How Does Rising House Price Influence Stock Market Participation in China?

A Micro-Household Perspective

Xiaoyu Chen *
Xiaohao Ji *

BERLIN

ECONOMIC RISK

SFB 649

* Fudan University, People's Republic of China

How Does Rising House Price Influence Stock Market Participation in China? A Micro-Household Perspective

Xiaoyu Chen [a1] and Xiaohao Ji [b]

[a] School of Public Health, School of Data Science, Fudan University, Shanghai, China

[b] School of Mathematical Science, Fudan University, Shanghai, China

Abstract

This is an empirical study on the effect of house price on stock-market participation and its depths based on unique China Household Finance Survey (CHFS) data in 2011 and 2013 including 36213 sample households. We mainly found that, with an increase of one thousand RMB per square meter in macro house price, the probability to participate in the stock market will increase by 5.4% before controlling for wealth effect and 2.84% afterwards, indicating the existence of wealth effect. The participation depths of the stock-total asset ratio is expected to decrease by 0.23% and absolute stock asset is observed to decrease by 5.8 thousand RMB in response to one thousand RMB increase of per square meter house price. The effect of house price on participation decision is also related to housing area, and the negative effect of house price on stock market participation depths gets more intense with the increase of the stock-total asset ratio.

Keywords: Stock Market, Participation decision and depth, House Price, China, CHFS data

1 Introduction

Since the reform and openness from the early 1980s, the saving rate in China keeps high due to the severe capital control, which leave savers in China only a few domestic investment vehicles. While the China's stock market, as one of them, has also experienced drastic growth, it is still in its nascent stage of development, with a capitalization of slightly less than 20 trillion RMB in 2013. In contrary, 48.9% of American households owned stock, either directly, or through mutual funds or other

means in 1998, which is still considered too low in some absolute sense in light of the historically high returns to investing in stock market. On the other hand, China has witnessed a great housing boom in the last decade, with an average annual real growth of 13.1 percent in first-tier cities, 10.5 percent in second-tier cities and 7.9 percent in the third-tier cities (Fang et al., 2015). This paper is mainly meant to investigate the effect of the increase of house price on the decision and depths of China households' stock-market participation.

This problem is worth studying upon firstly due to the considerably high house-ownership rate in China, close to 90% according to CHFS data in 2011 and the large proportion of housing asset in households' total asset. Real estate, as a rigid demand, thus, plays a vital role in Chinese households' everyday investment decisions in most aspects including these in the stock market. Secondly, theoretically speaking, after the involvement of housing in the life-cycle model, the effect of wealth and life cycle can be interpreted more reasonably (Cocoo, 2005). Many empirical works have been carried out and the results are quite confusing since the model suggests that the increase of housing asset should raise the stock participation while empirical results indicate the opposite (Chetty and Sandor, 2016). This paper treats housing independently from life cycle effect and using house price as a new entry point to study on the effect of housing on stock-market participation, since endogeneity within the effect of house price on stock-market participation is probably weaker than that within the effect of housing.

Furthermore, the relationship between house price and stock-market participation is quite complicated and different from that of housing itself. With the rise of house price, the wealthy families normally consider the real estates to be a more profitable and less risky investment choice in China, relative to the stock market, while those families with no self-owned real estate will be pushed to increase their savings and be limited in their investment in the stock market. On the other hand, the increase of house price may contribute to the accumulation of wealth and therefore enables households to participate in the stock market without too much financial burden. The lack of relevant investigations on house price as one of the determinants of stock-market participation in China makes the work in this paper very necessary.

The rest of the paper is organized as follows. Section 2 provides a literature review on the research of the determinants of stock-market participation and the influence of house price on the choices of households. Section 3 describes the CHFS data, the overall status of stock market and house price in China, the model specified in this paper. The most relevant variables used in this study will be also introduced.   The estimated effect of house price on stock-market participation decision and depths will be discussed in details in Section 4. This paper concludes in Section 5.

2. Literature review

There are many reasons to study upon the determinants of the stock-market participation. The most important one is that the stock-market participation rate may have a direct effect on the size of equity premium at the aggregate level, therefore the research of which may enlighten the research on equity-premium puzzle of Mehra and Prescott (1985). Another reason is that, despite the classic literature which suggest that all investors should invest in all kinds of risky assets at a certain ratio depending on personal risk preference, many existing researches have shown that households' choices of investment in reality are much simpler and safer, even with lots of households refusing the option of investing in the stock market (Markowitz, 1952; Merton, 1969; Samuelson, 1969). Thus the determinants may help to explain the limited household stock market participation. Furthermore, finding out the determinants of stock-market participation may help to explain some aspects of the investment decisions of households in China, and therefore may lead to the adjustment of policies. Lastly, the behaviour of individual investors and the reasons for the behaviour impinges directly on questions about the efficiency of financial markets.

Since the theoretical work on household portfolios by Markowitz, Merton and Samuelson, the researches on household portfolio choices have been an important part of the study of finance. These classic works, however, lead to the contradiction between empirical observations and the theoretical model (McCarthy, 2004). For instance, most of the early models failed to explain the effects of wealth and age on portfolio allocations. Thus the empirical study of the determinants of household

portfolio allocation, especially the impact on stock market participation, is very important. Furthermore, the model developed by Deaton and extended later to allow agents to buy both stocks and bonds suggests that the limited participation of individuals in the stock market might be able to explain the equity premium puzzle (McCarthy, 2004). On the other hand, including housing into the theoretical models enables the models to explain more powerfully about the empirical results, including the relatively low risky-asset rate.

