

Study of the Impact of Housing Provident Fund on Urban Households' Investment in Risky Financial Assets

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Abstract: Based on the 2019 CHFS data, this paper utilizes the Tobit model to consider the impact of housing provident fund on urban households' investment in risky financial assets and its mechanism of action. The results show that holding housing provident fund increases the investment ratio of urban households for financial products and risky financial assets, and there are differences in household income levels and financial literacy. Further research found that housing provident fund significantly increases urban households' future expectations and happiness, and thus increases the investment ratio of households in financial products and risky financial assets. The better the household's financial situation, the higher the rate of investment in financial products and risky financial assets will be when the household owns housing provident fund.

Keywords: Housing provident fund, Risky financial asset investment, Financial product investment.

1. Introduction

Today's world economy is constantly developing, and the lives of our residents are constantly evolving in a better direction. The report of the Twentieth Party Congress points out that the policy system of distribution according to factors should be improved, multiple channels should be explored to increase the factor incomes of middle- and low-income groups, and multiple channels should be used to increase the property incomes of urban and rural residents. In terms of significance, raising property income will make people's lives happier and better, and bring per capita disposable income to a new level. The progress of all people towards common prosperity is also conducive to the realization of Chinese-style modernization. Further from the existing national situation, on the one hand, the current wealth structure of Chinese residents is in transition, from physical assets to financial assets, and from a single allocation to multiple allocations. On the other hand, the housing provident fund system was established in China to play a protective role, and the coverage of the housing provident fund is getting bigger and bigger, and the effective allocation of the residents' financial assets is an important way to improve the residents' property income. The National Housing Provident Fund Annual Report 2022 shows that the amount of housing provident fund deposits in 2022 increased by 9.53% compared with the previous year, with urban private enterprises and other urban enterprises accounting for 61.22% of the total number of depositing units, and that the group of depositing units is further expanding. The number of withdrawals from the housing provident fund accounted for 39.95% of the total number of paid-up employees, with a wide variety of uses for withdrawals, and the socio-economic benefits are not to be underestimated. This shows that the popularity of housing provident fund is getting higher and higher, and its influence on residents' life is getting bigger and bigger, so it is very necessary to study the influence of housing provident fund on the investment of risky financial assets of urban households in China.

Against the above reality and theoretical background, this

paper utilizes the survey data from the 2019 China Household Finance Survey of Southwestern University of Finance and Economics, and after data merging and cleaning, the research is conducted mainly through the Tobit model. By analyzing the impact of housing provident fund holdings on urban households' investment in financial products and risky financial assets, as well as the mechanisms involved, practical and reasonable policy recommendations and conclusions are drawn.

The marginal contribution of this paper is mainly reflected in the following two aspects: first, in the research perspective, the existing literature mainly focuses on the impact of housing provident fund on family stock investment, while this paper, based on the current status of urban family investment, studies the impact of housing provident fund held by urban families on the investment of financial products, which enriches the study of family asset allocation; second, in the impact mechanism, this paper from the future expectations of residents, Second, in terms of the influence mechanism, this paper analyzes in depth from two perspectives: residents' future expectation, residents' happiness, and tests the micro-mechanism and channel path of the influence of urban families holding housing provident fund on financial management products as well as the allocation of risky financial assets, as well as tests the moderating effect of family wealth which helps to deepen the understanding of the intrinsic relationship between the variables.

The remainder of the paper is structured as follows: the second part is a literature review and theoretical analysis, based on which the research hypotheses and formulated; the third part consists of data selection, variable descriptions, and econometric modeling; the fourth part conducts an empirical study and analysis of the results, the fifth part conducts a mechanism test, and the last part concludes with conclusions and policy recommendations

2. Literature Review and Research Hypothesis

In this part, this paper starts with a literature combing, which reveals that there are several main branches of

literature that are closely related to this study. One branch analyzes the current situation of household financial asset allocation and the other analyzes the current situation of housing provident fund. The paper then goes on to propose research hypotheses on the reasons that may affect the investment of housing provident fund in household risky financial assets.

