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The Impact of China's Population Ageing on Household Financial Asset Allocation

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DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Malaysia Sarawak. Except where due acknowledgements have been made, the work is that of the author alone. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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ABSTRACT

The acceleration of population ageing in China will inevitably increase the burden of social old-age care and have significant impacts on the development of financial markets. The rational allocation of financial assets can enable households to acquire more property income and facilitate the appropriate allocation of social capital. Meanwhile, population ageing is a critical factor influencing the financial asset allocation of households. This study investigates the impact of population ageing on household financial asset allocation using data from the China Household Finance Survey (CHFS) in 2015, 2017, and 2019. From previous research findings, empirical studies specifically focused on China, particularly those utilizing micro-level household data, are still in their nascent stage, with limited research outcomes. Furthermore, this study introduces financial literacy as a moderating variable and risk attitude as a mediating variable, aspects that have been relatively less explored in existing literature. The study finds that ageing has a significantly negative effect on the allocation and depth of household risky financial assets. After conducting a robustness check using a two-way fixed effects model, the conclusion remains robust. This study investigates the influencing mechanisms from two perspectives: risk aversion and financial literacy. From the perspective of the mediating variable, ageing enhances the risk aversion of household heads, which in turn inhibits household investment in risky financial assets. From the perspective of the moderating variable, the inhibitory effect of ageing on investment in risky financial assets gradually weakens with the improvement of financial literacy. In addition, household savings are the premise and foundation of investment. This study examines the impact of population ageing on household savings rates using micro-level household data in China. The regression results based on a two-way fixed-effects model show that ageing has a significant negative effect on household savings rates. This indicates the existence of

significant lifecycle effects in the changes of household savings rates in China. The robustness of the conclusion is confirmed after replacing the calculation method of the explained variable. The findings of this study provide empirical evidence for the financial asset allocation behaviour of micro households from the perspective of population ageing. This offers a basis for policymakers to make informed decisions and enhance decision-making effectiveness, as well as laying a solid foundation for future research.

Keywords: Ageing, financial asset allocation, savings rate, CHFS

Kesan Penuaan Penduduk China Terhadap Peruntukan Aset Kewangan Isi Rumah

ABSTRAK

Proses penuaan penduduk di China yang berlaku dengan lebih cepat pasti akan meningkatkan beban kewangan jagaan sosial dan memberi kesan penting terhadap perkembangan pasaran kewangan. Penyusunan aset kewangan yang wajar boleh membolehkan keluarga mendapatkan pendapatan harta lebih banyak dan memberi faedah kepada penyusunan kewangan masyarakat yang wajar. Penuaan penduduk adalah faktor penting yang mempengaruhi penyusunan aset kewangan keluarga. Kajian ini berdasarkan data Kajian Kewangan Keluarga China (CHFS) tahun 2015, 2017, dan 2019 mengenai kesan penuaan penduduk terhadap penyusunan aset kewangan keluarga. Dari pandangan hasil kajian terdahulu, kajian empirikal khususnya yang menggunakan data keluarga mikro dalam konteks China masih dalam peringkat permulaan dan hasil kajian yang terhad adalah sedikit. Selain itu, dalam artikel ini, literasi kewangan diperkenalkan sebagai pembolehubah penyesuaian, dan keutamaan risiko diperkenalkan sebagai pembolehubah perantara, yang kurang dikaji dalam literatur terdahulu. Kajian mendapati bahawa penuaan mempunyai kesan negatif yang signifikan terhadap penyusunan aset kewangan risiko keluarga dan kedalaman penyusunan. Walaupun ujian kestabilan yang dijalankan menggunakan model kesan tetap dua hala, kesimpulan ini tetap kukuh. Kajian ini mengkaji mekanisme pengaruh dari dua perspektif, iaitu tahap penjijikan risiko dan literasi kewangan. Dari perspektif pembolehubah perantara, penuaan akan meningkatkan tahap penjijikan risiko tuan rumah, dan peningkatan penjijikan risiko akan menekan pelaburan aset kewangan risiko keluarga. Dari perspektif pembolehubah penyesuaian, dengan peningkatan literasi kewangan, kesan pengekangan penuaan terhadap pelaburan aset kewangan risiko akan berkurangan. Selain itu, simpanan keluarga adalah prasyarat dan asas bagi pelaburan. Kajian ini berdasarkan

data keluarga mikro China untuk mengkaji kesan penuaan penduduk terhadap kadar simpanan keluarga. Hasil regresi berdasarkan model kesan tetap dua hala menunjukkan bahawa penuaan mempunyai kesan negatif yang signifikan terhadap kadar simpanan keluarga. Ini menunjukkan bahawa terdapat kesan yang ketara mengenai perubahan kadar simpanan keluarga dalam konteks China yang berkaitan dengan efek alam hayat. Walaupun kaedah pengiraan pembolehubah yang dijelaskan telah digunakan semula, kesimpulan tersebut masih kukuh. Hasil kajian ini memberikan bukti empirikal mengenai tingkah laku penyusunan aset kewangan mikro keluarga dari perspektif penuaan, memberikan landasan bagi pembuat keputusan untuk membuat keputusan yang munasabah dan meningkatkan keberkesanan keputusan, dan memberikan asas kukuh untuk penyelidikan masa depan.

Kata kunci: *Penuaan, peruntukan aset kewangan, kadar simpanan, CHFS*

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LIST OF ABBREVIATIONS

CAPM	Capital Asset Pricing Model
CHFS	China Household Finance Survey
FEM	Fixed Effects Model
OECD	Organisation for Economic Co-operation and Development
POLS	Pooled Ordinary Least Squares
REM	Random Effects Model
TFR	Total Fertility Rate
UEBPI	Urban Employee Basic Pension Insurance
URBPI	Urban Resident Basic Pension Insurance
VIF	Variance Inflation Factor

CHAPTER 1

INTRODUCTION

1.1 Introduction

Population ageing is expected to have a persistent impact on both global economic growth and the lives of individuals (Goldstone, 2015). Population ageing refers to a demographic structure within a given society where the proportion of elderly individuals is relatively high (Li, 2006). The proportion of older individuals (aged 60 or 65 and over) in a population is a key indicator of the stage of population ageing. According to the classification criteria established by the United Nations, a society or region is deemed to have transitioned into an ageing society when the percentage of individuals aged 60 years and older surpasses 10% of the overall population, or when the percentage of individuals aged 65 years and older exceeds 7% (Qu & Zhao, 2006).

With the shift from high to low birth and death rates worldwide, almost all countries are experiencing population ageing (Liu, 2015). Initially, developed countries experienced lower birth rates than population replacement rates, and later developing countries followed suit. The global ageing process is accelerating, and human society is beginning to shift from a youthful to an ageing society.

China has the largest elderly population in the world (Xiang & Wang, 2021). According to the National Bureau of Statistics of China, by the end of 2021, the total number of elderly people aged 65 and above in China has reached 200 million, accounting for 14.2% of the country's total population. The rate of ageing in China is also developing faster in the future. The "2020 Development Report of China: Development Trends and Policies of

China's population ageing" predicts that China's elderly population aged 65 and above is expected to reach 380 million by 2050, representing almost 30% of the country's total population. The population aged 60 and above is also projected to approach 500 million, accounting for over one-third of the total population. A society where the elderly comprise the primary demographic will exhibit notable distinctions from one where the majority of the population consists of young adults or children. This demographic transition will have far-reaching implications for social development and precipitate transformations in economic and financial behaviour.

1.1.1 Trends in Global Population Ageing

Since the 17th and 18th centuries, with the spread of high-yield crops and the development of the Industrial Revolution, life expectancy and fertility rates worldwide have gradually increased, leading to a steady expansion of the world population. In the late 19th century, some developed countries in Europe began to enter the ageing stage due to the sustained decline in birth rates (Lee, 2003). Table 1.1 illustrates the changing trends of the global total population and the proportion of the population aged 65 and above to the total population from 1950 to 2100.

From 1950 to 2020, the world's total population increased from 2.478 billion to 7.805 billion, with an average annual growth rate of 1.65%. According to the United Nations' projections, the world's total population will increase from 7.805 billion in 2020 to 10.355 billion in 2100, with an average annual growth rate of 0.35%. Therefore, the population's average annual growth rate is expected to significantly decline after 2020. Ageing has gradually become a global demographic trend, and the acceleration of this trend has become more pronounced in the 21st century. As of 1950, the proportion of the population aged 65

and above to the world's total population was 5.13%. By 2020, 70 years later, the proportion had increased to 9.43%, nearly doubling in size.

According to the United Nations' projections, the global proportion of the elderly population will reach 11.82%, 14.47%, 16.51%, and 24.03% in 2030, 2040, 2050, and 2100, respectively. This means that the proportion of the population aged 65 and above to the world's total population is expected to increase by 7.08% from 2020 to 2050, indicating a significant acceleration in the degree of ageing.

Table 1.1: Global Population Development Trend Forecast, 1950-2100

Year	Total Population (1,000)	Proportion of Population Aged 65 and Over (%)
1950	2,477,675	5.13
1960	2,995,589	4.02
1970	3,657,599	5.30
1980	4,404,269	5.86
1990	5,269,760	6.10
2000	6,107,942	6.88
2010	6,941,951	7.65
2020	7,804,974	9.43
2030	8,511,723	11.82
2040	9,158,747	14.47
2050	9,687,440	16.51
2100	10,355,002	24.03

Source: United Nations World Population Prospects.

Ageing has become a widespread phenomenon worldwide. Table 1.2 shows the changes in ageing trends for high-income, middle-income and low-income countries, as well as for the twenty countries in the world with relatively high ageing.

According to Table 1.2, there are significant differences in the degree and growth rate of ageing among countries with different income levels. In 1960, the highest degree of ageing was observed in high-income countries, with a rate of 8.6%. The degree of ageing in middle-income and low-income countries was relatively similar, at 3.76% and 3.02%,

respectively. As of 2021, the degree of population ageing in high-income and middle-income countries was 18.93% and 8.45%, respectively, while the degree of ageing in low-income countries was not significantly different from the data in 1960, at 3.13%. In terms of growth rate, high-income countries had the fastest increase in ageing, with the proportion of the population aged 65 and above increasing by 10.33% from 1960 to 2021, a period of 61 years. In contrast, the increase in the proportion of the population aged 65 and above in low-income countries was the slowest, with only a 0.11% increase from 1960 to 2021, a period of 61 years.

Table 1.2: The Changing Trends of Ageing in Different Countries, 1960-2021

Region	1960	1990	2021
High Income	8.60	12.16	18.93
Middle Income	3.76	4.83	8.45
Low Income	3.02	3.12	3.13
Japan	5.62	11.87	29.79
Italy	9.52	14.87	23.68
Portugal	8.03	13.67	22.56
Germany	11.47	14.91	22.17
Finland	7.33	13.43	22.89
Bulgaria	7.58	13.17	22.42
Greece	7.05	13.56	22.51
Sweden	11.76	17.82	20.10
Latvia	10.57	11.88	21.61
Croatia	6.93	11.58	21.97
France	11.65	14.04	21.32
Denmark	10.60	15.60	20.27
Estonia	10.55	11.66	20.37
Spain	8.21	13.39	19.90
Malta	7.95	10.49	18.87
Australia	8.61	11.06	16.57
Slovenia	7.78	10.64	20.50
Czech Republic	9.36	12.68	20.45
Lithuania	7.93	10.88	20.59
Netherlands	8.91	12.73	19.95

Source: The World Bank (2023).

1.1.2 Trends in Life Expectancy and Total Fertility Rates

Ageing is an inevitable outcome of global economic development and a common phenomenon in the development of societies worldwide, with far-reaching impacts on all

aspects of social development and irreversible characteristics. Population ageing originates from the prolongation of human life expectancy and the decline in fertility rates.

With the improvement of material conditions and medical standards, mortality rates have generally declined globally, accompanied by a gradual increase in life expectancy. Table 1.3 describes the changes in life expectancy of major regions and countries since 1960.

The world's average life expectancy has increased from 52.58 years in 1960 to 72.27 years in 2020. In comparing between sexes, women have consistently had a higher life expectancy than men. As of 2020, the average life expectancy for women worldwide was 5.06 years higher than that of men. Regionally, while life expectancy has significantly increased worldwide in recent decades, the region with the greatest gains is East Asia and the Pacific, where life expectancy has increased from 45.54 years in 1960 to 76.76 years in 2020, an increase of nearly 31.22 years. The North American region has seen the least improvement, with life expectancy increasing from 69.89 years in 1960 to 77.74 years in 2020, an increase of only 7.85 years.

Table 1.3: Population Life Expectancy in Major Regions and Countries, 1960-2020

	1960			1990			2020		
Region	Males	Females	Total	Males	Females	Total	Males	Females	Total
World	50.73	54.60	52.58	63.29	67.75	65.43	69.82	74.88	72.27
High Income	65.68	71.39	68.47	71.99	78.77	75.29	77.57	83.03	80.21
Middle Income	46.22	49.13	47.58	62.15	65.99	63.99	69.31	74.28	71.71
Low Income	38.28	41.19	39.72	49.13	52.48	50.84	60.54	65.27	62.87
Europe and Central Asia	64.09	70.13	67.03	68.27	76.06	72.05	73.92	80.33	77.03
East Asia and the Pacific	46.59	50.43	45.54	66.84	71.16	67.86	73.99	79.70	76.76
South Asia	42.80	41.40	42.12	57.76	58.58	58.14	68.04	71.61	69.75
North America	66.75	73.19	69.89	72.05	78.98	75.44	75.04	80.58	77.74
Sub-Saharan Africa	38.99	41.82	40.38	48.55	51.95	50.21	58.90	62.83	60.85
Middle East and North Africa	45.81	47.10	46.44	63.85	67.83	65.77	70.81	75.32	72.95
Japan	65.31	70.14	67.67	75.91	81.91	78.84	81.64	87.74	84.62
United States	66.60	73.10	69.77	71.80	78.80	75.21	74.50	80.20	77.28
United Kingdom	68.20	74.20	71.13	73.10	78.80	75.88	79	82.90	80.90
France	66.60	73.30	69.87	72.60	80.80	76.60	79.20	85.30	82.18
Germany	66.75	71.99	69.31	72.06	78.56	75.23	78.60	83.40	80.94

Source: The World Bank (2023).

The total fertility rate (TFR) refers to the average number of children born to women of reproductive age in a particular country or region. It is a widely used indicator for measuring fertility levels and reflects the number of children born to women. Typically, a TFR below 2.1 indicates a fertility rate that is below the replacement level, meaning that the number of new-borns is not sufficient to replace the number of women and their partners. With the increase in life expectancy, the TFR has gradually declined in almost all regions globally. Table 1.4 describes changes in TFR for major regions and countries since 1960.

The average number of children born to women globally has decreased from 4.98 in 1960 to 2.3 in 2020. As the elderly population increases and the number of children born decreases, this will eventually lead to population decline and a reduction in labour and consumers. By region, as of 2020, sub-Saharan Africa had the highest TFR at 4.67, while North America had the lowest at 1.61. In terms of economic development, high-income countries had an average TFR of 1.53, which is below the replacement level. Low-income countries had a higher TFR at 4.68.

Table 1.4: Changes in Total Fertility Rates in Major Regions and Countries, 1960-2020

	Average number of live births per woman						
Region	1960	1970	1980	1990	2000	2010	2020
World	4.98	4.78	3.71	3.25	2.70	2.52	2.30
High Income	3.02	2.55	1.98	1.85	1.70	1.70	1.53
Middle Income	5.63	5.44	4.05	3.40	2.68	2.44	2.17
Low Income	6.58	6.72	6.67	6.44	5.94	5.25	4.68
Europe and Central Asia	2.84	2.56	2.17	1.96	1.56	1.73	1.67
South Asia	6.04	5.79	5.12	4.30	3.51	2.75	2.27
North America	3.67	2.46	1.83	2.06	1.99	1.90	1.61
Sub-Saharan Africa	6.60	6.74	6.77	6.35	5.76	5.26	4.67
East Asia and the Pacific	5.40	5.26	2.98	2.47	1.85	1.82	1.56
Middle East and North Africa	6.91	6.73	6.23	4.88	3.19	2.90	2.66
Japan	2.00	2.14	1.75	1.54	1.36	1.39	1.34
United States	3.65	2.48	1.84	2.08	2.06	1.93	1.64
United Kingdom	2.69	2.44	1.90	1.83	1.64	1.92	1.56
France	2.85	2.55	1.85	1.77	1.89	2.03	1.83
Germany	2.37	2.03	1.44	1.45	1.38	1.39	1.53

Source: The World Bank (2023).

1.1.3 Ageing and Changes in Economic and Financial Behaviour

In today's world, where ageing is gradually becoming more pronounced, the increasing proportion of elderly people is bound to change the demographic age structure of workers and retirees, children and the elderly, producers and consumers. Changes in the age structure of the population will inevitably lead to changes in human capital, production and consumption structures, as well as savings and investment structures.

Human capital is one of the key factors driving economic growth and societal development (Widarni & Bawono, 2021). However, with the increasing population ageing, the proportion of elderly people is gradually increasing, which will hinder the growth of labour force. The slowdown in the growth rate of labour supply will become an important factor that drags down economic growth (Nyce, 2005; Leitner & Stehrer, 2019). This is because a country's economic growth usually requires sufficient labour supply to support it, and the increase in elderly population will lead to a decrease in labour supply, thereby affecting the speed and quality of economic growth. In addition, the elderly population is more prone to illness and poor health conditions compared to young people, which will further affect the quantity and quality of labour force.