As pointed out by Chetty and Sandor (2016), most previous models in relevant literatures leads to the conclusion that housing should have a negative effect on the demand for risky assets since it raises the households' exposure to risk and illiquidity (Flavin and Yamashita 2002). They also managed to solve the inconsistence between models and previous empirical results (Heaton and Lucas, 2000b; Yamashita, 2002; Cocco, 2005) by distinguishing between home equity wealth and mortgage debt, with the estimation implying that a 10% decrease in household's housing will lead to a 6% rise of the mean stock share of liquid wealth, holding fixed wealth.

Many works have been done both in China and globally on the determinants of household stock-market participation besides housing, including many aspects of variables. Firstly, individual characteristics are thought to be vital to stock-market participation. Age and stock-market participation are indicated to have a nonlinear relation (Aizcorbe et al., 2003). Education level may play an important role in the story (Bertaut et al. 2000). More specifically, the gain of financial literacy is expected to increase the household stock-market participation (Yin et al., 2015). Personality traits of individuals like trust risk aversion, ambiguity aversion and optimism are also influential factors of the stock-market participation (Hong et al., 2004). Other characteristics include marital statues, sex and wealth as well (Poterba and Samwick, 2002; Vissing-Jorgensen, 2002). Secondly, background risks, which involves housing, are also included in the study. Entrepreneurial risk, more specifically the ownership of private businesses and the risk of income are thought to influence negatively the decision of private-business-owning household in stock market (Heaton and Lucas, 2000a; Faig and et al., 2002). While better health condition might have a positive effect on household's participation in the stock market (Rosen 2004). Thirdly, for the

interaction with the other individuals may cause effects on the investment in equity, social interaction measured by household's visits to neighbours and the church, local social capital and neighbours' participation in the stock market are all expected to play a role in the story (Guiso et al., 2004; Hong et al., 2004; Brown and et al. 2008). Other relevant determinants include saving motives, more specifically for investment in housing, and retirement and professional investment advice, leading to a bigger probability of stock-investment (Faig and Shum, 2006).

In China, a few researches relevant with the determinants of household stock-market participation have also been carried out, following the release of the CHFS data. Financial availability measured by financial services available in the neighbourhood, investment experience and financial literacy are estimated to have significantly positive effects on households' participation in the stock market (Yin et al., 2014, 2015). The difference between rural and urban areas, household assets, income, education, self-employment and social relations may all cause effects on household stock-market participation (Zhu et al., 2014). Before the release of the CHFS data, background risks (Jiang et al., 2009), social interaction and trust, life cycle and wealth (Wu et al., 2010) had been investigated as the determinants of stock-market participation. To the best of our knowledge, this paper is the only study which focuses on the effect of the house price on the stock-market participation in China, as a supplement to the theory of housing and portfolio choices, especially based on the unique micro-CHFS data which will be introduced in the following section.

3. Data and model

3.1 CHFS data

The study of household portfolio allocation and more specifically stock-market participation in China are constrained by the lack of micro-data and can hardly gain inspiring empirical results until 2011 when Survey and Research Centre for China Household Finance conducted a nationally representative household survey. The completed 8438 sample households in 2011, for example, are located in 320 communities in 80 counties, both rural and urban, all across 25 provinces (Gan et al. 2013). The second survey was conducted in 2013, in which the sample households

increase to 27775, locating in 1048 communities in 262 counties across 29 provinces. The CHFS focuses on the household data including household assets, financial assets, debts, income, demographic characteristics and so on. The survey is continuously carried out in 2015, one time every two year to make a panel data set, with an overall refusal rate of 11.6%, which is relatively low compared to similar data set like CHIP, CGSS or SCF. In this paper, we use the CHFS data in 2011 and 2013, covering totally 36213 sample households.

Table 1 depicts the households' stock-market participation rate respectively in 2011 and 2013 calculated from the CHFS data. The Overall participation rate of 2011, 2013 are 8.8% and 8.1% respectively. In both 2011 and 2013, there are drastic appreciations of participation rate with wealth, which is indicated by total assets, going from 1.1% in the first quantile of the wealth distribution to 21.9% in the fourth quantile of the wealth distribution in 2013, for example. The stock-market participation didn't increase with the time passing probably due to the bear market in 2013. An interesting fact is that though high-income families were intimidated by the depressing climate, there were a bigger proportion of low-income families that participated in the stock market in 2013 than 2011, probably due to the lack of timely information or overconfidence held by low-income family. The following analysis will separate the data into different categories in order to show the possible relationship between stock-market participation and some of its determinants.