2.1. Current status of research on household financial asset allocation

Asset allocation is an investor's choice to hold assets and portfolios of different wealth forms based on subjective risk preferences as well as objective trade-offs for returns (Zhang Xiaoni, 2020). With the continuous development of family finance, the importance of family financial asset allocation has become increasingly prominent (Lin Defa et al, 2019), and compared with developed countries, Chinese families' asset allocation is more concentrated on housing assets, and the diversification of asset allocation is more obvious (Chen Lei, 2015). Wei Zhao and Song Quanyun (2016) believe that when Chinese families invest, they make investment decisions based on their estimates of the cost-return characteristics of assets, and their own risk-bearing ability. When people's income level rises steadily, the greater the speculative motivation, the greater the need for financial assets to invest (Zhang Gan, Gao Jiechao et al., 2017), and the more affluent the family, the higher the degree of concentration of the asset allocation, and the fewer the investment mistakes (Campbell. JY, 2006). If the level of social trust rises and the social insurance system improves and develops, it will significantly increase the proportion of financial risk assets of urban households (Zang Rihong, 2017; Goldman D, 2013). Increasing age increasing population dependency burden, lack of financial literacy, and married women's participation in the labor force will reduce household financial market participation (Zicheng Wang, 2016, Weixing Wu et al, 2013; Xiaohua Xu et al, 2020). As the level of financial literacy of household heads increases, the inhibitory effect of household borrowing constraints on the willingness and scale of household stock market participation is effectively mitigated (Zaihua Wu et al, 2017). Reasonable allocation of the family's asset portfolio is of great significance to increase the property income of residents' families and protect the security of old age (Li Zhou, 2021).

2.2. Current status of the Housing Provident Fund study

Housing finance is a general term for all business activities that take housing as a credit base and utilize various financial instruments, financial markets and financial intermediaries to finance the development and construction of housing, distribution and consumption, circulation and trading. The establishment of the housing fund system has an important role in supplying funds for the expansion of the scale of housing development and construction, the transformation of housing distribution and consumption patterns, and the improvement of the circulation and trading system in China (Wei Cui et al, 1999). Currently many emerging economies have created housing provident funds, such as Mexico, Nigeria, Brazil, Jamaica, and the Philippines and China (Chiquier. L, 2009). China's housing provident fund system is legally mandatory, functionally mutual, essentially welfare, and exclusively used, and is a housing savings system with the goal of long-term housing security (Yidong Wu and

Xianzhu Wang, 2016). The purpose of the CPF system is to enhance the housing affordability of employees (Yuejin Xu et al, 2017), and there is a certain degree of "subsidizing the middle at both ends" spindle effect (Li Ding et al, 2020), and some scholars have argued that middle-income and higher-income residents will benefit more from the CPF system (Yunhe Lu et al. 2020), and that the system will significantly contribute to house price increases (Yidong Wu and Xianzhu Wang, 2016). This system will significantly contribute to the rise in house prices (Gu Chenglong et al, 2016), thus widening the already existing income gap among urban residents. Scholar Shuanghua Jin (2018) argues that the mediation of income distribution by individuals withdrawing housing provident funds is negative and not conducive to social equity. Participation in housing provident funds boosts the level of rental consumption of contributors, increases the probability of migrant workers purchasing a home in the inflow area (Jie Chen et al, 2021; Jiaqi Jiang et al, 2021), improves the willingness to purchase a home, and significantly increases the residents' sense of well-being (Juanjuan Ren, 2022). The housing provident fund not only improves the rate of home ownership in China and promotes the development of the housing market, but also has a certain role in promoting the development of China's risky financial market (Huadong Zhou, 2022), and significantly increases the possibility of investing in risky financial assets for families with homes and the proportion of investment (Xuanjuan Chen et al, 2021).

2.3. Theoretical Hypothesis Formulation.

By providing an overview of previous research results, this paper proposes hypotheses H1 and H2 to explore the impact of housing fund holdings on urban households' investment in risky financial assets.

Hypothesis H1: Urban households holding housing provident funds will increase their investment ratio in financial products as well as their investment ratio in risky financial assets.

Hypothesis H2: Urban households with housing provident funds have better future expectations of their lives, and thus will increase their investments in financial products and risky financial assets.

With the development of behavioral finance, more and more scholars have studied happiness as an emotional variable, which has given rise to the new research field of happiness economics. The happiness and satisfaction of ordinary people is a "barometer" of the performance of national governance, which is closely related to the public's recognition of the government (Junqiang Liu et al., 2012). Zhongyi Xiao (2018) and other scholars believe that it is of great significance to study the decision-making mechanism of subjective happiness and family financial behavior. Some scholars believe that the enhancement of happiness will enhance the depth of household participation in stock selection (Yaling Zhou et al., 2017), and some scholars believe that the enhancement of happiness has a negative impact on risky asset holdings (Dezhu Ye et al., 2015). So what exactly is the impact of residents' happiness on the financial products and risky financial assets investment of households holding housing provident funds? So this paper proposes hypothesis H3:

Hypothesis H3: Urban households with housing funds have a higher sense of well-being, which leads to increased investment in financial products and analyzed financial assets.