Human ageing can lead to a decline in cognitive abilities, which in turn can affect innovation capabilities (Czaja, 2007). Ageing is a natural biological process, and as individuals grow older, various organs and systems in the body undergo changes. Cognitive abilities gradually decline with age, and this decline can have an impact on an individual's work and life, especially for professions that require creative thinking and problem-solving abilities, such as scientists and engineers, which can have a more significant effect. This is because these professions require innovation capabilities, which in turn require high levels

of cognitive abilities and flexible thinking. As individuals age, their thinking tends to become more stable and fixed, which may lead to a decrease in their ability to accept and understand new things. At the same time, Zhang et al. (2022) posits that older employees with shorter remaining work-life years and lower risk tolerance lack intrinsic motivation for innovative behaviour. However, older adults often have a wealth of experience and knowledge, which provides them with a good foundation for innovative thinking. Gehringer and Prettner (2019) found through their research on OECD country data that an extension in lifespan can have a positive impact on technological progress.

From a life cycle perspective, individuals' contributions and demands on the economic system vary at different stages of life. Young people typically have higher consumption desires and expenditures, which positively impact the country's total demand level. However, as the population age structure changes, the consumption structure also changes. With the increase of the elderly population, the demand for practical industries such as healthcare and nursing will also increase, while the demand for other products and new technologies may decrease. On the other hand, the savings rate of adults of working age is generally higher than that of people aged 60 or above, and the decrease in the savings rate may lead to a slowdown in investment growth. Therefore, the phenomenon of ageing may have an important impact on the savings and investment structure of the country. Under similar conditions, a country with a substantial population of older adults may experience slower economic growth compared to a country with a higher proportion of working-age population (Bloom et al., 2010).

As the demographic composition evolves, individuals' financial habits also undergo transformations (Kang & Hu, 2021). At the individual level, families are the main actors in

making financial asset choices, and an ageing society will directly affect each person's financial decision-making at different stages of the life cycle, thus influencing the savings and consumption decisions and asset allocation decisions of different households. Young people may be more willing to consume or invest in high-risk, high-return assets, while older people may be more inclined to save and invest in low-risk, low-return assets to ensure their retirement income. The decisions made by individuals will have a direct impact on the development of the national financial markets, thereby influencing the stability and sustainability of the entire national economic system.

The ageing society will continue to affect the development of the national financial market through its impact on individuals' financial decision-making. With the increasing elderly population, there may be a decrease in demand for risk financial asset investments, leading to changes in investment structures and reforms in the capital market. Additionally, the retirement savings of elderly individuals may become significant financial assets, thus exerting important influences on the national financial market. Furthermore, population ageing could result in increased fiscal pressures, thereby affecting national debt and government policies. Therefore, the phenomenon of population ageing will have complex and profound implications for the development of the national financial market. The baby boomer generation, born between 1946 and 1964, possesses a proportion of 60% to 70% of American household financial wealth. As this demographic group reaches retirement age, the associated investment portfolios are reallocated, which will have a significant impact on the financial markets (Addoum, 2017).

1.2 Problem Statement

In the context of household financial planning, it is imperative to comprehensively consider various factors, such as the household's assets and liabilities, income and expenses, investment strategies, and savings plans, in order to make sound financial decisions (Campbell, 2006). This is aimed at maximizing the long-term consumption utility of the household throughout its entire lifecycle. Household financial behaviour decisions primarily encompass two aspects (Gomes et al., 2021; Zhan, 2020). The first aspect pertains to how resources are allocated between saving and consumption, specifically, the decision regarding the household savings rate. The second aspect concerns household investment decisions, namely, how resources are allocated among different financial assets. Therefore, this study will investigate these two dimensions of household financial behaviour, namely, the household savings rate and financial asset investment decisions.

Households set aside a portion of their income for savings. In the realm of household financial behaviour decisions, savings constitute an indispensable premise and foundation. Furthermore, high savings have consistently been one of the contributing factors to the rapid economic growth in China, sustaining elevated levels of investment (Zhao, 2022; Hu & Xu, 2014). Population ageing exerts a significant impact on household savings. Consequently, empirical data studying the influence of ageing on household savings can offer a deeper understanding of its implications, aiding in addressing potential economic challenges, which are of importance to China's economic growth.

As the elderly population continues to age, their income derived from labour will gradually decrease, diminishing their ability to cope with everyday life risks. At the present stage, the primary sources of economic support for elderly individuals in China are threefold,

ranked in descending order of prominence: support from household members, social pensions, and income from property (Zhou, 2021). The increasing number of elderly individuals and the extension of their lifespans imply that the total payout of public pension funds will continue to grow. Examining the sources of social pension funds, as per the "2019-2050 China Pension Actuarial Report", in the absence of considerations for per capita benefit enhancements, the financial burden of urban workers' basic pension insurance is steadily increasing. In 2019, nearly two contributors supported one retiree, whereas by 2050, it will be almost one contributor supporting one retiree. The expenditure of the first pillar, i.e., public pensions, exhibits a linearly increasing trend, placing immense pressure on the balance between income and expenses for public pension funds (Yao, 2021). Additionally, the second pillar, which is enterprise pensions, and the third pillar, represented by commercial pension insurance, have limited coverage and a relatively low contribution to GDP (Shao, 2016; Zheng, 2016). China's three-pillar pension system experiences a severe structural imbalance, with the second and third pillars failing to play their intended roles, resulting in limited social security for residents (Lu & Li, 2022; Li & Liu, 2011). The income structure of retirees is monolithic, and their income levels are challenging to fundamentally enhance, which could hinder the improvement of retirees' living standards. Intergenerational transfers within families represent another significant source of support for the elderly. However, in the context of declining birth rates and China's unique one-child policy, intergenerational transfers within families are diminishing (Wu, 2018). Given the decreasing trend in social security payments and reduced intergenerational transfers within families, income from property is poised to become more crucial. Consequently, the study of the allocation of financial assets within households in the context of ageing becomes imperative. A judicious allocation of financial assets stands as one of the primary avenues for households

to generate income from their property. Middle-aged and elderly residents possess significant social capital and wealth, and a prudent allocation of financial assets can smoothen consumption, enhance household utility, and contribute to the well-being of the elderly in their later years.

From a specific impact mechanism perspective, a study by Yin (2014) found that as the head of the household's financial knowledge level increases, the probability of household participation in financial markets also correspondingly increases, and households tend to invest more in riskier assets. Therefore, this study will introduce financial literacy as a moderating variable for empirical research.

Furthermore, age is a significant factor influencing risk preference attitudes, as individuals from different age groups may exhibit varying risk preference attitudes. Changes in risk preference attitudes have a significant impact on the allocation of risky financial assets. Therefore, this study will introduce risk attitude as a mediating variable for empirical research.

This study introduces financial literacy as a moderating variable and incorporates risk preference as a mediating variable, a method that has been relatively rare in previous literature. This research not only makes a significant contribution to the development of household financial theory in the context of an ageing society but also provides valuable insights for policy formulation and improvement.

The purpose of this study is to investigate the impact of ageing on financial asset allocation among Chinese households. Specifically, the study aims to address the following research questions:

i. What is the impact of population ageing on household savings rates?

ii. How does population ageing affect household financial asset allocation?

iii. What is the moderating effect of financial literacy on the relationship between ageing and household financial asset allocation?

iv. What is the mediating effect of risk attitude on the relationship between ageing and household financial asset allocation?

1.3 Objectives of the Study

The main purpose of this research is to study the impact of China's ageing on household financial asset allocation. The specific objectives are as follows:

i. To analyse the impact of ageing on the savings rate of households

ii. To examine the impact of ageing on household financial asset allocation

iii. To investigate the moderating effect of financial literacy on the relationship between ageing and household financial asset allocation

iv. To investigate the mediating effect of risk attitudes on the relationship between ageing and household financial asset allocation

1.4 Significance of the Study

1.4.1 Practical Implications of the Study

China is facing a serious ageing crisis, as its population continues to age at an alarming rate, which will increase the burden of elderly care on society as a whole. At the current stage, economic support remains one of the most pressing issues regarding the

elderly care difficulties in China (Yin, 2019). One of the important measures to ensure that the elderly can enjoy their retirement is to increase household property income. Rational allocation of financial assets by households is one of the main channels to obtain property income. The 19th National Congress of the Communist Party of China proposed to increase residents' property income through multiple channels and to strengthen the protection of citizens' property rights by law. One of the reasons for the lack of property income channels is the low participation rate and low allocation rate of household risk assets, which prevents the majority of residents from effectively enjoying the benefits of China's economic growth and financial market development (Nie, 2019). Exploring the impact and mechanisms of population ageing on household financial asset allocation can deepen our understanding of this phenomenon. Therefore, this study can provide a basis for decision-makers to make informed and reasonable decisions.

As the main body of financial asset allocation, households can invest their savings in either the banking market or the capital market by choosing different financial products. The development of the capital market can facilitate financing for high-tech enterprises, thereby promoting China's industrial restructuring and upgrading. Older adults tend to possess more assets than younger people. As the trend of ageing intensifies, exploring the impact of ageing on household financial asset allocation can deepen our understanding of this phenomenon, thereby providing a basis for decision-makers to make informed and reasonable decisions.

This study focuses on topics related to ageing and household financial asset allocation. Within the framework of the Sustainable Development Goals (SDGs), we emphasize the sustainability of our research to ensure that our work contributes positively not only to the interests of specific regions or areas but also to the global sustainable

development objectives. Ageing issues and household financial asset allocation are crucial for the societal sustainability. The findings of this study underscore the impact of ageing on household savings rates and financial asset allocation. This research has the potential to contribute to multiple SDGs. For example, our work can help in understanding how ageing affects poverty issues, thereby having a positive impact on poverty reduction goals. Furthermore, this study holds significant importance for enhancing the well-being of the elderly and promoting sustainable economic growth.

1.4.2 Theoretical Implications of Study

From a micro perspective, households are the main entities that make financial decisions. However, past research has mainly focused on financial markets, non-financial corporations, financial institutions, and other intermediaries in the financial field. Households are often downgraded to background information and modelled through a simple representative agent or as external noise traders (Gomes et al., 2021). This study focuses on Chinese households and explores the impact of population ageing on household financial asset allocation using high-quality microdata. Empirical evidence is provided for financial asset allocation in the context of ageing households. The proportion of elderly population and the age of the household head are used as explanatory variables, while financial literacy is introduced as a moderating variable and risk attitude as a mediating variable, thus expanding the scope of household financial asset allocation theory.

China has a long traditional culture of several thousand years, which differs significantly from that of the West. Due to cultural factors, the findings of Western studies on household finance may not necessarily be applicable in China. In order to gain a better understanding of the characteristics of household financial behaviour in China, it is

necessary to further investigate the factors influencing household financial asset allocation in China. Such research can help us gain deeper insights into Chinese households' financial behaviour and preferences and provide reference for policymaking.

The above content underscores the practical significance of the research, including the context of China's severe population ageing challenge. The research can provide rational policy foundations for policymakers to address the increasing burden of elderly care. Additionally, it emphasizes the theoretical significance of the study, as it extends the scope of household financial asset allocation theory, contributing to a deeper understanding of the characteristics of household financial behaviour.

1.5 Scope of the Study

This study aims to analyse the impact of population ageing on household financial asset allocation. Household savings serve as the prerequisite and foundation for financial asset investments. Therefore, the first specific objective of this study is to examine the effect of population ageing on household savings rates. The second specific objective is to investigate the influence of population ageing on household financial asset allocation. This research assesses household financial asset allocation behaviour from two perspectives. The first aspect considers whether households engage in investments in risk-bearing financial assets. The second aspect examines the extent of household participation in risk-bearing financial assets. Furthermore, in order to gain a better understanding of the mechanisms through which ageing affects household financial asset allocation, this study introduces risk attitude as a mediating variable and financial literacy as a moderating variable.

High-quality micro-level household financial data are of paramount importance for depicting household economic and financial behaviours. Therefore, this study employs

micro-level household financial data for empirical research. The data used in this study are derived from the China Household Finance Survey (CHFS), conducted by the Southwestern University of Finance and Economics. This survey encompasses 29 provinces and 343 counties across China.

In summary, this study contributes new theoretical insights to the research field and provides a basis for policymakers to make informed decisions through empirical analysis utilizing high-quality micro-level household data.

1.6 Definition of Key Terms

1.6.1 Household Financial Assets

A household is composed of a group of people who are closely connected through marriage, blood, or adoption, and who live together and share their lives and economic resources (Zhu, 2020). Members of a household usually have common responsibilities and obligations, such as caring for and supporting young or needy members or sharing household expenses and chores. The household is the most fundamental unit of all societies, and the establishment and order of society are based on the household (Nurmakhamatovna, 2022). The household provides important functions and values to society. The household bears the important tasks of socialization and education, passing down the spiritual wealth of society and culture, and helping members develop their personal potential and achieve life goals. At the same time, families provide irreplaceable services such as eldercare, caregiving, and support, highlighting their essential role.

The survival of a household depends on a certain amount of material wealth, and assets are the concrete manifestation of this material wealth. household assets are a stock concept, primarily referring to various properties, claims, and other rights that are actually

controlled or owned by the household, can be measured in currency, and are used for household consumption, investment and financing activities, as well as production and business activities, bringing economic benefits to the household (Xing, 2009). Property mainly refers to various tangible assets, financial products, and other obvious items; claims refer to money or property owned by individuals or institutions outside the household, which can be collected upon maturity; other rights mainly refer to intangible assets, such as various intellectual property rights.

From the classification of household assets, we can divide them into financial assets and non-financial assets based on their attributes. Financial assets refer to assets that have monetary value and can be transferred and traded, such as deposits, stocks, bonds, funds, etc. Non-financial assets, on the other hand, refer to assets that have utility value and are generally not directly transferable or tradable, such as real estate, automobiles, furniture, etc.

As the data used in this article is from China's household survey, the selection of indicators mainly refers to the research of Chinese scholars. In the research of Chinese scholars, there are mainly two forms of classification for financial assets. The first form is based on liquidity. Wu et al. (2007) divides household assets into liquid assets, financial assets, and total assets. Liquid assets include cash, stocks, wealth management products, deposits, funds, and financial derivatives, while financial assets include liquid assets, loans, insurance, and so on. Total assets comprise financial assets, productive fixed assets, durable consumer goods, and other assets.

The second form of classification is based on the risk attributes of assets (Fu, et al., 2022; Shen & Shi, 2020; Chen, 2018). This article classifies financial assets held by Chinese households into risky financial assets and risk-free financial assets according to the classification method used in the CHFS survey questionnaire over the years. Risky financial

assets include funds, stocks, wealth management products, precious metals, non-RMB assets, bonds (corporate bonds and financial bonds), and financial derivatives. Risk-free financial assets include deposits, cash, and government bonds.

1.6.2 Financial Literacy

Financial literacy refers to an individual's level of mastery of financial knowledge and skills, as well as their ability to apply this knowledge and skills to effectively manage their financial assets in order to achieve personal, household, or community financial goals (OECD, 2017). Specifically, financial literacy includes the ability to understand financial concepts, recognize financial products and services, personal financial planning skills, investment and risk management skills, among others. An individual with good financial literacy can better understand and apply financial knowledge, such as developing reasonable budget plans, effectively managing their debt, making investment decisions, and knowing how to avoid financial risks and fraudulent activities. This ability can help individuals achieve their financial goals.

1.6.3 Risk Attitude

Risk attitude refers to the attitude adopted by individuals when facing risks or, in other words, the response chosen by individuals after forming perceptions of uncertainty (Zhou, 2014). Risk attitudes can be categorized as risk aversion, risk neutrality, and risk preference.

1.7 Organization of the Study

This thesis is divided into six chapters. Chapter 1 provides an overview of the study. First, it presents the changes in global population ageing over the past decades using data from the United Nations and the World Bank, and briefly discusses the impact of population

ageing on economic and financial behaviour. It then discusses the problem statement, the research questions, the research objectives and the significance of the research. Chapter 2 provides the research background. First, the changing trends and characteristics of population ageing in China over the past few decades are discussed in detail. Second, it introduces the problems of elderly care in China and the impact of population ageing on the development of China's financial market. Chapter 3 provides a literature review for this study. Chapter 4 outlines the research methodology used in this study. Chapter 5 discusses the empirical analysis results of this study. Finally, Chapter 6 presents the conclusions and recommendations of this study.

1.8 Chapter Summary

This chapter provides an introduction to the research. Firstly, it outlines the global trend of population ageing using data from the United Nations and the World Bank and highlights the impact of population ageing on individual and household financial behaviours. Subsequently, it articulates the research problem statement, encompassing issues related to household savings rates and financial asset allocation, and presents the associated research questions and objectives. Finally, it underscores the significance of the research, delves into the scope of the study, defines key terms, and outlines the organization of the study.

CHAPTER 2

BACKGROUND OF THE STUDY

2.1 The Current Situation of China's Population

China is not only the country with the largest population in the world, but also the country with the highest number of elderly people. During the 40 years of economic reform, China's economy experienced rapid growth, which was largely attributable to the demographic dividend resulting from the country's large population. However, as the population ageing continues to deepen, the labour advantage that has propelled China's rapid economic growth is gradually diminishing, posing a challenge to the sustainable development of its economy.

Before the establishment of the People's Republic of China, the country was plagued by wars that resulted in social unrest, high mortality rates, and slow population growth. Following the establishment of the People's Republic of China, with the stabilization of society and improvement in medical conditions, the birth rate in China has experienced significant growth. Meanwhile, the mortality rate has rapidly declined, leading to a rapid increase in the population.

