact of credit availability on HHRA, this study constructs an interactive item of the attention to financial and economic information with credit availability, since households' members who pay attention to financial and economic information are more likely to borrow money to invest in risky assets. Table 8 shows the results of the moderating effect of the attention to financial and economic information. In Columns (1) to (3), full samples are incorporated, while the samples with the top 10% household income are included in Columns (4) to (6). Due to the collinearity, in Columns (3) and (6), only the interactive terms are entered. For full samples, although

the coefficients of credit availability are still statistically negative, households whose members pay more attention to financial and economic information are more likely to hold risky assets. For high-income households, credit availability still positively enhances HHRA, since the coefficients in Columns (4) and (5) are both positive at a significance of 5%. Meanwhile, the results also suggest that if the family members pay more attention to financial and economic information, those households tend to invest more in risky assets. More specifically, the moderating effects of the attention to financial and economic information are verified in high-income household groups. However, for full samples, although the results suggest a positive coefficient, it is not statistically significant. Thus, for high-income households, credit availability moderated with the attention to financial and economic information is positively associated with HHRA.

Table 8 Results of the moderating effect

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Credit availability	-0.086*	-0.089*		0.258**	0.248**	
	(0.048)	(0.048)		(0.109)	(0.113)	
Pay attention to financial and economic information		0.148***			0.103***	
		(0.024)			(0.037)	
Moderating effect			0.026			0.124***
			(0.027)			(0.035)
Gender	-0.080**	-0.083**	-0.081**	0.018	0.019	0.022
	(0.039)	(0.038)	(0.039)	(0.091)	(0.092)	(0.091)
Age	0.006	0.011	0.005	0.026	0.028	0.031
	(0.015)	(0.015)	(0.015)	(0.029)	(0.028)	(0.029)
Age2	-0.009	-0.014	-0.007	-0.016	-0.018	-0.022
	(0.017)	(0.016)	(0.016)	(0.031)	(0.030)	(0.032)
Edu2	0.899***	0.880***	0.900***	0.771***	0.762***	0.766***
	(0.050)	(0.050)	(0.051)	(0.137)	(0.141)	(0.140)
Edu3	1.596***	1.560***	1.587***	1.355***	1.332***	1.355***
	(0.064)	(0.067)	(0.065)	(0.113)	(0.115)	(0.113)
Marriage	-0.083	-0.069	-0.089	-0.244*	-0.226	-0.223
	(0.080)	(0.083)	(0.080)	(0.147)	(0.148)	(0.147)

Have a house	0.237***	0.258***	0.231***	-0.167	-0.145	-0.157
	(0.057)	(0.058)	(0.057)	(0.121)	(0.126)	(0.126)
Have a business	0.031	0.030	0.012	-0.480***	-0.478***	-0.445***
	(0.052)	(0.051)	(0.051)	(0.106)	(0.109)	(0.094)
Financial knowledge	0.210***	0.102***	0.202***	0.166***	0.076	0.111**
	(0.020)	(0.031)	(0.021)	(0.050)	(0.069)	(0.052)
Subjective financial knowledge	0.222***	0.271***	0.226***	0.178***	0.222***	0.208***
	(0.030)	(0.029)	(0.029)	(0.047)	(0.053)	(0.047)
Risk attitude	0.561***	0.697***	0.572***	0.673***	0.788***	0.738***
	(0.055)	(0.067)	(0.058)	(0.141)	(0.164)	(0.146)
Urban hukou	1.346***	1.343***	1.353***	1.104***	1.111***	1.104***
	(0.146)	(0.147)	(0.146)	(0.226)	(0.225)	(0.229)
Ln (consumption)	0.779***	0.771***	0.772***	0.353***	0.342***	0.347***
	(0.037)	(0.036)	(0.036)	(0.067)	(0.066)	(0.067)
Constant	-13.267***	-13.299***	-13.220***	-8.134***	-8.116***	-8.038***
	(0.561)	(0.542)	(0.558)	(0.894)	(0.892)	(0.886)
Province dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	30,096	30,096	30,096	3,009	3,009	3,009
Pseudo R^2	0.282	0.284	0.282	0.191	0.192	0.191

Notes: The data in parentheses are robust standard errors. Moreover, ***, **, and * represent 1%, 5%, and 10% significance levels, respectively. In Columns (1) to (3), regressions with full samples are performed, and in Columns (4) to (6), only samples with the top 10% household income are incorporated.

5. Conclusions and Implications

As income levels increase, substantial households will consider investing more in risky assets to accumulate wealth. Credit availability is an important source of driving power that accelerates economic development and plays a vital role in increasing the HHRA, especially for high-income households. Utilizing the data from the CHFS in 2017, this study employs the approaches of OLS and logit regressions to explore the impact of credit availability on HHRA. Simultaneously, the heterogeneous roles of household income are further investigated as well. The results suggest that the impact of credit availability on HHRA is affected by the heterogeneous roles of household income. In detail, for high-income households, credit availability is positively

associated with HHRA, while for low-income households, the positive impact of credit availability becomes to be negative. Meanwhile, the results also indicate that with the increase of household income, the effects of credit availability transfer from negative to positive. Additionally, this study further discusses the moderating effects of the attention of financial and economic information on the influence channels between credit availability and HHRA. The results reveal that for high-income households, credit availability moderated with the attention to financial and economic information positively contributes to HHRA.

The empirical findings of this study are informative for policymakers and financial institutions to take effective measures to help households invest in financial markets, which is positive to enhance household members' financial satisfaction. First, policymakers are encouraged to extend household access to financial markets. For low-income households, although credit availability is negatively associated with HHRA, it is positive to help families meet the financing needs of daily life, such as financing for purchasing daily necessities, children's education, and expenditures for durable goods. Second, financial institutions are recommended to design more consumer financial products to enhance households' availability of credit. This is positive to alleviate liquidity constraints caused by imperfect financial market development, which also plays a pivotal role in improving household members' quality of life. Third, governments are advised to formulate measures to build more financing channels, incorporating formal and informal channels. With the rapid development of the economy, as household income continues to rise, so does the need for individuals to invest in risky assets. It is of great significance to broaden households' financing channels for improving household credit availability and thereby meeting households' financial needs of investment in risky assets.

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