Family wealth accumulation is a stock concept, and in the

allocation of family financial assets, family wealth accumulation is the material foundation of family life and development (Yu Wu et al., 2016), which occupies a very important position in the allocation of family assets, and may affect the allocation choice of family risky financial assets (Caiyun Zhou, 2021). As a result, this paper proposes hypothesis H4:

Hypothesis H4: Household wealth accumulation strengthens the contribution of housing fund holdings to the share of urban households' investment in financial products as well as risky financial assets.

3. Research Design

3.1. Data Selection and Sample Screening

The data used in this paper comes from the China Household Finance Survey (CHFS) project organized and managed by the China Household Finance Survey and Research Center of Southwestern University of Finance and Economics (SWUFE), and mainly use the survey data of the project in 2019. The program's 2019 survey sample covers information on 34,643 households in 29 provinces (autonomous regions and municipalities directly under the central government) across China. Despite the current increase in the number of people to whom the housing fund applies, it still exists most predominantly among urban residents, thus this paper excludes the sample of rural households and only studies urban households. In this paper, we refer to the methodology of Huadong Zhou (2022) and other scholars in data preprocessing, excluding the samples with total household income and financial assets less than 0, and retaining only the sample households with the head of the household aged 18-65 years old, together with the treatment of some of the missing variables in the data, and finally there are 8977 urban households left as the valid research sample of this paper.

3.2. Definition of main variables and descriptive statistics

3.2.1. Explained Variables

This paper focuses on the impact of housing provident fund holdings on urban households' investment in risky financial assets. In the Chinese Household Finance Survey, total household assets include two major parts: non-financial assets and financial assets (Li Gan and Zhichao Yin et al., 2013). Zhichao Yin (2014) and other scholars further define stocks, funds, financial bonds, corporate bonds, financial derivatives, financial wealth management products, and foreign exchange gold as risky assets, and cash, cash in stock accounts, government bonds, demand deposits, and time deposits as non-risky assets. A brief analysis of the 2019 CHFS survey data reveals that wealth management products (including both types of internet wealth management products as well as financial wealth management products) have become the most dominant type of investment for current households, and the second most common type of investment product is stocks. As a result, this paper refers to Yongwei Chen (2015) and other scholars, and selects "the proportion of investment in financial products (fin-ratio)" and "the proportion of investment in risky financial assets (risk-ratio)" as the explanatory variables.

3.2.2. Core explanatory variables

The core explanatory variable of this paper is a dummy variable related to housing provident fund, and whether the

family members have housing provident fund (HPF) is chosen as the core explanatory variable. This paper sets the core explanatory variable HPF to take the value of 1 as long as there are family members in the sample households who own housing provident funds, if all family members do not own housing provident funds, the variable HPF takes the value of 0.

3.2.3. Other variables

Referring to the research methodology of Xuanjuan Chen (2021) and other scholars, the control variables selected in this paper mainly include the following variables: gender of the household head (gender), age of the household head (age), the household head with age squared (age2) the household head's risk preference (risk-like), the household head's marital status (marriage), the attributes of the household's housing (house), the household size (family-size), and household debt ratio (debt-ratio). For the risk appetite of the household head, it is defined using the household head's responses to the questionnaire questions. The question in the CHFS 2019 questionnaire, "If you had a sum of money to invest, what kind of investment would you most prefer?" The household head risk preference variable is assigned a value of 1 to 5 based on the options, with smaller values are assigned a value based on whether the family owns its own home; if the family owns its own home, the family housing attribute takes the value of 1, otherwise it takes the value of 0. Family-size is based on the number of family members and takes the value of 1,2,3 etc.

3.2.4. Descriptive statistics

Table 1 demonstrates the definitions and descriptive statistics of the main variables covered by the sample households. As can be seen from Table 1, the mean value of households in the sample holding housing provident funds is 35.8%, which is not a very high coverage ratio. The investment ratio of urban households in financial products is only 4.1%, and the ratio of stock investment is even less. Looking again at the rate of investment in risky assets, roughly 5% of urban households made this investment. The heads of residential households are predominantly male at 74.5%, the average age of the head of household is 47.54 years, and the mean value of the risk appetite level of the risk appetite level of the households is 4.083, implying that the risk appetite level of urban households is generally low. The mean value of the variable household size is 3.397, which shows that most of the sample households are three-member households, and the sample household indebtedness is 18.5% on average.