2.1.1 The Three Baby Booms after 1949

China experienced three baby booms from 1949 to 1995. Baby boom, also known as a birth peak, is a relative concept that refers to a year or period of time in which the birth rate is significantly higher than that of the preceding and following periods (Zha, 1991).

Figure 2.1 illustrates the changes in China's population birth rate, population death rate, and population natural growth rate from 1949 to 2022. Table 2.1 describes the changes

in annual birth population and total fertility rate in China from 1949 to 2022. The data analysis of Figure 2.1 and Table 2.1 will be discussed in the following section.

The first baby boom in China occurred in 1949 and lasted until 1958. During the same period, many countries such as the United States, the United Kingdom, and Japan experienced the phenomenon of a baby boom in the post-war recovery period. In this period, China ended a century of war and chaos, and the economy was to some extent restored. People's lives became more stable, and there was a phenomenon of compensatory fertility. As shown in Figure 2.1, from 1949 to 1958, the birth rate in China remained high, ranging from 29.22‰ to 37.97‰. As indicated in Table 2.1, during this period, the annual birth population in China remained around 20 million, and the total fertility rate fluctuated around 6.

From 1959 to 1961, due to the impact of three consecutive years of natural disasters, the total fertility rate in China began to decrease, dropping from 6.41 in 1957 to 3.29 in 1961. At the same time, the population birth rate also experienced a significant decline. In 1951, the birth rate in China was 37.97‰, but by 1959 and 1961, it had dropped to 24.78‰ and 18.02‰, respectively. During this period, there was also a significant decline in the number of births in China. In 1954, there were 22.6 million births in China, which decreased to 16.5 million and 11.97 million in 1959 and 1961, respectively. At the same time, the population death rate in China increased significantly, reaching a peak of 25.43‰ in 1960. The increase in the death rate directly led to a negative population natural growth rate. Nevertheless, the abrupt decrease in the birth rate during this period was an unexpected and fortuitous occurrence.

The duration of China's second population peak was from 1962 to the end of 1971. By 1962, China's birth rate had recovered to 37‰, and the TFR had recovered to 6. By 1963, China's birth rate had increased to 43.37‰, and the TFR had increased to 7.5, reaching the highest level since 1949. During this period, the number of births in China fluctuated around 25 million, higher than during the previous birth peak. The TFR remained around 6, also maintaining a historical high.

From 1962 to 1971, the average annual birth rate in China was 25.91 million, resulting in a cumulative total of 259 million births. According to data from the National Bureau of Statistics of China, in 1970, the total population of China surpassed 800 million, reaching 829 million. The rapid population growth could cause a heavy burden, and the excess population could result in a relative shortage of food supply. In addition, resources that could have been used for economic development were consumed by the growing population, thereby reducing the capital accumulation rate and economic growth rate (Guo & Yin, 2005).

The Chinese government gradually became aware that rapid population growth would have adverse effects on economic and social development. To address this challenge, the Chinese government formulated and established the household planning policy as a fundamental national policy in 1982. Under the implementation of the policy, China's total fertility rate showed a sustained and gradual decline. As of 1991, the total fertility rate had decreased to 1.93, which was lower than the replacement level needed to maintain a stable population.

It is widely recognized in the Chinese academic community that China experienced its third peak in population birth rates in the mid-1980s, which continued until the mid-1990s.

Two baby booms occurred in China between 1949-1958 and 1962-1971, during which the total fertility rate remained at a high level, resulting in a large number of births. With the implementation of the household planning policy, the total fertility rate during the third peak of birth rates was relatively low and gradually declined. At this stage, the highest peak of the total fertility rate was 2.76, but it had dropped to 1.59 by the end. In short, with the implementation of the household planning policy, China's total fertility rate gradually declined during the third peak of population birth rates.

Although the birth rate was low during the third peak of China's population boom, a large number of young men and women born in the 1960s (when the birth rate was at its highest) will reach the age of marriage and childbearing starting from the mid-1980s. With the rapid increase in the number of new marriage and childbirth candidates, even maintaining the current low fertility rate will result in a significant increase in the number of births, thus leading to another birth peak (Zha, 1991).

With the decrease of natural population growth rate, China's population structure has shown a trend of ageing and a decrease in the proportion of young population. To alleviate this problem, the Chinese government began to implement the universal two-child policy in 2015. However, the implementation effect of this policy is not satisfactory. According to the 2022 National Economic and Social Development Statistics Bulletin, the number of births in China was 9.56 million, resulting in negative population growth for the first time. Understanding these historical trends helps us gain a better comprehension of China's population structure and challenges, thus providing a solid foundation for the justification of this study.

Table 2.1: Changes in China's Birth Population and Total Fertility Rate, 1949-2022[1]

Year	Birth Population (10,000)	Total Fertility Rate	Year	Birth Population (10,000)	Total Fertility Rate
1949	1,950	6.14	1986	2,393	2.72
1950	2,023	5.81	1987	2,529	2.76
1951	2,107	5.70	1988	2,464	2.54
1952	2,105	6.47	1989	2,414	2.52
1953	2,151	6.05	1990	2,391	2.51
1954	2,260	6.28	1991	2,265	1.93
1955	1,984	6.26	1992	2,125	1.78
1956	1,982	5.85	1993	2,132	1.69
1957	2,169	6.41	1994	2,110	1.63
1958	1,909	5.68	1995	2,063	1.59
1959	1,650	4.30	1996	2,067	1.55
1960	1,392	4.02	1997	2,038	1.53
1961	1,197	3.29	1998	1,942	1.52
1962	2,478	6.02	1999	1,834	1.53
1963	1,975	7.50	2000	1,771	1.63
1964	2,747	6.18	2001	1,702	1.56
1965	2,718	6.08	2002	1,647	1.57
1966	2,589	6.26	2003	1,599	1.57
1967	2,575	5.31	2004	1,593	1.61
1968	2,769	6.45	2005	1,617	1.62
1969	2,726	5.72	2006	1,585	1.64
1970	2,749	5.81	2007	1,595	1.67
1971	2,586	5.44	2008	1,608	1.70
1972	2,579	4.98	2009	1,591	1.71
1973	2,476	4.54	2010	1,592	1.69
1974	2,246	4.17	2011	1,604	1.67
1975	2,120	3.57	2012	1,635	1.80
1976	1,862	3.24	2013	1,640	1.71
1977	1,795	2.84	2014	1,687	1.77
1978	1,745	2.72	2015	1,655	1.67
1979	1,727	2.75	2016	1,786	1.77
1980	1,787	2.74	2017	1,723	1.81
1981	2,078	2.79	2018	1,523	1.55
1982	2,247	2.97	2019	1,465	1.50
1983	2,066	2.56	2020	—	1.28
1984	2,063	2.61	2021	1,062	—
1985	2,211	2.63	2022	956	—

Source: China National Statistical Yearbook (2022), Statistical Bulletin of China's National Economic and Social Development (2021), Zha (1991) and The World Bank (2023).

[1] Note: The birth population data for 2010 and before is estimated based on the total population and birth rate published by the National Bureau of Statistics of China over the years. Data from http://opinion.caixin.com/2020-09-18/101606735.html. The birth population after 2010 comes from the Statistical Bulletin of China's National Economic and Social Development. The total fertility rate in 1987 and before quoted from Zha (1991). Total fertility rate data after 1987 from World Bank.

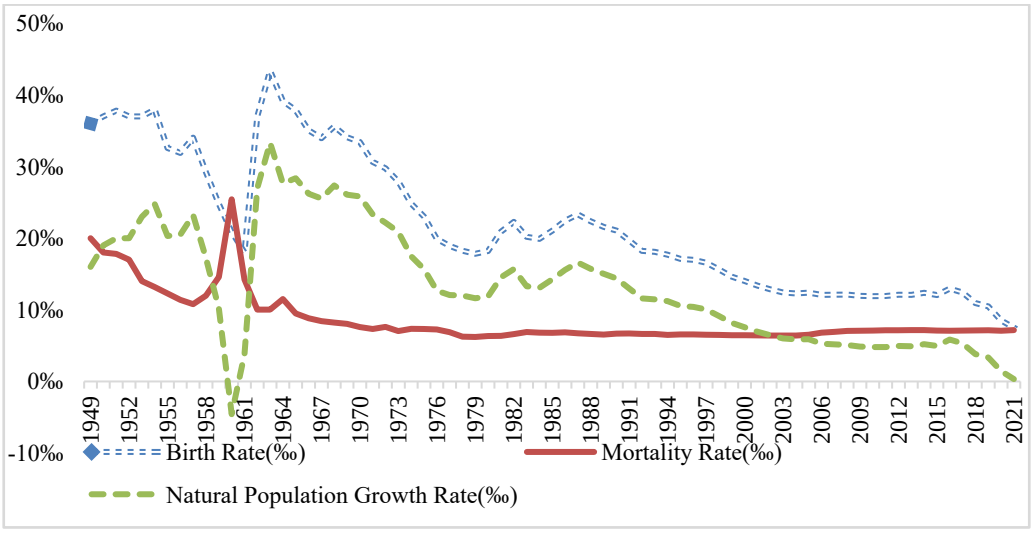

Figure 2.1: Changes in China's Population Growth Rate, 1949-2021

Source: China National Statistical Yearbook (2022)

2.1.2 Trends in Life Expectancy of Chinese Population

As time passes, China is facing an acceleration of population ageing, which is the result of various factors. Among them, the direct causes of the accelerated population ageing include the decline in total fertility rate and the increase in average life expectancy. With the decline in total fertility rate, the proportion of the young population in the total population is gradually decreasing. At the same time, due to the increase in average life expectancy, the number of existing elderly people is constantly increasing, which further exacerbates the phenomenon of ageing. Therefore, these two factors are working together to make China's population ageing problem increasingly serious.

According to the 2022 China National Statistical Yearbook, China's per capita GDP increased from 385 yuan in 1978 to 80,976 yuan in 2021. With the rapid growth of the Chinese economy, the living standards and healthcare levels of the people have been constantly improving, leading to significant improvements in their health. The development

and upgrading of medical facilities have enabled people to access better healthcare services, including better medical equipment, diagnosis, and treatment methods. Additionally, people have become more attentive to health maintenance, diet, and exercise, which also contribute to the extension of life expectancy. As a result of these changes, life expectancy among the Chinese population has been continuously increasing Figure 2.2 illustrates the life expectancy of the Chinese population from 1960 to 2020.

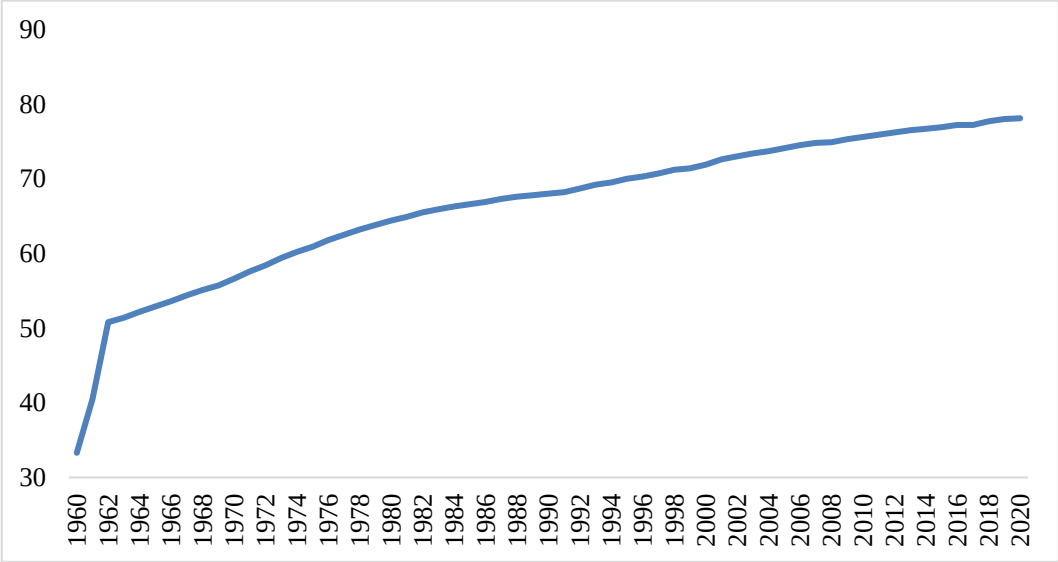

Figure 2.2: Trends in Life Expectancy of Chinese Population, 1960-2020

Source: The World Bank (2023)

China's average life expectancy has increased from 33.3 years in 1960 to 78.1 years in 2020. By comparing with Table 1.3, it is known that China's life expectancy has surpassed the world's average level and is between the average life expectancy of high-income and middle-income countries, but still lags behind developed countries such as Japan and France. From the perspective of life expectancy growth, during the nearly 60 years from 1960 to 2020, China's average life expectancy has increased by 44.8 years, with an annual growth rate of 1.43%, indicating a very rapid growth. Therefore, understanding the trends in life

expectancy among the Chinese population is crucial for justifying and emphasizing the significance of our further research on this topic.

2.1.3 Population Age Structure in China

The age distribution of the Chinese populace is currently experiencing substantial transformations, primarily propelled by a deceleration in population growth, declining fertility rates, and an augmentation in life expectancy. Table 2.2 showcases the demographic structure of the Chinese population between 1999 to 2021, encompassing the year-end total population, the percentage of individuals aged 0-14, 15-64, and 65 years and above, in relation to the overall population.

From 1999 to 2021, the total population of China has been consistently increasing, rising from 1.257 billion to 1.412 billion. This implies an increase of 155 million individuals in the population over a period of 22 years. During this time period, China has experienced significant changes in its population structure. The proportion of individuals aged 14 and under has decreased from 25.4% to 17.5%, while the proportion of individuals aged 65 and above has increased from 6.9% to 14.2%. These figures indicate that China's population is undergoing rapid ageing. In 2000, the percentage of the population aged 60 and above, as well as 65 and above, was 10.3% and 7%, respectively, signifying the country's entrance into an ageing society. By 2021, the population of elderly individuals aged 65 and above in China had reached 200 million, comprising 14.2% of the total population. Over the 22-year period, the proportion of elderly individuals in the total population has increased by 7.3%, exacerbating the ageing situation.

Table 2.2: Population Age Structure in China, 1999-2021

Year	Total Population (10,000)	Proportion of Population Aged 0-14 (%)	Proportion of Population Aged 15-64 (%)	Proportion of Population Aged 65 and over (%)
1999	125,786	25.4	67.7	6.9
2000	126,743	22.9	70.1	7.0
2001	127,627	22.5	70.4	7.1
2002	128,453	22.4	70.3	7.3
2003	129,227	22.1	70.4	7.5
2004	129,988	21.5	70.9	7.6
2005	130,756	20.3	72.0	7.7
2006	131,448	19.8	72.3	7.9
2007	132,129	19.4	72.5	8.1
2008	132,802	19.0	72.7	8.3
2009	133,450	18.5	73.0	8.5
2010	134,091	16.6	74.5	8.9
2011	134,735	16.5	74.4	9.1
2012	135,404	16.5	74.1	9.4
2013	136,072	16.4	73.9	9.7
2014	136,782	16.5	73.4	10.1
2015	137,462	16.5	73.0	10.5
2016	138,271	16.7	72.5	10.8
2017	139,008	16.8	71.8	11.4
2018	139,538	16.9	71.2	11.9
2019	140,005	16.8	70.6	12.6
2020	141,212	17.9	68.6	13.5
2021	141,260	17.5	68.3	14.2

Source: China National Statistical Yearbook (2022).

Table 2.3 presents the statistics of China's elderly population by age group in 2010 and 2020. The data in the table are derived from the national census conducted every 10 years in China, which provides more detailed and accurate information on the population. As shown in the table, the number and proportion of the population in each age group have been increasing rapidly from 2010 to 2020. As of 2018, all members of the first baby boom generation born after 1949 in China had reached the age of 60 or above. By 2022, the second baby boom generation will also gradually reach the age of 60. As the first and second baby boom generations enter the ranks of the elderly, it is foreseeable that the issue of ageing in China will become even more severe. These trends hold significant relevance for our study as they provide motivation for a comprehensive exploration of demographic issues in China.

Table 2.3: Statistics of China's Elderly Population by Age Group in 2010 and 2020

Age Group	Population in 2010	Proportion of population in 2010 (%)	Population in 2020	Proportion of population in 2010 (%)
60-64	58,667,282	4.4	73,352,938	5.21
65-69	41,113,282	3.08	74,005,566	5.25
70-74	32,972,397	2.47	49,590,036	3.52
75-79	23,852,113	1.79	31,258,849	2.22
85 and above	20,989,382	1.57	35,800,835	2.54

Source: China's Census Data (2020).

2.1.4 Population Ageing Situation in Different Regions of China

China has a vast territory with a land area of 9.6 million square kilometres, spanning 5,000 kilometres from east to west. Geographically, the western region of China is predominantly composed of plateaus and mountains, while the eastern region is characterized by plains. Moreover, the eastern coast of China stretches for a distance of 18,000 kilometres. These geographical features have not only led to significant economic and cultural disparities among regions, but also resulted in differences in the population age structure. Taking into account economic development and geopolitical factors, this article adopts the regional classification method proposed by Lu et al. (2017) and places Heilongjiang and Jilin provinces in the central region, and Liaoning province in the eastern region. Therefore, the Chinese Mainland is divided into three regions, as shown in Table 2.4.