Table 1: Stock market participation rate in 2011 and 2013

	2011	2013
All household	8.8%	8.1%
The 1st wealth quantile	0.7%	1.1%
The 2nd wealth quantile	1.8%	2.5%
The 3rd wealth quantile	7.2%	6.8%
The 4th wealth quantile	25.5%	21.9%
Top 5%	43.8%	34.1%

Figure 1 shows the different stock-market participation rates among different cities by wealth quantiles. The cities are divided into three categories: the first-tier, the

6

second-tier and the others. The first-tier cities include Beijing, Shanghai, Guangzhou and Shenzhen, while the second tier cities include 33 cities like Changchun, Dalian, Nanjing, Chongqing and etc. In both 2011 and 2013, households in the first-tier cities were much more likely to participate in the equity market, as can be seen from Figure 1 clearly.
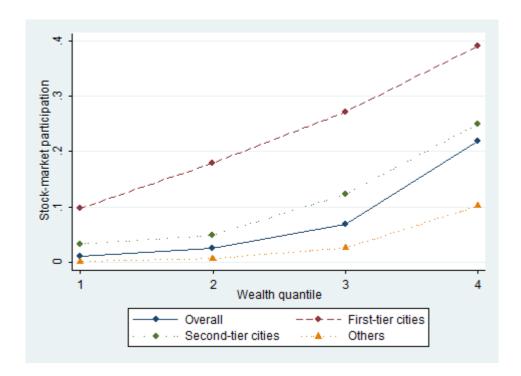

Figure 1: stock-market participation rate and city tiers

Figure 2 shows the stock-market participation rates of households with different numbers of houses, through which the fact that households with more than one house have apparently a much bigger chance to participate in the stock market than those with at most one house. But whether or not the effect of number of real estates will stay positive after controlling wealth and house price remains unsolved. These raw results from the figures indicate a likely relationship between real-estate asset and stock market participation, since residents of first-tier cities with higher house prices seem to be more likely to participate in the stock market and the number of houses also have much to do with the stock-market decision.
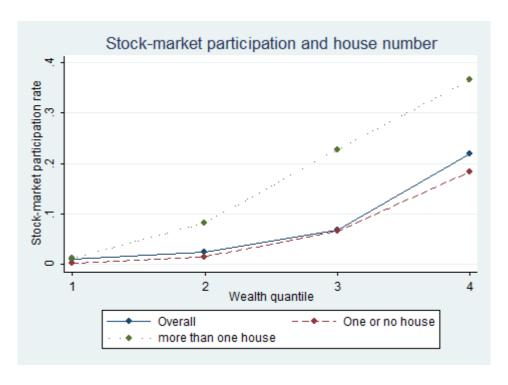
Figure 2: stock-market participation and house number

3.2 Model and variables

In regard of the effect of house price on equity investment decisions, the CHFS data including much individual and household information on real estate and financial asset provides us very specific and valuable resources for the analysis. To specify the corresponding regression models, the dependent variable and the main independent variable are of most important. For stock market participation decision, a dummy variable of stock market participation is created according to the relevant question 'Does your family have any stock accounts?' in CHFS questionnaires and used as the dependent variable. The Probit model will be adopted to estimate the effect and OLS as the benchmarks. For stock market participation depths of households that have already got involved in the market, two measuresare the total asset in stock market and the ratio of stock asset to total asset are used as the dependent variables and the OLS and Tobit model will be chosen to undertake the estimation. . For all the models, the most important independent variable in this study is the macro house price of the city that each household lives in, measured by 10 thousand yuan per meter squared. Micro house price, referring to the total house asset owned by households, will be used in the robustness test.

The covariates include education, income, marital status, age and so on which could be collected from the CHFS data. A dummy for rural residents are included according to the information investigated on place of residence. The household variable of education, income, marital status and age are taken to be the equivalents of the head of each household. More specifically, education level is measured by a concrete variable. Number 1 is used to indicate none education received while 9 stands for PHD and above. Other important determinants of household stock market participation that have already been studied upon are also included. For social interaction with neighbours and others, the questionnaires include relevant questions on transfer expenditures like receiving and giving money on weddings and funerals to measure households' social interaction, both with family members and others. The background risk factors involve self-employment, which is measured by a dummy created according to the question 'Last year, did your family engage in any industrial or commercial projects?' As to personal traits, risk aversion is estimated by the question of 'Assume you have some assets to invest, which type of project would you invest in?' and number 1 stands for low risk aversion favouring high risks and high return, while 5 stands for the opposite. A subjective measure of exposure to financial information is also carried out in 2013, corresponding to the question 'To what extent are you concerned with financial information?' while number 1 stands for 'considerably so' and 5 for never. The indicator of use of Internet is also limited to a one-year data, since the question 'What is the major path for you to get information,' including the answer of 'Internet', wasn't available in data of 2013.

Table 2: Descriptive statistics of continuous variables

	2011					2013				
	stock-total asset ratio	stock asset	house price	house asset	house area	stock-total asset ratio	stock asset	house price	house asset	house area
mean	12.6%	13.9	0.56	48.3	153.8	11.2%	12.7	0.7	55.8	165.4
median	5.3%	5	0.38	17	115	4.3%	4.2	0.5	25	117
25%	2.1%	1.9	0.277	6.2	78	1.5%	1.3	0.38	9	78
75%	14.5%	14	0.68	45	200	11.5%	11	0.8	60	200
95%	51.7%	50.6	1.55	200	360	50.9%	50	1.71	225	425

Notes: stock-total asset ratio and stock asset are limited to those families involved in the stock market while house asset and house area are limited to those who own houses. House price indicates the macro house price of the cities where the household live. Stock asset and house asset are measured by ten thousand RMB. House price is measured by ten thousand RMB per square meter. House area is measured by squared meter.

Table 2 shows the descriptive statistics of the main continuous variables used in this paper, including stock asset and stock-total asset ratio among those households that own stocks, along with macro house price, house asset and house area. The mean stock-total asset ratio among those that have already been involved in the stock market decreased from 12.6% in 2011 to 11.2% in 2013, and stock asset decreased from 139 thousand RMB to 127 thousand RMB, while the mean value of house asset increased from 483 thousand to 558 thousand among those who own real estates. The table also depicts the overall picture of housing and stock-market participation by showing the quantiles of each variable.