3.3. Model setup

3.3.1. Benchmark model

When examining the impact of paying provident fund on urban households' investment in risky assets, since the explanatory variables of financial products and risky asset investment ratio take values in the range of 0 to 1, the data are truncated, based on the data characteristics of this paper, we choose to use Tobit model to conduct the benchmark regression:

$$Y_j^* = \alpha + \beta \times \text{HPF} + \gamma \times \text{control} + \varepsilon, Y_j = \max(0, Y_j^*), \quad (1)$$

Where Y_j denotes the actual observed value of the investment ratio of financial products and risky assets of household j , with the value range of $[0,1]$; Y_j^* denotes the value of the investment ratio of financial products and risky

assets of household j that is greater than zero; HPF is the core explanatory variable, whether or not the household holds a

housing provident fund; and control is the selected control variable, $\varepsilon \sim N(0, \sigma^2)$.

Table 1 Description statistics of sample households

Variable Name	Variable Definition	Number of observations	Average Value	Standard deviation
HPF	Housing Provident Fund holdings	8,977	0.358	0.479
fp-ratio	Investment Ratio of Financial Products	8,977	0.041	0.127
risk-ratio	Risky assets investment ratio	8,977	0.050	0.142
gender	Sex of head of household	8,977	0.745	0.436
age	Age of head of household	8,977	47.540	10.45
age2	Squared age of head of household	8,977	2370.000	968.8
risk-like	Household head risk appetite	8,977	4.083	1.093
marriage	Marital status of head of household	8,975	2.175	0.846
house	Family housing properties	8,977	1.105	0.307
family-size	Family size	8,977	3.397	1.402
debt-ratio	Household indebtedness	8,977	0.185	2.004
expectation	Future expectations	8,975	5.366	3.784
happiness	Sense of well-being	8,974	0.954	0.211
Wealth	Family property	7,967	12.190	1.402

3.3.2. Mediating effects model

After the benchmark regression, in order to deeply explore the path of the impact of housing provident fund holdings on urban households' financial products as well as investment in risky financial assets, this paper adopts the stepwise regression method to construct the following mediation effect model with reference to the study of Zhonglin Wen and Baojuan Ye (2014):

$$Y = a_0 + a_1X + a_2\text{control} + \mu_1, \quad (2)$$

$$M = \beta_0 + \beta_1X + \beta_2\text{control} + \mu_2, \quad (3)$$

$$Y = \gamma_0 + \gamma_1X + \gamma_2M + \gamma_3\text{control} + \mu_3, \quad (4)$$

Where Y denotes the investment ratio of urban households in financial products and the investment ratio of risky financial assets, X is whether the household holds housing provident fund, M is the mediator variable, control is the control variable, and μ_i is the random perturbation term.

3.3.3. Moderating effects model

In order to explore the moderating effect of housing provident fund holdings on urban households' investment in financial products and investment in risky financial assets, this paper constructs the following moderating effect model:

$$Y = c_0 + c_1X + c_2W + c_3XW + c_4\text{control} + v, \quad (5)$$

where Y and X have the same meaning as above, W is the moderating variable, XW is the interaction term between the core explanatory variable and the moderating variable, and v is the random perturbation term.

4. Analysis of Empirical Findings

4.1. Benchmark regression results

According to the setting of model (1) style, this paper adopts the Tobit model, and Table 2 below shows the regression results of the model, which estimates the impact of housing provident fund on urban households' investment in financial products and risky financial assets. In order to more intuitively show the economic implications of the estimated coefficients of whether urban households hold housing provident funds (HPF), Table 2 directly shows the marginal

coefficients of the variables. In particular, columns (1) and (9) of Table 2 include only the core explanatory variables. The estimation results in both columns (1) and (3) show that the coefficients on (HPF) for

the core explanatory variables are positive and significant at the 1% level. This result suggests that, given all else being equal, the holding of HPF by urban households increases the investment ratio in financial products as well as risky financial assets, thus Hypothesis 1 is confirmed. Columns (2) and (4) incorporate other control variables such as the gender of the household head. As can be seen from the results demonstrated in Table 2, the coefficient value of the core explanatory variable HPF decreases slightly from the previous column after the addition of the control variables, but it is still significant at the 1% level. This indicates that the positive impact of holding HPF on the investment ratio of urban households in financial products as well as risky financial assets does not change with the characteristic variables and the results are relatively robust.