Table 2.4: Regional Divisions of China by Province

Region	**Contains Provinces**
The eastern region	Hainan, Guangdong, Shandong, Hebei, Jiangsu, Liaoning, Shanghai, Beijing, Tianjin, Zhejiang, Fujian
The central region	Heilongjiang, Jilin, Shanxi, Henan, Hunan, Hubei, Jiangxi, Anhui
The western region	Shaanxi, Inner Mongolia, Xinjiang, Gansu, Guizhou, Chongqing, Yunnan, Guangxi, Sichuan, Qinghai, Ningxia and Tibet

Source: Lu et al. (2017).

Table 2.5 describes the population ageing in different regions of China. The Chinese government conducts a national census every ten years, which provides detailed and accurate population data. In this article, the fifth and seventh national censuses are selected to analyse the differences in ageing among different regions, with the data collected in 2000 and 2020, covering a time span of 20 years.

According to regional divisions, the ageing phenomenon in the eastern, central, and western regions of China has shown an upward trend. Among them, the ageing phenomenon in the eastern region was the most severe in 2000, while the ageing trend in the central region has grown the fastest, with the proportion of elderly people exceeding that of the eastern region in 2020, becoming one of the regions with the most severe population ageing phenomenon. In 2000, the proportion of elderly people in the eastern, central, and western provinces was 7.70%, 6.63%, and 6.36% of the total population, respectively. By 2020, these figures had increased to 13.35%, 13.13%, and 14.27%, respectively.

At the provincial level, as of 2020, population ageing was most severe and growing rapidly in the Liaoning province, with the proportion of the population aged 65 and above accounting for 17.42% of the total population, a 9.59% increase in ageing over the past two decades. There was a total of 10 provinces with a population ageing rate exceeding 15% as of 2020, including four provinces located in the economically developed eastern coastal regions and four in the central regions, with two in the western regions. Five provinces had a population ageing rate below 10%, namely Guangdong, Qinghai, Ningxia, Xinjiang, and Tibet. Apart from Guangdong, all were located in underdeveloped western provinces. Tibet had the lowest ageing rate at 5.67%. Understanding the regional variations in population ageing in China lends legitimacy to our study, aiding in a more nuanced comprehension of

the country's demographic challenges. It also provides a vital foundation for informing future social policies and planning.

Table 2.5: Population Ageing Situation in Different Regions of China

Region	2000 Census Data		2020 Census Data		Difference (%)
	Total population (10,000)	Proportion of population aged 65 and over (%)	Total population (10,000)	Proportion of population aged 65 and over (%)	
The National	126,583	6.96	141,177	13.50	6.54
Eastern Mean	4,466	7.70	5,512	13.35	5.65
Beijing	1,382	8.36	2,189	13.30	4.94
Tianjin	1,001	8.33	1,387	14.75	6.42
Hebei	6,744	6.86	7,461	13.92	7.06
Liaoning	4,238	7.83	4,259	17.42	9.59
Shanghai	1,674	11.53	2,487	16.28	4.75
Zhejiang	4,677	8.84	6,457	13.27	4.43
Jiangsu	7,438	8.76	8,475	16.20	7.44
Fujian	3,471	6.54	4,154	11.10	4.56
Shandong	9,079	8.03	10,153	15.13	7.10
Guangdong	8,642	6.05	12,601	8.58	2.53
Hainan	787	6.58	1,008	10.43	3.85
Middle Mean	5,195	6.63	5,258	14.27	7.64
Shanxi	3,297	6.20	3,491	12.90	6.70
Jilin	2,728	5.85	2,407	15.61	9.76
Heilongjiang	3,689	5.42	3,185	15.61	10.19
Anhui	5,986	7.45	6,103	15.01	7.56
Jiangxi	4,140	6.11	4,519	11.89	5.78
Henan	9,256	6.96	9,937	13.49	6.53
Hubei	6,028	6.31	5,775	15.59	9.28
Hunan	6,440	7.29	6,644	14.81	7.52
Western Mean	2,961	6.36	3,190	13.13	6.77
Inner Mongolia	2,376	5.35	2,405	13.05	7.70
Guangxi	4,489	7.12	5,013	12.20	5.08
Chongqing	3,090	7.9	3,205	17.08	9.18
Sichuan	8,329	7.45	8,367	16.93	9.48
Guizhou	3,525	5.79	3,856	11.56	5.77
Yunnan	4,288	5.99	4,721	10.75	4.76
Shaanxi	3,605	5.93	3,953	13.32	7.39
Gansu	2,562	4.99	2,502	12.58	7.59
Qinghai	518	4.33	592	8.68	4.35
Ningxia	562	4.47	720	9.62	5.15
Xinjiang	1,925	4.53	2,585	7.76	3.23
Tibet	262	4.50	364	5.67	1.17

Source: China's Census Data (2020) and China's Census Data (2000).

2.1.5 Population Ageing in Urban and Rural Areas in China

China is a country with vast territory and a large population. Due to various factors such as history, culture, and nature, there exist significant differences in development levels and economic strength among different regions. In addition to regional disparities, the development gap between urban and rural areas is also a serious problem faced by China. This gap is manifested in many aspects, such as income disparity, differences in educational and medical resources, and demographic structure differences.

According to data from the National Bureau of Statistics of China, prior to 1978, the majority of the Chinese population resided in rural areas, with an extremely low urbanization rate and urban population accounting for only 18% of the total population. With the rapid growth of the Chinese economy, the urbanization rate began to accelerate, resulting in an emerging economic development gap between urban and rural areas. As a result, rural areas have become increasingly unattractive to young people during the process of urbanization. As a result of the relaxation of household registration restrictions by the government, many rural laborers have migrated to cities in search of better economic returns. This migration process has shown obvious age selectivity, with young laborers leaving and the elderly and children staying behind. This process will have a significant impact on the ageing process of both urban and rural areas.

As can be seen from Figure 2.3, the proportion of elderly people aged 65 and above has been on the rise in both urban and rural areas from 2001 to 2020. Prior to 2004, the proportion of elderly people in urban areas had been consistently higher than that in rural areas, but from 2005 to 2009, this gap gradually narrowed. However, since 2009, the proportion of elderly people in rural areas has sharply increased and surpassed that in urban

areas, demonstrating a significant urban-rural disparity. Understanding this urban-rural ageing disparity contributes to a deeper exploration of ageing issues and provides essential contextual support for the rationale of this study.

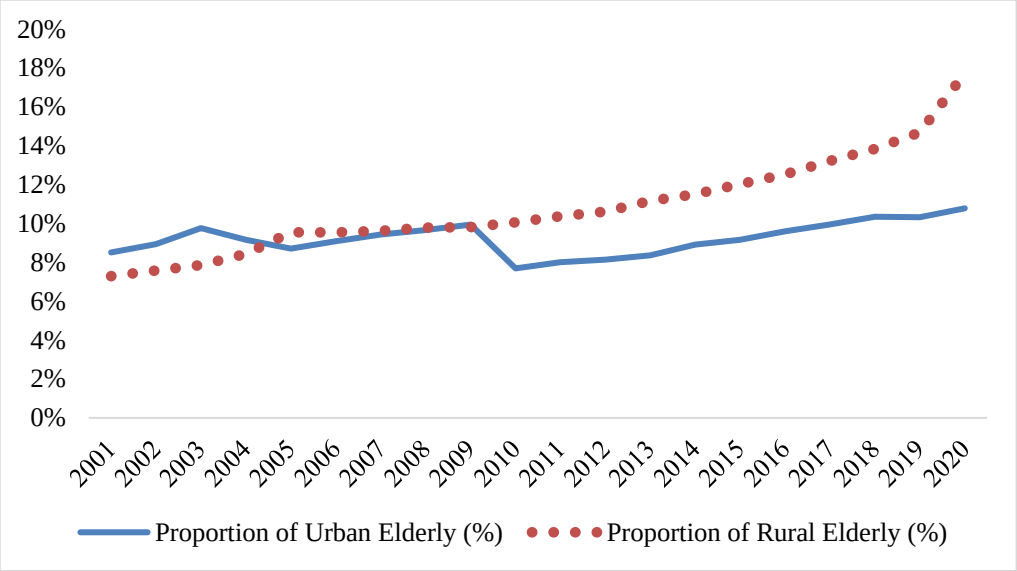

Figure 2.3: Trends in Population Ageing in Urban and Rural Areas, 2001-2020

Source: China Population and Employment Statistical Yearbook (2021)

2.1.6 The Elderly Dependency Ratio in China

In a country's population structure, if the proportion of the elderly and children is relatively low, then the labour resources are relatively high. At this time, a population age structure that is favourable for economic growth is formed, which is called the demographic dividend. The demographic dividend theory suggests that the stage in the demographic transition when the proportion of middle-aged labour resources is high while the proportion of children and elderly is low is the most important population phase. The age structure at this stage is very conducive to economic prosperity because the supply of suitable labour

resources is abundant, which leads to a high investment and high growth state in the overall economy.

Population dependency ratio is one of the important indicators to measure population dividend, which relates to the proportion of non-working population (including the elderly and children) to working population. Specifically, the elderly dependency ratio refers to the ratio of the population aged 65 and over to the population aged 15-64, while the child dependency ratio refers to the ratio of the population aged 0-14 to the population aged 15-64. The total dependency ratio refers to the ratio of all non-working population (i.e., the elderly and children) to the population aged 15-64. These indicators can help us better understand the population structure and utilization of labour resources in a country or region.

The dependency ratio is a crucial indicator of demographic structure and an important parameter for assessing the “population burden coefficient” in measuring social development. As China’s demographic structure continues to shift towards a population ageing and declining birth rates, the number of elderly individuals is increasing while the number of working-age individuals is gradually decreasing. This situation has led to a continuous increase in the elderly dependency ratio. As the dependency ratio increases, each working-age individual must bear a heavier burden of care, which means that the caregiving burden on the working-age population becomes increasingly heavy. This not only imposes economic pressure on individuals but also has an impact on the entire society's economic development. As working-age individuals must assume more caregiving responsibilities, their disposable income may decrease, potentially reducing their consumption and investment capacity, thereby slowing down economic growth.

The increase in old-age dependency ratio imposes heavy financial burden on the pension system. With the rapid growth of the elderly population in China, social security costs will increase rapidly, posing a huge burden on the national finances. Moreover, in the trend of declining birth rates, the labour force will gradually decrease, leading to a reduction in the number of contributors to social security funds. This reduction in contributors will result in the government facing the risk of the basic social pension insurance becoming unsustainable. The increase in life expectancy for the elderly will bring about “longevity risk”, as the period during which the elderly receive pensions is extended with the increase in life expectancy. The extension of the elderly lifespan not only brings enormous burden to the social pension system, but also generates many social problems. If the elderly lose their ability to live independently due to deteriorating health, long-term care is required. With the increase in age, medical and nursing costs will rapidly increase.

According to Figure 2.4, the elderly dependency ratio in China increased from 8.3% in 1990 to 20.8% in 2021, representing a growth of 12.5%. Notably, the rate of increase has been even more rapid since 2010. According to the “Population and Labour Green Paper: China’s Population and Labour Issues Report No. 19” released by the Chinese Academy of Social Sciences, as the baby boomer generation born in the 1950s gradually enters old age, the labour force population will rapidly decrease. This is because as this generation gradually exits the labour market, the number of their children and grandchildren cannot fill the positions they leave behind, leading to insufficient labour supply. Therefore, the old-age dependency ratio will continue to rise and maintain this trend until 2060, which will gradually increase the burden of elderly care. With the continuous increase in the elderly dependency ratio, it implies that China needs to take measures to address the elderly population's retirement and healthcare needs while maintaining sustainable economic

growth. This also underscores the significance of this study because the allocation of household financial assets in the context of ageing becomes crucial.

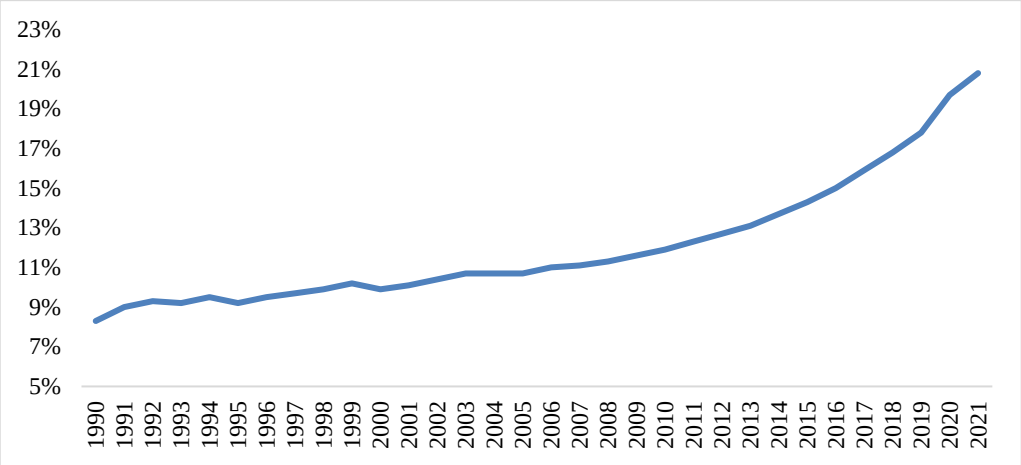

Figure 2.4: Trends in the Elderly Dependency Ratio in China

Source: China National Statistical Yearbook (2022)

2.2 China's Pension System

Elderly care is crucial for the stability and sustainable development of human societies. Generally speaking, there are three levels of elderly care in China, namely economic support, daily care, and spiritual comfort. At the current stage, economic support remains the most pressing issue for the elderly in China (Mu, 2000).

As elderly people age, their income from labour gradually decreases, while the cost of living, such as medical care and housing, continues to increase. This leads to a gradual weakening of their ability to cope with daily life risks. Therefore, the elderly need more social support, including assistance in the form of pensions and social welfare, to ensure their basic living needs. Additionally, since elderly individuals generally have more fragile physical conditions, they may require more medical services and care, which also requires certain economic support. Furthermore, the elderly have needs in terms of their mental and

emotional well-being, including care, companionship, and communication, to help maintain a positive attitude and quality of life. In summary, at the current stage, the issue of economic support for the elderly remains one of the most pressing issues to be addressed in China's elderly care difficulties.

From the perspective of the sources of elderly people's retirement funds, an important source is intergenerational transfers within families, that is, the financial support provided by children to their parents. In China, raising children to support parents in old age is a traditional concept. Specifically, families invest their unused resources, including finances, education, and social capital, into their children during their younger years. Such investment can be considered a form of financial asset, as it can be converted into the future eldercare funds.

However, modern Chinese society faces the dual challenges of a low birth rate and the one-child policy. With only one child per household, each child will bear a greater responsibility and burden in intergenerational transfers in the future. Due to the implementation of China's one-child policy, the household structure in China generally consists of four elderly individuals, a married couple, and one child. As the older generation ages, the married couple may find themselves responsible for the financial support of four elderly individuals, while also caring for their own household and child. This burden may exceed the couple's capacity to handle. As a result, it can be difficult for children to have enough financial resources and time to care for and support their ageing parents. On the one hand, children need to bear the cost of their own living expenses and education, and on the other hand, they also need to consider the issue of supporting their elderly parents. This burden may affect their career development and household life. Additionally, due to the

impact of the one-child policy, some elderly individuals may lack emotional support and companionship from their children.

In addition to intergenerational transfer within families, another important economic source is the pension system established by the state. The social pension insurance system in modern society originated earliest in Germany. There are three initial concepts for this system (Barr & Diamond, 2010).

The first concept was to provide a function of smoothing consumption over a person's life cycle. The social pension system can ensure that the insured pay premiums during their working period when they are capable of earning money, through institutional arrangements and mandatory requirements established by the state. This system can save a portion of income and transfer it for use when individuals lose their ability to work. The second concept is a pay-as-you-go arrangement, whereby the contributions paid by participants in employment are transferred to those who have retired. The risk of old age is thus shared by the group. The third concept is to achieve a certain degree of social redistribution through institutional arrangements. Social pension insurance can adopt a differentiated pension replacement rate policy, which means setting a lower pension replacement rate for high-income individuals and a higher pension replacement rate for low-income individuals, in order to reduce income inequality. Specifically, high-income individuals receive a lower proportion of their pre-retirement income in pension benefits after retirement, while low-income individuals receive a higher proportion of their pre-retirement income in pension benefits, thus ensuring their post-retirement standard of living. This policy can to some extent reduce income inequality and promote social equity and stability.

In China, the basic pension insurance system was initially established on the basis of the labour insurance system. After the establishment of the People's Republic of China, in order to emulate the Soviet Union's practice, state-owned enterprises established a pension insurance system similar to the "pay-as-you-go" system. The operation of this system is that enterprises will pay pensions to eligible retirees in the same period based on the current contribution amount, i.e., enterprises will collect contributions in the current period and pay pensions to eligible employees in the same period (Peng, 2021).

The pay-as-you-go pension system, which is based on the principle of short-term balance between income and expenditure, does not generate significant capital accumulation. While this approach can avoid the risk of fund depreciation caused by inflation and relieve pressure on investment operations, the system faces the risk of insolvency as the population ageing continues to grow (Yuan, 2001). This highlights the need to address the structural deficiencies of the existing pension system and to develop a multi-pillar pension system to mitigate external risks and promote sustainable growth. In 1994, the World Bank first proposed the three-pillar pension system in its report "Preventing the Old Age Crisis: Policies to Protect the Old and Promote Growth" as a joint response to the pension risks faced by the elderly.

