UNIVERSITA' DEGLI STUDI DI PADOVA

DIPARTIMENTO DI SCIENZE ECONOMICHE ED AZIENDALI "M.FANNO"

CORSO DI LAUREA MAGISTRALE IN ECONOMICS AND FINANCE

TESI DI LAUREA

"THE STOCK MARKET PARTICIPATION PUZZLE IN CHINA"

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ANNO ACCADEMICO 2019 – 2020

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Abstract

This thesis investigates the portfolio choice of Chinese urban households by employing data from the China Household Finance Survey (CHFS), with a focus on stock market participation. We start by documenting the participation rate for different assets. The majority of households is the owner of primary residence, while only a few participate in the stock market or hold risky assets. In order to explain the participation puzzle, first, we perform a descriptive analysis showing the relation between household financial resources, personal characteristics, and participation rate. Then, we conduct a two-stage regression analysis using the Heckman procedure, considering access to the internet as the variable affecting participation but not risky assets share. Coherently with the literature and theoretical predictions, wealthy, well-educated, risk-tolerant, higher trust, well financially informed households are more likely to invest in risky assets as the first probit results show. The second stage results find evidence that once households have participated in the stock market, trust level, education, housing wealth and income do not affect the financial assets share invested in stocks, while wealthy, risk-tolerant households hold a higher share of stocks in own financial portfolio.

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1. Introduction

Over the last 30 years, the compositions of household wealth in China have been dominated by housing and fixed bank deposits. The typical urban household is the owner of the primary residence and allocates 70-75% of total wealth to real estate and 10-15% to the bank deposit and cash. The majority of Chinese household does not participate in the stock market directly or indirectly through mutual funds. Therefore, the effective participation in the stock market is only drawn by less than 20% of households, which is typically composed of the upper class of the population, relatively well educated, less averse to the risk, and more confident toward others. These characteristics are quite similar to European stockholders. (Guiso, Haliassos and Jappelli, 2003).

In this regard, the Shanghai stock exchange composite index, known as the national representative index, has doubled its value in the last 20 years. Therefore, refraining from participating in the stock market is sub-optimal in achieving economic benefits. In fact, the classical theory of portfolio choice predicts that in presence of a positive equity premium, all households should participate in the market through a well-diversified financial portfolio, which includes all risky assets. Additionally, the theory states that all investors should hold the same financial portfolio with the same asset composition, where the latter differs only in terms of share of each risky asset and according to their tolerance to the risk. However, practice does not always match theory. In fact, the current trend shows that the financial market is composed of a small fraction of households that hold very different portfolios. In the literature, this gap between theoretical predictions and empirical evidence is referred to as the stock market participation puzzle, which was first introduced and analyzed by Haliassos and Bertaut (1995).

Afterward, many different factors have been considered to explain the puzzle. The participation cost is the first relevant explanation. In the financial markets with frictions, fixed entry cost, per-period participation cost, and trading cost are unavoidable costs that investors have to pay to invest in the stock market. A rational investor will not invest in stocks if such

costs are higher than the expected benefits. Starting from this assumption, Vissing-Jørgensen (2004) shows that fixed costs determine a wealth threshold below which it is not optimal to invest in stocks. In particular, concerning urban households in China, a cost of only 316 yuan explains the decision of half of the non-participants in 2017. Hence, fixed costs can explain the strong correlation between stock market participation and financial wealth. Nevertheless, this theory does not fully resolve the puzzle since even at the very upper tail of wealth, only a fraction of households hold risky assets.

Based on the aforementioned observations, this thesis investigates the stock market participation puzzle in China providing empirical evidence. In particular, this thesis follows closely Guiso, Haliassos, and Jappelli (2003) paper's methodology but applies to an interesting and representative microdata in China. To the best of the author's knowledge, this thesis is the only study which focuses on the Chinese urban household stock market participation determinants, as an empirical supplement to the theory of household portfolio choices. This thesis is based on the unique and exhaustive data collected in the 2017 China Household Finance Survey (CHFS) which is introduced in section 3. First, this thesis provides a generic descriptive analysis, showing that the participation rate is correlated with education, wealth, income, and presents a hump shape over the life cycle of urban households. Second, this thesis studies the stock holding puzzle in China, quantifying the fixed costs with parameters derived from the Chinese stock market and CHFS data. Third, this study shows the key factors which determine significantly the participation rate using the probit analysis. Unsurprisingly, education, wealth, income, age, trust, and risk attitude appear again to be determinant. Furthermore, the effect of homeownership is controversial: being a homeowner has a strong negative impact on the participation rate, showing the crowding-out effect; meanwhile, having more than one house (multi-home ownership) encourages participation in the stock market and the participation rate is positively correlated with housing wealth. The different effect is probably due to the different function of housing. In general, the first house is considered a good of necessity, households have to withdraw cash from bank and stock account to meet down payment requirements. Purchasing a second and third house is often a pure investment decision. Thus, investors tend to hold a more diversified portfolio.

The remainder of the thesis is organized as follows: Section 2 presents a brief literature review. Section 3 introduces the CHFS 2017 microdata. Section 4 compares the main assets returns with a focus on stocks and houses. Section 5 presents descriptive statistics of household asset participation rate and household asset composition over time. Section 6 briefly describes the participation principle predicted by standard portfolio theory and introduces the fixed cost explanation. Section 7 empirically examines the participation determinants. Section 8 concludes.

2. Literature review

Starting from the '90s, households' financial portfolio choice has been drawing researchers' interest. Since then, a large literature has developed, focused on understanding the drivers of household financial decisions. Gollier (1999) summarized the classical theory concerning household portfolios. The standard theory of financial portfolio choice implies that all individuals should participate in the stock market and the share invested in stocks depends only on individual risk tolerance. Furthermore, investors' portfolios should be well-diversified and in the presence of a riskless asset, all investors should hold risky assets in the same proportion regardless of their risk preference.

Clearly, these implications fail in reality. Using the data from the China Household Finance Survey, Yang and Gan (2020) report Chinese urban households' assets participation rate when they analyze the role of bequest motives in household portfolio choices and wealth inequality. In all three survey years (2011, 2013, 2015) the homeownership rate is very high, meanwhile, the stock market participation rate never reaches 20%. Using repeated cross-sectional and panel data drawn from the 1989–95 Bank of Italy Survey of Household Income and Wealth (SHIW), Guiso and Jappelli (2000) introduce a detailed panorama of the portfolio composition of Italian households and its evolution. The direct stock market participation rate of Italian households was merely 7% in 1998 and below 5% in the previous years. They extend their analysis on stock ownership among households in major European countries (France, Germany, Italy, the Netherlands, Sweden, and the UK) finding that there is an increase in stock market participation in all countries and there are persistent differences across countries, especially the US, UK, and Sweden have considerably more participation than France, Germany, Italy. In addition, there is a robust correlation between the participation decision, wealth, and education. In the end, their findings show that education and wealth have only a relatively small effect on the asset share invested in stocks, conditional on participation. Specifically, education, financial resources, and age are correlated: education level and income or wealth are notoriously positively correlated, while wealth and income vary in predictable ways with age, as implied by life cycle models of

consumption. Education has a positive and significant effect in all countries with a similar impact among the European countries, even allowing for differences in income and wealth. Moving from the third to the fourth quartile of financial wealth has a much stronger effect on the probability of becoming a stockholder than moving from the second to the third, and even stronger than moving from the first to the second. Moreover, the convex profile is more evident for financial wealth than for income. In all countries, education increases significantly the probability of entering the stock market either directly or indirectly. More educated households are not only more likely to have heard of stocks but also to learn easily about how to invest in stocks and to estimate more precisely the costs and benefits this entails. (Guiso, Haliassos and Jappelli, 2003)

The gap between theoretical predictions and empirical evidence is referred to in the literature as the stock market participation puzzle. Haliassos and Bertaut (1995) are the firsts to introduce and analyze the problem of the stock market participation puzzle. They investigate why the majority of United States households do not hold stocks despite the equity premium and predictions of expected-utility models. Their results show that indirect stockholding, the degree of risk aversion alone, heterogeneity of beliefs, habit persistence, or borrowing constraints in the form of a lower bound on wealth do not explain the phenomenon.

The standard theory of financial portfolio choice is based on the assumption of frictionless of the financial market. In the real financial market, investors face typically three types of transaction costs: (1) a pure entry cost which is a fixed cost to enter the stock market. (2) a per-period participation cost, due to the intermediary fee for investing in stocks. (3) a trading cost, trading commission for selling or buying an asset. Vissing-Jørgensen (2004) introduces and analyzes the theory of fixed costs. In her seminal contribution, she is able to show that if investors face a fixed cost to invest in the stock market, such cost would determine a wealth threshold below which investing is not optimal. Thus, fixed costs are able to explain the strong correlation between financial wealth and stock market participation. Empirical studies point to a significant structural dependence in the stock market entry decision, which is consistent with the fixed costs explanation. Alan (2006) estimates the magnitude of such costs, using an estimated model that matches the zero-median holding as well as the hump-shaped age–

participation profile observed in the data. The stock market entry cost is estimated to be 2.15 percent of the permanent component of annual labor income. Another relevant explanation of the stock holding puzzle is limited knowledge. In order to invest in a certain type of asset, an investor should be aware of the existence of that asset. Merton (1987) advanced the concept of limited awareness to explain the lack of diversification and portfolio heterogeneity across investors. If investors are aware of only a subset of the assets they cannot fully diversify, and they can be aware of different assets. A further explanation of the puzzle is focused on trust. Many households do not participate due to a lack of trust in the financial system. The correlation between trust and stock market participation has been emphasized by Guiso et al. (2008). They develop a theoretical model in which trust is considered as a subjective probability of being cheated in the stock market. Given fixed participation costs, a decrease in the level of trust increases the wealth threshold and decreases the optimal share upon investment. Hence, trust can explain the low participation rate of the wealthy, and at the same time, if it has changed during the years, it can also provide an explanation of the decline in the participation rate over the years. Guiso et al. (2008) show also that there is a high correlation between the level of trust measured by the World Value Survey and the participation rate observed at the country level. Thus, trust as a cultural factor can explain also the large difference in household risk-taking behavior in different countries.

The standard theory of financial portfolio choice ignores the opportunity of investment in real estate assets. Jordà et al. (2017) compute and compare the rate of return on housing, equity, bonds, bills, deposits, other financial and non-financial assets over the very long-run. They find that for 16 advanced countries, the real rates of return on equity and housing have been comparable. Housing asset has been presenting a higher Sharpe ratio than equity in all countries, due to the fact that the price volatility has been much lower. Flavin and Yamashita (2002) assert that owner-occupied housing is the single most important consumption good as well as the dominant asset in most household portfolios and it must be considered as both consumption and a risky asset. Englund et al. (2002) assert that there are substantial gains from policies or institutions that would permit households to hedge their investment in housing. Consequently, they argue that the low correlation between housing and other assets suggests that housing

should contribute to diversifying the portfolio and lowering risk. Standard tests of portfolio efficiency neglect the existence of illiquid wealth. Pelizzon and Weber (2008) conduct an analysis conditional on housing to test the efficiency of household portfolios. Efficient portfolios in periods of no adjustment are affected by housing price risk through a hedge term if housing stock adjustments are not frequent. Thus, household financial portfolio efficiency tests should be executed conditionally upon housing wealth. They find that housing wealth plays a key role in determining whether portfolios chosen by homeowners are efficient, using Italian household portfolio data, and time series on financial assets and housing stock returns. In another paper, Pelizzon and Weber (2009) studied the optimal portfolios when housing needs change over the life cycle. Sum of a standard Markowitz portfolio and a housing risk hedge term forms an efficient financial portfolio. The empirical results show that net housing plays a key role in determining which household portfolios are inefficient. The largest proportion of inefficient portfolios is obtained among those with positive net housing wealth, who should invest more in stocks and risky assets.

The housing asset is the most important component of household wealth. The first results of the 2011 China Household Finance Survey (CHFS) show that 89.7% of households own their residential properties in urban China. The homeownership rate is about 30% higher than the world average (Gan et al. 2012). In the literature, there are controversial conclusions about how the housing investment will affect the stock market participation rate in China. Huang (2010) developed a dynamic asset allocation model to study the relationship between homeownership and households' portfolio choice, including the housing rental market, housing adjustment costs, mortgage collateral borrowing requirement. The results show that the liquidity of housing wealth has a significant impact on the optimal portfolio choice of households. Furthermore, homeownership is hump-shaped in ages and homeowners tend to be more risk-averse in financial investment than renters who are not given a homeownership choice. Chen et al. (2019) conducted an empirical analysis with IV-Tobit models. Their results show that multiple-housing ownership significantly crowds out the proportion of risky financial assets held by urban Chinese households, which reflects the substitution effect and people's risk awareness with regard to real estate. Zou and Deng (2019) examined the effects of both financial literacy

and housing value on household financial market participation using data from the 2012 consumer finance survey in China. The results show that the housing value has an evident crowding-out effect on household financial market participation in urban China, while financial literacy significantly improves the probability of household financial market participation. Further analysis finds that financial literacy has a stronger effect on financial market participation for households with a low housing value. However, this crowding-out effect is not observed in the paper of Chen and Ji (2017) which studied empirically the effect of house price on stock market participation. They proved instead the existence of wealth effect: the growth of one thousand renminbi per square meter in macro house price will increase the probability to participate in the stock market by 5.4% before controlling for wealth effect and 2.84% afterward. He et al. (2019) find that there is evidence of a positive link between home equity and household portfolio choice. The household participation in the stock market and stock shareholdings are significantly correlated with home equity. In response to an increase of 10% of home equity, the stock market participation rate and shareholdings will increase by approximately 0.6% and 0.3%, respectively. The effect is more evident for multi-homeowners and those in the first and second tiers of cities. The results show evidence of wealth effect and the impact of collateral values of home equity appreciation on homeowners' portfolio allocations. The crowding-out effect of home equity on households' portfolio choice decisions is not found.

3. CHFS 2017 Micro Data

The China Household Finance Survey (CHFS) is a nationally representative, annual longitudinal survey of Chinese families and individuals. The CHFS is conducted by the Research Institute of Economics and Management at Southwestern University of Finance and Economics (SWUFE) and is a random sampling panel that contains information on demographic characteristics, inventory of major housing, and consumption expenditure. The CHFS collects household micro-level information. Unlike other Chinese major surveys, the CHFS imposes a special focus on housing and financial assets, debts and credit history, income and expenditures, social welfare and insurance, intergenerational and interpersonal transfer payments, demographics, and employment. The first survey is launched in 2011, collecting information about 8438 families and more than 29,000 individuals. The first wave was carried out in traditional face-to-face interviews, and quarterly follow-up interviews were conducted with Computer Assisted Telephone Interviews (CATI). Starting from the second wave, four relatively remote provinces were added and the sample size of provinces with a small sample size was further expanded.

This thesis uses the data from the CHFS 2017 which is the last public available database. This fourth wave realized a total sample of 40,011 households, comprising 1428 rural communities in 355 counties of 29 provinces. The large coverage of national-wide samples allows CHFS 2017 to be representative at the national, provincial, and sub-provincial city level.

The sampling design for the CHFS includes two main components: an overall sampling scheme and an onsite sampling scheme based on mapping. This design has two objectives: first, to produce sufficient data to answer research questions such as household asset allocation, consumption, and saving; and second, to draw a random sample which is representative of all households in China. To achieve these scopes, the sampling design has the following four characteristics: (1) oversample observations from relatively wealthy regions. (2) oversample observations from urban areas. (3) the sample is representative of the diverse geographic regions of China. (4) if all else is equal, the least costly procedures are adopted. (Gan et al. 2012)

Another particular feature of the CHFS is that the refusal rate is quite low comparing with other Chinese and international major surveys, including the China Health and Retirement Longitudinal Survey (CHARLS), Chinese Household Income Project (CHIP), China Health and Nutrition Survey (CHNS) and Chinese General Social Survey (CGSS). The overall CHFS refusal rate is 3.6 % lower than the overall CHARLS refusal rate and is 4.2 % lower in the urban sample and 6.9 % lower in the rural sample. Considering also the fact that the CHFS sample covers many urban communities in Eastern China and touches upon sensitive issues such as income, saving, and wealth allocation, the refusal rate of the CHFS is surprisingly low. From an international perspective, the CHFS refusal rate is also satisfactory. The CHFS refusal rate is quite decent even compared to the refusal rates of four well-respected survey projects, including the Survey of Household Income and Wealth (SHIW, Italy), the Survey of Consumer Finances (SCF, USA), the Panel Study of Income Dynamics (PSID, USA) and the Consumer Expenditure Survey (CES, USA). The PSID, the benchmark of longitudinal survey projects, has achieved a very low refusal rate ranging from 2% - 6 % recently. The CHFS is more comparable to the other three survey projects and the SCF in particular, given their common interests in household consumption, income, and assets. The refusal rates of the SCF, CES, and SHIW all exceed 25 % and that of the SCF exceeds 30 %. The international comparison further shows the good quality and reliability of the CHFS microdata in terms of the refusal rate.

The China Household Finance Survey developed a proprietary interview system and management platform, basing on the framework and design concept of the cutting-edge CAPI system which provides a full package for conducting computer-based household interviews. This innovation aims to decrease effectively human non-sampling errors by presetting the range of possible answers, catching typing errors, and avoiding skipped questions. Furthermore, this system helps to maintain data confidentiality while keeping data accessible in real-time. Besides the CAPI system, the CHFS project team also designed a comprehensive system for quality control to reduce man-made errors. The system incorporates the following aspects: stringent management of sampled cases and a detailed survey management system. All of these factors significantly improve data quality.

Once the data is collected, The CAPI system has a recording function. All interview conversations are recorded, as well as all keystrokes and mouse movements. In other words, the system records the para-data of the interview process. The data are transmitted to the server in real-time. The real-time monitoring involves the following:

1. Select a certain portion of finished interviews and list to the recordings and confirmed their accuracy by phoning the interviewees.

2. Use statistical tools to check data quality. For the outliers, the associated video footage is replayed and the interview recordings are listened to by a quality controller. When necessary, the quality control team will phone the interviewees or revisit them in person.

3. Conduct call-back interviews with all the interviewed households.

Those efforts help minimize man-made errors, smooth the fieldwork process, and improve the data quality.

After the data is collected, the center will conduct the preliminary processing on all data, mainly including: deleting invalid samples due to serious groundless answer and cheating by interviewers, deleting invalid variables, deleting sensitive data, correcting duplicate sample numbers caused by humans, and correcting interviewers' active reports that are man-made misuse; merging, tracking new visiting data, splitting a household and personal data, splitting multiple choices; adding labels, adding questionnaire types; cleaning up notes and other options, confirming the numerical value interpolation and related rules. After preliminary processing, the data generates a usable version. If the extreme value or abnormal value is found again during the data utilization, the center will check the secondary recording for confirmation. If there is no recording, the extreme value and abnormal value are processed by creating a model to update the data version and inform the users.