After adding control variables, the marginal effect of whether or not holding housing provident fund (HPF) on the investment ratio of urban households in financial products is 2.8%, and the marginal effect on the investment ratio of urban households in risky assets is 3.6%, which are both significant at the 1% level. Analyzing the results of the other variables, it can be concluded that the effect of male-headed households on the investment ratios of financial products and risky assets is significantly negative at the 1% level, which is consistent with the findings of previous studies. The marginal effect of the age of the head of household and the square of age is also significantly negative at the 1% level. The marginal effects of the degree of risk preference of the head of household are -1.2% and -1.7%, respectively, indicating that the degree of risk preference affects the investment ratio of urban households in financial products as well as risky financial assets. The marginal effects of household housing status and household size are significantly negative. Household debt ratio has a significant negative effect on the investment ratio of financial products and risky financial assets.

Table 2. Benchmark regression results

Explanatory variable	(1)	(2)	(3)	(4)
	Fp-ratio	Fp-ratio	risk-ratio	risk-ratio
HPF	0.036*** (0.000)	0.028*** (0.000)	0.016*** (0.000)	0.036*** (0.000)
gender		-0.008*** (0.002)		-0.010*** (0.000)
age		-0.004*** (0.000)		-0.003*** (0.000)
age2		0.000*** (0.001)		0.000*** (0.001)
Risk-like		-0.012*** (0.000)		-0.017*** (0.000)
marriage		-0.002 (0.170)		-0.002 (0.133)
house		-0.015*** (0.000)		-0.014*** (0.001)
Family-size		-0.001* (0.081)		-0.003*** (0.004)
Debt-ratio		-0.021*** (0.000)		-0.025*** (0.000)
N	8977	8975	8977	8975

Note: *, **, and *** indicate significant at 10%, 5%, and 1% levels, respectively, and values in parentheses in the table are standard errors.

4.2. Robustness Check

In the Benchmark regression, we conclude that holding housing provident fund increases the investment ratio of urban households in financial products as well as risky financial assets. In order to avoid endogeneity problems caused by indicator definitions and omitted variables, etc., this paper conducts the following types of robustness tests.

4.2.1. Substitution of variables

According to the setting of the CHFS2019questionnaire, the head of the household in this paper is not necessarily the head of the household in the account book, but the family member who plays a decisive role in the household, and we believe that the head of the household can make a decision on whether or not the household makes a risky financial investment. So this paper replaces the core explanatory variable in the baseline regression, whether the household holds a housing provident fund (HPF), with whether the household head owns a housing provident fund as the explanatory variable, denoted as HPF1. i.e., as long as the household head in the household owns a housing provident fund, HPF1 takes the value of 1; otherwise, it takes the value of 0. The results of the regressions after the replacement are shown in Table 3 below: from column (1). From column (1), "household head has housing provident fund (HPF)" can also increase the investment ratio of urban households in financial products, and column (2) shows that HPF1 can increase the investment ratio of urban households in risky financial assets, both of which are significantly positive at the 1% level.

In addition to replacing the core explanatory variables, this paper also replaces the explanatory variables to conduct robustness tests. Replace "the proportion of urban households' investment in financial products (FP-ratio)" with "whether urban households invest in financial products (FP)".

According to the data characteristics of the explanatory variables, Probit model is chosen for regression analysis. At the same time, "the proportion of urban households' investment in risky financial assets (risk-ratio)" is replaced by "whether urban households invest in risky financial assets(risk-asset)", and the same Probit model is used for the

regression analysis. The regression analysis is also conducted using the Probit model. The results are shown in column (3) and (4) of Table 3 below: housing provident and risky financial assets at the 1% level, and the results of the Benchmark regression are robust.

Table 3. Robustness tests: replacement variables

	(1)	(2)	(3)	(4)
	fp-ratio	risk-ratio	fp	Risk-asset
HPF1	0.109*** (0.000)	0.137*** (0.000)		
HPF			0.504*** (0.000)	0.507*** (0.000)
Control variable	Yes	Yes	Yes	Yes
Pseudo R ²	0.069	0.089	0.184	0.182
Observations	7775	7775	8975	8975

Note: *, **, and *** indicate significant at 10%, 5%, and 1% levels, respectively, and values in parentheses in the table are standard errors.