4. Empirical results

4.1 The effect of house price on the stock-market participation
Table 3 shows the estimated effect of house price on the dummy variable of whether or not to participate in the stock market. The columns (1) to (4) are estimated by OLS and (5) to (8) are measured by Probit model. Column (1) and (5) report the baseline estimation in which the wealth is not controlled. Following Hong and et al. (2004), four dummies corresponding to the second, third, fourth and fifth wealth quintiles are included later in columns (2) and (6). In column (3) and (7), the wealth indicator is modified to be 19 wealth quantile dummies, rather than 4 dummies. In column (4) and (8), more variables like marital status, party member dummy and self-employment dummy (dummy variables) are included, and the social interaction indicator is also included, measured by the transfer expenditures like receiving and giving money on weddings and funerals. Year and provincial effects are all controlled.

As can be seen from the Table 3, both estimation methods show the similar result that house price has a significantly positive effect on the decision of stock-market

participation. Under the Probit estimation, column (5) suggests that with an increase of one thousand yuan per meter squared in macro house price, the possibility of stock-market participation is expected to increase by 5.41%, controlling for most other variables except for wealth. And this estimated effect declines to 4.14% after controlling for the 4 wealth quantile dummies and 3.35% after controlling for the 19 wealth quantile dummies. The OLS estimation leads to a similar result, despite the fact that the estimated effect stops declining after controlling other variables such as the social interaction indicator. The decline of estimated effect of house price after controlling for the wealth indicators suggests that the increase of macro house may contribute to higher stock-market participation rate by wealth accumulation. The higher house price get, the more wealthy most family will be and the less likely they are going to be faced with severe financial burden. It's also necessary to mention that after the wealth indicators and most relevant variables are controlled, the estimated positive effect of house price stays significant both economically and statistically, which indicates a possible unobservable path through which the increase of house price may spur stock-market participation, besides by the accumulation of wealth.

The coefficients of other variables in Table 3 are worth explaining and being compared to existing literature. Risk aversion indicator has a significantly negative marginal effect as expected, staying approximately the same controlling for more variables. The significant inverted U effect of age is observed, peaking at approximately 65 years old for the head according to the Probit model. The estimated effect of the dummy for year 2013 is significantly negative in all the columns, which indicates a large-scale escape from the stock-market due to the devastating financial climate, consistent with the results shown in table 1 in the data section.

Table 3: The estimated effect of house price on the stock-market participation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS				Probit			
House price	0.144***	0.104***	0.075***	0.071***	0.541***	0.414***	0.335***	0.284***
	(0.017)	(0.017)	(0.017)	(0.022)	(0.081)	(0.084)	(0.087)	(0.104)
Ln(income)	0.021***	0.011**	0.008	0.007	0.070***	0.015	0.007	-0.001
	(0.005)	(0.005)	(0.005)	(0.006)	(0.025)	(0.025)	(0.025）	(0.031）
Age	0.028***	0.024***	0.022***	0.026***	0.165***	0.139***	0.136***	0.144***
	(0.003)	(0.003）	(0.003）	(0.004）	(0.016)	(0.016）	(0.017）	(0.021）
Age squared	-0.000***	-0.000***	-0.000***	-0.000***	-0.002***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	0.048***	0.035***	0.033***	0.033***	0.247***	0.188***	0.181***	0.170***
	(0.002)	-0.003	-0.003	-0.003	(0.013)	-0.014	-0.014	-0.018
Risk aversion	-0.043***	-0.039***	-0.038***	-0.045***	-0.215	-0.208***	-0.206***	-0.224***
	(0.003)	(0.003）	(0.003）	(0.004）	(0.016)	(0.016）	(0.017）	(0.02）
year 2013	-0.033***	-0.040***	-0.040***	-0.042***	-0.140***	-0.196***	-0.196***	-0.198***
	(0.010)	(0.01）	(0.01）	(0.012）	(0.050)	(0.051）	(0.051）	(0.059）
2nd wealth quintile		0.014				0.254**		
		(0.014）				(0.118）		

12

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
3rd wealth quantile		0.012				0.363***		
		(0.014）				(0.11）		
4th wealth quantile		0.075***				0.801***		
		(0.013）				(0.102）		
5th wealth quantile		0.178***				1.082***		
		(0.014）				(0.102）		
province dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
19 wealth quantile dummies	No	No	Yes	Yes	No	No	Yes	Yes
More controlled variables	No	No	No	Yes	No	No	No	Yes

Notes: Independent variables include: macro house price of cities ('House price,' measured by ten thousand RMB per square meter), the log of income of the households' head ('Ln(income)'), age and age squared, an education indicator ('Education,' a discrete variable, taking on the number 1 for those households with heads who 'Never attended school' and 9 for 'PHD'), a risk-aversion indicator('Risk aversion,' estimated by the question of 'Assume you have some assets to invest, which type of project would you invest in?', and number 1 stands for low risk aversion favouring high risks and high return, while 5 stands for the opposite.) Other controlled variables are not shown in the table.