Based on these particular characteristics, the micro-data collected by CHFS is a reliable source for accurate research. Due to the lack of a housing market in rural China, this thesis focuses on the household finance patterns of urban households. Results computed in this thesis are all weights adjusted. This thesis applies the following data elaboration process: the rural sample is dismissed and the main focus addresses the impact of household head personal qualities, financial resources, and home ownership on stock market participation and the

portfolio share of risky financial assets in urban China. This process is applied due to two main reasons: First, China's financial markets and financial products are still under-developed, which is further aggravated in rural areas. Second, among Chinese rural households, the awareness of investing in risky financial products continues to be weak and incomplete. Both factors result in an even lower rate of stock and risky asset holding in rural China.

4. Assets return

Since the Reform and Opening-up Policy launched in 1978, China has been experiencing explosive economic growth. Figure 4.1 provides a rapid overall trend of GDP growth in the last thirty years. The prospering of the real economy inevitably causes the growth of real assets price and represents an important stimulus for the financial market. In the next two chapters, we briefly review the history and main features of the stock and housing market.

Figure 4.1: China nominal GDP and annual growth rate.
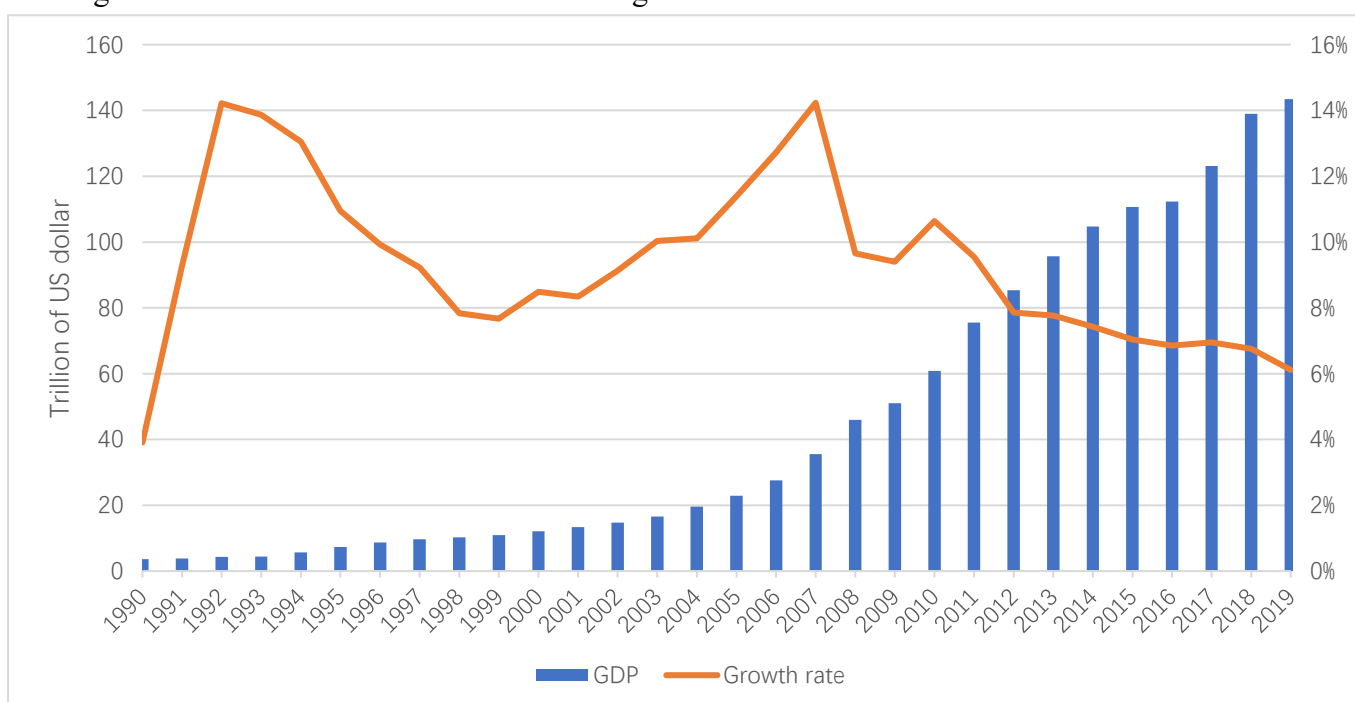
Source: The World Bank. Currency in trillion of US dollar. Growth rate in right scale.

4.1 Stock market

China's stock market started in the early 1990s. On 19th December 1990, the day of the open celebration ceremony of the Shanghai Stock Exchange, only eight companies were listed with

a total market value of 2382 million yuan. By the end of October 2020, Shanghai Stock Exchange has 1760 listed corporations with 1803 listed shares. The total market capitalization is 41,686,700 million yuan. Shenzhen Stock Exchange has 2322 listed corporations and the total market capitalization is 31,894,200 million yuan. After 30 years of development, the total market value of China's stock market has increased by 30000 times and the trading volume has increased more than 1000 times.

The result reveals that the stock market in China has developed rapidly in these thirty years. Although the Chinese stock market is on the way of development starting from 1990, there are still many problems. The inefficient operation, half-baked investment, and financing dysfunction are most relevant. There remains a large space for the financial market to improve. In fact, China has only slowly developed a legal framework for stock markets and has a weak law enforcement record, which played at best a marginal role in China's market development (Pistor and Xu, 2005). Allen et al. (2012) show that Chinese financial markets are not efficient in terms of price and investors' risk-taking behavior is not necessarily driven by fundamental values of listed firms. Moreover, the stock prices are more ''synchronous'', that is moving up and down simultaneously, in emerging countries including China than that in developed countries (Morck et al. 2000). They suggest that poor investor protection and imperfect regulation cause this phenomenon. On basis of all these factors, it is not easy for Chinese households to invest in the stock market. As consequence, more and more investors start to consider mutual funds as an important investment instrument in the financial market. Mutual funds grow rapidly, both in quantity and market capitalization, satisfying investors' diversification requests. Mutual fund companies are the most important institutional investors, in China. Mutual funds are not only optimizing the investors' structure in the financial market but also disseminating the concept of value investing to the public (Zhao and Wang 2007). However, mutual fund trading is somehow more complicated than stock trading. Some mutual funds can be traded like stocks through third-party sales platforms, while others need to be bought from banks or directly from the mutual fund companies. Therefore, mutual funds trading procedures could require more information and time than stocks.

Stocks and mutual funds are most held among risky financial assets. In this thesis, stock refers to the shares of a listed company which can be traded in the two stock exchanges (the Shanghai and Shenzhen stock exchanges) and mutual fund refers only to public offering mutual funds, such as the mutual funds sold by commercial banks and mutual fund companies. Different from financial markets in developed countries, the financial advising industry in China is not well developed. Financial advice providers such as private banks offer services to households with more than USD 1 million of investable assets, which means only extremely wealthy households can obtain professional advice (Wang et al. 2014). Given the lack of support from financial service professionals, financial literacy is considered as an important factor concerning the Chinese household's portfolio choice and their financial wellbeing. Also, this allows us to explore the net effect of financial literacy without worrying about the potential compounding effect of financial advising service. Most existing papers on financial literacy using available data from the United States and other European countries (Van Rooij et al. 2011). In light of the fact that China's aggregate household saving rate is among the highest in the world (Wang and Wen 2012), it is fundamental to study the role of financial literacy in how Chinese households invest in risky assets. The long Confucian cultural tradition imperceptibly influences Chinese households to risk-taking behaviors, which prefer to follow the popular proverb "stay in the middle". In fact, there are also research findings showing that the Chinese are more risk-averse than Americans in their financial decisions which may also due to cultural reasons (Fan and Xiao 2006; Weber and Hsee 1998). Therefore, the cultural difference may affect the financial decisions of Chinese households.

The Chinese stock market is an immense market, characterized by the different performance of different sectors. Figure 4.2 reports the performance of four main price indexes during the period between January 2006 and July 2020.

Figure 4.3 reports the annualized return and growth of price indexes in the China stock market between 2006-2019. SSE 50 and CSI 300 indexes represent the price return of large corporations on the stock market. CSI Small cap 500 and SZSE SME price index represent the price trend of the medium-small listed companies. More specifically, in these 14 years: SSE 50 increased by 3.8 times, CSI 300 increased by 4.4 times, CSI Small cap 500 increased by 6.8

times, and the SZSE SME price index increased by 6.8 times. If an investor started to invest in SZSE SME in 2006, he or she would receive an almost 100 percent higher return than investing in SSE 50.

Figure 4.2: Chinese stock market price indexes performance
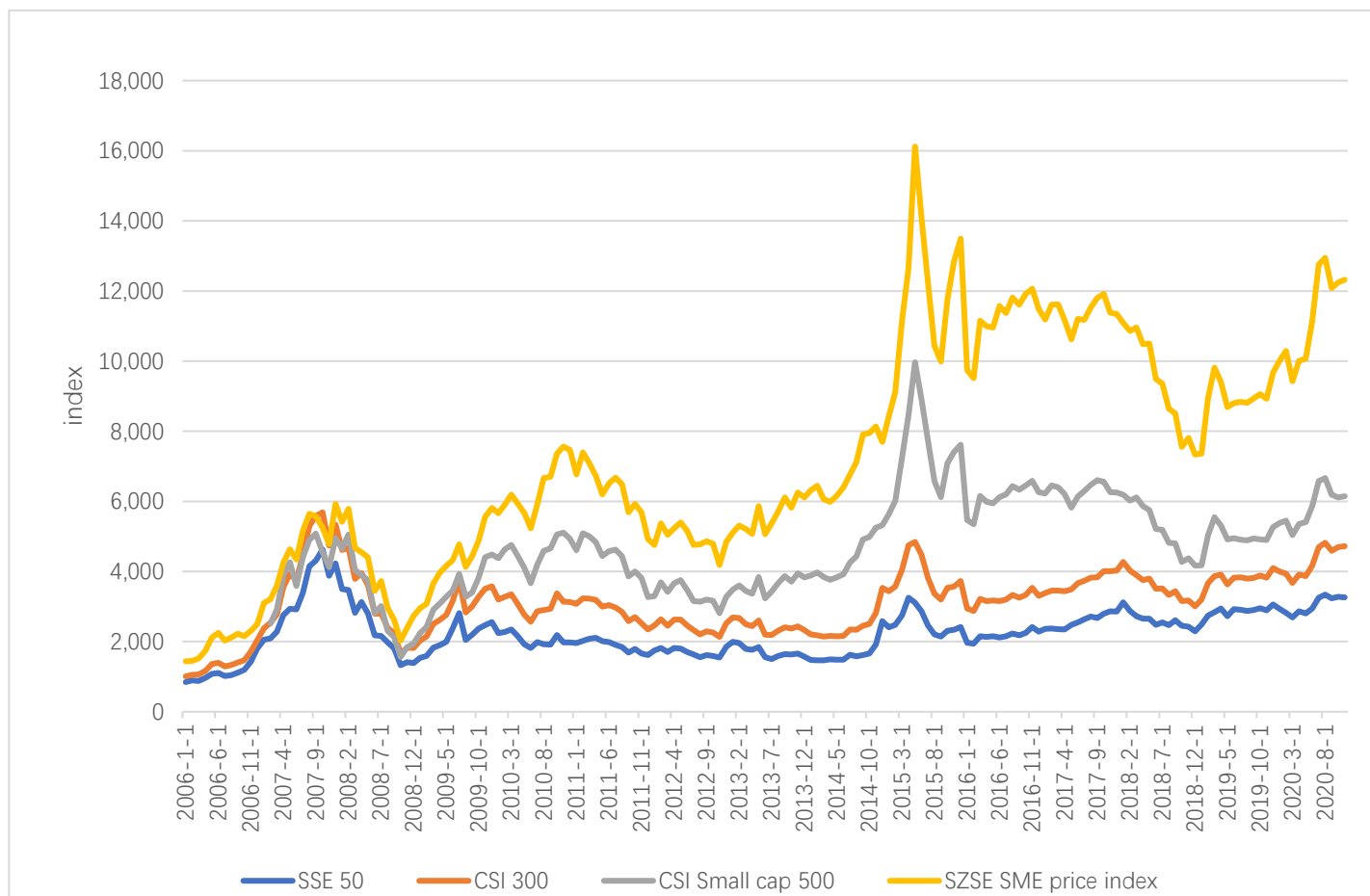
Source: www.investing.com.

Note: SSE 50 represents the top 50 companies listed on the Shanghai stock exchange. CSI 300 replicates the performance of the top 300 stocks traded on the Shanghai Stock Exchange and the Shenzhen Stock Exchange. CSI Small cap 500 consists of the largest remaining 500 A-Share stocks after excluding both the CSI 300 Index constituents and the largest 300 stocks. SZSE SME price index represents the price performance of the medium-small listed companies.

Figure 4.3: Chinese stock market indexes cumulative return and annualized return (2006-2019)
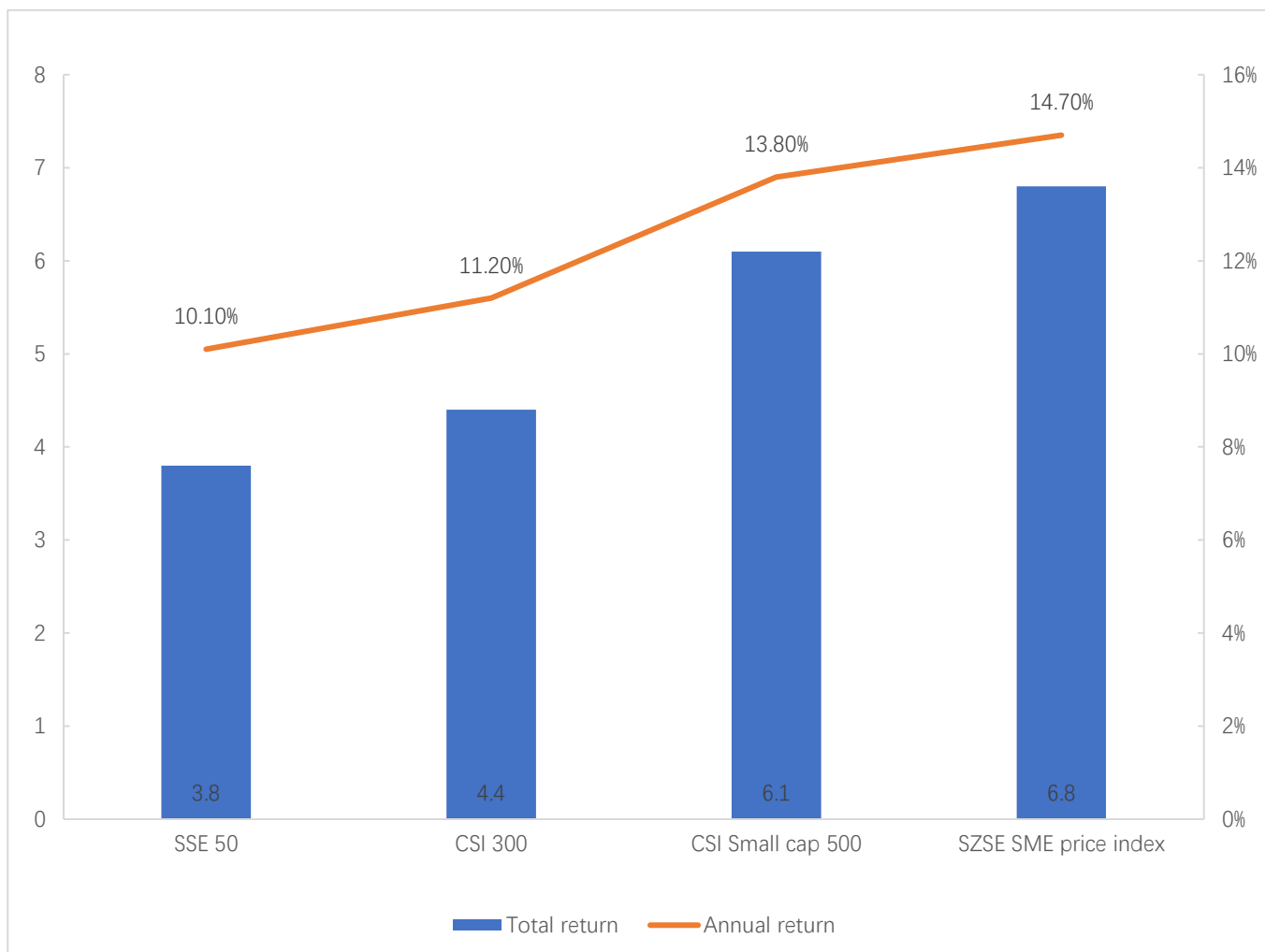
Note: Left scale refers to the total return between 2006 and 2019. Right scale refers to average annual return. Note: SSE 50 represents the top 50 companies listed on the Shanghai stock exchange. CSI 300 replicates the performance of the top 300 stocks traded on the Shanghai Stock Exchange and the Shenzhen Stock Exchange. CSI Small cap 500 consists of the largest remaining 500 A-Share stocks after excluding both the CSI 300 Index constituents and the largest 300 stocks. SZSE SME price index represents the price performance of the medium-small listed companies.

Figure 4.4: Chinese stock market price indexes performance in different time periods

Source: www.investing.com. Numbers in percent.

The Chinese stock market is characterized by high volatility and a periodical macro trend (fig. 4.4). It is possible to identify six periodical trends between 2006 and 2020[1]:

1. January 2006 – October 2007. This is a high growth period. In this period, the stock price reached a peak in October 2007 as we can see in figure 4. The SSE hit an all-time high, 6124 points. The growth of the SSE index is driven mainly by the stock price increase of large companies. This phenomenon never appears again. In this period, the SSE index increased by 470%, meanwhile, the SZSE SME price index increased only by 270%.

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[1] Notes are taken from the investment lessons of Professor Y. Xu, Peking University

2. November 2007 – October 2008. This is the main price correction period. Within one year, four main price indexes experienced an astonishing sharp fall period. The stock market lost more than half of its value, almost 60-70%. The Global financial crisis also had a great impact on the stock market in China.

3. November 2008 – November 2011. The background of this period is the 4 trillion RMB (586 billion US dollar) stimulus package launched in 2009. The Chinese economy was recovering with an accelerated path from the Global financial crisis. In this period, the small shares were surprisingly over-performing. SZSE SME price index increased by more than 200%, precisely 274% in just two years.

4. December 2010 – November 2012. In this period, the macroeconomic regulation and control phase initiated. The monetary policy was tightening and A shares went down. The main four price indexes declined by 18-50%. The SZSE SME price index which experienced the highest increase in the previous period, decreased by 45%.

5. December 2012 – May 2015. This period lasted two years and six months. The Chinese stock market entered into a long growth period again. Especially medium-small shares had a larger increase. CSI 300 increased only by 130% meanwhile SZSE SME price index increased by 300%.

6. June 2016 – June 2020. Four years. In this period, the stock market experienced another price correction period during the summer of 2015. Then, the period of price fluctuations was initiated. However, starting in 2019, the market showed positive signs, and price indexes restart to increase slowly.