With the continuous advancement of China's economic system reform and the intensification of the ageing trend of its population, the country's pension system has begun to undergo reforms and adopted the World Bank's recommendation to introduce a three-pillar model. The first pillar is the basic pension insurance system, which is managed and operated by the government and aims to provide basic pension security for all insured persons. The second pillar is the enterprise annuity, which is voluntarily provided by

enterprises to provide additional pension security for their employees, helping to improve their welfare benefits and loyalty. The third pillar refers to voluntary retirement savings plans, such as commercial retirement insurance offered by insurance companies, which individuals can voluntarily purchase. Its purpose is to provide more flexible and personalized retirement security solutions to meet the needs of different groups. Through this three-pillar model of pension security system, it is possible to better address the challenges brought about by the population ageing, and to ensure the quality of life and social stability of the elderly.

The basic pension insurance system was established in the early 1990s in China. Currently, it consists of two major parts, namely, the urban employee basic pension insurance system (UEBPI) and the urban resident basic pension insurance system (URBPI).

The UEBPI is designed for enterprise employees and voluntarily participating individual business owners. The contribution is shared by both the employer and employee, with the employer contributing 20% of the total salary before tax to the social pooling fund, and the employee contributing 8% of the total salary to the individual account. For individual business owners, the contribution base is based on the local average wage level and is paid at a rate of 20%.

The URBPI covers urban and rural residents without fixed incomes. The social pooling component is exempt from contribution, and pension payments are fully subsidized by the central and local governments, with individuals only require paying into their personal accounts (Zheng, 2018). Urban and rural residents have different personal contribution levels. Urban residents can choose to pay ten different levels of contributions ranging from a minimum of 100 yuan to a maximum of 1000 yuan, with each level increasing by 100 yuan. Rural residents can choose to pay five different levels of contributions ranging from a

minimum of 100 yuan to a maximum of 500 yuan, with each level also increasing by 100 yuan. The government will provide each insured person with a minimum annual subsidy of 30 yuan, regardless of whether they are urban or rural residents.

The enterprise annuity system refers to a pension insurance system established by enterprises for their employees, which originated from the supplementary pension insurance established in 1991. The implementation of the enterprise annuity system is determined independently by the enterprise and belongs to a different level of pension system compared to the basic pension insurance system and the personal savings-oriented pension insurance system. Generally speaking, enterprise annuity is a form of "deferred salary" provided by enterprises for retired employees based on the humane needs of the workforce. Enterprises establish annuity plans based on their economic strength on the basis of the basic pension insurance system to alleviate employees' concerns regarding retirement, medical care, and work-related injuries.

The enterprise annuity system, which was implemented in 2004, stipulates that both the enterprise and individual employees must jointly contribute the necessary funds, and the specific amount is determined through negotiation between the two parties. This means that the source of funds for enterprise annuities is not the government, but rather from the contributions of the enterprise and individual employees. Currently, China's enterprise annuity system is not mandatory, and the government's efforts to promote enterprise annuities are reflected in policies that encourage and incentivize them. The implementation of enterprise annuities depends on the voluntary actions of employers and requires collective negotiation and consultation between employers and employees. Thus, enterprise annuities have a high degree of autonomy and flexibility.

The Enterprise Annuity Foundation reinvests all the returns from the contributed fund shares back into the fund. The government establishes individual accounts for each employee participating in the enterprise annuity, in order to record their contributions to the enterprise annuity fund. Upon retirement, employees are eligible to receive enterprise annuity payments, which are determined by the accumulation of funds in their personal accounts and their investment returns (Fang, 2019). The establishment of the enterprise annuity system helps improve China's social security system, enhance the social security level of employees, and also benefits employee management and talent retention for enterprises.

Public pension insurance is a social security system established by the government, aiming to provide basic living security and financial support for elderly individuals. However, the benefit level of public pension insurance is limited. If one wishes to maintain a relatively high standard of living after retirement, it is necessary to seek assistance from other forms of retirement savings, such as commercial life insurance, stock investments, and so on.

Commercial pension insurance is a form of annuity insurance that aims primarily to provide retirement benefits and serves as a supplement to social pension insurance. The insured of commercial pension insurance can receive retirement benefits from a certain age after paying a certain amount of insurance premium. As a result, despite the decrease in income after retirement, the insured can still maintain their pre-retirement standard of living with the help of the pension. Commercial pension insurance in China originated from the establishment of personal savings-oriented pension insurance in 1991. The personal savings-oriented pension insurance is a voluntary participation system in which employees choose

the handling agency. It is the earliest institutional arrangement of the third pillar of personal pension insurance in China, but no supporting policies are introduced and implemented subsequently (Li, 2023).

In April 2018, the Chinese government issued a notification announcing the pilot implementation of tax-deferred commercial pension insurance in the industrial parks of Shanghai, Fujian, and Suzhou. This marked the official launch of China's third pillar pension insurance.

As commercial pension insurance mainly involves three stages, the first stage is the payment stage, in which the buyer (i.e., the insurance policyholder) needs to pay the insurance premium to the insurance company to obtain the coverage of commercial pension insurance. These insurance premiums will be used by the insurance company for the investment accumulation in the next stage. The second stage is the investment accumulation stage, in which the insurance company invests the commercial pension insurance premiums in investment targets such as stocks, bonds, real estate, etc., to obtain investment returns. These returns will be used to pay for commercial pension insurance claims and increase the value of commercial pension insurance premiums. The third stage is the pension receiving stage, which refers to the buyer reaching retirement age and being able to receive pension benefits from commercial pension insurance.

According to whether each link enjoys tax preferential policies, they can be divided into eight types, as shown in Table 2.6. Among them, “E” represents tax exemption for that link, and “T” represents tax collection for that link. “EET” refers to tax-deferred commercial pension insurance.

Table 2.6: Taxation Model of Commercial Pension Insurance

Trading Session	Taxation Model							
	EEE	TEE	ETE	EET	ETT	TTE	TTT	TET
Payment Stage	E	T	E	E	E	T	T	T
Investment Stage	E	E	T	E	T	T	T	E
Collection Stage	E	E	E	T	T	E	T	T

Source: Ma (2023).

Personal tax-deferred commercial pension insurance is a form of insurance that allows insured individuals to pay their pension insurance premiums in a pre-tax manner during their working years, thereby reducing their current tax burden. Insured individuals only need to pay personal income tax when they meet the conditions for receiving pension benefits. Insured individuals can choose different pre-tax payment amounts based on their income, and there are two types of limit standards: for insured individuals who receive salaries, wages, and other income, the limit is the lower of 6% of monthly income or 1,000 yuan; for insured individuals who receive income from individual businesses and operations, the limit is the lower of 6% of taxable income for the year or 12,000 yuan. When insured individuals reach the retirement age prescribed by the state, they can choose to receive pension benefits on a monthly or annual basis, with a general payment term of either lifetime or a fixed period of 15 to 20 years. When receiving pension benefits, 25% of the amount does not need to be subject to personal income tax, while the remaining 75% is subject to personal income tax calculated based on a 10% tax rate.

The introduction of personal tax-deferred commercial pension insurance can not only provide multiple pension protections for insured individuals, but also alleviate the problem

of insufficient supply of pension services caused by China's population ageing and build a more complete multi-level pension security system (Sun, 2020).

2.3 The Dilemma of China's Pension System

As China's social system gradually improves, a three-pillar insurance system consisting of basic old-age insurance, enterprise annuities, and commercial pension insurance as its core has been established. However, current circumstances indicate that this insurance system still faces many challenges and issues.

China's basic pension insurance operates on a pay-as-you-go system, where the current contributions of workers are used to pay the pensions of current retirees. With the increasing population ageing in China, the number of elderly people continues to grow while the number of working-age people gradually decreases, resulting in an increasing burden on the pension system. In other words, each worker will need to bear a heavier pension burden in the future, the number of retirees that each worker will need to support will gradually increase, and the number of workers supporting each retiree will gradually decrease. This will bring significant pressure on the sustainability of the pension system and its ability to pay pensions. According to the Actuarial Report on Chinese Pension System from 2019 to 2050, by 2050, nearly one contributor will be required to support one retired person.

Assuming the current fiscal subsidy policy remains unchanged, with the proportion of contributions to the basic pension insurance fund from levied income accounting for 80.6%, fiscal subsidy income accounting for 15.1%, and fund interest income accounting for 4.3%, the total current surplus of the urban employees' pension insurance fund will experience a trend of first rising and then falling from 2018 to 2022. Specifically, it will increase from 277.66 billion yuan in 2018 to 329.12 billion yuan in 2020 and then continue

to decrease to 280.36 billion yuan in 2022. The growth rate of the current surplus will show a continuous decline from 20.7% in 2018 to -8.1% in 2022. If there were no fiscal subsidy policies, the annual current surplus from 2018 to 2022 would have been negative, commonly referred to as “deficit spending”. Moreover, the deficit gap resulting from the inability to cover expenditures with revenues would continue to widen (Qi, 2019). Liu (2014) estimates that if the government uses fiscal subsidies to finance the pension system in the future, the discounted total amount of government fiscal subsidies needed for the pension fund gap from 2010 to 2050 could reach 27.5-billion-yuan, equivalent to 143% of China’s GDP in 2010. The financial sustainability of the basic pension insurance system is increasingly dependent on fiscal subsidies, which will inevitably impose a greater burden on the government's finances.

From the perspective of the basic pension replacement ratio (the ratio of the monthly average pension of retired workers to the monthly average wage of workers), the overall level of replacement ratio for enterprise employees’ basic pension insurance is relatively low. Based on the 2020 average monthly wage of enterprise employees of 6,654 yuan and the average monthly per capita basic pension insurance benefit of 2,900 yuan, the average replacement ratio is only 43.6% (Xue et al., 2020). Under the assumption of a target replacement ratio of 55%, Fei et al. (2023) estimate a pension gap of 2.25 trillion yuan for urban employees in China in 2020. As the number of retired employees continues to increase, and the scissors gap between the average wage level and the growth rate of basic pension insurance benefits widens, the total amount of the pension gap is expected to reach nearly 90 trillion yuan by 2050 under conservative assumptions. Furthermore, the study finds that enterprise annuities have a relatively limited effect in supplementing the pension gap.

Enterprise annuity is an important component of China's pension system, but there are many problems associated with it, and the most significant issue is the low coverage rate. According to statistics, as of 2021, the number of employees participating in enterprise annuities accounted for only 8.23% of the number of employees participating in the basic pension insurance for urban workers, and the proportion of enterprises that have established enterprise annuity plans is approximately 0.41% of the total number of enterprises (Yue & Fan, 2023). China's second-pillar enterprise annuity system start relatively late, with a limited coverage range, incomplete system development, and a lack of effective market mechanisms, which have hindered its development (Shao, 2016).

The statistical criteria for commercial pension insurance are not clearly defined, resulting in a lack of standardization in this area. Additionally, the coverage of commercial pension insurance in China is still relatively narrow, with a slow scale of development. For instance, the personal income tax deferred commercial pension insurance introduced in 2018 only generate a premium income of 300 million yuan by the end of April 2020 (Chen, 2022). In comparison to developed nations like the United States, China's commercial pension insurance exhibits significant disparities, including low insurance density, inadequate insurance depth, and a disproportionately small proportion of insurance to GDP (Zheng, 2016).

As public pension benefits decline and intergenerational transfers of households decrease due to demographic changes, the importance of individuals reserving financial assets to ensure their post-retirement livelihoods is gradually increasing. In the context of diminishing alternative sources of income, it is becoming increasingly important for individuals to engage in rational financial asset allocation after retirement. Appropriate asset

consumption rates and investment returns can help reduce poverty and longevity risks in retirement. Therefore, as life expectancy increases and the proportion of elderly population grows, proper financial asset allocation becomes particularly crucial.

2.4 Ageing and China's Financial Market

From the perspective of individual households, population ageing will inevitably affect the financial asset allocation decisions of each household at different stages, thereby affecting their retirement income. From a macro perspective, financial institutions are important intermediaries for savings-to-investment transformation. Financial institutions can provide households with investment options that are both liquid and secure, as well as high-yield investment options to meet their investment needs. At the same time, financial institutions also need to guide household investment funds towards projects in the real economy (Wang, 2019).

The financing channels for physical enterprises can mainly be divided into two categories: indirect financing channels represented by banks and direct financing channels represented by capital markets. Indirect financing refers to physical enterprises obtaining financing by borrowing money from banks. This approach has the advantage of being quick and convenient, allowing enterprises to meet their financing needs promptly. In addition, banks have a relatively standardized loan approval and management process. On the other hand, direct financing through capital markets involves physical enterprises issuing securities such as bonds and stocks to directly obtain financing from investors. This approach has the advantage of increasing the enterprise's reputation, lowering financing costs, and providing investors with more options. For traditional industrial enterprises, which have relatively mature production technologies and stable markets, their earnings are relatively

stable. Banks can assess their repayment ability based on their stable earnings and provide corresponding loan support. Furthermore, industrial enterprises usually belong to asset-heavy industries with a large number of fixed assets, and banks can increase their credit lines by pledging or mortgaging these assets. As a result, banks typically review loan applications from these enterprises and provide corresponding credit support.

Advanced high-tech industry represents the economic strength of a nation, while high-tech enterprises, especially startups, often face immature market development and limited profitability. Furthermore, high-tech enterprises tend to prioritize research and development and innovation, unlike traditional manufacturing industries that require significant investments in fixed assets. China is currently in a critical stage of economic structural transformation and upgrading, characterized by a shift in its industrial structure from traditional low-end manufacturing to high-end manufacturing and the service sector. In order to achieve this economic goal, it is essential to have an adapted and efficient financial system to support the smooth transition of the real economy.

Currently, China's social financing is mainly dependent on indirect financing through institutions such as banks. However, this model has some limitations, such as banks' low risk preferences, high collateral requirements, and cumbersome financial auditing, which limit their ability and willingness to provide financing to small and medium-sized enterprises (SMEs) and high-tech emerging industries, making it difficult for high-tech enterprises to secure funding (Wang and Yang, 2016). In contrast, the direct financing market can better price assets and attract more risk-seeking capital. Therefore, the rapid development of the direct financing market is closely related to the upgrading and transformation of industrial structure.

Older people are often the main holders of financial assets. According to “The 2019 Survey of Assets and Liabilities of Urban Household in China”, households with heads aged 56 to 64 have the highest average total assets, while households with heads aged 18 to 25 have the lowest average total assets. The rising trend of ageing is likely to have an impact on the financial asset allocation of households, which in turn, may affect the flow of household savings between banks and capital markets.

In February 2019, the Central Political Bureau of China proposed to deepen the supply-side structural reform of finance, which marks that the overall idea of China’s financial reform should start from optimizing the financial structure to improve the efficiency of financial services for the real economy. It can be foreseen that China will vigorously promote the basic institutional reforms of the capital market in the future, strengthen the market mechanism of survival of the fittest, and truly exert the efficient resource allocation power of the capital market. Against this backdrop, studying the financial asset allocation of households in the context of population ageing has important implications for the development of China’s capital market and upgrading of industrial structure. Such research can provide valuable insights for policy makers to better understand the investment demand in the capital market, and accordingly formulate more appropriate policies to meet the market needs.

2.5 Chapter Summary

This section elucidates the research background of the thesis. With declining fertility rates and increasing life expectancy, China is entering a deeply ageing society, which will exacerbate the burden of elderly care on the entire society. Currently, the main sources of livelihood for elderly people in China are social pensions, household support, and property

income. However, the basic pension insurance is gradually unable to bear the burden of elderly care, and the construction of the second and third pillars is also not yet perfect. At the same time, the phenomenon of low birth rates will also limit intergenerational transfer within families. Therefore, it is becoming increasingly important for residents to ensure their livelihood in old age through financial asset allocation. In addition, ageing will inevitably affect households' financial asset allocation decisions and further influence the direction of economic development as a whole.

CHAPTER 3

LIITERATURE REVIEW

3.1 Introduction

From a micro perspective, households are significant agents in financial investment decision-making, and at the same time, they constitute the core components of the entire economic system. However, past research has mainly focused on financial markets, non-financial firms, financial institutions, and other intermediary agents in the financial field. Household finance has often been downgraded to a background variable, modelled through a simple representative agent or treated as an external noise trader (Gomes et al., 2021).

Despite the significant role of household finance in financial research, it is only in the past decade that systematic research on household finance has begun to receive increasing attention (Agarwal et al., 2022). With an increasing amount of micro-level household financial data being collected and recorded, this provides a solid foundation for empirical analyses based on micro data. These high-quality household survey data allow models to better reflect reality and consider various heterogeneous effects in a more comprehensive manner.

3.2 Theoretical Background of the Study

3.2.1 Life Cycle Hypothesis

The household is the most fundamental organizational structure in socio-economic activities. The original asset allocation theory did not involve intertemporal choice, and the goal of investors was to maximize the utility of end-of-period wealth. However, in practical life, household financial decisions are often more long-term. Individuals or families will pay

attention to the situation in the next period, so when making investment decisions, they need to consider the impact of lifecycle factors, making the whole decision-making process more complex (Li et al., 2011).

The traditional life-cycle hypothesis, abbreviated as LCH, is a theory that analyses the consumption function of households (Modigliani & Brumberg, 1954). The consumption function theory refers to a series of hypotheses based on consumer behaviour assumptions, which reveal a functional relationship between income and consumption (Shi, 2005).

The life-cycle hypothesis (LCH) is a theory based on utility maximization that studies income, consumption, and saving behaviour. The core idea of this theory is that the total amount of consumption over a person's life cycle is determined by the total amount of income and wealth they can obtain. Wise consumers should consider their future income levels as a basis for planning their consumption and savings across different life stages, in order to maximize their utility level and ensure financial stability and security throughout their entire lifecycle.