Education has a significantly positive effect on stock-market participation, just the same as argued by Bertaut and Starr-McCluer. (2000). The education indicator has been tried as a dummy variable that indicates whether the head of the household had received college or above education. The estimation suggests that the marginal effect of households' heads owning college or above degrees is 21.6 percent under Probit estimation and 25.7 percent under OLS estimation (not shown). Besides, as mentioned in the data section, the measure of financial information availability and the availability of Internet is limited to data in 2011 and 2013 respectively, so in the regressions of Internet availability, the data in 2011 are used, while in the regressions of financial information, those of 2013 are used. The estimated marginal effects of Internet availability under OLS and Probit estimation are 0.107 and 0.481, while the estimated marginal effects of financial information are 0.056 and 0.264, all significant at the one percent level (not shown).

Table 4 shows the effect of house price on stock-market participation with the existence of house area under OLS and Probit estimation. The investment in real estate may also have a negative effect for the reason argued by previous studies that with the increase of real-estate asset, less money is left for equity market. In order to have a deeper insight, 4 dummies of total area quantiles of each household's real estate and the total area of each household's real estates will be incorporated into the regression respectively. The sample is limited to the households that own real estate, while wealth, income, age, risk aversion, social interaction indicator and other effects are all controlled as former discussions. The table shows that the larger the area of real estates that a certain household owns, the bigger the positive effect of house price on stock-market participation gets. The estimated effects of the dummy of the 5th house area dummy (not shown) are -4.8% and -3.2% under OLS and Probit estimations, both significant at the 1% level. According to column (3) and (4), the results show that the marginal effects of total house area are all significantly negative, which are -0.007 and -0.059 respectively under OLS and Probit estimation, and before adding the interaction of house price and total house area, the effect of house price stays significantly positive. This also suggests that controlling house price, the more real estates a certain household owns, the less likely they are to invest in the stock market, since most of their assets are real estate assets. The interaction of total house

area and macro house price has a significantly positive effect on households' choice to participate in the stock market, which is consistent with the hypothesis that with the appreciation of house price, households with more real estates will benefit more or be more confident about their assets and therefore are more active in financial investment.

Table 4: Effect of house price and house area on stock-market participation decision

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	Probit	OLS	Probit	OLS	Probit
House price	0.098***	0.284***	0.102***	0.315***	0.074***	0.024
	(0.023)	(0.105)	(0.023)	(0.105)	(0.027)	(0.133)
Four house area dummies	Yes	Yes	No	No	No	No
House area			-0.007*	-0.059**	-0.018***	-0.213***
			(0.004)	(0.024)	(0.007)	(0.051)
House area					0.017*	0.176***
*House price					(0.009)	(0.049)

Notes: The columns (1) and (2) control for the four house area dummies and the others control for the continuous house-area variable. Other variables like wealth, income, age, risk aversion, social interaction indicator and so on are controlled, the same as column (4) and (8) in Table 3.

The next problem focuses on households without real estates, as the extreme of households with little housing asset. Since the appreciation of house price may even aggravate the burden of households that own no real estate and are willing to have one, which is quite common in China, the increase of house price makes it even less possible for them to participate in the stock market. Households with no real estates are divided from the whole database in order to test this hypothesis. Table 5 shows the estimated effects of the house price on stock-market participation among those families without houses. The results show that the estimated effects of macro house price on stock-market participation, none of which is significant, are all negative within these households. It is apparent that the estimation of the effect of house price is negative now, though not necessarily significant, while the estimated effects of the other variables stay the same sign, despite these of the indicator of income and the dummy variable of year 2013. This result is also consistent with the hypothesis that

households with no houses are either immune to the change of house price or less likely to participate in the stock market with the increase of house price.

Table 5: Estimated effects among households without real estates

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS			Probit		
House price	-0.118	-0.119	-0.133	-0.404	-0.549	-0.766
	(0.081)	(0.080)	(0.081)	(0.441)	(0.439)	(0.469)

Notes: The controlled variables are the same as those in the columns (2), (3), (4), (6), (7), (8) in Table 3. The effects without controlling for wealth are also not significant (not shown).

In order to show how house prices influence those outside the stock market, the question 'Why doesn't your family have stock account?' available in the questionnaire is used to create dependent variables. The following discussion is limited to those who don't participate in the stock market. Variables created include 'Limited funds', 'Return too low', 'Cumbersome procedure' and 'Lost money before'. For instance, 'Limited funds' is a discrete variable taking on the value 1 if the household chose the answer 'Limited funds' in response to the mentioned question and 0 otherwise. Table 6 shows the effect of house price and income on the dependent varibles of reasons not to participate in the stock market by using OLS estimation. Columns (1) to (8) are limited to those with housing, while columns (9) to (12) are limited to those without housing. In columns (1) to (4) and (9) to (12), the effect of wealth is not controlled, and the results of households without housing after controlling for wealth effect are not shown in the table since they are approximately the same as those of columns (9) to (12). The variables 'Cumbersome procedure' and 'Lost money previously' are included to show the robustness of the results, since the results show that house price and income are not likely to influence them, consistent with intuition.

For those who own real estate, the higher the macro house price becomes, the less likely households who don't participate in the stock market make the choice of 'Limited funds' and the more likely they will choose the reason that the return from equity market is too low. Therefore, with the increase of house price, the obstacle in front of non-stock-market investors varies from limited funds to low returns, which

may mainly be explained by the appealing return in the equity market. But as discussed in the previous section, the overall effect of house price is positive. Besides, macro house prices seem to have little to do with the reasons of cumbersome procedures and previous loss in the stock market, which is consistent with intuition. With the increase of income, the barrier of funds is also of less importance, but the expectation of return doesn't really change.