Figure 4.5 reports the stock price growth rate between 2010-2019, sorted by industry sectors. The most performant sector is Consumer staples, followed by the Health care industry. The Telecommunication Services, Materials, and Energy had the worst performance. The total return of these three is unpleasantly negative.

Figure 4.5: Stock price growth by industry sector (2010-2019)
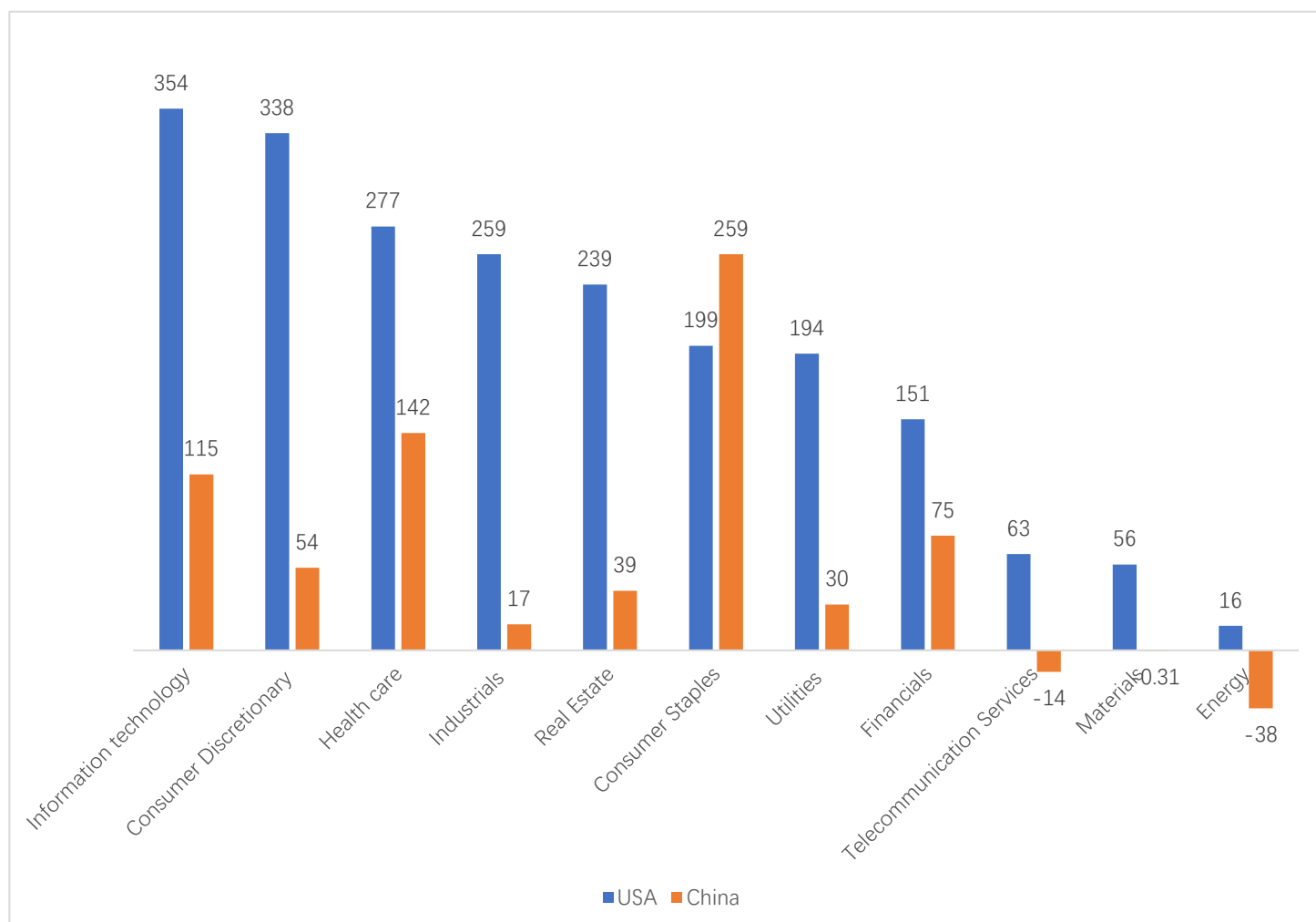
Source: Wind economic database. Numbers in percent.

4.2 Housing market

In the 1980s, a real estate market initiated developing in China. In urban cities, state-owned houses were allocated to urban residents based on working units (Danwei) and symbolic rents were charged. Wang and Murie (1999) summarized that there were huge problems with the

housing shortage, poor management, and corruption in the housing distribution process. Gradually, principal urban housing reforms intended to commercialize residential properties according to the demands of the market economy took the path. In 1994, at the dawn of privatization of housing, public houses were allowed to be sold to state employees only. The purchase of housing from state working units ended in 1998. During the same year, the real estate property acquire requests were allowed to receive financial credit services from the national commercial banks, which promoted further the commercialization of housing in China. In 2003, the "Notifications of the State Council" approved officially the promotion of the sustainable and healthy development of real estate markets. This government document set up an important milestone in the development history of housing markets in China. For the first time, the real estate industry is officialized as the backbone sector of economic growth. Figure 4.6 shows the share of real estate activities in GDP over years.

Figure 4.6: Housing's combined contribution to GDP
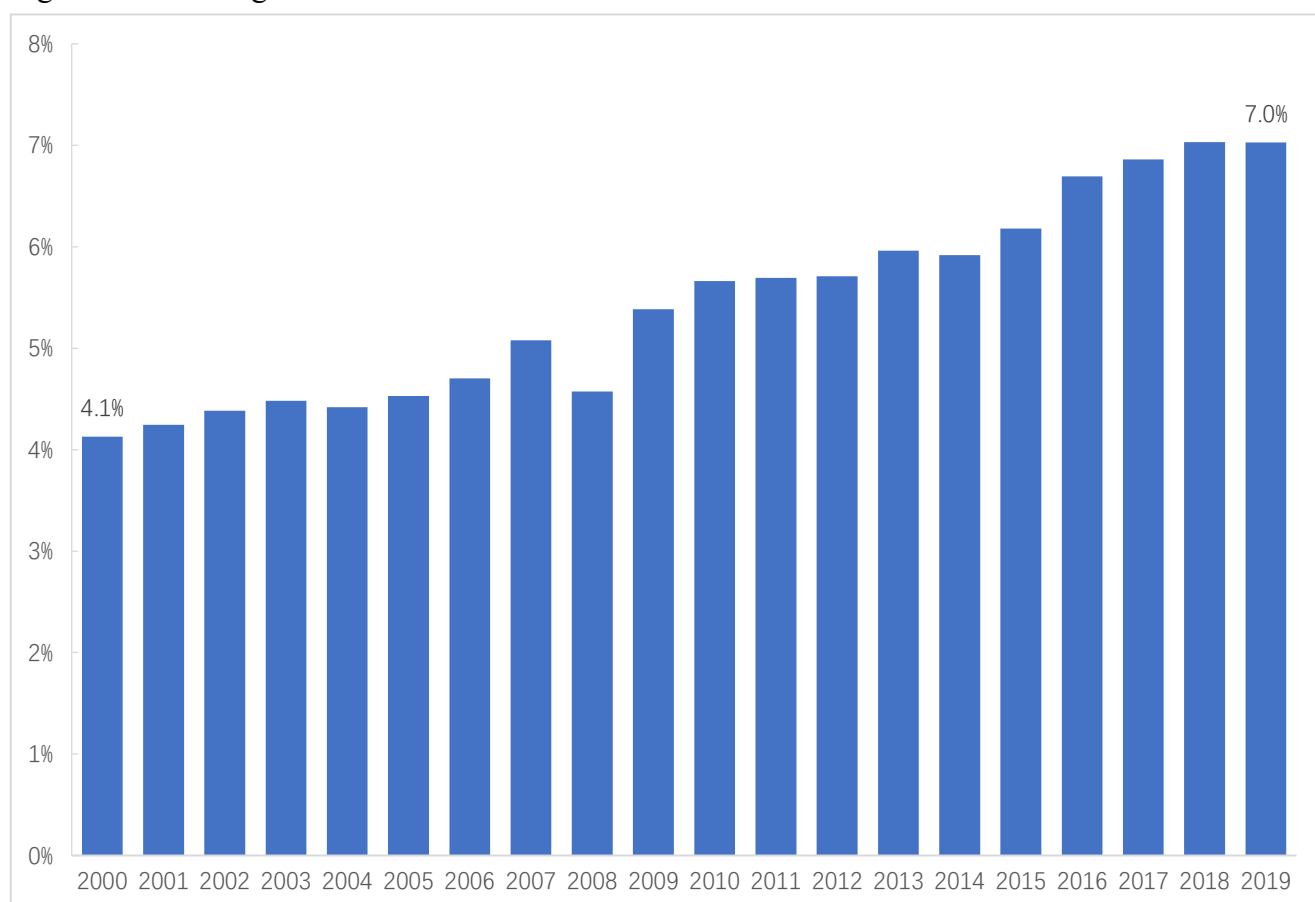
Source: National Bureau of Statistics of China

After that, the housing market has been experiencing a prosperous phase, and the price growth entered into the freeway, even though the price growth is not uniform across the country. On average, the national selling price of urban commercialized residential buildings increased from 2267 yuan/m^2 in 2002 to 14411 yuan/m^2 in 2018 (Fig. 4.7). During the same period, housing prices in China's tier-one cities (Beijing, Shanghai, Guangzhou, and Shenzhen) have risen more than eight-fold times.

Figure 4.7: Average Selling Price of Commercialized Residential Buildings
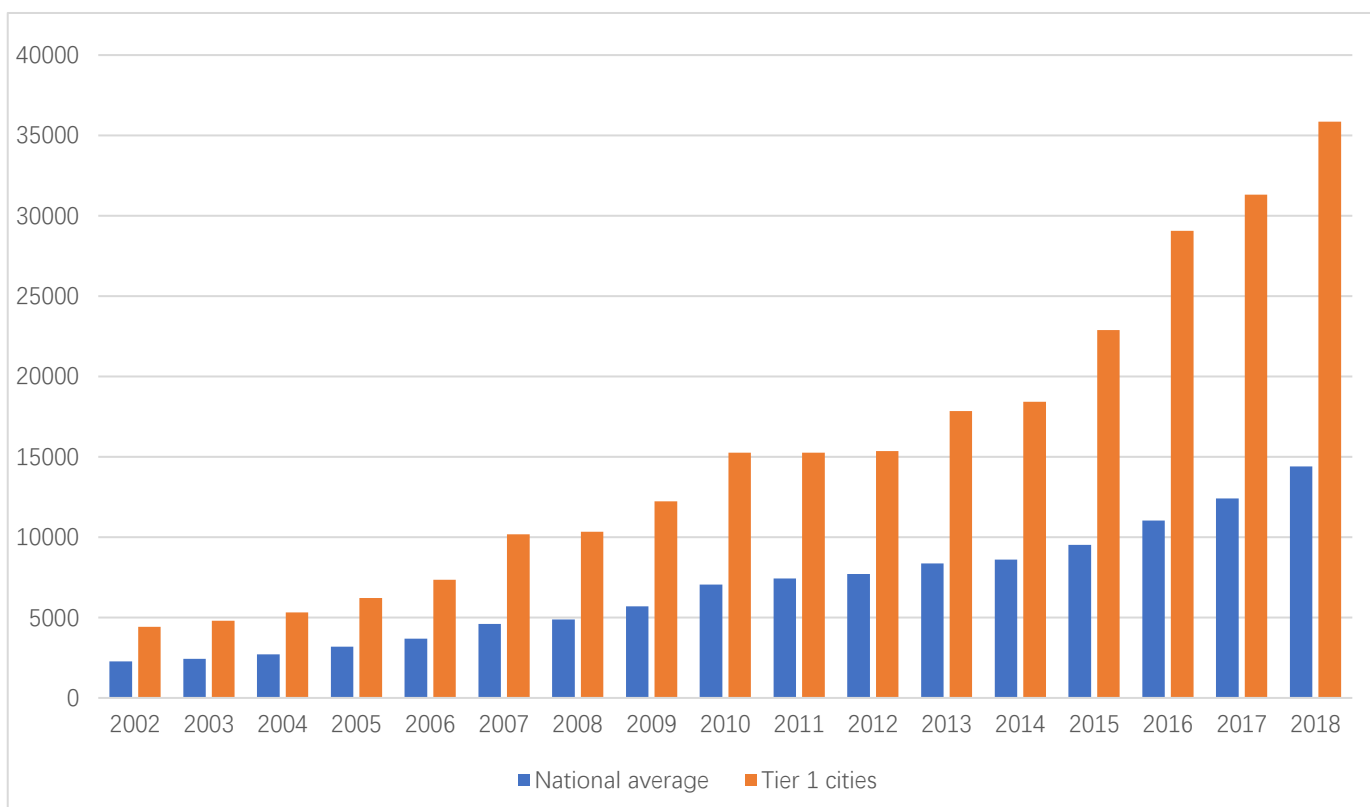
Source: National Bureau of Statistics of China.

Note: unit in yuan/square meter. Tier 1 cities include Beijing, Shanghai, Guangzhou and Shenzhen.

In summary, the explosive growth of the Chinese real economy drives the continuous growth of assets price, offering considerable returns for investors. The stock price is extremely volatile and extremely liquid, due to the low transaction costs and relatively threshold money for investment. Meanwhile, the housing market is characterized by low volatility due to high transaction costs, and it is high illiquid and highly leveraged.

4.3 Comparison

Figure 4.8 reports the cumulative return of the main financial asset and housing from January 2006 to July 2020. For the stock, we use the Shanghai Stock Exchange composite index as the representative stock index. The housing return is computed using the monthly variation of the second-hand sale price of residential buildings of seventy selected cities, provided by the National Bureau of Statistics of China (NBSC). In fact, the second-hand house sale price is more representative for investors who invest in real estate. The investment in housing generates not merely the capital gain computed as the difference in buying and selling price, but also a positive cash stream as rent. Weber and Pelizzon (2005) set annual basis rent equals to 5% when they analyze efficient portfolios whether housing is a hedge against rent risk. However, the price rent ratio is typically low in Chinese cities. We set 2% on annual basis according to the Research Report on Residential Rental Yield in 50 Cities (First quarter of 2020) published by Shanghai E-House Real Estate Research Institute. We use the typical annualized 10-year T-bill rate to simulate government bond returns. For the corporate bond, we use instead, the standard & poor China Corporate Bond index. The stock return has been long higher than other assets' return, even though it is characterized by extreme volatility.

In Table 4.1 we show the first and second moments of the annual excess returns of four principal investable assets for households: stock, housing, government bond, and corporate bond. We use the available data from the time period of January 2006 – July 2020. These are expressed as percentage annual rates of return net of the time-varying risk-free rate. We consider a one-year benchmark deposit interest rate, taken from National Interbank Funding Center, as a risk-free rate. We use nominal returns to estimate expected excess returns for all assets. The risk-free rate is subtracted from the returns of other assets to obtain excess returns.

Figure 4.8: Assets cumulative return index (Jan 2006 = 100)
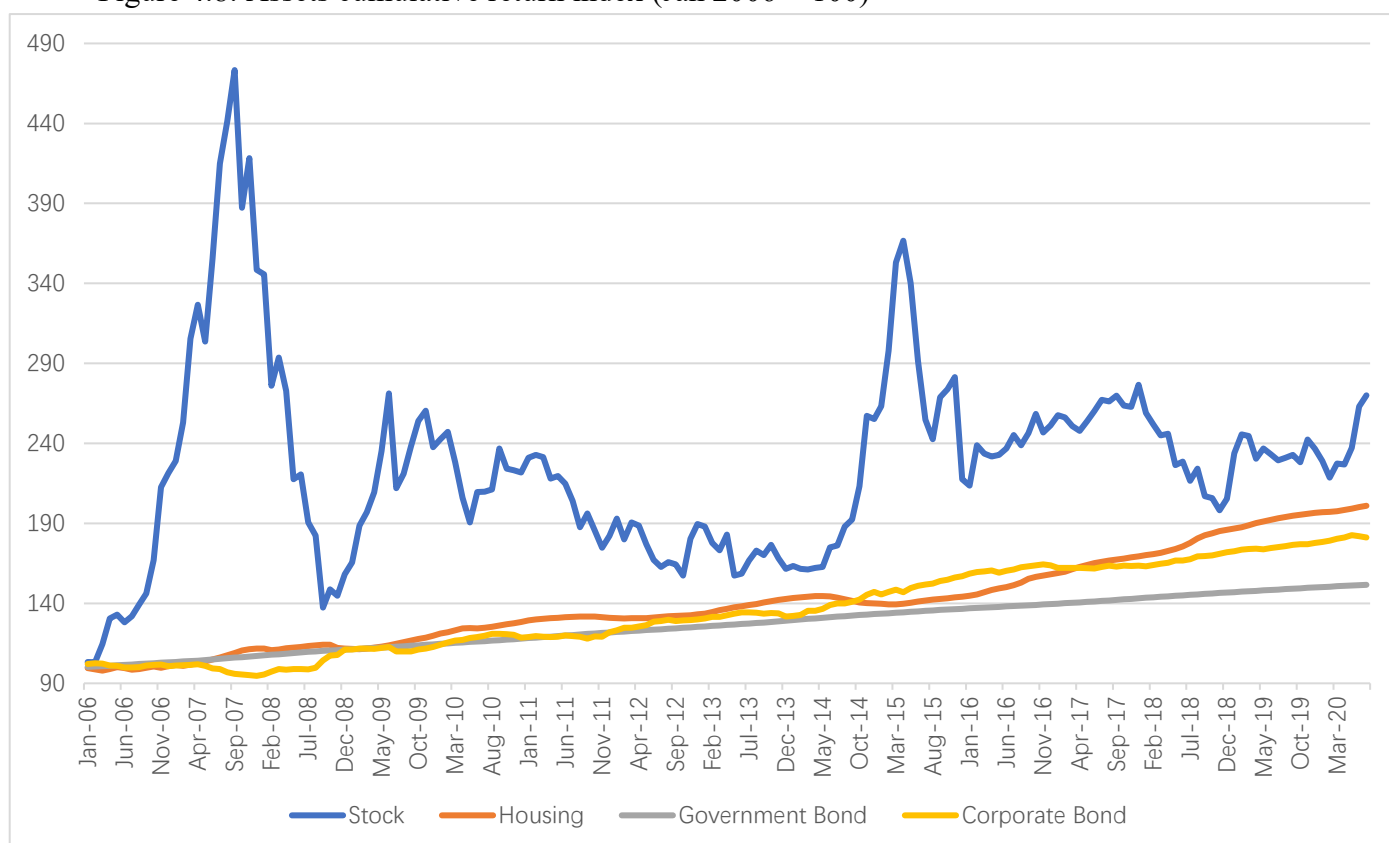
Source: Yahoo finance, NBSC, China money and S&P Global.