The life cycle theory suggests that human life can be divided into three stages: the growth stage, the stable stage, and the decline stage. During the growth stage, which typically spans from birth to young adulthood, individuals tend to have a lower income level, but due to the anticipated increase in future income, their consumption as a proportion of income is high. This phenomenon results in a higher marginal propensity to consume and a lower marginal propensity to save. This implies that for each unit increase in income, individuals tend to increase consumption by a greater amount than savings.

The stable period typically ranges from middle age to late adulthood. As individuals age, the proportion of stable period consumption to income gradually decreases, resulting in

a lower marginal propensity to consume and an increased marginal propensity to save. This suggests that individuals are more willing to save a portion of their income rather than using it all for consumption during the stable period.

The declining period typically ranges from late adulthood to the end of life. During this phase, individuals tend to rely on previously accumulated savings to meet their living needs, leading to a higher propensity to consume. This implies that older adults rely more on accumulated savings to meet their living needs rather than increasing their income. According to the life cycle hypothesis, each individual is in a different life cycle stage. If the demographic structure of society remains stable, the marginal propensity to save will also be stable. However, if the proportion of elderly population increases, the marginal propensity to consume will increase, and the marginal propensity to save will decrease, which will affect household savings rates and further asset allocation.

In order to better study household asset allocation behaviour, scholars began to incorporate investment decisions into the lifecycle framework. Samuelson (1969) constructs a multi-period model based on the Markowitz-Tobin single-period mean-variance model to analyse the problem of consumption and investment decisions throughout the life cycle. Merton (1969) constructs a continuous-time model to study the problem of consumption and investment decisions throughout the life cycle. The greatest advancement of Merton's model is that it assumes investment is made under the premise of maximizing household consumption utility, rather than investment utility. The study concludes that the proportion of risky assets invested is solely determined by differences in risk attitudes. Theoretically, investors should allocate a certain proportion of their wealth to risky assets in order to

achieve asset appreciation. Samuelson and Merton's extension of the single-period model to a more practically significant multi-period model is a major breakthrough.

In order to make Merton's continuous time model more realistic, Bodie et al. (1992) introduce the factor of labour time choice into the lifecycle model and solved the problem of optimal consumption choice and optimal asset allocation under the condition of maximizing individual lifetime utility. The research results show that the accounting of human capital is crucial for explaining the investment decision-making behaviour of rational individuals. Human capital refers to the expected future labour income that a person possesses through education, skills, and work experience, among other means. The value and risk of human capital are different at different stages of the lifecycle, so the optimal asset allocation strategy is also different. As age increases, the value of human capital gradually decreases, so the investment proportion of risky assets should be gradually reduced. Especially when approaching retirement age, the value and expected income of human capital have almost been fully realized, so the investment portfolio should be more conservative and rely less on risky assets.

However, the life-cycle theory includes three hypothetical conditions: individuals continuously accumulate assets to maximize their utility over their lifetime; individuals have sufficient cognitive ability to optimize investment decisions; and individuals have sufficient willingness to execute their formulated decisions (Benartzi & Thaler, 2007). However, in real life, the rationality and willpower of each individual are limited. In addition, since investment is a relatively complex field, many people may lack the necessary knowledge and skills to understand and respond to market changes. Such assumptions are difficult to achieve.

Subsequently, scholars gradually extended the life-cycle model. Cocco (2005) incorporates housing investment into the model. Gomes et al. (2008) incorporates the uncertainty of labour income into the model. Fagereng et al. (2017) include participation costs and small probabilities of stock market crashes into the model. Catherine (2022) includes the relationship between market returns and skewness of individual income shocks into the model. Extensions of the life-cycle model typically incorporate background risks such as human capital and real estate investments as well as credit constraints. These extension factors are all important determinants of household saving and investment at different stages of the life cycle. This is an important step in incorporating heterogeneity into household investment decision-making, providing multiple insights into individual investor asset allocation decisions (Gomes, 2020).

3.2.2 Background Risk Theory

In the process of household investment, investors always aim to minimize risks and achieve stable returns. To this end, they typically take measures to reduce risks, including hedging and diversification. Hedging refers to investors simultaneously engaging in multiple investments to reduce the risk of individual investments. For example, if an investor wants to buy a particular stock, they can simultaneously purchase a put option for that stock to protect themselves against the risk of a price decline. Diversification, on the other hand, involves spreading funds across different asset classes, industries, or regions to reduce the risk of individual investments. However, there are risks that cannot be hedged through financial market transactions, which are commonly referred to as background risks (Strobl, 2022; Wu et al., 2015; Baptista, 2012).

Background risks mainly encompass housing risk, income risk, and health risk (Wu et al., 2015). Property risk comprises two primary categories: property price risk, which pertains to risks associated with fluctuations in housing prices, and commitment expenditure risk. The latter arises from commitments related to mortgage payments or rent in the face of uncertain future labour income (Fratantoni, 1998). Income risk primarily refers to the risk faced by households due to the uncertainty of future income fluctuations. Health risk relates to the risks borne by households due to the health status of their members.

Background risks mainly affect a household's risk-bearing capacity and expectations for the future, thereby impacting the household's asset allocation. When a household invests in risky assets, they not only need to consider the risks associated with the assets but also the risks associated with background risks occurring. When a household experiences background risks, their aversion to risky assets increases, leading to more low-risk asset allocation. This is because the household may need more funds to deal with the risks, and therefore they need to retain more cash or low-risk assets to cope with the risks. In addition, background risks may increase psychological pressure on household members, leading them to be more inclined to choose low-risk assets. Many empirical studies have found that Households tend to reduce their investment in risky assets and shorten their investment horizons when facing background risks (Peng, 2022; Wu, et al., 2014).

Income generated by human capital is one of the most important sources of household income and a crucial factor in household consumption and investment decisions. Guiso et al. (1996) conducte early research on labour income risk. They use household wealth data from Italy to empirically investigate the impact of income risk on risky asset investment. The results show that background risk reduces the willingness to take other

avoidable risks. When investors face background risk, they reduce their risk exposure by holding a higher proportion of low-risk assets. Betermier et al. (2012) use Swedish household data to empirically study the relationship between labour income and financial investment decisions. The study finds that households change their investment portfolio when their employment status changes, thus hedging their income risk in the capital market. Furthermore, all else being equal, when the volatility of household wage income shifts from low to high volatility, the proportion of household risky asset holdings decreases.

Empirical studies by numerous scholars have also confirmed that an increase in labour income risk reduces the proportion of household risk assets allocation (Chang et al., 2022; Fagereng et al., 2018; Angerer and Lam, 2009). Moreover, Angerer and Lam (2009) further distinguish between permanent and transitory income risks, where the former significantly lowers the proportion of risk assets in household portfolios, while the latter does not have a significant impact.

Many Chinese scholars have conducted extensive research using data from their country. For example, He et al. (2009) analyse data from nine Chinese cities in 2006 and systematically examined the impact of background risk factors on the investment of residents' risk financial assets. The study finds a negative relationship between labour income risk and investment in risk financial assets by residents. In addition, residents who have medical social insurance or purchased commercial health insurance are more likely to invest in risk financial assets. Chen et al. (2014) use detailed asset allocation information from 13,000 customers provided by a bank in Jiangsu Province to conduct empirical research using the Ordered Probit model. They find that labour income risk had a negative impact on household risk asset allocation. As household income increases, more households allocate assets to risk.

Zhang and Zhao (2015) conduct similar empirical research using data from the China Household Finance Survey (CHFS), and the results also show that labour income risk has a reverse effect on the proportion of risk financial asset holdings.

Housing risk is an important manifestation of background risk. Besides its function as a place to live, housing also serves as an investment and can be financed through loans to acquire insufficient funds for purchasing property. However, due to its low liquidity and lack of diversification in investment, fluctuations in housing prices can affect asset allocation (Wu et al., 2015). Housing investment has a significant crowding-out effect on stock investment (Gao et al., 2020). Due to the existence of housing investment, young people can only invest limited wealth in real estate, which reduces their investment in risk assets.

Chetty et al. (2017) find that an increase in household mortgage debt leads to a decrease in the level of participation and share of investment in the stock market, while an increase in home equity is positively correlated with stock ownership. In addition, an increase in debt level and a deterioration in liquidity are negatively correlated with household stock allocation, which may even exacerbate market downturns. Duan (2021) constructs a panel dataset based on three years of data from the CHFS to explore the impact of housing on household risk and financial asset investment. The study finds that if households hold high-risk properties, they are more likely to reduce their participation and frequency in financial markets and to seek lower-risk investments. The crowding-out effect of housing risk is more pronounced for households owning only one property than those owning multiple properties. Moreover, the crowding-out effect of housing risk is more significant for young and old households than middle-aged households, while it is more evident for low-income households than high-income households. Wang et al. (2023) conduct a study using

CHFS data from 2013 to 2019, and their empirical findings indicate that housing liquidity can facilitate the financial asset allocation and consumption expenditure of multiple-property households.

According to the "CHFS Report 2019", the proportion of housing net worth in urban and rural household wealth is 71.35% and 52.28%, respectively. 91% of the per capita wealth growth comes from the increase in housing net worth. Housing has become the most important asset and source of wealth effect for Chinese households. Research by Chinese scholars also shows a negative correlation between housing risk and risk investment in Chinese households (Zhang & Zhao, 2015; Chen, 2014). Wu and Qi (2007) use investor behaviour survey data conducted by the Aldo Investment Consulting Centre in China in 2005 to conduct empirical research, which also showed that real estate investment has a crowding-out effect on stock market investment. Zhou et al. (2023) apply the CHFS data and the simultaneous Tobit model to estimate and analyse, finding that an expected increase in interest rates would increase the allocation to both risk-free and risky assets but decrease the allocation to housing. An expected increase in house prices would increase housing investment but decrease the allocation to risky assets.

Health risk is an important factor influencing household asset allocation. Due to random events and ageing, the health status of household members may deteriorate, leading to a reduction in disposable income and total assets, and thus prompting households to hold safer assets due to precautionary savings motives. Deterioration in health status leads to an increase in medical expenses, which in turn limits expenditures on household investments (Bogan & Fertig, 2013). The deterioration of health can lead to a shortened lifespan and affect investors' investment horizons (Zhou et al., 2020). In addition, health risks can also

reduce future income and increase labour income risk, thus affecting household financial asset allocation.

Rosen & Wu (2004) uses data from the US Retirement Survey to study the effect of health status on household asset allocation. The study finds that health status accurately predicted the probability and share of holding various types of risky financial assets, including retirement account assets, bonds, and stocks. Household families with poorer health status reduce their holdings of financial assets, particularly risky ones. To further explore this phenomenon, Crainich et al. (2017) develop a bivariate function of health and wealth effects and studied the asset allocation of investors with different health levels. They found that investors with lower health status tended to decrease the proportion of their holdings in risky assets. This suggests that there is an important relationship between health status and household asset allocation, and investors' health status affects their asset allocation decisions. Shen and Yu (2021) utilize panel data from the China Household Tracking Survey spanning from 2014 to 2018 to examine the relationship between health status and household participation in risk financial investments. They find that household health status significantly influences their risk financial investment behaviour, with the probability and proportion of households holding risk financial assets significantly decreasing when health status deteriorates. Additionally, they conduct mechanism tests and discovered that health status mainly affects household participation in risk financial investments through the channel of medical burden. Deteriorating health status exacerbates the medical burden that households bear, leading to a reduction in their participation in risk financial investments. Other Chinese scholars using micro data from China have also reached similar conclusions (such as Sui et al., 2021; Zhang, 2020). The proportion of stock

holdings among elderly people with different health conditions also varies, with elderly people in good health holding more stocks than those in poor health (Yogo, 2016).

However, the results of many scholars' studies have not demonstrated that health risks significantly affect residents' asset choices and their household participation in risky assets (Li & Cai, 2016; Wu et al., 2011; Li & Guo, 2009; Berkowitz & Qiu, 2006).

The deterioration of health conditions can also affect investors' mental health, leading to more conservative behaviour when facing financial risks (Xi, 2019). Specifically, mental health can alter investors' cognitive abilities, emotional regulation, risk aversion, and discount rates, thereby influencing asset allocation decisions (Bogan & Fertig, 2013).

3.2.3 Portfolio Theory

The term "asset allocation" originates from the Latin word "portafoglio" and generally refers to a collection of investments, such as stocks, bonds, and financial derivatives, held by individual or institutional investors. Classic theories of household asset allocation are based on the assumption of rational economic agents and consider the risk and return characteristics of assets as the determining factors in studying household asset allocation decisions. These theories mainly include the extensive margin of decision-making participation, and the intensive margin of the depth of decision-making involvement (Yang, 2019).

Markowitz (1952) employs variance as a measure of risk in stock returns and introduced the mean-variance model for portfolio selection. He argues that investors make investment decisions based on the maximization of expected utility. He assumes that investors aim to maximize the expected returns of a portfolio at a given level of expected

risk or minimize the risk of a portfolio at a given level of expected returns, exhibiting risk aversion. He presents the concept and methodology for identifying the minimum variance portfolio set, revealing how investors, under uncertainty, construct efficient frontiers by combining risk assets. This theory also elucidates how investors make optimal investment decisions along the efficient frontier based on their utility preferences and the inherent mechanisms of risk reduction through diversification.

Markowitz's research lays the foundation for modern portfolio theory and holds significant theoretical and practical implications. Prior to this, economists and investment managers predominantly focuses on the analysis and management of individual investment assets.

Tobin (1958a) recognizes a significant flaw in Markowitz's model, which did not include cash and other risk-free assets when selecting investment targets. Therefore, Tobin introduces risk-free assets into Markowitz's model and proposed the famous separation theorem. Investment in asset portfolios can be divided into two steps: first, the decision to select securities based on the most efficient risk portfolio, and second, how to allocate between risky and risk-free assets. Tobin believes that this combination of risky and risk-free assets formed a new efficient set, meaning that this portfolio could provide higher expected returns at the same risk level among all feasible portfolios. This theory provides an important theoretical foundation for the development of the Capital Asset Pricing Model (CAPM).

Markowitz's mean-variance model can help investors build the most efficient asset portfolio through rigorous mathematical calculations. However, in the 1950s, when computers are not yet popular and computing power was limited, the model's extensive data

calculations make it impractical for real-world applications. To address this issue, many economists build upon Markowitz's and Tobin's research and, from an empirical perspective, studied the functional relationship between the expected returns and risks of risky assets in market equilibrium, leading to the development of the CAPM model (Mossin, 1966; Lintner, 1965; Sharpe, 1964). CAPM represent a significant step forward for applying Markowitz's work to the real world and became a cornerstone of modern finance. The core idea of the CAPM model is that non-systematic risks can be eliminated through diversification in the capital market, but systematic risks cannot, and these risks give rise to a premium for risky assets.

The CAPM describes a linear relationship between stock returns and market risk, but subsequent research has revealed its limited explanatory power for certain anomalies. Fama and French (1992) augment the CAPM by introducing value and size factors, creating the three-factor model. The market factor represents the overall performance of the stock market and is typically measured by the returns of the market index. The value factor assesses the relative attractiveness of value stocks within the portfolio, while the size factor accounts for the impact of company size on the portfolio. Typically, the size factor is measured by comparing the returns of small-cap stocks to large-cap stocks, and the value factor is measured by comparing the returns of undervalued stocks to overvalued stocks. Compared to the CAPM, the three-factor model provides a better explanation for variations in portfolio performance.

3.3 Population Ageing and Savings Rate

Household is the fundamental unit that comprises the society in real life. As the main decision maker of consumption and investment, studying savings behaviour and investment

decisions in the context of households is of practical significance. As the classic life-cycle theory elucidates, the motive behind household savings is essentially to achieve intertemporal allocation of wealth and smooth consumption. That is, to maximize long-term consumption utility over the entire life cycle of the household.

With this goal in mind, each household must engage in financial planning over a long but limited period of time. Financial decisions made by households will mainly involve two aspects (Gomes et al., 2021; Zhan, 2020). The first is how to allocate resources between saving and consumption, that is, the issue of household savings rates. The second is household investment decisions, namely, how to allocate household savings among different financial assets. As the subject of financial asset allocation, households can invest their savings in the banking market or capital market by choosing different financial products.

The life-cycle theory posits that consumers strive to maximize their lifetime utility, which results in the smoothing of their income and consumption. According to this theory, individuals exhibit higher marginal savings rates during their middle-age period, while the marginal savings rates in both their youth and old age tend to be lower (Yuan & Yu, 2014). Specifically, young people typically have lower savings rates because they may allocate more funds towards investing in their education and career development. In their middle-age period, individuals' savings rates usually peak, as they may have already achieved relatively stable incomes and have completed some major expenses such as buying a house or a car, which allows them to save more easily. However, as individuals gradually enter their old age, their marginal savings rates may decrease again. Older people usually lack stable work incomes and rely on social security and pension schemes. Additionally, with an increase in the proportion of the elderly population, daily living expenses, healthcare costs, and other

expenses tend to rise, all of which may contribute to the decline in the savings rates of the elderly. According to the life-cycle theory, population ageing can result in a reduction in household savings rates. This, in turn, can lead to various macroeconomic challenges, such as a decrease in national savings rates, which may cause a slowdown in economic growth.