4.2.2. Instrumental variables regression

In this paper, although the variables of interest have been controlled as much as possible, the model may still suffer from endogeneity problems. Therefore, the instrumental variables method is used in this part to further mitigate the estimation bias problem caused by endogeneity. Moreover, this paper is a quantitative analysis based on micro household financial survey data, which makes it more advantageous to use the instrumental variables approach to deal with endogeneity. Based on the theory of "Peer Effect" in economics, i.e., "using the upper level data as an instrumental variable for the lower level data", and drawing on the practice of scholars such as Weijun Li (2023), this paper selects the household's province's Enterprise Housing Provident Fund (EPF) contribution rate as an instrumental variable, and then estimate it using the IV-Tobit model. The logic of choosing this variable as an instrumental variable is as follows: on the one hand, whether an urban household holds a housing provident fund or not is significantly correlated with the enterprise housing provident fund contribution rate in the province where the household is located, due to the influence of local government policies as well as social networks, which are constrained by the provident fund system. At the same time, the contribution rate of the enterprise housing fund in the province where the household is located is determined by the provident fund policy of the region, which is not directly related to the investment decision of the household's risky financial assets. Therefore, it is reasonable for this paper to choose the contribution rate of enterprise housing provident fund in the province where the household is located as an instrumental variable.

Table 4 demonstrates the regression results of the IV-Tobit model. The F-value of the weak instrumental variable test in the first stage of the two-stage regression is 55.74, which is much higher than the value of 10 suggested by the rule of thumb, which ensures the correlation between instrumental variables and endogenous variables, and the absence of weak instrumental variables proves the reasonableness of the instrumental variable selection in this paper. Meanwhile, Table 4 also demonstrates the P-value of Wald test, which significantly rejects the original hypothesis, indicating that there is some endogeneity in the model, and the T-test is also very significant, and it can be considered that the results of IV-Tobit estimation in this paper on this basis are reliable.

According to the results given by the IV-Tobit model: the holding of housing provident fund on the investment of urban households in financial products as well as the investment in

risky financial assets are all significantly positive at the 1% level, which is consistent with the benchmark regression results in Table 2, indicating that the results are robust.

Table 4. Instrumental variable regression

	(1)	(2)
	Fp-ratio IV-tobit	Risk-ratio IV-tobit
HPF	1.459*** (0.004)	1.589*** (0.003)
Control variable	Yes	Yes
Wald endogeneity test (p-value)	0.000	0.000
Phase IF-value	55.74	55.74
Value of instrumental variable T	3.27	3.27
Observations	8975	8975

Note: *, **, and *** indicate significant at 10%, 5%, and 1% levels, respectively, and values in parentheses in the table are standard errors.

4.2.3. Sample selectivity bias

In this paper, the Propensity Score Matching (PSM) method is used for robustness testing as a way to reduce endogeneity problems that may arise due to sample selectivity bias, neglected observations, etc. In this paper, three methods of radius matching, 1:1 nearest neighbor matching, and kernel

matching are used for the test, and the results are basically the same (see Table 5), and the housing provident fund is a significant positive promoter of urban households' investment in financial products as well as risky financial assets, which is consistent with the Benchmark regression, thus indicating that the regression results are robust.

Table 5. Robustness test: propensity score matching method (PSM)

kind	Fp-ratio			Risk-ratio		
	Experimental group	Control group	ATT	Experimental group	Control group	ATT
unmatched	0.056	0.033		0.073	0.037	
Radius match	0.056	0.037	0.019*** (6.130)	0.073	0.042	0.030*** (8.910)
1:1 nearest neighbor matching	0.056	0.037	0.018*** (4.810)	0.073	0.045	0.028*** (6.660)
Nuclear matching	0.056	0.036	0.020*** (5.950)	0.073	0.041	0.032*** (8.550)

Note: *, **, and *** indicate significant at 10%, 5%, and 1% levels, respectively, and values in parentheses in the table are standard errors.

4.3. Heterogeneity analysis

This section categorizes the sample based on two variables, the household's income level and the household's financial literacy, and examines the impact of housing provident funds on the household's investment in risky financial assets. The estimation results are presented in Table 6 below.

4.3.1. Heterogeneity in household income levels

Based on the level of the household's income, this paper categorizes the sample households into three groups: low-income, middle-income, and high-income. Based on the research of Markus (2016) and other scholars, this paper defines the middle-income group as 67%-200% of the median income, so that those below 67% of the median household income level are defined as the low-income group, and those above 200% of the median household income are defined as the high-income group. Regressions were performed after grouping and Suest Test, and the regression results are shown in the first half of Table 6. For different income households, holding housing provident funds makes a difference in the investment of urban households in financial products as well as risky financial assets, with low-income households having the greatest impact. According to the analysis of CHFS data, financial products in the sample data are the most important type of investment for current households, and low-income households tend to invest in lower-risk financial products.