We can observe that the annual excess return of the stock is by far the highest among the examined assets. This is a piece of strong evidence to confirm the existence of equity premium in the Chinese stock market. The housing offers a significant and stable return whose volatility is almost 10 times lower than stock's one. The government bond is traditionally considered a safe financial asset. In fact, the expected return and standard deviation are the lowest with respect to the other assets. The corporate bond plays an intermediate role in terms of expected excess return (1.83%) and standard deviation.

The correlation matrix suggests that the stock is weakly correlated with housing and government bond, but significantly and negatively with the corporate bond. This observation is rather counterintuitive and will be examined further in the regression analysis. Correlation coefficients of housing, government bond, and corporate are significant, respectively with a positive and negative sign.

Table 4.1: 2006-2019 Sample first and second moments of annual excess returns and correlation matrix

	Stock	Housing	Government Bond	Corporate Bond
Expected return %	11.59	2.57	1.06	1.83
standard deviation %	43.36	4.44	0.65	5.09
Correlation				
Stock	1	0.03	0.09	-0.56
Housing		1	0.64	-0.61
Government Bond			1	-0.31
Corporate Bond				1

Of interest to us is the correlation between housing returns and other financial asset returns. We proceed with a further regression analysis. In this case, the monthly excess returns are used in order to have a higher number of observations. The results are reported in table 4.2. Column (1) shows the regression results of stock excess return on housing, government, and corporate bond. Unsurprisingly, the coefficients are not statistically different from zero, which means, the stock is not significantly correlated with other assets. The regression results of housing excess return on other financial assets are reported in column (2). Housing is positively correlated with government bond and negatively with the corporate bond. On the basis of this evidence, the corporate bond represents a possible hedge term in household portfolios of Chinese homeowners.

Table 4.2:   Regression of excess return

VARIABLES	(1) Stock	(2) Housing
Housing	-1.395	
	(1.549)	
Government bond	5.684	4.412***
	(13.06)	(0.742)
Corporate bond	-0.450	-0.0933**
	(1.165)	(0.0448)
Stock		-0.00446
		(0.00482)
Constant	0.00512	-0.00192**
	(0.0146)	(0.000879)
Observations	175	175
R-squared	0.007	0.255

Note: Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

5. The household portfolio choice in China

The household portfolio in China is characterized by the central position of housing assets. This particular feature is related to national political policy and macroeconomic trends. Relatively few households hold risky assets in their portfolio which is not mean-variance efficient in the standard sense, as we previously verified that the equilibrium equity premium is positive in the long-run. In the literature, several papers indicate the benefit of holding the risky asset in the investment portfolio. Heaton and Lucas (2000) show that homeowners can diversify their portfolios by holding stocks. Pelizzon and Weber (2009) suggest that households with positive net housing have the largest proportion of inefficient portfolios and should invest more in stocks.

In this section, we will present the actual household asset participation rate with particular attention to housing and stock. Then, we will advance a preliminary discussion concerning the reasons for low stock market participation and a high homeownership rate in China.

5.1 Descriptive analysis of household assets participation rate

Table 5.1 lists the assets participation rate of urban households across three surveys. Almost 90% of households is the owner of the primary residence. More than 15% of households possess even other real estate properties. The homeownership rate is extremely high compared to the United States which accounts for only 66.45%[2]. The high homeownership rate is characterized by the special social-economic system in China. Before the Reform and Opening-up Policy in 1978, there was no private urban housing market in China, and the provision of urban housing was a part of the socialist welfare system. Even after 1978 the reform of distribution of Chinese welfare housing still progressed slowly because of the continuing debate on the cession of state-owned land and work unit owned housing. The key transformation of urban housing

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[2] Source: SCF 2013

Table 5.1: Participation rates of different asset

Year	2011	2013	2015	2017
Homeownership	87.71	86.46	88.32	88.14
Multi-home ownership	16.05	15.79	17.90	18.42
Financial asset				
Bank deposit	70.06	72.18	78.16	89.42
Stock	13.32	11.43	18.04	10.76
Mutual fund	6.38	5.42	6.69	4.18
Bond	1.05	1.1	0.79	0.75
Financial derivative	0.03	0.21	0.1	0.08
Gold	0.89	1.35	0.67	0.60
Foreign assets	1.77	1.5	0.27	0.22
No. of households	5,194	19,029	20,211	25,066

Note: numbers in percent.

commercialization was carried out in the 1990s. The official ending of the allocation of welfare housing in 1998 marked the establishment of a market-oriented urban housing system in China.

Instead of relying on the state or state-owned enterprises (Danwei) to provide welfare housing, most families in China today must turn to the urban commodity housing market to satisfy their accommodation needs. The nationwide establishment of an urban Housing Provident Fund in 1994 was an important policy to facilitate the transition of housing from a welfare item to a commodity. In 1998, the distribution of welfare housing within state-owned enterprises and government ministries was abolished through the transition of welfare housing to private property. Before this transition, more than 80-90% of housing investment was from government or state-owned enterprises.

The rate of holding bank deposits is very high in all four survey years of 2011, 2013, 2015, and 2017 and is increasing over time. Almost 90% of households have a short-term or fixed-term bank account. The direct stock market participation surpasses barely the threshold of 10%. The indirect stock market participation through mutual funds is merely around 4-6%. The

evidence from the survey data shows a very limited portion of households participates directly or indirectly in the stock market. Furthermore, the participation rates of other risky financial assets are negligible, around 0-2%. Comparing to Western households, stockholding in Europe is undertaken by 24 percent of households, half of the US proportion. (Guiso, Haliassos and Jappelli, 2003)

Figure 5.1 shows that the homeownership rate presents a hump shape over the life cycle, with a peak in the 40-60 age group. This observation is consistent with the prediction of the dynamic asset allocation model developed by Huang (2010). The youngest 20-29 age group typically has the lowest homeownership rate, since they have to accumulate enough wealth to meet the down payment requirement.

Figure 5.1: Home ownership rate by age groups
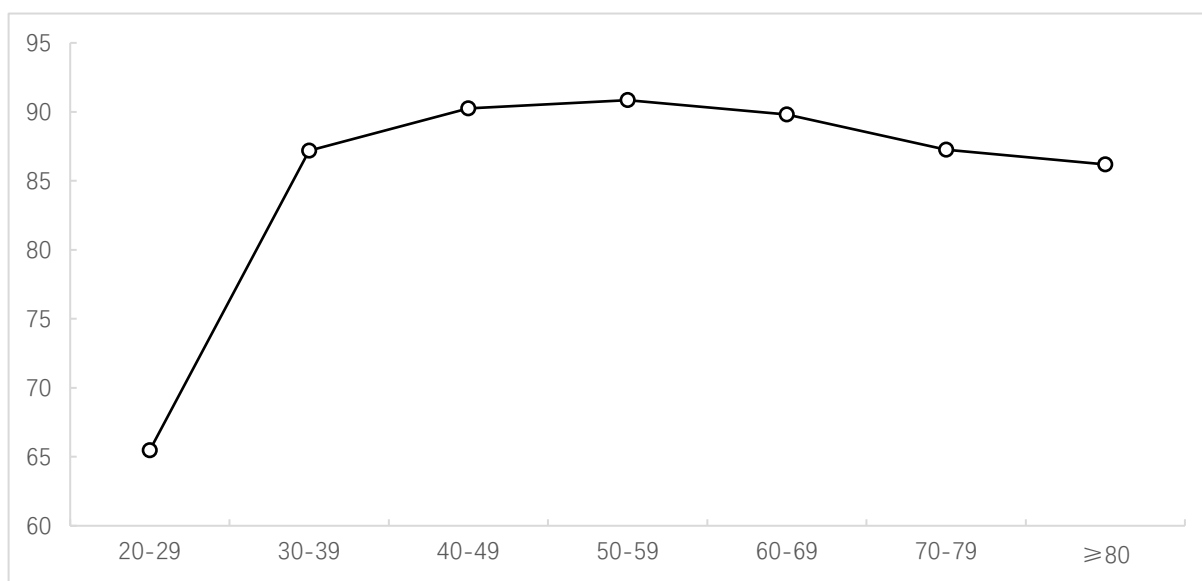
Note: numbers in percent.

This thesis uses two measures of stock market participation over the four survey years: the proportion of households that invest in stocks directly (i.e. without the intermediation of institutional investors); and the proportion that invests in stocks either directly or indirectly through a fund.

Figure 5.2 explores the age-participation relation. The profile has a hump shape similar to homeownership. The participation rates are significant for the very young group and increase sharply to reach the top in the middle-age households who are typically at the peak of their wealth and for whom the portfolio problem is more relevant. Then both participation rates start to decline sharply as age increases. The elder age groups have the lowest rates. This profile of participation rate is in line with the advice typically given by financial planners to the young investors which are typically advised to hold a larger share of risky assets in their financial portfolios to capture the superior expected return of these assets and to reduce it as they age needing more safe assets.

Figure 5.2: Stock participation rate by age groups
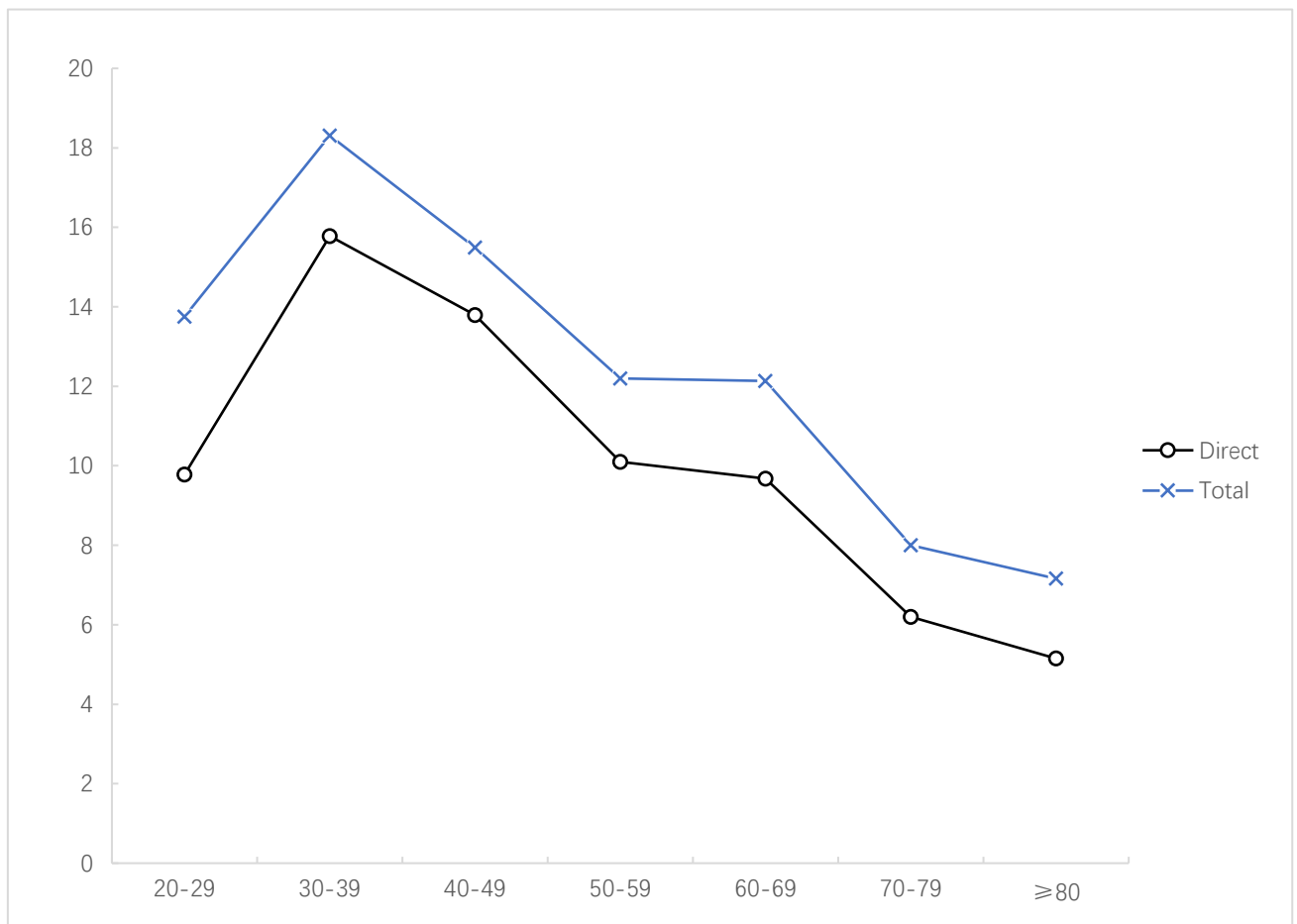
Note: numbers in percent.

Figures 5.3 and 5.4 plot the proportion of households that participate in the stock market by survey year and education level. In all four survey years, participation is higher in the group with a college education. Guiso, Haliassos and Jappelli (2003) observe a similar pattern for European households. Thus, higher education entails not only a wage premium, documented by the large empirical literature on the returns to education but also a higher expected return on saving through increased access to the stock market. This component of the returns to education is not non-negligible. If a college-educated, 40 years old investor, with a total available fund of 100,000 yuan, invests half of it in stocks (yielding an annualized real expected return of, say, 8%) and a half in a safe asset with a real return of, say, 2.5% per year, can expect to end up at retirement age (say, age 65) with almost doubled assets than an individual whose only choice is to allocate all available wealth in the safe asset.

Figure 5.3: Direct stock market participation, by Education
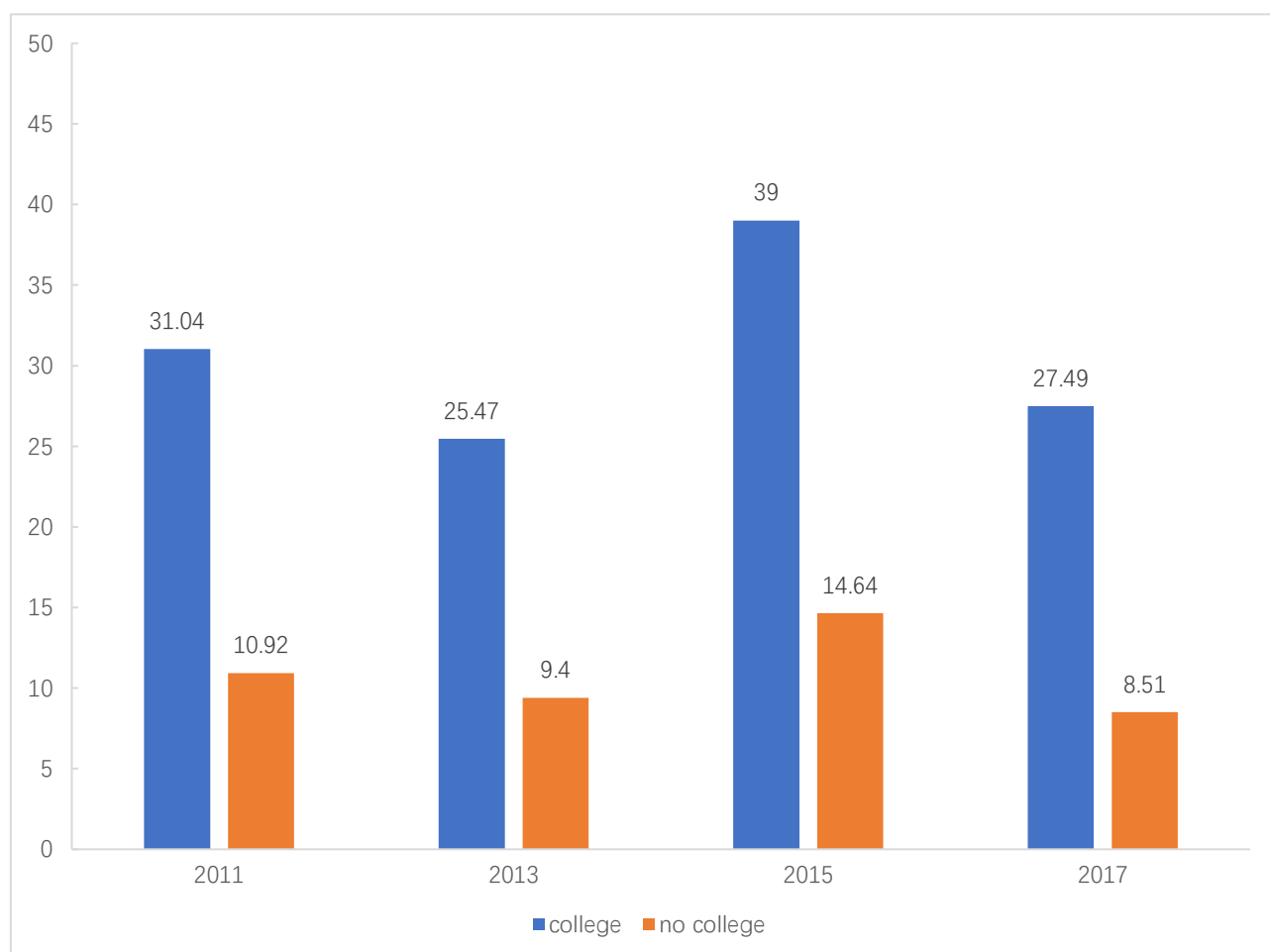
Note: numbers in percent.

Figure 5.4: Total stock market participation, by Education
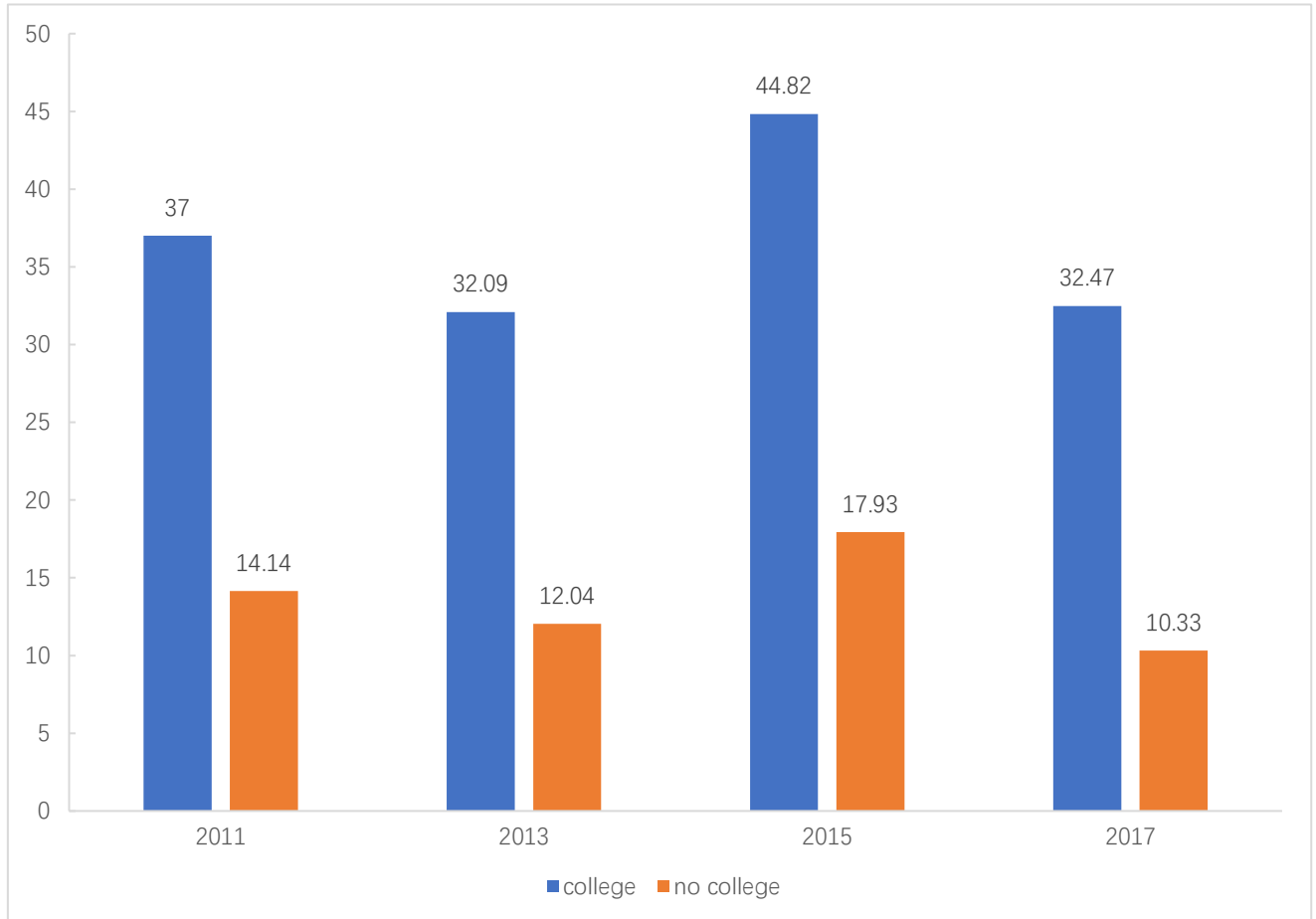
Note: numbers in percent.