Furthermore, after controlling for the wealth quantile dummies, the estimation of the effect of house price on the reason of 'Limited funds' is no longer significant, which is consistent with previous discussion that the increase of house price will lead to the accumulation of wealth and will be followed by less financial burden. On the other hand, the reason why those households with no real estates choose not participate in the stock market seems to have nothing to do with house price, whether or not controlling for wealth. (The results after controlling for wealth are not shown since similarly, they are all not significant.) Lastly, the estimated effect of house price on the reason 'Returns too low ' is significantly negative both before and after controlling for wealth effect, which indicates that the increase of house price may induce households to invest in the real-estate market, since the return of housing investment is seemingly higher due to the high house price. The effect of house price is thus different than that of housing itself.

In a word, the estimated effect of house price on the reason of 'Limited funds' is significantly negative before controlling for the wealth effect and not significant anymore afterwards, which is consistent with the story that house price affects the stock-market participation by wealth accumulation, while the effect of house price on the reason of 'Returns too low' is significant both before and after controlling for the 19 wealth dummies. The effects of income are also included for the test of robustness, and the results are consistent with intuition.

Table 6: How house price influence the dependent variables of reasons not to participate in the stock market

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Households with housing								Households without housing			
	Not controlling for wealth				Controlling for wealth				Not controlling for wealth			
	Limited funds	Returns too low	Cumbersome procedure	Lost money previously	Limited funds	Returns too low	Cumbersome procedure	Lost money previously	Limited funds	Returns too low	Cumbersome procedure	Lost money previously
Houseprice	-0.074**	0.017*	0.002	0.021	-0.035	0.017*	-0.001	0.015	0.025	0.02	-0.043	-0.006
	(0.035)	(0.010)	(0.011)	(0.013)	(0.036)	(0.010)	(0.011)	(0.013)	(0.081)	(0.026)	(0.034)	(0.031)
Ln(income)	-0.045***	0.001	0.002	0	-0.038***	0.001	0.001	-0.001	-0.068***	0.006	0.020**	0.014*
	(0.009)	(0.003)	(0.003)	(0.003)	(0.009)	(0.003)	(0.003)	(0.003)	(0.022)	(0.007)	(0.009)	(0.008)

4.2 The effect of house price on the participation depths in the stock market

Besides the effect of house price on the decision to invest in the stock market investigated firstly, another intriguing problem is the effect of house price on the participation depths in the stock market among households that have already been involved. Two measures of the participation depths in the stock market are considered: stock asset to total asset ratio and absolute stock asset. Table 7 shows the OLS and Tobit estimation of the effects of macro house price on the depths variables of absolute stock asset and stock-market asset relative to the household's total asset. The controlled variables are almost the same as those in Table 3, including the wealth effect, income, age and age squared, education level, a year dummy, marital status, a social-interaction indicator, a risk-aversion indicator, a party-member dummy, a self-employment dummy and so on.

Table 7: The effect of house price on stock-market choices

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Stock-total asset ratio				Stock asset			
	OLS		Tobit		OLS		Tobit	
House price	-0.024***	-0.026**	-0.023**	-0.023**	-6.946***	-6.856**	-6.465**	-5.769*
	(0.009)	(0.01)	(0.01)	(0.011)	(2.656)	(3.012)	(2.878)	(3.271)
Region	No	Yes	No	Yes	No	Yes	No	Yes

Notes: stock asset is measured by ten thousand RMB.

Despite the fact that the effect of house price on the stock-market participation decision is significantly positive within the whole sample, this new result shows that the appreciation of house price has a negative effect on the stock asset holdings of households already involved, which is probably due to the fact that with higher house price, households are more likely to invest in the real-estate market and therefore reduce their investment in the equity market. Furthermore, the result stays strong and almost the same, controlling regional effects, with estimated marginal effect of approximately -2.5% for the relative asset and -6.9 for the absolute one, which suggests that with an increase of one thousand RMB per square meter, the stock-total

asset ratio is expected to decrease by 0.23%（1.83% of the mean stock-total asset ratio）and absolute stock asset is expected to decrease by 5.8 thousand RMB (4.17% of the mean stock asset). Other measures of stock asset are also considered, including the ratio of stock asset to financial asset. The result (not shown) isn't significant as expected mainly due to house price's lack of influence on the decision made in the financial asset.

Figure 3 shows the quantile regression results of house price on the stock-market participation depths in order to find the different effects of house price on stock-market participation among households with different proportions of stock asset. The estimated effects of house price on the ratio of stock market asset to total asset are -0.002, -0.007, -0.02 and -0.03 respectively at 0.2, 0.4, 0.6, 0.8 quantiles. Therefore, the negative effect of house price on participation depths is expected to get more intense with the increase of stock market participation. Furthermore, the Breusch-Pagan test statistics are significantly different than zero, which indicates the heteroscedasticity and justify the use of the quantile regression. In a word, the quantile regression tells us that the negative effect gets more intense with the increase of stock market participation depths.
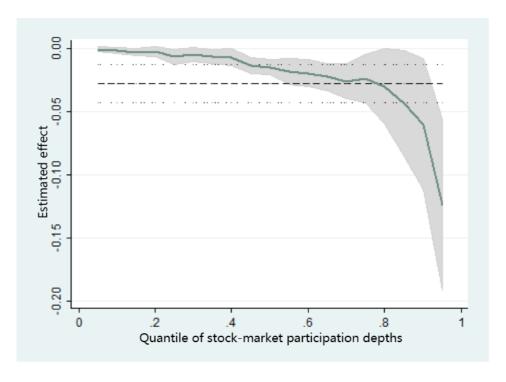
Figure 3: Quantile regression of house price on the stock-market participation depths