4.3.2. Heterogeneity in household financial literacy

Household financial literacy is an indication of how well a

household understands financial literacy and represents its ability to manage financial resources. Drawing on Zhichao Yin (2014) and other scholars as well as Zaihua Wu (2017), this paper defines household financial literacy based on the household's responses to three questions in the 2019 CHFS questionnaire on interest rate calculations, inflation rates, and stock sector risk perceptions, and explores the impact of whether or not households with different levels of financial literacy hold a Housing Provident Fund (HPF) on investment in risky financial assets. If a family answers all three questions correctly, it is defined as having high financial literacy and assigned a value of 1. If it fails to answer all questions correctly, it is defined as having low financial literacy and assigned a value of 0. According to the empirical results, families with low financial literacy are more willing to invest in financial products, and families with high financial literacy holding housing provident fund do not invest in financial products significantly, which may be due to the fact that the investment threshold of financial products is not so high and is more suitable for the investment of financial assets. This may be because the investment threshold of financial products is not so high, which is more suitable for ordinary investors to invest. For investment in risky assets, holding housing provident fund has a positive effect on both types of sample households, and the results pass the Suest Test. The positive effect of housing provident fund on investment in risky financial assets is also more obvious among low financial literacy households.

Table 6 Heterogeneity analysis

clusters	Financial product		Risk asset		N
	Ratio	Standard error	Ratio	Standard error	
Lower income	0.099***	(0.031)	0.126***	(0.032)	2793
Medium income	0.028**	(0.014)	0.045***	(0.014)	4430
High income	0.083***	(0.020)	0.113***	(0.020)	1752
Low financial literacy	0.116***	(0.011)	0.139***	(0.011)	8402
High financial literacy	0.045	(0.029)	0.070**	(0.028)	573

Note: *, **, and *** indicate significant at 10%, 5%, and 1% levels, respectively, and values in parentheses in the table are standard errors.

5. Mechanism Testing

The Benchmark regressions and robustness tests in the previous section show that housing provident fund holdings significantly promote urban household's investment in financial products and risky financial assets. How does housing provident fund affect households' investment in financial products and risky financial assets? In this section, the research hypotheses proposed earlier will be empirically

tested.

5.1. Analysis of intermediation effects

5.1.1. Analysis of the mediating effect of future expectations

Future expectation refers to the rational expectations of households about their future economic situation. Drawing on the research of scholar Jiaqi Chen (2022), this paper argues that households' future expectations can be measured by the sample households' expenditures on culture and recreation, purchasing and repairing of cultural and recreational consumer goods, and traveling expenditures in the previous year. For the mediating effect of this variable, Table 7 demonstrates the regression results of the stepwise method test. Since the mediating variable future expectations is a continuous variable, OLS regression was used in the second step. The results in column (2) show that the coefficient β_1 is significantly positive, and the results in columns (3) and (6) show that the coefficient γ_2 of the regression equation is significantly positive at the 1% level, and the coefficient γ_1 is also significant, which leads us to believe that the variable of future expectations does play a mediating role, i.e., holding housing provident fund will significantly increase the future expectations of the household, and thus the investment rate of the household in financial products and risky financial assets is increased. Risky financial assets, research hypothesis 1 can be verified.

Table 7. Analysis of mediating effects of future expectations

variant	(1)	(2)	(3)	(4)	(5)	(6)
	Fp-ratio	Future expectations	Fp-ratio	Risk-ratio	Future expectations	Risk-ratio
HPF	0.028*** (0.000)	1.758*** (0.080)	0.083*** (0.010)	0.036*** (0.000)	1.758*** (0.080)	0.106*** (0.011)
Future expectations	—	—	0.024*** (0.001)	—	—	0.026*** (0.002)
Control variable	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R ²	0.074	0.121	0.113	0.093	0.121	0.135
N	8975	8973	8973	8975	8973	8973

Note: *, **, *** denote significant at 10%, 5%, and 1% levels respectively; values in parentheses in the table are standard errors.