Figures 5.5 and 5.6 show the pattern of stock ownership by income and financial wealth deciles. Participation increases with investor financial resources, measured either by income or wealth. At low levels of income or wealth, very few investors hold stock directly, while the fraction increases rapidly with income or wealth. This observation is consistent with the prediction of fixed cost theory. Assuming that fixed cost is homogenous across the population, an investor with levels of income or wealth may be unwilling to participate in the stock market since the potential benefit does not exceed the fixed cost. The relation is convex, suggesting that the benefits from participation are increasing marginally with investor's resources. This effect is more accentuated with the growth of total financial wealth.

Figure 5.5: Stock Market Participation, by Income Deciles
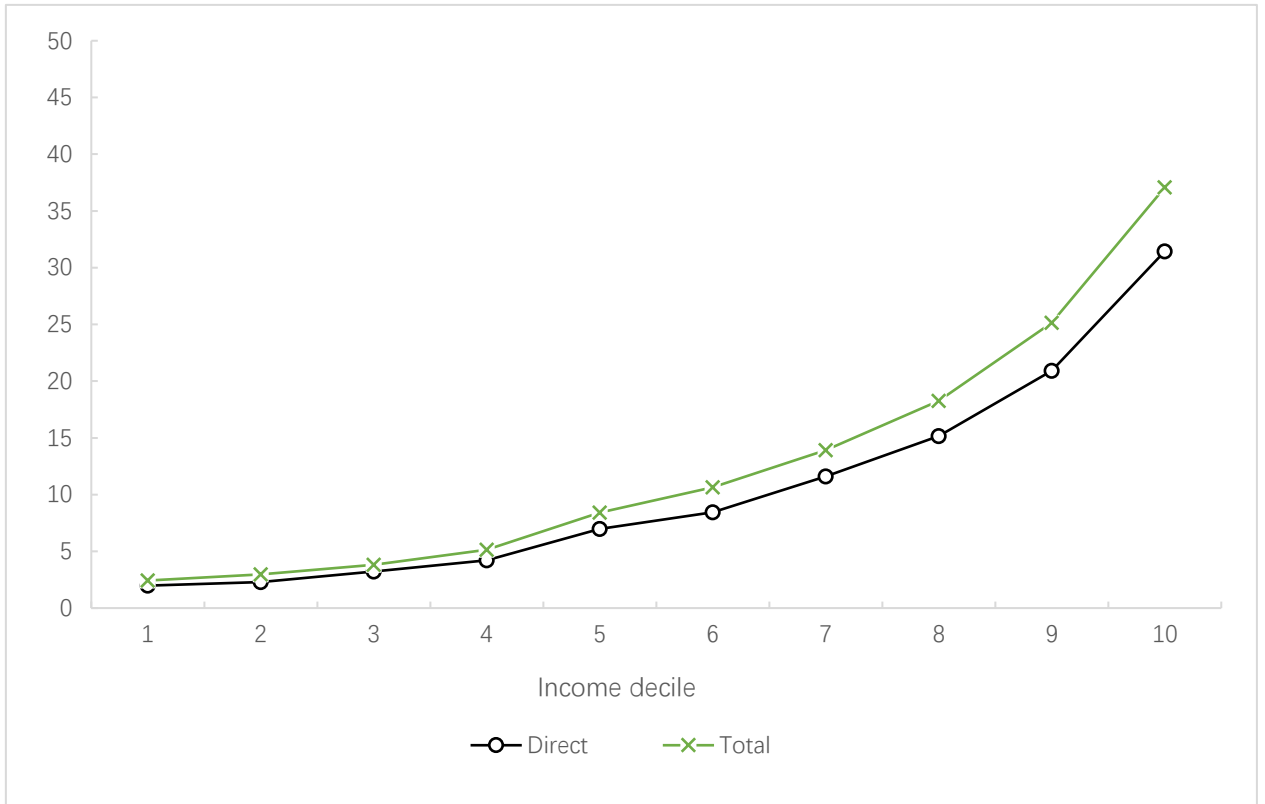
Note: numbers in percent.

Figure 5.6: Stock Market Participation, by Financial Wealth Deciles
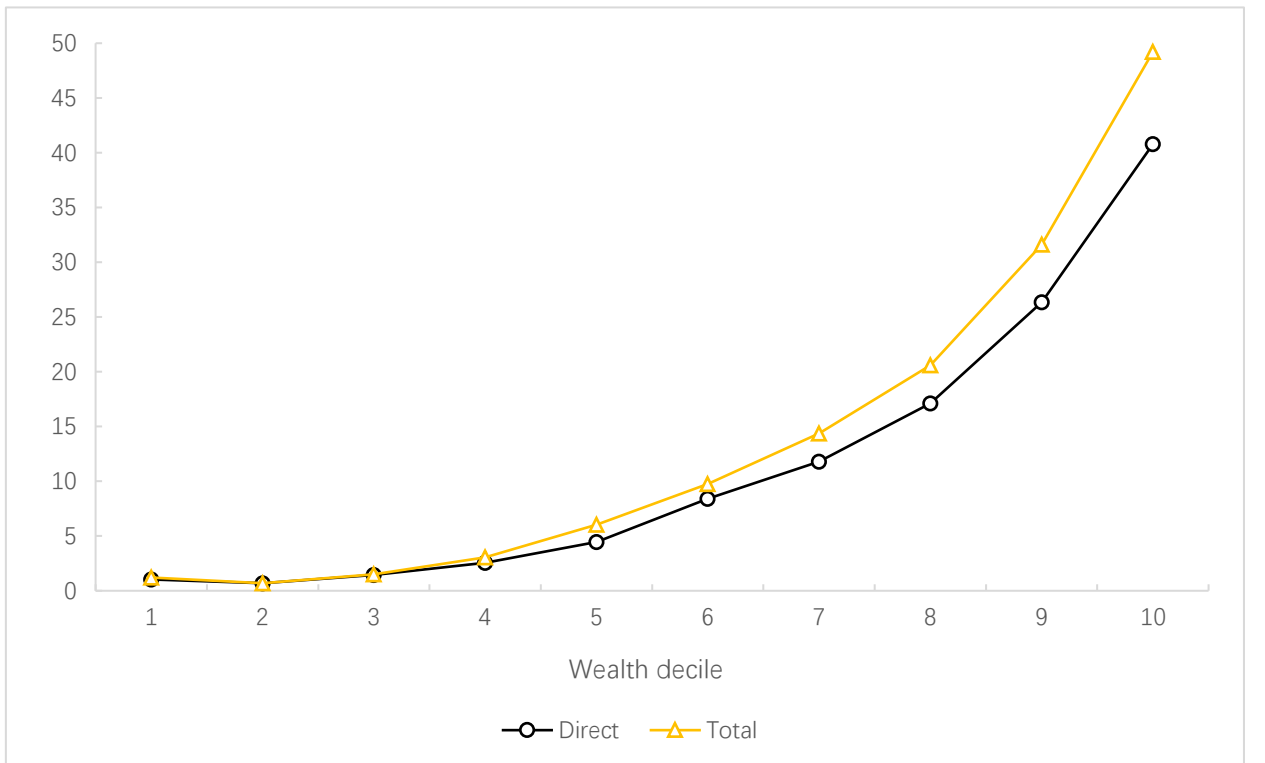
Note: numbers in percent.

Figure 5.7 reports the reasons why the household doesn't hold a stock account. It is a multiple-choice question. More than half of households don't participate directly in the stock market because they don't have the relevant knowledge concerning the stock market. This seems to confirm the hypothesis of limited financial awareness. The second reason is the "insufficient funds" selected by 37.22% of households. This seems to confirm the hypothesis of fixed costs. In fact, fixed costs determine a wealth threshold below which it is not optimal to invest in stocks. Surprisingly, 33.93% of households believe they have no interest in the stock market. Clearly, this part of households does not fully understand the benefits of investing in the stock market. Thus, participation is positively correlated with financial literacy as emphasized by Van Rooij et al. (2011)

Figure 5.7: Non participation motivation for households in China
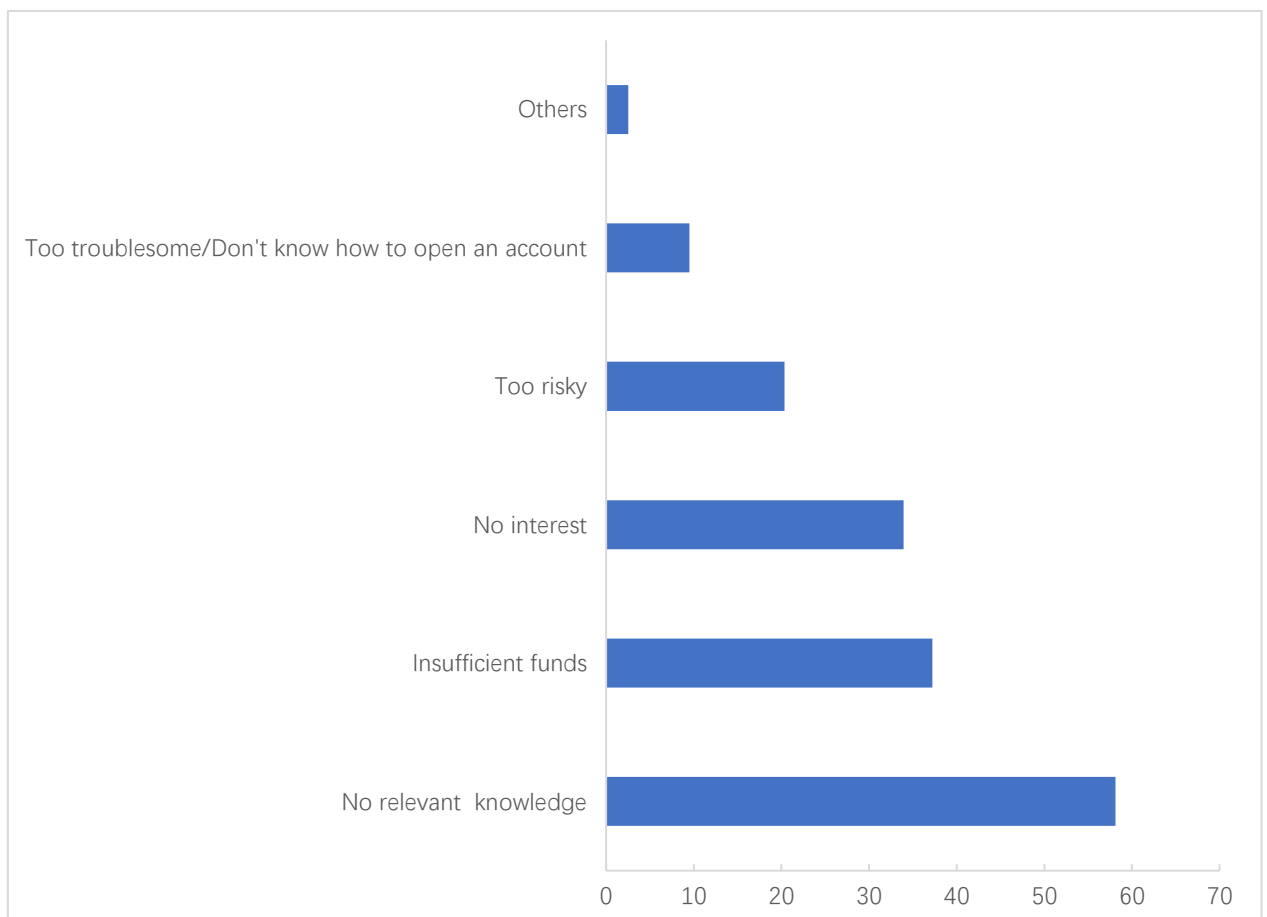
Note: Original question is why doesn't your household open a stock account? (Multiple choice) Numbers in percent.

5.2 The asset composition over time

Housing is the largest asset for most households. Fluctuations in the housing market can lead to large changes in households' wealth and economic activity. On average, housing wealth accounts for more than 70 percent of total household assets and safe financial assets for 20 percent. Meanwhile, the share of risky assets is extremely low, accounts only for 2-3 percent of total wealth.

Figure 5.8 illustrates the household assets composition over four survey years. Total household assets include non-financial assets and financial assets. Non-financial assets include private commercial business, real estate, vehicles, and other non-financial assets. Financial assets include cash, deposits, stocks, funds, bonds, derivatives, financial wealth management products, foreign financial assets, gold, other financial assets, and personal lending. More in detail, safe financial assets include cash, bank deposits, and personal lending. Risky assets include stock, mutual funds, financial derivatives, and other risky financial assets.

A typical households' wealth is decomposed into five main categories: houses, bank deposits, other financial assets, others and debts, in which bank deposits cover short-term deposits and fixed-term deposits, other financial assets further break down to stocks, bonds, mutual funds, financial derivatives, wealth management products, and foreign exchange, and others incorporate gold, cash, and money lent to others. Compared to the popularity of houses and bank deposits among urban households in China, both the participation rate and their shares in wealth on other financial assets, like stocks and bonds, still have quite a large space to improve on.

Chinese households have experienced significant housing price appreciation since 2003, with an annual real growth rate of more than 10% in Beijing, Shanghai, Shenzhen, Guangzhou, and other provincial capital cities (Fang et al, 2015). The CHFS in 2013 demonstrates that the nominal mean (median) capital gains from first apartment purchases are approximately 340% (344%), whereas the nominal mean (median) capital gains from second apartment purchases is prices, homeowners can quickly accumulate wealth and improve their ability to invest in risky

Figure 5.8: Households' assets composition over years
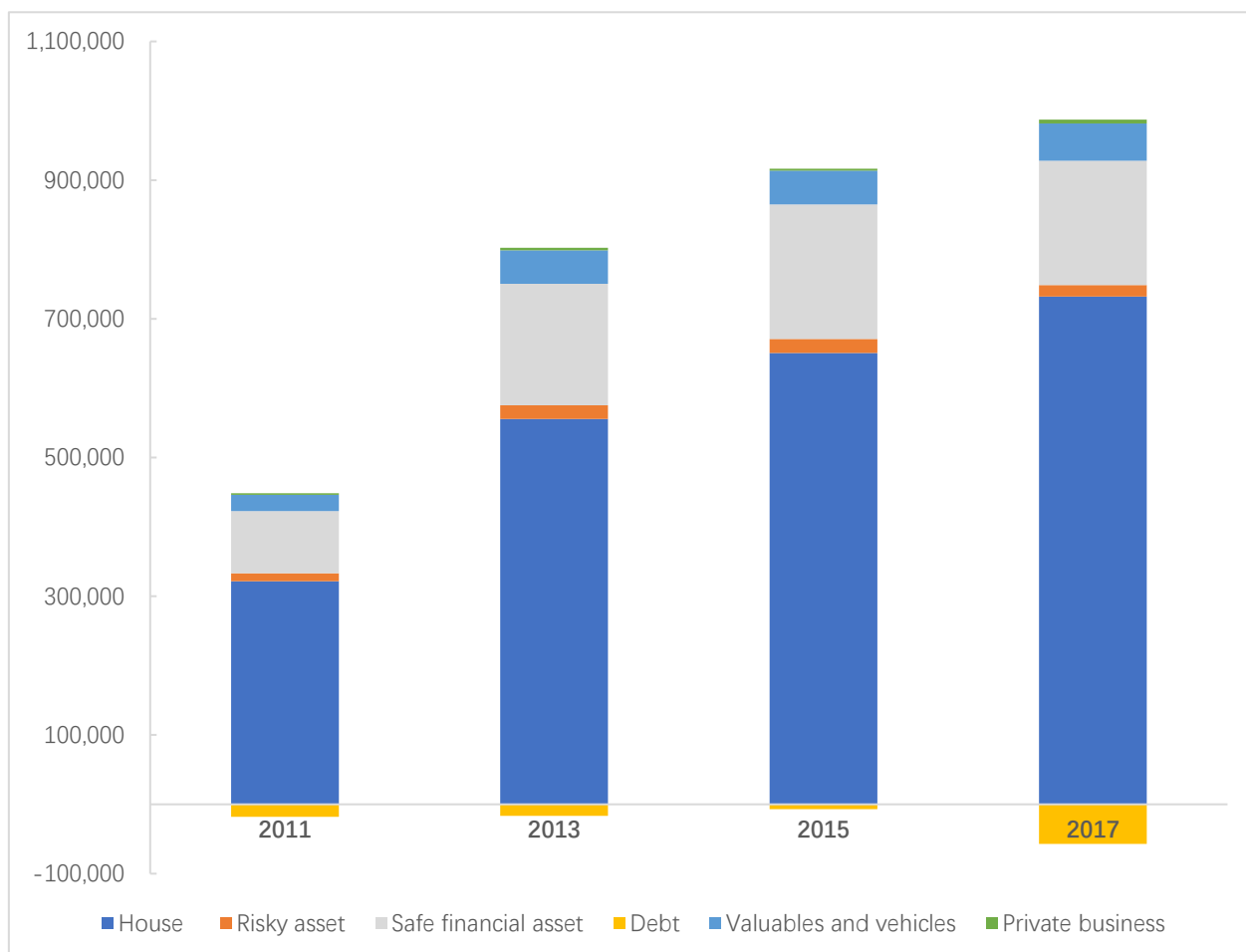
Note: currency in Renminbi. Values deflated by the consumer price index (2011 = 1, source: OECD)

financial assets such as stocks. Further, about 86.9% of urban households owned at least one home in 2013, a ratio that increased to 89.7% in 2015 according to the CHFS.