4.4 The robust test

The most important problem then is that the observed relations between house price and household stock-stock market and its depts may reflect a considerable number of unobservable influences that lead to spurious estimation even after controlling for most observable variables. Intuitively, since the households are not randomly assigned with macro house price, it's reasonable to doubt that the estimation shown in the previous sections are actually biased. Due to this endogeneity in this equation caused by unobservable factors that may contribute to the change of house price and the decision to participate in the stock market, one might argue that the coefficients doesn't account for the real effect itself. Therefore we try to solve this problem by firstly using instrumental variables, which is the average house price of the closest four cities of the location of each specific household. For example, if one household lives in Shanghai, the corresponding instrumental variable will be set as the average macro house price of Suzhou, Jiaxing, Nantong and Wuxi. The instrumental variable is considered effective because clearly it is very likely to be correlated with the local house price and, furthermore, since it's the average of house prices of provinces that have little to do with the investigated households, the IV is unlikely to be correlated with the households' decisions choices anywhere.

Table 8 shows the regression results using the instrumental variable under different estimation method and dependent variables. The controlled variables are the same as their counterparts in the previous discussion after controlling for the wealth effect. The OLS estimated coefficient suggests that a one thousand RMB appreciation in the macro house price increases the probability that one will participate in the stock market by 2.7 percentage points. The estimated marginal effect of house price under Probit estimation is 0.979, both with the OLS estimation, are all higher than the baseline estimation. In these regressions, variables controlled include income, wealth, age, education, social interaction indicator and etc. Both fixed time and provincial effects are included as well. Table 8 also shows the estimated effects of house price on stock market asset holding, using the instrumental variable, which suggests that with a one thousand RMB appreciation in house price, the ratio of stock asset to total asset will decrease by 0.56% and absolute stock asset will decrease by 24 thousand RMB. The corresponding estimated marginal effects under Tobit regression are also

significantly -0.041 and -21.088.

Table 8 Regression using the instrumental variable

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	Probit	OLS	Tobit	OLS	Tobit
	Decision	Decision	Stock-total asset ratio	Stock-total asset ratio	Stock asset	Stock asset
House price	0.274**	0.979*	-0.056**	-0.041**	-24.743*	-21.088*
	(0.12)	(0.537)	(0.024)	(0.02)	(14.973)	(12.537)

Furthermore, we undertake the second robust test by replace macro house price with the micro price level indexed by the total real-estate assets available in the CHFS data in the previous regressions (not shown as table). The results are significantly consistent with the previous results. The tables suggest that with a one million rise in household's real-estate asset, the possibility that the household will choose to participate in the stock market is expected to increase 3.3 percent according to the OLS estimation. Among these who are already involved in the stock market, each one hundred thousand rise in real-estate asset will contribute to a 7.4 thousand RMB (5.3% of the mean stock asset) decrease in the absolute stock asset and 0.31% (2.5% of the mean stock-total asset ratio) decline in the stock to total asset ratio. The robust tests justify our results in this study.

5. Conclusion

The analyses based on the unique CHFS data in this study conclude that the macro house price has both statistically and economically significant effect on the households' stock-market participation decision and their depths in the stock market. With the increase of one thousand RMB per square meter in macro house price, the probability that each household in that city to participate in the stock market will increase by 5.4% before controlling for wealth effect and 2.84% afterwards (indicating the existence of wealth effect within the effect of house price), the stock-total asset ratio is expected to decrease by 0.23%（1.83% of the mean stock-total asset ratio）and absolute stock asset is expected to decrease by 5.8 thousand RMB

(4.17% of the mean stock asset). Generally, though the increase of house price will motive those who haven't entered the stock market to participate in it, it's actually pulling back those who have already been involved and letting them invest less in the stock market.

For the effect on the stock-market participation depths, the negative effect of house price will get even more intense with the increase of the area of self-owned housing, while the effect of house price on the decision whether or not to participate in the stock market among those who own no housing is insignificantly negative. Furthermore, the increase of house price will decrease the possibility of not participating in the stock market due to the reason of 'Limited funds' and will increase that due to the reason of 'Returns too low', for those who don't participate in the stock market, and the controlling of wealth will make the former one not significant anymore, also indicating the effect of wealth. On the other hand, for the effect on the participation depths in the stock market, the effect on stock-total asset ratio is more intense among those with high stock-total asset ratio, according to the quantile regression. The robustness test using IV and Micro house asset show the similar results as those in the previous discussions.

An explanation for our results is that with the increase of house price, households in China may have a bigger opportunity to participate in the stock market, partially because of the accumulation of wealth and the decrease of the barrier to participation (maybe most of them just have a stock account or a little investment in the stock market), while the higher the house price is, the more likely these households who have already been involved in the stock market will decrease their investment, probably due to the high returns in the housing market (most of them are still participating in the stock market, just investing less). We believe that the effect of house price, independent from housing, can partially explain the influence of real estate from a different direction and has important meanings under the context of the housing boom and relatively low stock-market participation rate in China, as discussed in the previous sections, but since the complicated nature of the portfolio choices and the relatively narrow entry point of our research, the problem like the effect of house price on the overall portfolio choice remains to be studied upon.