5.1.2. Analysis of the mediating effect of residents' happiness

Residents' happiness reflects the degree of satisfaction with their current life, and this paper constructs a dichotomous variable of residents' happiness based on the question "In general, do you feel happy now?" in CHFS 2019, with responses of "unhappy" and "very unhappy" assigned a value of 0 and the others assigned a value of 1. The dichotomous variable of residents' happiness was constructed by assigning the responses of "unhappy" and "very unhappy" as 0 and the others as 1. According to the characteristics of the variable of residents' happiness, the second step of stepwise regression

method chooses Logit model for regression, and the regression results are shown in Figure 8. Column (2) shows that the coefficient β_1 is significantly positive at the 1% level, indicating that housing provident fund significantly increases residents' happiness. Columns (3) and (6) show that the coefficient of γ_2 is significantly positive, while the coefficient of γ_1 is also positive and significant at the 5% level, i.e., holding housing provident fund increases residents' happiness and thus increases urban households' investment in financial products and risky financial assets. The empirical results confirm the existence of the mediating effect, so that the research hypothesis 2 can be verified.

Table 8. Analysis of mediating effects of residents' happiness

	(1)	(2)	(3)	(4)	(5)	(6)
	Fp-ratio	happiness	Fp-ratio	Risk-ratio	happiness	Risk-ratio
HPF	0.028*** (0.000)	0.659*** (0.123)	0.124*** (0.010)	0.036*** (0.000)	0.659*** (0.123)	0.150*** (0.011)
happiness	—	—	0.049** (0.026)	—	—	0.055*** (0.026)
Control variable	Yes	Yes	Yes	Yes	Yes	yes
Pseudo R ²	0.074	0.041	0.074	0.093	0.041	0.093
N	8975	8972	8972	8975	8972	8972

Note: *, **, and *** indicate significant at 10%, 5%, and 1% levels, respectively, and values in parentheses in the table are standard errors.

5.2. Analysis of moderating effects

Household wealth status (WEALTH_i) is a variable that reflects the economic strength of the household. In this paper, the total assets of a household are subtracted from the housing assets of the household, and in order to overcome the problem of heteroskedasticity, this part is logarithmically processed, so as to obtain the variable of household wealth status. The proportion of investment in wealth management products and risky financial assets of urban households is taken as the explanatory variable, whether the household holds housing provident fund is taken as the explanatory variable, and the household wealth status is regressed with its cross-multiplier term. As shown in Table 9 below, there is a moderating effect of household wealth status between the ratio of household housing provident fund holdings and investment in financial products, and the moderating effect coefficient is positively significant at the 1% level; meanwhile, there is a moderating effect of household wealth status between the ratio of household housing provident fund holdings and investment in risky financial assets, and the moderating effect coefficient is also positively significant at the 1% level. The empirical results are consistent with Hypothesis 3 that household wealth status will have a positive moderating effect on housing provident fund holding and investment in financial products and risky financial assets. That is, the better the household wealth status, the more the housing provident fund ownership will increase the ratio of investment in financial products and risky financial assets.

Table 9. Analysis of moderating effects of household wealth status

	(1)	(2)
	Fp-ratio	Risk-ratio
HPF	-0.004 (0.003)	-0.000 (0.004)
wealth _i	0.017*** (0.001)	0.019*** (0.001)
HPF*wealth _i	0.014*** (0.002)	0.023*** (0.003)
Control variable	Yes	Yes

Note: *, **, and *** indicate significant at 10%, 5%, and 1% levels, respectively, and values in parentheses in the table are standard errors.

6. Conclusions and Policy Recommendations

This paper uses 2019 CHFS data to study the impact of housing provident fund holdings on urban households' investment in risky financial assets. Based on Tobit regression, it is found that holding housing provident fund increases the investment ratio of urban households in financial products and risky financial assets, and the results also remain robust after treatment with replacement variables, instrumental variables, and sample selectivity bias. From the heterogeneity analysis, low-income households tend to invest in lower-risk financial products; low-financial literacy households will tend to make relatively low-risk financial asset investments. Second, this paper finds that holding housing provident funds significantly increases urban households' future expectations, thus increasing their investment ratios in financial products and risky financial assets. Holding housing provident fund also increases residents' happiness, which in turn increases

urban households' investment in financial products and risky assets. The better the household's financial situation, the higher the ratio of investment in financial products and risky financial assets will be increased by holding housing provident fund. Based on the above findings, this paper concludes the following policy recommendations: first, the government can improve the social security system so that more urban households can enjoy housing provident funds, thus allowing urban households to increase their investment in financial products and risky financial assets. Second, sound and positive policies can be introduced to raise urban households' expectations for the future, so that they can increase their investment ratio in financial products and risky financial assets. Finally, urban households can improve their understanding of financial knowledge and enhance their financial literacy so that they can invest in risky financial products in a more rational manner.

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