Among the principal household assets, housing supplied more than 80% of a household's total assets on average and has become the largest asset of Chinese households. Riskless financial assets follow next, accounting for 10.82% of a household's total assets. In contrast, approximately 25% of Chinese households hold specific risky financial assets, which account for less than 2.3% of household assets. Even those who own risky financial assets, these account for less than 4% of household total assets

In summary, the main features of household finance in urban China are as follows: (1) Both the homeownership rate and share of bank deposits are very high. (2) The housing wealth is the most asset for Chinese households. On average, housing wealth accounts for more than 70

percent of total household assets and safe financial assets for 20 percent. (3) Relatively few households hold stock and other risky assets. (4) The stock market participation is correlated with age, education, income, and wealth. (5) The homeownership rate and stock participation rate present a hump shape over the life cycle of urban households, but with a different profile.

6. The implication of limited participation

The lack of participation in the financial markets poses significant challenges to the standard theory of portfolio choice. To start with, we introduce a very simple framework to describe household portfolio choice. In particular, we will show that in the simplest version, given a positive equity premium, a standard portfolio choice model is not able to explain why so few households participate in the stock market. The literature has referred to this as the "stock market participation puzzle", or "stockholding puzzle" (Haliassos and Bertaut, 1995), and has developed several different explanations able to explain, at least in part, for such a puzzle.

6.1 The standard theory of household portfolio choice

Consider a simple static portfolio choice model. Suppose there are only two assets, one safe (bank deposit) and one risky (stocks). Investors invest α share in risky asset and invest the rest in safe asset. We denote with $\tilde{R}$ the return on risky asset. The symbol $\sim$ indicates that the return is random. The return on safe asset is indicated with R_f which is certain and absent of risk. Thus, the final wealth will result as:

$$\widetilde{W} = \left(R_f + \alpha(\tilde{R} - R_f)\right) W \tag{1}$$

If the investor has a standard utility function $U(W)$, that is, the utility function is monotonically increasing in W, so that $U'(W) > 0$ and moreover the investor is risk averse, thus $U''(W) < 0$. The fraction invested in the risk-free asset is given by $(1 - \alpha)$. Short-selling is not allowed. Thus, a rational investor would choose the share α to maximize his expected utility of final wealth.

$$\max V(\alpha) = EU\left[\left(R_f + \alpha(\tilde{R} - R_f)\right)W\right] \tag{2}$$

To obtain the maximum value, it requires that the first order condition is satisfied. Thus, we derive the first order condition from the equation (2) with respect to α:

$$EU'\left[\left(R_f + \alpha(\tilde{R} - R_f)\right)W\right](\tilde{R} - R_f)W = 0 \tag{3}$$

$$EU'(\tilde{W})(\tilde{R} - R_f)W = 0 \tag{4}$$

Suppose that the equity premium is strictly positive, then the first condition is always satisfied.

$$R_E \equiv E(\tilde{R} - R_f) > 0 \tag{5}$$

Thus, the second order condition requires:

$$E\left[U''(\tilde{W})(\tilde{R} - R_f)^2 W^2\right] < 0 \tag{6}$$

The second order condition is always satisfied for risk averse investors. We verify whether the zero investment in the risky is an optimal solution for investors. If the investor chooses $\alpha = 0$ for this to be optimal it must be

$$EU'[R_f W](\tilde{R} - R_f)W = U'(R_f W)E(\tilde{R} - R_f)W = 0 \tag{7}$$

This conclusion holds only if the equity premium is zero. If there is no equity premium, a risk averse investor will not invest in stocks. On the contrary, if the equity premium is positive, then the equation (7) will be:

$$U'(R_f W)E(\tilde{R} - R_f)W > 0 \tag{8}$$

If the equation (5) always holds true, that is, the equity premium is always positive. Hence, with $\alpha = 0$ the optimality condition is violated since $U'[R_f W] > 0$. A positive share in stocks is necessary to guarantee the first order condition is satisfied. Such a conclusion is a strong implication of the basic asset allocation model: every investor should invest a positive fraction of wealth in the risky asset, independently from his or her degree of risk aversion. In the literature this is referred as the participation principle which is a strong implication of this basic portfolio model with expected utility maximizing investors and no frictions. However, the participation principle does not state that whatever the degree of risk aversion the amount invested in stocks is the same.

In the trivial case where stock return is always higher than the risk-free asset return in all states, i.e. $\tilde{R} - R_f > 0$ always holds, then all the wealth should be invested in stocks. A share in stocks larger than 100 percent is possible only if short sales are allowed: in this case the investor should short the risk-free asset (raises debt at risk-free rate) and invests in the risky asset.

6.2 The fixed cost theory

A first extension of the framework that, at least in part, can explain the puzzle is the introduction of a fixed participation cost. In particular, such a feature explains one of the well-documented features of the data, the correlation between stock market participation and wealth that we have documented in the previous section. For this explanation to be plausible, participation costs should not be too large. It is hard to obtain direct estimates of participation costs. An alternative method is using the information on monetary fees which include transaction costs for trading stock and management fees. Those costs, in general, are in the range of 0.5-2% of the value of the investment but are not necessarily fixed or paid only upon entry. However, this method ignores many factors which can affect participation cost: for example, the time costs of making transaction and collecting the information. These costs are directly observable. One

approximate but easy way is recovering the distribution of participation costs from the joint distribution of wealth and participation (Vissing-Jørgensen 2004). This section closely follows the work of Vissing-Jørgensen (2004).

Assume that in order to invest in the risky asset and to benefit from the positive equity premium, households must pay a fixed cost f, and thus their decision weights the benefits from participation against this cost. In fact, the cost can be avoided by not investing in stocks and holding all the wealth in the risk-free asset. First of all, let us see how the presence of a fixed (per-period) participation cost changes the problem in equation (1). Similarly, households choose to maximize the expected utility from their wealth, that, however, in the case of positive becomes $W - f$. Thus, we can define α^* as the optimal share invested in the risky asset that solves the following optimization problem:

$$\max V(\alpha) = EU\left[\left(R_f + \alpha(\tilde{R} - R_f)\right)W - fI(\alpha)\right] \tag{9}$$

where $I(\alpha)$ is an indicator function that takes value 0 if $\alpha = 0$ takes value 1 if $\alpha > 0$. Deriving with respect to α, the same first order condition is obtained as in eq. (3), only with W replaced by $W - f$. Clearly, the conclusion is the same, the α^* that solves the optimization problem must be strictly positive.

$$EU'\left[\left(R_f + \alpha^*(\tilde{R} - R_f)\right)W - f\right](\tilde{R} - R_f)W = 0 \tag{10}$$

However, given α^*, the investor participates in the stock market if his or her expected utility from the investment is higher than the utility coming from investing only in the risk-free asset, thus avoiding to pay the fixed cost. In fact, a rational investor will compare the expected utilities upon the participation decision. In the case of participation, the expected utility will be:

$$\text{Expected utility} = EU\left[\left(R_f + \alpha(\tilde{R} - R_f)\right)W - f\right] \tag{11}$$

The equation (11) shows that the expected utility increases with the equity premium and decreases with the fixed cost. For a given equity premium, a relatively high fixed cost is sufficient to discourage participation. The expected utility gain from participation depends also on the optimal share α^*. The economic benefit will be larger as the optimal share conditional on participation increases.

Let us define the certainty equivalent of the risky return as follows:

$$EU\left[\left(R_f + \alpha(\tilde{R} - R_f)\right)W - f\right] = U\left[\left(R_f + \alpha(\hat{R} - R_f)\right)W - f\right] \tag{12}$$

Then, the investor participation condition can be formalized as follows:

$$U\left[\left(R_f + \alpha(\tilde{R} - R_f)\right)W - f\right] > U(R_f W) \tag{13}$$

The equation (13) specifies that the investor will participate in stock market if and only the utility from composite investment portfolio is strictly higher than that of invest only in safe asset.

Since utility is monotonically increasing in its argument, we can compare the terms inside the parenthesis.

$$\left(R_f + \alpha^*(\hat{R} - R_f)\right)W - f > R_f W \tag{14}$$

We can drop the term $R_f W$ which is present in the both sides. Then, the participation condition is true if and only if:

$$\alpha^*(\hat{R} - R_f)W > f \tag{15}$$

We can then interpret the two sides of equation (15) as the benefits and the costs from participation, respectively. The right-side hand side represents the fixed costs to enter the stock market. The left-hand side is the net benefit from investing α^* share of wealth in the risky asset. The equation (15) establishes that the extra gain from investing in stocks must be sufficiently large to cover the fixed costs f. If this condition is met, the investor participates.

From equation (15) it is clear that the value of the fixed cost defines a wealth threshold below which the expected utility maximizing investor is better off staying out from the stock market and investing all of his or her wealth in the safe asset. For a given optimal share invested in stocks, and given the "risk-adjusted" equity premium $(\hat{R} - R_f)$, the equation (15) defines a threshold of investor's wealth, W^*. Rearranging equation (15), such wealth threshold is expressed as:

$$W^* = \frac{f}{\alpha^*(\hat{R} - R_f)} \tag{16}$$

As can be seen from equation (16), the framework above implies that the relationship between the wealth threshold that triggers participation and the fixed cost is linear; the slope depends on the ratio between the return on the risk-free asset and the risk-adjusted excess return obtainable investing a fraction α^* in the risky asset, where α^* is the optimal share invested in case of participation. Given a fixed cost f, the lower α^* or the risk adjusted equity premium, the higher the threshold.

We can now replicate the exercise made by Vissing-Jørgensen (2004) in order to obtain an estimate of these costs from the data. The intuition is quite simple: since we assume that cost is fixed for everyone and we observe a participation rate of x% in the risky asset, given the risk-adjusted equity premium and the optimal share invested conditional on participation, we can compute the value of the benefit as a function of wealth, and then estimate the level of the cost necessary in order to explain a participation rate of x%. Three assumptions are needed in order to make this computation. First of all, we assume that the optimal share α^* equals to the average share invested by participants. Thus, such share is optimal also for nonparticipants. We consider as risky the amounts invested directly in stocks, in mutual funds and very small

fraction in other risky assets (financial derivative, foreign stocks etc.). Then, we compute the share invested in the risky asset as the fraction of liquid financial wealth (i.e. financial wealth excluding the cash value of social securities including the life insurance policies and pension plans) held into these three financial instruments. From the one side, this approach clearly overstates both the participation rates and the risky share in the portfolio, as a significant part of mutual funds and managed accounts holdings may not be invested in stocks. The second assumption regards the equity premium: we compute the average annual equity premium between 1997 and 2019. It turned out to be 8.27% and it is considered as equilibrium equity premium. The equity premium is rather higher compared to the historical excess return in the United States which is estimated between 6% and 7%. A third assumption is to compute the benefits as $B = \alpha^* (\hat{R} - R_f) W$.

Figure 6.1 shows the distribution of the stock market participation benefit computed as described above using data of CHFS 2017 wave. Given the equation (16) the value of the benefit is linear in financial wealth. For a matter of readability, percentiles above the 95th are not included in the figure. Table 6.1 shows the level of fixed costs needed to explain the decision of 50, 75, 90 percent of nonparticipants households in each wave. From table 6.1 it is evident that even a low participation cost is able to account for the decision to not participate in a large share of the sample. For example, a cost of only 316 yuan explains the decision of half of the nonparticipants in 2017. Clearly, this is related to wealth: from equation (16), indeed, we notice that the benefits from participation are directly proportional to wealth. Thus, the low levels of costs able to explain the decision of a significant part of nonparticipant households reflect the low median financial wealth, as can be seen in table 6.1. Thus, the presence of a fixed participation cost can plausibly explain the relationship between wealth and stock market participation well documented in the data, at least at relatively low values of wealth.

However, there are two features of the data that participation costs cannot explain. First of all, there are a large fraction of households that do not own risky assets even at a high level of wealth. As an example, in the table, we report also the hypothetic fixed cost necessary to explain

the decision to not invest in the risky asset of every nonparticipating investor in the sample. As can be seen, we would be forced to assume implausibly high values for the fixed cost.

Figure 6.1: Stock market participation benefits for nonparticipants.
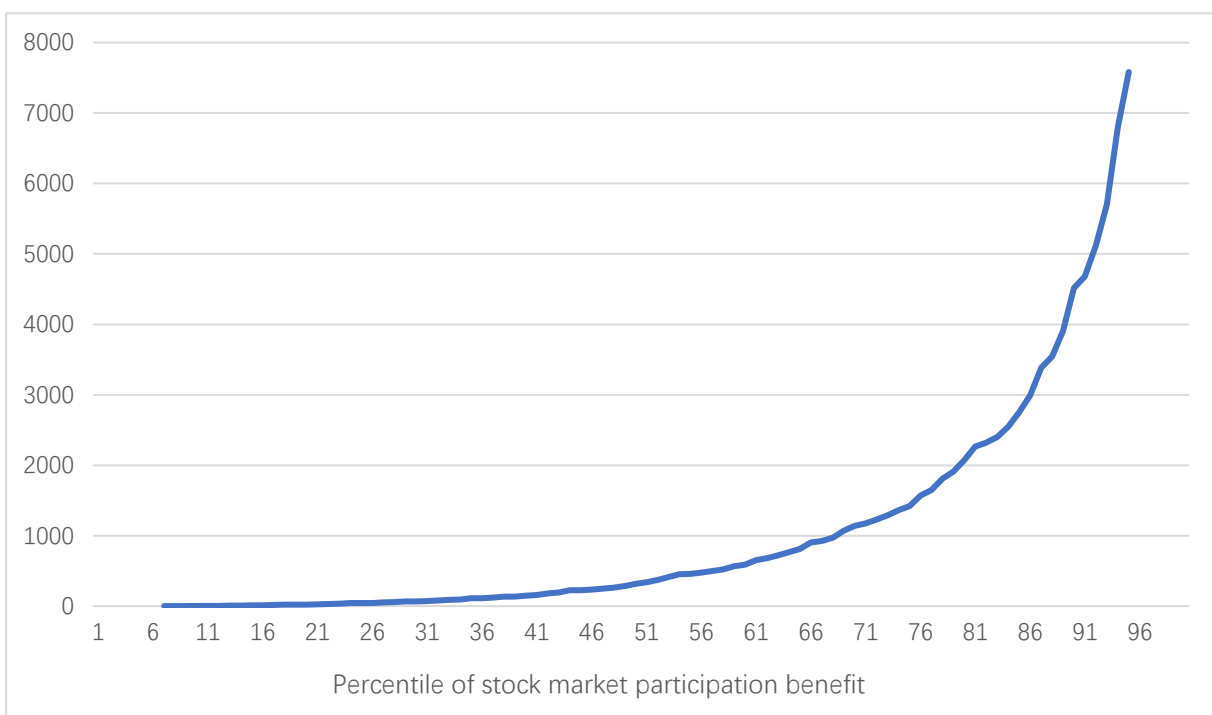
Note: computed from CHFS 2017. Currency in Renminbi.

Second, participation costs cannot account for the considerable drop in participation that we report in table 6.1. In the table we compute also the value of fixed costs that generates a participation rate equal to the one observed in the data. The computation is very simple: we assume that participation is related to wealth only and since a given value of the cost determines a wealth threshold that triggers participation, we select the level of the cost that exactly individuates the percentile along the wealth distribution that corresponds to the rate of nonparticipation observed. To be clearer, let us consider for example participation in 2015. The participation rate is 21.93%, the highest among the four waves. The average share equals 32.60%. Following the computation described before we find a cost equal to 3436 yuan. In order to allow an easier interpretation of the evolution of these costs over time, we also repeat the same computation but fixing α^* equal to 0.30. Indeed, costs in a specific year are determined by the participation rate, the corresponding percentile of the distribution of financial

wealth and the share invested. Hence, setting a fixed α^* we limit the sources of variability only to changes in financial wealth and in the participation rates. It is clear, looking at table 6.1 in which the participation fixed costs should have increased throughout the years. But it is very unlikely that this happened, if anything, instead, the access to stock and financial products such as mutual funds should have become easier, thanks to the technological progress and the progressive development of financial markets in China occurred especially with the development of digital financial services apps.

Table 6.1: Fixed costs needed to explain the decision of x% of nonparticipants.

	Survey year			
	2017	**2015**	**2013**	**2011**
Fraction				
50%	316	431	130	162
75%	1,422	1,779	813	860
90%	4,514	5,390	2,641	2,556
Matching participation rate[1]	5,575	3,436	2,688	2,193
Share fixed at 0.30[2]	6,126	3,162	2,666	2,009
Summary statistics				
Participation rate %	12.24	21.93	13.55	17.19
Average Share %[3]	27.30	32.60	30.25	32.76
Liquid financial wealth				
Mean	114,059	129,554	61,278	71,564
Median	21,500	26,500	8,000	10,000

Note: currency in Renminbi.

[1] Fixed costs that generate a participation rate equal to the one observed in the data.

[2] Fixed costs that generate a participation rate equal to the one observed in the data, with the share invested fixed to 0.30.

[3] Average share conditional on participation, in percent.

7. Empirical analysis

In this section, we show the empirical analysis results. First, we present a probit regression for the participation rate. In the following chapter, we report regression results for asset shares invested in stocks, conditional on participation.

7.1 Econometric analysis of stock participation rate

We run four probit regressions to analyze how relevant factors determine the direct and total stock market participation rate. The first probit regression focuses on the effects of financial resources and personal attributes. Then, we add the homeownership status dummy to verify its relation with stock participation. Furthermore, we control the multi-home ownership status to separate the two groups of homeowners: the owner of the primary residence and owner of other residential housing properties. Finally, we add in control the housing-income ratio, a relative measure of housing wealth, to verify if an increase in housing wealth will significantly lead to household participation in the stock market.

Age, education level and financial resources are correlated. In fact, education level and financial resources are notably positively correlated, while financial wealth and income vary in predictable ways with age, as implied by life cycle consumption models. To account for this correlation and to isolate the contribution of each one factor while holding others constant, we report probit analysis for the participation decision and regressions for the portfolio share of stocks conditional on participation. Besides controlling simultaneously for income, financial wealth, age and education, we also include a dummy variable for whether the household head is married.