References

Aizcorbe, Ana M., Arthur B. Kennickell and Kevin B. Moore (2003), 'Recent changes in U.S. family finances: Evidence from 1998 and 2001 Survey of Consumer Finances', Federal Reserve Bulletin 89, 1-32.

Bertaut, C. and M. Starr-McCluer, 'Household Portfolios in the United States,' Household Portfolio, ed. by L. Guiso, M. Haliassos, and T. Jappelli. MIT Press, Cambridge, 2000.

Brown, J. R., Z. Ivković, P. Smith and S. Weisbenner (2008), 'Neighbors Matter: Causal Community Effects and Stock Market Participation,' Journal of Finance, 63(3), 1509-1531.

Chetty, R. and Sandor, L. (2016), 'The effect of housing on portofio choice', NBER Working Paper No. 15998

Cocco, J. (2005), 'Portfolio Choice in the Presence of Housing,' Review of Financial Studies 18, 535-567.

Fang, Hamming, Quanlin Gu, Wei Xiong and Li-An Zhou (2015), 'Demystifying the Chinese Housing Boom', NBER Working Paper 21112

Faig, M. and P. M. Shum (2002), 'Portfolio choice in the presence of personal illiquid projects', Journal of Finance 57, 303-328.

Faig, M. and P. M. Shum (2006), 'What explains household stock holdings', Journal of Banking and Finance 30, 2579-2597.

Flavin, M. and Yamashita, T. (2002), 'Owner-Occupied Housing and the Composition of the Household Portfolio,' American Economic Review, 92(1): 345-362.

Gan, Li, Zhichao Yin, Nan Jia, Shu Xu, and Shuang Ma. (2013), 'Household Assets and Household Demand for Housing in China.' Journal of Financial Research, No 4, 2013.

Guiso, L., P. Sapienza and L. Zingales (2004), 'The Role of Social Capital in Financial Development,' The American Economic Review: 94(3), 526-556(31)

Rosen, Harvey S. (2004), 'Public Finance,' The Encyclopedia of Public Choice: 252-262.

Heaton, John and Deborah Lucas (2000a), 'Portfolio choice and asset prices: The importance of enterpreneurial risk', Journal of Finance 55, 1163-1198.

Heaton J. and Lucas, D.J. (2000b), 'Portfolio Choice in the Presence of Background Risk,' Economic Journal 110(460): 1-26.

Hong, Harrison, Jeffrey D. Kubik, and Jeremy Stein (2004), 'Social interaction and stock-market participation', *Journal of Finance* 59, 137–163.

Jiang, C., Ma, Y. and An, Y. (2009), 'An analysis of portfolio selection with background risk,' Journal of Banking & Finance, 2009, 34(12): 3055-3060.

Markowitz, H. (1952), 'Portolio Selection,' the Journal of Finance, Volume 7, Issue 1, March 1952, Pages 77-91

McCarthy, D. (2004), 'Household Portfolio Allocation: A Review of the Literature,' Journal of Economic Literature.

Mehra, R. , E.C. Prescott (1985), 'The equity premium: A puzzle', Journal of monetary Economics 15 (2), 145-161

Merton, R. C. (1969), 'Lifetime Portfolio Selection Under Uncertainty: The Continuous Time Case,' Review of Economics and Statistics 51, 247-257.

Poterba, J. M., and A. A. Samwick (1997), 'Household Portfolio Allocation over the Life Cycle,' NBER Working Paper, 6185.

Poterba, James M. and Andrew A. Samwick (2002), 'Taxation and household portfolio composition: US evidence from the 1980s and 1990s', Journal of Public Economics, 87, 5-38.

Samuelson, P. A. (1969) 'Lifetime Portfolio Selection by Dynamic Stochastic Programming,' Review of Economics and Statistics, 51, 239–246.

Vissing-Jorgensen, A. (2002), 'Towards an Explanation of Household Portfolio Choice Heterogeneity: Nonfinancial Income and Participation Cost Structures,' working paper, Northwestern University.

Wu Weixing, Yi Jinran and Zhe Jianming (2010), 'Empirical Analysis on the Effects of Life Cycle, Wealth and House,' Economic Research Journal, 2010, s1.

Yamashita, T. (2003), 'Owner-Occupied Housing and Investment in Stocks: An Empirical Test,' Journal of Urban Economics, 53(2): 220-237.

Yin, Zhichao, Yu Wu, and Li Gan (2015), 'Financial Availability, Financial Market Participation and Household Portfolio Choice," Economic Research Journal, 3, 2015.

Yin Zhichao, Song Quanyun, and Wu Yu (2014), 'Financial Literacy, Trading Experience and Household Portfolio Choice," Economic Research Journal, 4, 2014.

Zhu Guangwei, Du Zaichao and Zhanglin (2014), 'Guanxi Stock-market Participation and Stock Return,' Economic Research Journal, 11, 2014.

SFB 649 Discussion Paper Series 2016

For a complete list of Discussion Papers published by the SFB 649, please visit http://sfb649.wiwi.hu-berlin.de.

SFB 649 Discussion Paper Series 2016

SFB 649 Discussion Paper Series 2016

For a complete list of Discussion Papers published by the SFB 649, please visit http://sfb649.wiwi.hu-berlin.de.