Harper (2019) argues that ageing leads to a decline in health status, resulting in greater utilization of healthcare services compared to other age groups. As the proportion of elderly individuals within the population continues to grow, it is anticipated that healthcare expenditures will increase as a result of the heightened demand for healthcare services. Wakabayashi (2007) uses household survey data from Japan and finds that the increase in expenditures on elderly care and medical services is an important reason for the decline in the savings rate as population ageing accelerates. Fukuda and Okumura (2021) use panel data from Japanese prefectures and find that since the mid-1990s, population ageing has had a negative impact on the savings rate as the labour force has declined. China shares a similar culture with Japan and is also experiencing rapid ageing, making Japan's experience a valuable reference for China. Ji and Che (2019) conduct a study utilizing data from OECD countries and observe a negative correlation between the elderly dependency ratio and the savings rate.

Furthermore, several Chinese scholars have obtained similar empirical findings. For instance, Zhao et al. (2017) conduct an empirical study using provincial panel data from China spanning the years 2001 to 2014. They find that as the degree of ageing in China intensifies, the increasing proportion of the elderly population leads to a decline in the savings rate. Studies conducted by Wang (2021) and Dong et al. (2013) also support this conclusion. Based on the above analysis, it is evident that most of the research conducted on

this topic utilizes macro data for empirical analysis, and there is a scarcity of research utilizing micro data.

3.4 Population Ageing and Household Financial Asset Allocation

The impact of household heterogeneity on household financial asset allocation is one of the extensively researched issues by scholars. In the research process, scholars have approached the problem from four perspectives. First, the influence of background risk on household financial asset allocation (Fagereng et al., 2018; Chetty et al., 2017; Angerer and Lam, 2009). Secondly, the impact of various demographic characteristics on household financial asset allocation, such as age, marriage, education level, etc. (Lu and Yin, 2021; Shi and Shen, 2021; Duan et al., 2016). Thirdly, household social networks are an important influencing factor in household financial investment decision-making (Zhang & He, 2022; Georgarakos & Pasini, 2011). Finally, they investigate the impact of financial literacy on household financial asset allocation, including its effects on information processing ability and reducing transaction costs (Kang & Hu, 2020; Jappelli & Paduia, 2015; Mouna & Jarboui, 2015).

As the population ageing becomes more serious in various countries, an increasing number of elderly people rely on the savings accumulated during their working careers and investments in these savings. Scholars are paying more and more attention to the relationship between population ageing and financial asset allocation. Under normal circumstances, investors tend to adopt conservative investment strategies as they approach retirement age, reducing the proportion of risk assets. Specifically, older adults tend to choose financial products with stable income and relatively low risk in financial asset allocation. These financial products have lower yields but are relatively stable and less affected by market

fluctuations. High-risk, high-return investments such as stocks are less favoured by elderly investors.

This is mainly due to two reasons (Bodie, 1992). Firstly, the flexibility of labour gradually decreases throughout the lifecycle, and an individual's effective human capital also diminishes. After retirement, human capital will be completely exhausted. This is because as individuals age, they typically experience physical and psychological limitations that impede their ability to exhibit the same level of flexible work capacity and adaptability as they did when younger. Additionally, with increasing age, individuals are more likely to face health issues, further restricting their work capacity and flexibility. Secondly, as individuals age, their human capital gradually decreases, and their ability to hedge against market risk also declines.

According to the research by Bakshi and Chen (1994), individuals tend to choose different types of investments at different stages of their lives. In their youth, people generally prioritize investing in real estate. As they enter middle age and their income increases, they become more willing to take on risk and choose to invest in risky financial assets. As they reach old age, individuals' risk preferences usually decrease, and they are more inclined to choose low-risk financial products for investment. In other words, investment decisions are influenced by age, and individuals at different stages of life have different risk attitude and investment preferences, leading to the selection of different investment targets.

In a household survey of personal financial data in the United States, the remaining years until retirement are found to be the most important factor in determining the proportion of stock investment (Choi & Robertson, 2020). Addoum (2017) also find that couples tend

to significantly reduce their allocation to risky assets after retirement. Therefore, it can be inferred that age is a significant influencing factor on individuals' investment decision-making. Different stages in the life cycle of a household entail varying external factors such as income and preferences, which have a crucial impact on the household's consumption and asset investment.

Gomes and Smirnova (2022) empirically examine the life-cycle effect of risk asset investment using the 2019 PSID survey data. The study finds that the stock market participation rate exhibits a camel-shaped pattern of increasing and then decreasing with age, and the proportion of risky financial assets remains stable before middle age and gradually declines thereafter. Fagereng et al. (2017) use 15 years of Norwegian household tax registration data from 1995 to 2009 to study households' stock allocation throughout their life cycle. The study finds that the stock participation rate reaches its peak at retirement and gradually decreases thereafter. As retirement approaches, investors begin to reduce the proportion of stocks in their investment portfolios. Many studies also show that the proportion of households holding risky assets follows a camel-shaped pattern of increasing and then decreasing with age (Parker et al., 2022; Brunetti, 2010; Yoo, 1994).

In recent years, with the continuous improvement of data collection in Chinese households, many scholars have arrived at similar empirical conclusions through micro-level household data analysis. These research results indicate that as the degree of ageing in households deepens, the likelihood of households participating in risk asset investments decreases, as does their proportion of risk assets allocated in investment portfolios (Lu & He, 2022; Shi & Shen, 2021; Tang & Hu, 2020; Chen, 2018; Wang, 2016). In addition, population ageing has a negative impact on the types of risk assets held by households (Shen

& Shi, 2020). All these findings confirm the existence of significant life-cycle effects in household financial asset allocation.

3.5 The Moderating Effect of Financial Literacy

Financial literacy is a critical component in individuals' lives, as it has the potential to optimize financial returns and enhance their standard of living. It is of paramount importance in the lives of individuals (Maidani et al., 2023). The enhancement of financial literacy significantly exerts a positive impact on the accumulation of household financial assets (Koomson et al., 2022). Having good financial literacy can help people better understand finance and investment, enabling them to better manage their financial situation, and improve their financial stability and security. By understanding different financial tools and investment strategies, individuals can better utilize financial markets, maximize their investment returns, and improve their standard of living. In addition, good financial literacy can also help individuals better cope with emergency financial situations and plan for their retirement, thereby making their financial situation more robust.

Financial literacy has a multifaceted impact on the financial investment decisions made by households. Within the intricate and specialized realm of the stock market, possessing robust financial literacy can enhance one's ability to process information, thereby mitigating transaction costs (Jappelli & Paduia, 2015). Individuals have a preference for certain returns and tend to exhibit aversion towards uncertain returns. Risk assets typically exhibit high risk and high return characteristics. However, as individuals gain more knowledge and experience with regard to risks, they are better equipped to handle uncertainty and demonstrate a stronger risk tolerance (Almenberg & Dreber, 2015; Zhu et

al., 2016). The level of financial literacy is positively correlated with the probability of participating in the financial market (Nguyen & Nguyen, 2020).

Individuals with higher financial literacy are better equipped to understand and respond to risk assets, comprehend their risk and return characteristics, as well as market fluctuations and changes. In terms of investment and asset allocation, they are more likely to make wise decisions by selecting financial assets that suit their risk attitude and investment objectives, thus better controlling investment risk. Therefore, the improvement of financial literacy can help individuals better understand risk assets and make more rational and prudent investment decisions. In a study conducted by Fong et al. (2021) using data from Singapore's elderly population, a positive association was discovered between financial literacy and pension-related financial decision-making. This finding suggests that enhancing financial literacy among the elderly could lead to increased participation in the stock market and greater diversification of household assets. As a result, improving financial literacy could potentially promote greater involvement in high-risk investments and increase the proportion of risky assets held within household financial portfolios (Lu & He, 2022; Kang & Hu, 2020; Cui & Liu, 2019).

As population ageing intensifies, the impact of ageing on household financial asset allocation is gradually increasing. Based on previous research, we can draw the conclusion that older people with good financial literacy are better able to handle financial information and have a greater understanding of financial assets. Financial literacy can help older people allocate their assets more rationally and prudently to some extent. Therefore, this thesis believes that financial literacy can moderate the impact of ageing on household financial asset allocation.

3.6 The Mediating Effect of Risk Attitude

Investor preferences determine their tolerance for risk. Many studies show that there is a positive correlation between risk appetite and investment in risky assets (Mou & CHOO, 2023; Bucciol et al., 2019; Barasinska et al., 2012; Hu & Zang, 2016; Yilmazer & Lich, 2015). Investors with higher risk appetite tend to invest more funds in higher-risk assets in order to obtain higher returns. Conversely, investors with lower risk appetite tend to choose more conservative investment methods to ensure the safety and stability of their funds. This positive correlation is universal in capital markets, and investors' risk tolerance is typically influenced by various factors such as their investment objectives, investment experience, age, and income level.

Age is a significant determinant of risk attitude. Palsson (1996) empirically examines the relationship between household characteristics and risk aversion level using a sample of over 7,000 households in Sweden in 1985 and found that residents' age affects their level of risk aversion, with an increase in age leading to an increase in risk aversion. This thesis argues that there are several reasons why age affects risk aversion levels. Firstly, when people are young, their income sources are more stable, but as they age, income risks arise. Income instability will reduce individuals' and households' willingness to bear risks. Secondly, an increase in age brings health risks (Chen, 2018; Crainich et al., 2017). Elderly people typically experience deteriorating health as they age, and deteriorating health reduces their willingness to bear risks. These factors may all contribute to an increase in individuals' level of risk aversion. As individuals age, their risk experience continuously increases, resulting in a gradual reduction in the proportion of those who underestimate risk and an increase in the proportion of those who overestimate risk (Guo & Li, 2023).

Additionally, as people age, they may also experience cognitive impairments. There is a strong positive correlation between investment decision-making ability and cognitive ability (Mushafiq, 2022; Pak & Babiarz, 2018; Christelis et al., 2010). However, some studies show a negative correlation between cognitive ability and risk preferences (Dohmen et al., 2010). Cognitive impairments may affect elderly individuals' asset allocation decisions through two pathways (Pak & Babiarz, 2018). Firstly, cognitive impairments may increase the cost of information acquisition. Elderly individuals may be more susceptible to cognitive impairments as their cognitive abilities may decline with age. This means that elderly individuals require more time and effort to comprehend and acquire investment information, which increases their information costs. Due to high information costs, elderly individuals may reduce their willingness and ability to participate in risky financial asset investments. The second pathway of influence is that investors with cognitive impairment tend to have unstable emotions, such as impatience and a focus on short-term losses, which can significantly impact their ability to take risks. In other words, cognitive impairment can lead older adults to lack rationality and prudence in financial investment decision-making, making them more inclined to avoid risk.

In addition, the proportion of individuals of different ages within a household can also have an impact on financial asset selection (Shen & Shi, 2020). If a household has a higher proportion of elderly members, it implies that the household needs to bear more caregiving responsibilities, medical expenses, and living costs, thereby increasing the corresponding risks. For example, the elderly may require long-term care, which will increase the financial burden and risk for the household. Additionally, China's current pension system is not yet fully developed, and many households face greater pension risks. These increased risks can reduce the household's risk-bearing capacity, thereby affecting its

financial asset choices. To reduce risk and protect household assets, households may tend to choose safer financial assets.

Based on the traditional household structure in China, the household head usually assumes the role of decision-maker regarding household matters, including financial asset allocation. When the household head faces background risks, their risk aversion may increase, subsequently influencing the household's investment decisions concerning risky financial assets. Considering this scenario, this thesis proposes that the ageing process could impact households' risk attitude, consequently affecting the distribution of risky financial assets within the household.

3.7 Research Hypotheses

Household savings serve as a prerequisite and foundation for financial asset investment. Based on the aforementioned theory and mechanism, this article puts forward the following research hypothesis:

H1: Population ageing has a significant negative impact on household savings rates.

This thesis aims to analyse the impact of ageing on household financial assets, which are categorized as either risky or risk-free based on their level of financial risk. Although risk-free financial assets such as cash and bank deposits are more familiar to residents and commonly used, investing in risky assets better reflects a household's asset structure. Consequently, this study primarily focuses on how ageing affects the allocation of risky financial assets within households (Wang et al., 2016). Therefore, this article primarily examines the impact of ageing on the allocation of risky financial assets within households. Household asset allocation decisions mainly include participation in the decision-making

process at the extensive margin and the depth of participation in the decision-making process at the intensive margin. This study first makes hypothesis from the perspective of participation as follows:

H2: Population ageing has a significant negative impact on household participation in risk financial asset allocation.

In the context of the impact of ageing on household financial asset allocation, as this study measures household financial asset allocation behaviour from the dimensions of participation and depth of participation, this research subsequently makes hypothesis from the perspective of participation depth as follows:

H3: Population ageing has a significant negative impact on the depth of household participation in the allocation of risky financial assets.

Based on the above analysis, this thesis believes that financial literacy can moderate the impact of ageing on household financial asset allocation. Therefore, this study first formulates hypotheses from the perspective of participation as follows:

H4: Increasing financial literacy can reduce the negative impact of ageing on household participation in the allocation of risky financial assets.

With regard to the moderating effect of financial literacy, this study subsequently formulates hypotheses from the perspective of participation depth as follows:

H5: Increasing financial literacy can reduce the negative impact of ageing on the depth of household participation in the allocation of risky financial assets.

Based on the above analysis, this article believes that ageing will affect household allocation of risky financial assets by influencing their risk attitudes. Therefore, the following hypothesis is proposed.

H6: Ageing can have a negative impact on household allocation of risky financial assets by reducing their risk preferences.

3.8 Conceptual Framework

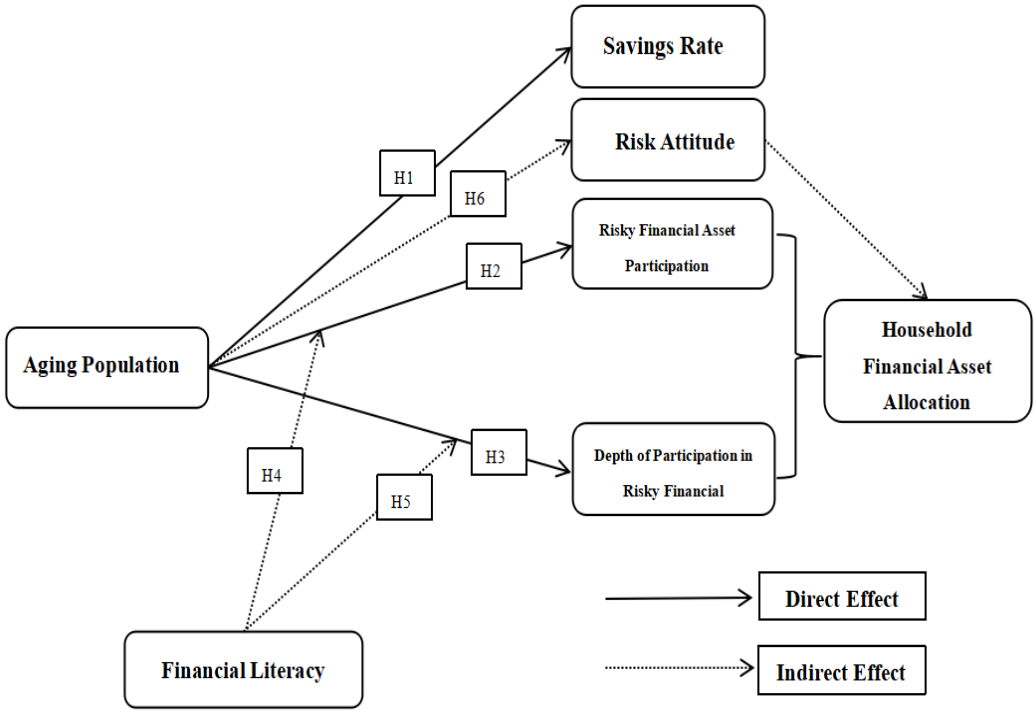

Figure 3.1: Conceptual Framework of the Study

The conceptual framework is built upon the assumptions discussed earlier. Within this framework, household savings rate and financial asset allocation are the dependent variables under investigation, ageing is considered as the independent variable, financial literacy serves as a moderating variable, and risk attitude acts as a mediating variable. Solid

lines represent direct effects, while dashed lines represent indirect effects. To elaborate further, the study first examines the impact of ageing on the household savings rate (H1). Secondly, the research focuses on the influence of ageing on household financial asset allocation, encompassing two aspects: whether households engage in risk asset allocation and the depth of their participation (H2 and H3). Furthermore, from the perspective of the causal mechanism, the study also explores financial literacy as a moderating effect, potentially mitigating the adverse effects of ageing on risky financial asset allocation (H4 and H5). Finally, the research delves into the mediating effect of risk attitude (H6).

3.9 Literature Gap

This chapter provides a detailed exposition of the theoretical basis and impact mechanism of population ageing on household financial asset allocation. Empirical research on this topic, especially studies utilizing micro household data in China, is still in its infancy and there are few research findings available. Furthermore, this study introduces financial literacy as a moderating variable and risk attitude as a mediating variable, which is a relatively novel approach in previous literature. Such research not only contributes to the development of household finance theory under the backdrop of population ageing but also facilitates policy development and improvement. In summary, this study argues that investigating the impact of population ageing on household financial asset allocation from the perspective of Chinese micro households can fill certain academic gaps and has both research value and practical significance.

3.10 Chapter Summary

This chapter elaborates on the lifecycle theory, background risk theory, and portfolio theory, providing a basis for the mechanism analysis in this chapter. Building on these

theories, this chapter discusses in detail the mechanism by which ageing affects savings rates and household financial asset allocation, and proposes theoretical hypotheses based on this analysis.