Table 7.1 shows the regression results for the participation decision for direct participation and Table 7.2 shows those for total participation. To eliminate possible multicollinearity

Table 7.1: Probit Regressions for Direct Participation

	(1)	(2)	(3)	(4)
Married	-0.0415	-0.0324	-0.0332	-0.0338
	(0.0420)	(0.0421)	(0.0421)	(0.0423)
Risk tolerant	0.251***	0.251***	0.253***	0.255***
	(0.0333)	(0.0333)	(0.0334)	(0.0334)
Risk averse	-0.330***	-0.330***	-0.328***	-0.327***
	(0.0377)	(0.0377)	(0.0377)	(0.0378)
High trust	-0.00722	-0.0112	-0.0142	-0.0148
	(0.0548)	(0.0549)	(0.0550)	(0.0552)
Low trust	-0.0719***	-0.0733***	-0.0717***	-0.0709**
	(0.0277)	(0.0277)	(0.0277)	(0.0277)
Limited knowledge	-0.430***	-0.430***	-0.429***	-0.425***
	(0.0726)	(0.0727)	(0.0727)	(0.0728)
Home ownership		-0.116***	-0.142***	-0.163***
		(0.0445)	(0.0451)	(0.0455)
Multi-home ownership			0.107***	0.0988***
			(0.0303)	(0.0303)
Housing income ratio				0.000902***
				(0.000201)
College	0.306***	0.308***	0.308***	0.302***
	(0.0337)	(0.0338)	(0.0338)	(0.0338)
Age 30-39	0.356***	0.374***	0.371***	0.383***
	(0.0679)	(0.0684)	(0.0683)	(0.0686)
Age 40-49	0.547***	0.572***	0.562***	0.574***
	(0.0662)	(0.0672)	(0.0672)	(0.0675)
Age 50-59	0.601***	0.627***	0.618***	0.627***
	(0.0680)	(0.0690)	(0.0689)	(0.0693)
Age 60-69	0.800***	0.825***	0.820***	0.823***
	(0.0698)	(0.0707)	(0.0706)	(0.0709)
Age > 70	0.614***	0.636***	0.640***	0.642***
	(0.0747)	(0.0754)	(0.0753)	(0.0756)
II wealth quartile	0.521***	0.522***	0.522***	0.525***
	(0.0667)	(0.0667)	(0.0667)	(0.0671)
III wealth quartile	1.022***	1.026***	1.026***	1.025***
	(0.0610)	(0.0611)	(0.0611)	(0.0615)
IV wealth quartile	1.519***	1.525***	1.518***	1.509***
	(0.0598)	(0.0599)	(0.0600)	(0.0603)
II income quartile	0.0863	0.0863	0.0891*	0.157***
	(0.0528)	(0.0528)	(0.0528)	(0.0554)
III income quartile	0.216***	0.221***	0.216***	0.291***
	(0.0505)	(0.0506)	(0.0506)	(0.0535)
IV income quartile	0.407***	0.414***	0.393***	0.474***
	(0.0503)	(0.0504)	(0.0509)	(0.0541)
Internet access	0.760***	0.760***	0.758***	0.757***
	(0.0405)	(0.0405)	(0.0405)	(0.0406)
Number of Observations	24,882	24,882	24,882	24,882

Note: Wealth refers to financial wealth. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 7.2: Probit Regressions for Total Participation

	(1)	(2)	(3)	(4)
Married	-0.0746*	-0.0657*	-0.0667*	-0.0670*
	(0.0397)	(0.0396)	(0.0397)	(0.0399)
Risk tolerant	0.205***	0.205***	0.206***	0.208***
	(0.0318)	(0.0318)	(0.0318)	(0.0319)
Risk averse	-0.376***	-0.376***	-0.374***	-0.372***
	(0.0354)	(0.0354)	(0.0354)	(0.0355)
High trust	-0.00304	-0.00671	-0.0100	-0.0106
	(0.0527)	(0.0527)	(0.0529)	(0.0529)
Low trust	-0.0810***	-0.0823***	-0.0806***	-0.0794***
	(0.0267)	(0.0267)	(0.0267)	(0.0267)
Limited knowledge	-0.467***	-0.467***	-0.466***	-0.462***
	(0.0679)	(0.0679)	(0.0679)	(0.0680)
Home ownership		-0.109**	-0.136***	-0.158***
		(0.0423)	(0.0428)	(0.0431)
Multi-home ownership			0.115***	0.108***
			(0.0293)	(0.0293)
Housing income ratio				0.000901***
				(0.000208)
College	0.325***	0.327***	0.327***	0.321***
	(0.0327)	(0.0327)	(0.0327)	(0.0328)
Age 30-39	0.227***	0.245***	0.243***	0.253***
	(0.0640)	(0.0642)	(0.0641)	(0.0643)
Age 40-49	0.400***	0.426***	0.415***	0.426***
	(0.0624)	(0.0629)	(0.0629)	(0.0632)
Age 50-59	0.508***	0.533***	0.525***	0.533***
	(0.0640)	(0.0646)	(0.0645)	(0.0648)
Age 60-69	0.729***	0.754***	0.749***	0.753***
	(0.0658)	(0.0662)	(0.0662)	(0.0664)
Age > 70	0.536***	0.559***	0.564***	0.565***
	(0.0699)	(0.0701)	(0.0700)	(0.0703)
II wealth quartile	0.596***	0.598***	0.598***	0.600***
	(0.0631)	(0.0631)	(0.0631)	(0.0635)
III wealth quartile	1.107***	1.111***	1.111***	1.111***
	(0.0582)	(0.0583)	(0.0583)	(0.0587)
IV wealth quartile	1.658***	1.663***	1.656***	1.648***
	(0.0572)	(0.0573)	(0.0573)	(0.0577)
II income quartile	0.0873*	0.0877*	0.0909*	0.155***
	(0.0496)	(0.0496)	(0.0496)	(0.0521)
III income quartile	0.237***	0.242***	0.237***	0.308***
	(0.0474)	(0.0474)	(0.0475)	(0.0504)
IV income quartile	0.441***	0.448***	0.425***	0.502***
	(0.0473)	(0.0474)	(0.0479)	(0.0511)
Internet access	0.705***	0.705***	0.703***	0.701***
	(0.0369)	(0.0369)	(0.0369)	(0.0370)
Observations	24,882	24,882	24,882	24,882

Note: Wealth refers to financial wealth. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

phenomenon in the effect of age, income and wealth, we use a set of age-bracket dummies, income-quartile and wealth-quartile dummies. The excluded age dummy is for the youngest group of investors below age thirty. Regarding the income and financial wealth, the excluded dummy is the first quartile of the respective distribution.

The effect of education on the stock market participation rate was notoriously explicit in the simple descriptive section. In this thesis, we use the college degree dummy to simulate the effect of education. Even controlling for differences in income and financial wealth, education has a positive and significant effect. Controlling the homeownership and housing wealth, education still has a positive and significant effect. Indeed, education significantly increases the probability of entering the stock market either directly or indirectly. Guiso, Haliassos and Jappelli (2003) point out that more educated households are not only more likely to have heard of stocks but also to learn easily about how to invest in stocks and to estimate more precisely the costs and benefits this entails.

Both income and financial wealth have a positive and strong effect on stock ownership. The descriptive analysis presents a convex relation, and it is confirmed in the controlled experiment provided by the probit analysis. Moving from the third to the fourth quartile of monetary wealth incorporates a much stronger effect on the probability of becoming a stockholder than moving from the second to the third. This effect is even stronger than moving from the first to the second. Furthermore, the convex pattern is more evident for financial wealth than for income. As results in Table 7.2 show, these conclusions apply also to total participation. Income and wealth have a significant, positive effect on total participation. This strong effect contains a straightforward interpretation in terms of participation costs. If households have sufficient large amounts of investable fund which consists of the sum of wealth and income, they will perceive a net benefit from being in the stock market if the optimal amount to be invested in stock is sufficiently large to overcome the costs. This may be true if all potential investors face identical fixed costs. In fact, the financial sector offers better services and conditions to large investors than to smaller ones, amplifying further, the relevance of income and wealth in the participation decision. Furthermore, the importance of income and wealth will be further amplified in the presence of peer effects. Each member of the more affluent group is

more likely to hold risky assets, and any given affluent household is probably going to possess more household members that invest in the stock market. This might provide a further drive for affluent households to participate in the stock market themselves.

As well as households' financial status, the cultural factor such as trust is also an important determinant of risk-taking in household portfolios. Larger confidence in the financial system would encourage the households to participate and hold a higher share of risky assets. Guiso et al. (2008) develop a probability-weighted model to determine the effects of trust on participation. Their results show that an investor will never enter the stock market if he or she perceives a probability to be cheated higher than a certain threshold, called the trust threshold. Moreover, this threshold does not depend on the level of wealth, and thus, the model is particularly suitable to explain why even wealthy households do not participate. Table 7.1 shows that the "low trust" coefficient is strongly and negatively correlated with stock market participation as expected. Surprisingly, the "high trust" coefficient does not have a significant effect on the participation decision, since it is not statistically different from zero. These conclusions apply also to total participation. The empirical results suggest the participation rate is not a linear function in trust. This deduction is consistent with the trust threshold theory of Guiso et al. (2008).

Among the personal attributes, risk preference is probably one of the most important determinants of participation. Different risk attitude leads to different investment strategy. Question H3104 captures the risk attitude of households. Each interviewee is invited to answer how to invest if she or he has a sufficient quantity of money for investment. There are six options. The first five options are listed cardinally from the highest level of risk to the lowest level. The last option is "don't know". The risk-tolerant group includes households who have selected the first two options, while risk averse households are those unwilling to take any risks. We identify the households which don't know how to invest as the limited financial knowledge group. Risk tolerant investors tend to invest in risky assets to have a higher return. Risk-averse investors, on the contrary, tend to invest in safe assets to lower the portfolio risk and have a stable return. The empirical results are coherent with theoretical predictions.

Another particularly interesting variable is the limited financial knowledge dummy. It is strongly and negatively correlated with stock participation. The empirical results are consistent with the limited awareness theory. However, as we will see in the next chapter, the limited financial knowledge will play a totally different role in determining the conditional risky share.

Residential housing property is the most important asset for the majority of households in China. Generally, housing wealth accounts for more than 70% of household total wealth. With such a large share, variations in housing wealth could lead to significant changes in households' total assets and thus change households' investment behavior. The empirical results show that the effect of homeownership is controversial: being a homeowner has a strong negative impact on the participation rate, showing the crowding-out effect; meanwhile, having more than one residential housing property (multi-home ownership) encourages participation in the stock market. Furthermore, the participation rate is positively correlated with housing wealth. The different effect is probably due to the different function of housing. The first house is considered in the general good of necessity, households have to withdraw cash from the bank account and stock account to meet down payment requirements. Purchasing a second and third house is often a pure investment decision. Thus, investors tend to hold a more diversified portfolio. A further explanation for the discouraging effect of the first house on risky assets addresses the participation cost. The stock holdings for younger and less wealthy investors, which are owners of primary residence, will decrease because the investment in housing implies that less liquid financial resources will be available. Thus, being a homeowner but not a multi-home owner reduces their willingness to pay for the fixed costs associated with equity market participation.

7.2 Econometric analysis of conditional portfolio shares

This thesis explores beyond the analysis of the participation decision to the study of optimal portfolio shares of stocks, conditional on participation by the household. In the standard theory of portfolio of choice, investors characterized by constant relative risk aversion (CRRA) utility

function, the optimal share invested in the stock market is independent of the investor's wealth. Nevertheless, the optimal share is decreasing in wealth if investors have constant absolute risk aversion (CARA) utility function. We verify the theoretical predictions with the econometric estimation of conditional portfolio shares.

Tables 7.3 shows regression estimates for the share of financial assets invested in stocks, conditional on participation. These are two-stage regressions, adjusted for selection using the Heckman procedure. The Heckman two-step procedure requires that the selection equation should contain at least one variable that is not in the outcome equation. In this case, we consider the possibility to access to the internet in the selection equation. However, the inverse mills ratio in both estimations is not significant, that means for this problem, selection bias is not a significant issue.

In general, the conditional portfolio share is harder to predict on the basis of demographic variables and household wealth than the decision to participate. Unexpectedly, having a college degree is not be associated with a higher share of wealth invested in stocks since the coefficient is not significant. However, the positive education effect is present in the risky asset share. The estimates suggest that households with a college degree tend to hold average stock share, but invests higher share in mutual funds. The results are coherent with studies of Chu et al. (2017), which indicated that Chinese households with higher financial literacy tended to delegate at least part of their portfolio to professionals and invest in mutual funds, especially those with an advanced level of financial literacy. However, households who were overconfident about their financial literacy would probably try to invest by themselves and were more likely to hold only stocks in their financial portfolios. The findings also suggested that a higher level of financial literacy may result in a better financial outcome since households with higher financial literacy had a better chance of receiving a positive investment return. Notoriously, financial literacy is positively correlated with education. (Kaiser and Menkhoff, 2017)

Finally, the estimates show that the coefficients of income are not statistically different from zero with exception of the fourth quartile income dummy which is weekly significant with a negative sign. This counterintuitive result suggests that as income increases, households tend to hold the same share in stocks and risky assets. The coefficients of financial wealth dummies

Table 7.3: Regressions for Asset Share Invested in Directly and Indirectly Held Stocks

VARIABLES	(1) Stock share	(2) Risky asset share
Married	-1.167	-0.287
	(1.799)	(1.714)
College	0.665	2.819*
	(1.498)	(1.458)
Age 30-39	1.055	1.165
	(3.102)	(2.742)
Age 40-49	3.225	2.929
	(3.241)	(2.805)
Age 50-59	7.338**	6.656**
	(3.360)	(2.933)
Age 60-69	5.810	8.973***
	(3.561)	(3.125)
Age > 70	5.887*	9.276***
	(3.445)	(3.045)
II wealth quartile	23.32***	36.39***
	(4.586)	(4.525)
III wealth quartile	29.42***	39.04***
	(4.961)	(4.970)
IV wealth quartile	24.44***	34.27***
	(5.790)	(5.864)
II income quartile	-0.439	0.455
	(2.987)	(2.820)
III income quartile	-3.623	-3.413
	(2.905)	(2.766)
IV income quartile	-5.162*	-3.821
	(3.050)	(2.940)
Housing income ratio	-0.00830	-0.00396
	(0.00871)	(0.00816)
Risk averse	0.193	0.890
	(1.978)	(1.911)
Risk tolerant	6.430***	6.408***
	(1.524)	(1.390)
High trust	-1.759	-2.038
	(2.090)	(2.004)
Low trust	0.386	0.0237
	(1.162)	(1.110)
Limited knowledge	10.09**	8.542**
	(3.938)	(3.717)
Inverse mills ratio	2.676	2.503
	(3.502)	(3.391)
Number of Observations	24,882	24,882

Note: Second-stage regressions, adjusted for selection using the Heckman procedure. Wealth refers to financial wealth. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

are positive and very significant. The third financial wealth quartile tends to have the highest share, meanwhile, the fourth wealth quartile group has a lower share. Considering the fact that the fourth income quartile is negatively correlated with share invested in stocks, the results suggest the households in higher entail of wealth distribution seem to have CARA utility function. The empirical findings regarding a flat profile of portfolio shares against age and income are coherent with available panel-data evidence on the infrequency of portfolio adjustments during life. Especially, 47 percent of those highly educated account holders made no changes in how the flow of their contributions gets allocated to alternative investment accounts, while another 14 percent made just one change (Ameriks and Zeldes 2001). Account-holders even have the choice of adjusting their portfolio allocation by moving accumulated funds from one account to the other, but roughly 73 percent made no such change within the ten-year period, while another 14 percent made just one change. The housing wealth is either irrelevant in this aspect. An increase in housing wealth-income ratio does not lead to a significant increase in conditional risky asset share.

The trust is irrelevant to determine the share invested in the stock market, either directly or indirectly. The risk aversion coefficient presents the same characteristic since it is not statically different from zero. The results suggest the optimal share is independent of these factors once investors decide to participate in the stock market. The risk tolerance dummy is very significant and it raises the conditional stock and risky asset share by 6.4 points. Risk-tolerant investors tend to adopt an aggressive investment strategy with higher risk exposure.

As we have mentioned in the previous chapter, the limited financial knowledge dummy variable presents interesting and contradictory properties. It is strongly and negatively correlated with participation, as we examined in the previous chapter. However, a different pattern is shown in the conditional risky asset share regression analysis. Investors with limited financial knowledge tend to invest 10 percent higher in stock and 8.5 percent higher in risky assets than average share. This means, investors with limited financial knowledge are reluctant to participate in the stock market, but once they decide to participate, they tend to deviate from the average asset allocation, holding a higher proportion in stocks and risky assets.

The theoretical predictions concerning the importance of entry barriers to the stock market in the form of participation costs, both fixed costs and obstacles in information acquisition, are reconfirmed by our empirical findings comparing the participation determinants and those for portfolio shares. The weak relation between the conditional asset share and housing wealth, income, education suggests that once these factors have affected the decisions whether invest in stocks or not, they have no additional impact on portfolio composition.

Due to the particular feature of limited financial knowledge status examined before, it is worthwhile to explore further the topic. Therefore, we proceed with the descriptive analysis. Figure 7.1 reports the limited financial knowledge percentage by each age group. The graph shows clearly that the limited financial knowledge is an increasing function of age. This result is quite understandable given that the Chinese stock market was founded only at the beginning of the 90s'. Moreover, households belonging to the advanced age groups are likely to have a lower level of education, which increases the probability of being limited in financial knowledge.
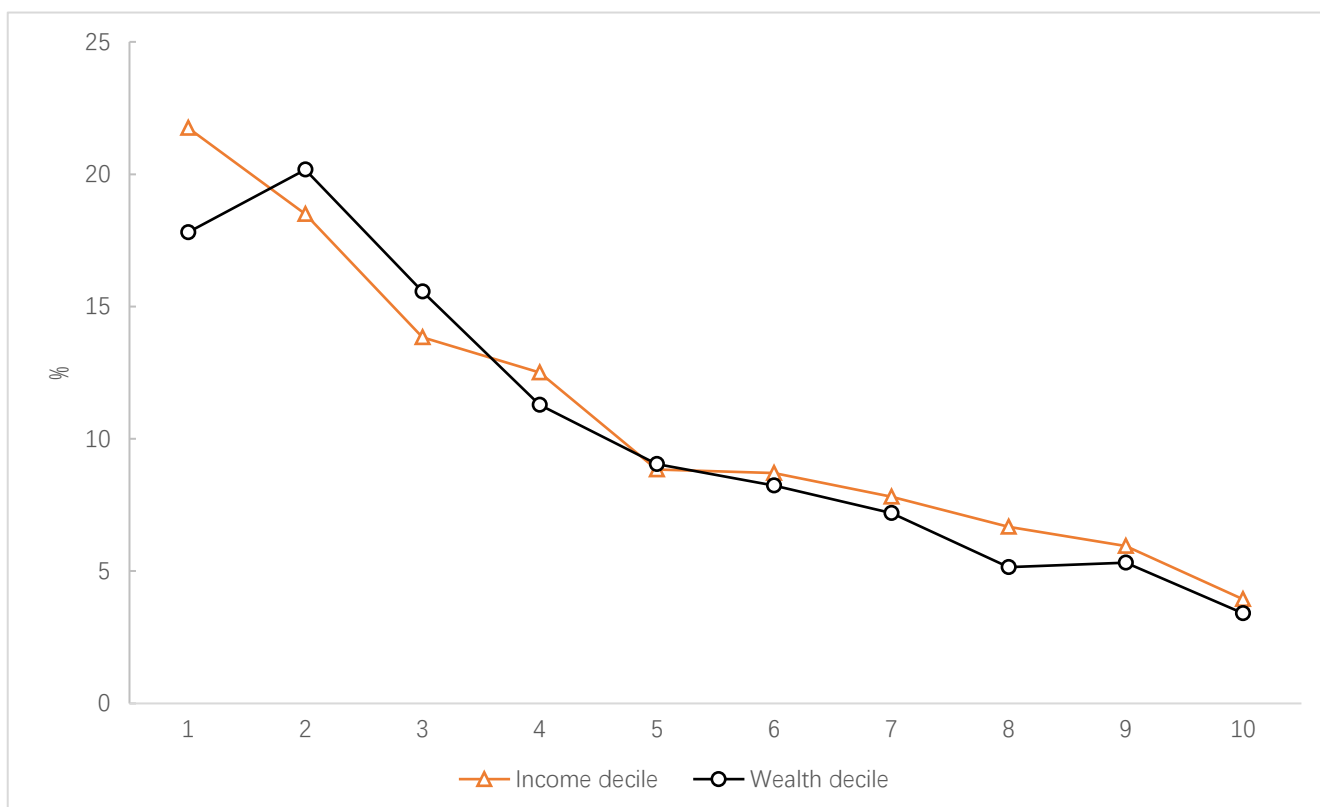
Figure 7.1: Limited financial knowledge percentage by age group
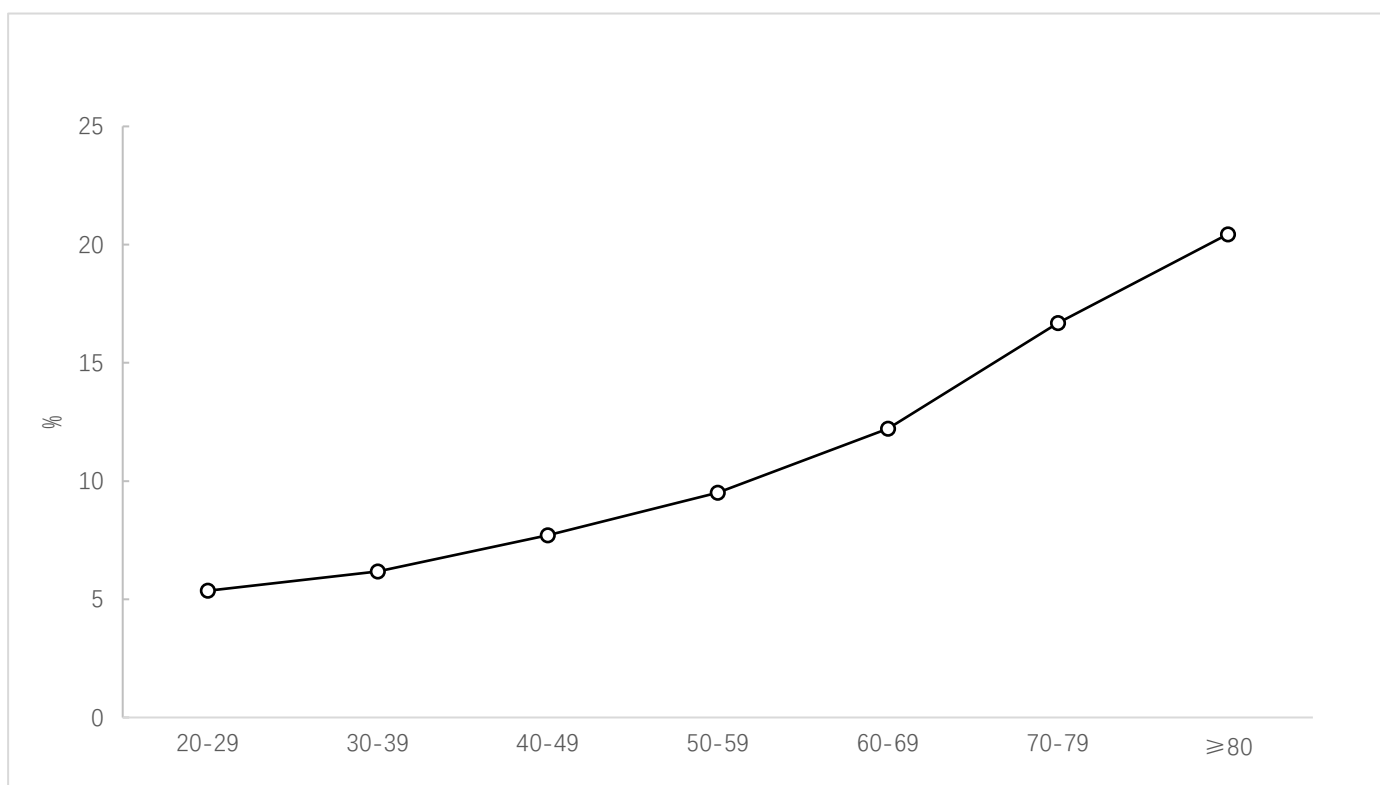
Note: numbers in percent.

Figure 7.2 shows the limited financial knowledge percentage by income and wealth decile. The income and wealth present similar profiles. The financial knowledge is positively correlate with households' financial resources and households in the under tail of distribution is more likely to be subject of limited financial knowledge status.

Figure 7.2: Limited financial knowledge percentage by Income and Wealth decile

Note: numbers in percent.

As we have analyzed in previous chapters, the limited financial knowledge presents very particular and contradictory effects on households' risk-taking behaviors: households with limited financial knowledge have a much lower probability to participate in the stock market, but once they participate, they tend to allocate extra 10 percent of the share of total financial wealth in stocks. Based on this evidence, we proceed with a descriptive analysis comparing due groups: the participant and nonparticipant, conditional on limited financial knowledge; the other one is between investors with and without limited financial knowledge, conditional on participation.

As results in Table 7.4 show, participants are relatively wealthier, healthier, younger than those who don't participate in the stock market. Even in the presence of limited financial knowledge, wealthy households are more likely to be aware of the benefit of investing in stocks. The simple descriptive analysis suggests that the effect of the fixed costs, introduced by Vissing-Jørgensen (2004), is present even among households with limited financial knowledge. Another suggestion is that the wealth threshold described by equation (16) is probably higher for households with limited financial knowledge. On the other side, the descriptive analysis doesn't show a significant difference between participants with limited financial knowledge and those without this feature. Roughly speaking, participants without limited financial knowledge are wealthier than those possess this characteristic, where the latter tend to invest like the first group.

Table 7.4: Characteristics of participants with limited financial knowledge

Mean	Limited financial knowledge		Participant	
	Participant	Non participant	Limfink	No limfink
Age	52.6	60.0	52.6	51.0
Education year	11.0	7.2	11.0	11.5
Health	3.7	3.2	3.7	3.7
Trust	2.47	1.94	2.47	2.41
Income	164,420	68,403	164,420	213,214
Fin. Wealth	235,447	37,330	235,447	373,238
Hou. Wealth	2,312,734	582,837	2,312,734	2,307,736
N. of houses	1.35	0.98	1.35	1.34
Happiness	3.80	3.87	3.80	3.82
N. of cars	0.62	0.16	0.62	0.60
Luxury good exp. Last yr.	24,473	10,329	24,473	39,867
Commercial insurance %	20	3.9	20	21.94
Pension plan %	88.33	79.73	88.33	93.68
Health insurance%	90	91.32	90	96.21
Self-employed %	15	10.76	15	15.97
N. of observations	60	2584	60	2637

Note: Currency unit is Renminbi. The variables Health, Trust and Happiness are self-reported subjective cardinal values, ranging from 1 lowest to 5 highest. Commercial, health insurance, and pension plan refer to the effective participation rate. Limfink is the abbreviation for limited financial knowledge.

Table 7.5 reports the investment methodology selected by participants with limited financial knowledge. Column 3 and 4 respective average stock and risky assets share of participants who have chosen methods listed in column 1. Unexpectedly, "fundament analysis" and "technical analysis" is selected by 36.7% and 28.3% of participants. Generally, these two methods are reserved for professional investors. A plausible explanation is that most interviewees selected also these two apparently reasonable options since this is a multiple-choice question. Beside "fundamental analysis", "introduction by relatives and friends" is the most selected option. The stock and risky assets share is normally higher than the average share held by all investors. A plausible explanation for those results is that investors with limited financial knowledge rely on others' recommendations for stock investment, mostly by friends and relatives, followed by TV and economic news.

Table 7.5: Stock investment methodology of participants with limited financial knowledge

How do you choose which stock to invest in?	Selection	stock share	Risky assets share
Fundamental analysis	36.7	35.4	40.6
Technical analysis	28.3	36.4	38.9
Economic news	25.0	21.0	25.4
Introduction by relatives and friends	35.0	27.1	35.4
Recommendations from TV	15.0	30.0	32.1
Consultation of professionals	8.3	26.4	30.3
By sentiment	13.3	28.2	33.0
Others	5.0	14.9	14.9

Note: multiple choice question. Numbers in percentage. Column (3) and (4) are respective average stock and risky assets share of participants who have chosen methods listed in column (1)

Table 7.6 shows the motivation for investing in stocks. Note that the "low risk" option is selected by only 5% of participants which holds an incredible 68.1% of stock share in their own financial portfolio. Risky assets share exceeds even 70%. This revelation suggests that this portion of participants is likely to have a misleading perception of risk, given that the stock is traditionally considered one of the riskiest financial assets. "Confidence in the ability of stock investment" is another interesting option, selected by 23.3% of interviewees. The stock share and risky assets share are far away from the sample average, showing a probable overconfidence phenomenon. In fact, households who are overconfident in their financial

ability tend to invest by themselves and are disposed to hold a higher stock share in their portfolio. (Chu et al. 2017).

Table 7.6: Motivation for investing in stocks of participants with limited financial knowledge

Why does your household choose to invest in stocks?	Selection	stock share	Risky assets share
High yield	33.3	22.6	28.5
Low risk	5.0	68.1	71.6
Diversified investment	11.7	28.1	35.2
Confidence in the ability of stock investment	23.3	33.5	39.4
Introduction by others	28.3	25.7	29.4
Pastime	20.0	36.6	39.3
Others	6.7	13.6	47.0

Note: multiple choice question. Numbers in percentage. Column (3) and (4) are respective average stock and risky assets share of participants who have chosen motivations listed in column (1)

In summary, we describe merely the characteristics of participants with limited financial knowledge. However, note that this group is composed only of 60 samples. Further analysis is left for future research, which can explore the abnormal behaviour of this particular group.

8. Conclusion

In this thesis, we have analyzed the Chinese urban household portfolio choices using the microdata collected by the Chinese Household Finance Survey. In particular, this thesis focuses on the direct and total stock market participation in China. We start by describing the key features of household finance. The majority of households is the owner of primary residence, while only a few participate in the stock market and hold risky assets despite the fact the stocks offer an outstanding positive risk premium in the medium-long term. The stock ownership rate presents a hump shape over the life cycle of urban households and scarcity of financial knowledge is the most important reason for non-participation. The lack of stock market participation is identified in the literature as the stock market participation puzzle, which could be explained by several theories. This thesis in particular focuses on the fixed cost theory introduced by Vissing-Jørgensen (2004). The descriptive analysis shows that there is a significant positive relation between stock market participation and financial wealth which is consistent with fixed cost theory. Accordingly, we have estimated the fixed participation costs for urban households in China over four years' time horizon and in 2017 the median participation costs are 316 yuan. Nevertheless, this theory does not fully resolve the puzzle, given that the fixed costs should be implausibly high to explain the low participation observed at the very upper tail of wealth.

We proceed with econometric analysis in order to understand the stock market participation determinants. As the empirical results have demonstrated, wealthy, well-educated, more risk-tolerant, multi-home owner, higher trust households are more likely to invest in risky assets. Those households in general possess also some financial knowledge. Further empirical analysis specifies that once households have participated in the stock market, trust level, education, housing wealth and income do not affect the financial assets share invested in stocks. On the contrary, wealthy, more risk-tolerant households hold a higher share of stocks in their own financial portfolio.

As the empirical supplement to the theory of household portfolio choices, it is clear that the analysis provided by this thesis has several important implications also for public policy. Concerning in particular the dynamics of wealth accumulation and inequality, it may be useful to understand why households do not participate in the stock market. If wealthy households are more likely to invest in the stock market and the equity premium is significantly positive, they are expected to achieve a higher rate of return. The wealth inequality will inevitably rise if the rate of return on capital exceeds economic growth (Piketty 2014). One implication is that policymakers should promote additional financial education programs to stimulate participation, either provided by the public sector or private institutions. The technological progress and the progressive development of financial markets in China occurred especially with the diffusion of digital financial services mobile applications, have been having a notable impact on participation costs and financial knowledge dissemination. These extensions and examinations are left for future research.

References

ALAN, S. (2006): "Entry costs and stock market participation over the life cycle", Review of Economic Dynamics 9, 588–611

ALLEN, F., ZHANG, C., & ZHAO, M. (2012): "China's financial system: Opportunities and challenges." In Capitalizing China (pp. 63–143). University of Chicago Press.

AMERIKS, J. & ZELDES, S. (2001): "How Do Household Portfolio Shares Vary with Age?", mimeo, Columbia Graduate School of Business.

CHEN, X., & JI, X. (2017): "The Effect of House Price on Stock Market Participation in China: Evidence from the CHFS Micro-Data", Emerging Markets Finance and Trade Journal, DOI: 10.1080/1540496X.2016.1263794

CHEN, X., LI, R. & WU, X. (2019): "Multi-home ownership and household portfolio choice in urban China." J Hous and the Built Environ. https://doi.org/10.1007/s10901-019-09713-8

CHU, Z., WANG, Z., XIAO, J., & ZHANG, W. (2017). "Financial Literacy, Portfolio Choice and Financial Well-Being." Social Indicators Research. 132.

ENGLUND, P., HWANG, M. & QUIGLEY, JM. (2002): "Hedging Housing Risk". Journal of Real Estate Finance and Economics, pp. 167-200.

FAN, J. X., & XIAO, J. J. (2006): "Cross-cultural differences in risk tolerance: A comparison between Chinese and Americans." Journal of Personal Finance, 5(3), 54–75.

FLAVIN, M. & YAMASHITA, T. (2002): "Owner-Occupied Housing and the Composition of the Household Portfolio". The American Economic Review.

GAN, L., YIN, Z., JIA, N., XU, S., MA, S., & ZHENG, L. (2012): Data you need to know about China, Book published by Springer, DOI:10.1007/978-3-642-38151-5

GOLLIER, C. (1999): "What Does the Classical Theory Have to Say about Household Portfolios?"

GUISO, L., HALIASSOS, M., & JAPPELLI, T. (2003): "Household Stockholding in Europe: Where Do We Stand and Where Do We Go?" Economic Policy. 18. 123-170. 10.2139/ssrn.346542.

GUISO, L., & JAPPELLI, T. (2000): "Household Portfolios in Italy", CSEF Working Papers 43, Centre for Studies in Economics and Finance (CSEF), University of Naples, Italy.

GUISO, L., SAPIENZA, P., & ZINGALES, L. (2008): "Trusting the Stock Market," The Journal of Finance, 63, 2557–2600.

HALIASSOS, M., & BERTAUT, C. (1995): "Why Do So Few Hold Stocks?" Economic Journal, 105, 1110–29.

HEATON, J., & LUCAS, D. (2000): "Portfolio choice and asset prices: The importance of entrepreneurial risk." The Journal of Finance, 55(3), 1163–1198.

HE, Z., SHI, X., LU, X., & LI, F. (2019): "Home equity and household portfolio choice: Evidence from China", International Review of Economics & Finance, Volume 60, Pages 149-164.

HUANG, LL. (2010): "Homeownership and Household Life-Cycle Portfolio Choice". International Conference on Computer Application and System Modeling.

JORDÀ, Ò., KNOLL, K., KUVSHINOV, D., SCHULARICK, M., & TAYLOR, A. (2017). "The rate of return on everything, 1870–2015". The Quarterly Journal of Economics 134 (3), 1225-1298

KAISER, T., & MENKHOFF, L. (2017): "Does Financial Education Impact Financial Literacy and Financial Behavior, and If So, When?". The World Bank Economic Review. 31. 611-630.

MERTON, R., C., (1987): "A simple model of capital market equilibrium with incomplete information", Journal of Finance 42, 483–510.

MORCK, R., YEUNG, B., & YU, W. (2000): "The information content of stock markets: why do emerging markets have synchronous stock price movements?" Journal of Financial Economics, 58(1), 215–260.

PELIZZON, L., & WEBER, G. (2008): "Are Household Portfolios Efficient? An Analysis Conditional on Housing". The Journal of Financial and Quantitative Analysis, pp. 401-431.

PELIZZON, L., & WEBER, G. (2009): "Efficient portfolios when housing needs change over the life cycle", Journal of Banking & Finance, Volume 33, Issue 11, 2009, Pages 2110-2121.

PIKETTY, T. (2014): Capital in the Twenty-First Century, Harvard University Press.

PISTOR, K. & XU, C. (2005): "Governing Stock Markets in Transition Economies: Lessons from China", American Law and Economics Review, Volume 7, Issue 1, Spring, Pages 184–210.

VAN ROOIJ, M., LUSARDI, A., & ALESSIE, R. (2011): "Financial literacy and stock market participation." Journal of Financial Economics, 101(2), 449–472.

VISSING-JØRGENSEN, A. (2004): "Perspectives on Behavioral Finance: Does "Irrationality" Disappear with Wealth? Evidence from Expectations and Actions," in NBER Macroeconomics Annual 2003, Volume 18, National Bureau of Economic Research, Inc, 139–208.

WANG, M., LAI, K. K., & YEN, J. (2014): "Private banking and wealth management industry in China." In China's financial markets: Issues and opportunities (pp. 205–206). Routledge.

WANG, X., & WEN, Y. (2012): "Housing prices and the high Chinese saving rate puzzle." China Economic Review, 23(2), 265–283.

WANG, Y. P., & MURIE, A. (1996): "The process of commercialization of urban housing in China." Urban Studies, 33, 971-989.

WEBER, E. U., & HSEE, C. K. (1998): "Cultural differences in risk perception, but cross-cultural similarities in attitudes towards perceived risk." Management Science, 44(9), 1205–1217.

WEBER, G., & PELIZZON, L. (2005): "Efficient Portfolios when Housing is a Hedge Against Rent Risk." SSRN Electronic Journal. 10.2139/ssrn.676903.

Yang, X., & Gan, L. (2020): "Bequest motive, household portfolio choice, and wealth inequality in urban China", China Economic Review, Volume 60, 2020, 101399, ISSN 1043-951X.

ZHAO, X., & WANG, S. (2007): "Empirical study on Chinese mutual funds' performance." Systems Engineering Theory and Practice, 27(3), 1–11.

ZOU, J., & DENG, X. (2019): "Financial literacy, housing value and household financial market participation: Evidence from urban China", China Economic Review, Volume 55, Pages 52-