CHAPTER 4

METHODOLOGY

4.1 Introduction

This chapter provides an overview of the research methodology employed in this study. In the second section, the source and characteristics of the micro household data used in this study are described. The third, fourth, and fifth sections describe the process of variable selection, definition, and computation. The sixth section introduces the Static Linear Panel Model, Poisson Model, Tobit Model, and Probit Model. The seventh section presents the empirical models used in this study.

4.2 Data Source and Description

This section provides comprehensive information regarding the data utilized in the study. The purpose of this section is to acquaint readers with the origins of the data, the methods employed for its processing, and specific details relevant to its utilization in the research, ensuring the credibility and replicability of the study.

In order to study the impact of ageing on household financial asset allocation in China more comprehensively and accurately, this thesis will use micro household financial data. According to Campbell (2006), a high-quality micro household dataset should include five aspects. First, the representativeness of the data. The sample must have representative characteristics of the population's overall distribution, with a particular emphasis on age and wealth, as most financial behaviours are related to these two factors. Second, the completeness of asset categories. The scope of statistical analysis of household data should encompass all types of assets. Third, the specificity of assets. The classification of asset

categories should be sufficiently precise and detailed to facilitate further analysis of household asset diversification issues. Fourth, the accuracy of the data. Fifth, the continuity of the data, meaning that the data set should be longitudinal, allowing for the tracking of changes in household finances over time.

The data used in this study was obtained from the China Household Finance Survey (CHFS) conducted by the Southwestern University of Finance and Economics in China. According to Campbell's criteria for high-quality micro household data, CHFS data also has the following five features (Lu et al., 2017). Firstly, the sampling process is scientifically rigorous, as the sample design is a key step in ensuring representativeness. CHFS employs a combination of overall and end-point sampling, using stratified, staged, and proportional to population size (PPS) methods. Secondly, the categories of household assets are complete, as CHFS investigates Chinese household balance sheets from both non-financial and financial assets perspectives. Thirdly, the information on household assets is very specific. Fourthly, the statistical data is accurate. The CHFS project adopts the internationally recognized Computer-Assisted Personal Interviewing framework and design concept, with the support of a specialized organizational management team. The entire process of the investigation, from sample design to survey implementation, from data collection to cleaning, is strictly in accordance with standardized, fair, and objective principles, ensuring the quality of the data. Lastly, the data has continuity, as the project conducts follow-up surveys every two years.

As of May 2023, the official website of CHFS has data updated only up to 2019. Additionally, the data of numerous households has been consistently collected and recorded, which can be integrated into a panel dataset. Therefore, in order to ensure the timeliness of

the data and the robustness of the statistical results, this study uses nationwide household sample data from 2015, 2017, and 2019. The survey covers 29 provinces and 343 districts and counties in China. The CHFS provides comprehensive and specific information on household assets, making it suitable for the empirical research in this study. The core dependent variables of this study are household savings rate and household financial asset allocation, so missing and abnormal values were removed separately based on the different dependent variables. To avoid extreme values having a large impact on the estimation results, this study removed household samples with savings rates less than -200% or greater than 100% (Zhao & Zhou, 2021; Yang & Zhang, 2019).

4.3 Dependent Variable and Independent Variable

The dependent variable, also known as the response variable, is the outcome or output in a research question, and it depends on changes in the independent variable. The independent variable, also referred to as the explanatory variable, is chosen and controlled by the researcher to investigate its impact on the dependent variable. The relationship between the dependent variable and the independent variable is at the core of the research. Researchers aim to understand how the independent variable influences the dependent variable, to validate or refute hypotheses, unveil causal relationships, or discover associations. The accurate definition, measurement, and manipulation of the dependent and independent variables are crucial for the effectiveness of the research.

4.3.1 Household Savings Rate

The first dependent variable of this study is household savings rate. Two methods are used to calculate the household savings rate. The first method involves subtracting household consumption expenditures from household total income to obtain net income. The

household savings rate is then calculated by dividing the household net income by the household total income (Chang & Jiang, 2021; Li & Xu, 2020; Li & Huang, 2015). According to the survey content of the CHFS data, household total income includes income from wages and salaries, operating income, property income, transfer income, etc. Household consumption mainly includes expenses for daily living, food, clothing, culture and entertainment, communication expenses, transportation expenses, education expenditures, and medical expenses, etc.

The second method takes into account that education and medical expenses have large amounts and uncertainties, which can cause significant short-term fluctuations in household consumption expenditure. Therefore, when calculating household consumption expenditure, education and medical expenses should be deducted (Chang & Jiang, 2021; Zhou et al., 2020; Su et al., 2016).

4.3.2 Household Financial Asset Allocation

This study evaluates households' financial asset allocation behaviour from two perspectives. The first aspect considers whether households engage in risky financial asset investments. If a household owns risky financial assets or holds investment accounts, it is considered to be participating in risky financial asset investment. At this time, the dependent variable is a dummy variable (0, 1 variable), and if the household holds risky financial assets, it is assigned a value of 1, otherwise it is assigned a value of 0 (Jian & Xu, 2019; Zou & Yang, 2019; Chen, 2018). The second aspect is the depth of household participation in risky financial assets, which is measured by dividing the total amount of risky financial assets held by households by the total amount of financial assets (Xue et al., 2021; Jian & Xu, 2019; Chen, 2018).

4.3.3 Independent Variable

This study selects two indicators to measure the degree of population ageing. The first indicator is the proportion of the population aged 65 and over in the total household population (Li & Xu, 2020; Shen & Shi, 2020). The second indicator is the age of the household head (Chang & Jiang, 2021; Shen & Shi, 2020). The household head is the main economic source or decision maker for household affairs and has an important impact on household financial decisions.

4.4 Moderating Variable and Mediating Variable

When the relationship between the dependent variable Y and the independent variable X varies with changes in a third variable Z, Z is referred to as a moderator in the relationship between X and Y. In this case, Z is considered a moderating variable. A moderating variable can influence the direction (positive or negative) or strength of the relationship between the dependent and independent variables, contributing to a more accurate interpretation of the research findings. When the independent variable X affects the dependent variable Y through a mediator variable M, M is referred to as a mediator. Mediator variables help uncover how the relationship between the independent and dependent variables is established, providing researchers with a deeper understanding of the phenomenon.

4.4.1 Moderating Variable

Financial literacy was selected as a moderator variable in this study. Financial literacy is a significant factor in households' investment decision-making. This study believes that designing a survey questionnaire on financial knowledge and using the respondents' answers to derive a financial literacy index can more accurately reflect their

level of financial literacy. The CHFS survey questionnaires on household financial knowledge have been different over the years, and some questions on financial knowledge have missing data. Hence, in calculating the financial literacy index for this study, the data from 2015 and 2017 were not utilized. In cases where data availability permitted, this study selected two questions from the 2019 CHFS survey questionnaire related to calculating interest rates and inflation rates to examine the financial literacy levels of respondents.

This study adopted the processing method of Van Rooij et al. (2011), Yin et al. (2014), and Lu and He (2022) and considered that the financial literacy levels represented by wrong answers and "do not know" answers are different. As such, two binary variables were established for each question in the form of dummy variables - one indicating if the answer was correct and the other indicating if it was a direct response (answering "cannot calculate" is considered an indirect answer). This study treated refusal to answer and not knowing how to answer as indirect answers. Based on these four variables, a factor analysis was performed. First, the suitability of the four variables for factor analysis was tested, and the results are shown in Table 4.1. After the test, the overall KMO statistic value reached 0.684, which is greater than 0.6, and the Bartlett sphericity test was 55,189.438, with a corresponding p-value of 0.000, indicating that factor analysis was appropriate. The factor analysis results are shown in Table 4.2. Following the principle of selecting factors with eigenvalues greater than 1, Factor 1 was selected, which had a cumulative contribution rate of 65%. Therefore, this factor was retained as the financial literacy indicator.

Table 4.1: Results of KMO Test

	KMO Test
Interest Rate Question Answered Correctly	0.6947
Direct Answers to Interest Rate Question	0.7084
Inflation Question Answered Correctly	0.6859
Direct Answers to Inflation Question	0.6543

Table 4.2: Factor Analysis Results

Factor	Eigenvalue	Difference	Proportion	Cumulative
F1	2.5828	1.7900	0.6457	0.6457
F2	0.7929	0.4092	0.1982	0.8439
F3	0.3837	0.1431	0.0959	0.9399
F4	0.2406	-	0.0601	1.0000

4.4.2 Mediating Variable

This study assesses the risk attitude of households by analysing their responses to a risk attitude question in a survey questionnaire. Specifically, the question asked was "If you had a sum of money to invest, which investment option would you choose?" The answer options are "1. High risk, high return investment; 2. Slightly higher risk, slightly higher return investment; 3. Average risk, average return investment; 4. Slightly lower risk, slightly lower return investment; 5. Not willing to take any risk; 6. Don't know." Following the methods used by Lu and Yin (2021) and Lan et al. (2018), this study classifies households who choose the first and second choices as risk-seeking and assigns them a value of 3; households who choose the third option are classified as risk-neutral and assigned a value of 2; and households who choose the fourth, fifth, and sixth choices are classified as risk-averse and assigned a value of 1.

4.5 Control Variables

Control variables refer to variables other than the core independent variable that may influence the dependent variable. Control variables are not the primary focus of the study, but they can introduce potential interference with the study's conclusions, and thus, they require control. Control variables aid in eliminating confounding effects of other variables on the dependent variable, ensuring that the observed effects are attributed to the independent variable. After controlling for other potential influencing factors, researchers can have greater confidence in determining the causal relationship between the independent variable and the dependent variable. In summary, control variables play a critical role in research methodology, contributing to the scientific rigor and credibility of the study, allowing researchers to more precisely comprehend the relationships between variables and establish reliable causal relationships. By controlling for factors that could potentially affect the research outcomes, researchers can draw more persuasive conclusions, making the research findings more compelling.

4.5.1 Child Rearing Ratio

The number of children being raised within a household significantly affects the financial behaviour of the household (Wu & Tan, 2017). An increase in the number of children being raised in a household is associated with higher consumption expenditure, which in turn leads to a decrease in the savings rate. An increase in the number of children being raised within a household leads to an increase in expected expenses, which alters the household's risk attitudes and results in changes in financial asset allocation (Jia et al., 2021). Therefore, this study selects the child-rearing ratio as a control variable. The child-rearing ratio is measured as the percentage of the population aged 14 and under within the total household population (Zhao & Zhou, 2021; Lan et al., 2018).

4.5.2 Education Level of Household Head

Educational attainment is closely related to personal economic income, financial management abilities, and levels of financial risk awareness. Household heads with higher education are more likely to possess knowledge and skills for financial planning, risk assessment, and effective investment, which may lead to higher economic incomes. Therefore, in this study, the education level of household heads is selected as a control variable (Huang & Jin, 2022; Wu and Li, 2016). Based on the reference to the above literature, according to the answers set in the survey questionnaire, the educational level of household heads is assigned values in ascending order of educational level.

The specific assignment method is as follows: no educational degree is assigned a value of 1, completion of primary school education is assigned a value of 2, completion of junior high school education is assigned a value of 3, completion of high school education or an equivalent is assigned a value of 4, completion of an associate degree program is assigned a value of 5, completion of an undergraduate degree program is assigned a value of 6, completion of a master's degree program is assigned a value of 7, and completion of a doctoral degree program is assigned a value of 8.

4.5.3 Household Net Worth

The increase in household net assets can enhance the household's resilience to financial risks and increase their demand for financial investment. Moreover, wealthier households tend to have a lower Engel coefficient and a higher likelihood of saving. Therefore, this article selects household net assets as a control variable (Shen & Shi, 2020; Xie, 2018). In this study, household net assets are measured as the difference between total assets and total liabilities.

4.5.4 Gender of Household Head

In households, the primary financial decision-maker is typically the head of the household. The gender of the household head is also an important factor influencing household asset allocation. Therefore, in this study, the gender of the head of household is chosen as a control variable (Kang & Hu, 2020; Jian & Xu, 2019). The gender of the head of household is a dummy variable (0, 1 variable). Based on the responses to the survey questionnaire, the gender of the head of household is assigned a value of 1 for male and 0 for female.

4.5.5 Health Status of Household Head

According to the background risk theory, the health status of the head of household is also an important factor that affects the allocation of household financial assets. Therefore, in this study, the health status of the head of household is chosen as a control variable (Liu & Sun, 2021; Kang & Hu, 2020; Qi & Zhang, 2019). Based on the literature cited above, this study assigns values to the health status of the head of household according to the responses to the survey questionnaire. Specifically, a health status of “extremely good” is assigned a value of 5, “very good” is assigned a value of 4, “average” is assigned a value of 3, “not good” is assigned a value of 2, and “extremely not good” is assigned a value of 1.

4.5.6 Marital Status of Household Head

Marital status is an important factor within households that can influence financial decision-making. For instance, married individuals may take into account their spouse’s opinions when purchasing large items or making important investments, while single individuals may have greater autonomy in making their own decisions. Therefore, this study selects the marital status of the household head as a control variable (Jian & Xu, 2019; Qi &

Zhang, 2019; Wang, 2016). The marital status of the household head is treated as a binary variable (0 or 1). Based on responses from the survey questionnaire, household heads who are married are assigned a value of 1, while those who are unmarried are assigned a value of 0.

Table 4.3: Variable Description

Variables	Code	Measurement Method
Dependent Variables		
Risky financial asset participation	RFAP	Whether the household participates in risky financial assets
Depth of participation in risky financial assets	RFAD	The ratio of risky financial assets to the total financial assets held by households
Savings Rate	SR	The ratio of net income to total household income
	SRA	Add healthcare expenditure and education expenditure to net income
Independent Variables		
Population Ageing	PEP	Percentage of the elderly over 65 in the total household population
	AGE	Age of household head
Control Variables		
Household Net Worth	HNW	Total household assets minus total household liabilities
Child Rearing Ratio	CRR	The percentage of the population aged 14 and under within the total household population
Health Status	HS	Assigning values based on health status
Gender	HHG	Males are assigned a value of 1, while females are assigned a value of 0
Marital Status	MS	Married is assigned a value of 1, unmarried is assigned a value of 0
Education Level	EDU	Assigning values based on educational level
Moderating Variable		
Financial Literacy	FL	Financial literacy level
Mediating Variable		
Risk Attitude	RA	Risk Preference=3; Risk Neutral=2; Risk Aversion=1

In addition, the descriptions for each variable are presented in Table 4.3. Table 4.3 consists of three main parts: variable names, variable codes, and measurement methods. There are three dependent variables: Risky financial asset participation, Depth of participation in risky financial assets, and Savings Rate. Since this study measures household savings rate in two ways, there are two codes for savings rate. The independent variable is

Population Ageing, and as this study measures ageing in two ways, there are two codes for ageing. The moderating variable is Financial Literacy, and the mediating variable is Risk Attitude.

4.6 Static Linear Panel Model, Probit Model, Tobit Model and Poisson Model

In this study, we conducted empirical research using Static Linear Panel Model, Probit Model, Tobit Model, and Poisson Model. Each model will be introduced separately. The following discussion of empirical modelling methods primarily adopts the work of Chen (2010).

4.6.1 Static Linear Panel Model

Panel data refers to a type of data comprising indicators from various entities at different time points, possessing two dimensions: time series and cross-sectional. Compared to traditional time-series data or cross-sectional data, panel data has several advantages. Firstly, panel data can fully utilize the information of time periods and cross-sectional units, providing researchers with a large amount of data and more variables. This increases the degrees of freedom of the data, effectively reduces the collinearity among explanatory variables, and further improves the effectiveness of model estimation. Secondly, panel data can control for the heterogeneity of each individual that cannot be observed. Thirdly, panel data can analyse research problems from multiple levels and depict more complex variable structures.

When conducting regression analysis on panel data, panel models are commonly employed as a statistical method. Typically, we denote $i = (i = 1,2,\cdots, N)$ as cross-section and $t = (1,2\ \cdots, T)$ as time and set the following linear model:

$$y_{it} = X_{it}\beta + \alpha_i + \lambda_t + \varepsilon_{it} \quad \text{Equation 4.1}$$

Let y_{it} be the dependent variable $N \times 1$, X_{it} be the independent variable $N \times K$, ε_{it} be the model error term, β be the parameter to be estimated, which represents the marginal effect of X_{it} on y_{it}. α_i represents individual effects, which do not change over time but vary across individuals, and λ_t represents time effects, which do not vary across individuals but change over time.

Obviously, both individual effects and time effects represented by α_i and λ_t are often unobservable or difficult to quantify. This can lead to the issue of omitted variables, which is a significant source of endogeneity. Panel models enable the control of individual fixed effects and time fixed effects, which can help mitigate unobservable individual differences and time trends, thereby alleviating endogeneity concerns. Depending on the sample size of individuals N and time periods T, panel data can be classified into macro panels with a large T and small N or micro panels with a small T and large N. The estimation methods and analytical focus vary depending on the size of N and T.

To ensure the robustness of research findings, this study employed panel data for regression analysis, thus necessitating the use of panel models. In panel models, when no consideration is given to the lagged relationships between variables and the assumption is that the relationships between variables are linear, this type of panel model is referred to as a static linear panel model. Generally, panel models can be classified into three main types: pooled regression model, fixed effects model, and random effects model. The distinguishing factor among these panel data regression models lies in the assumptions regarding unobservable individual effects.

Firstly, let me introduce the pooled regression model. In most cases, it is difficult to observe and quantify individual effects, and the basic assumption of this model is that there are no individual effects or structural changes, and each individual has exactly the same regression equation, that is, the intercept and slope are the same, $\alpha_i = \alpha_j = \alpha, \beta_i = \beta_j = \beta$. This allows the panel data to be mixed together directly, and as long as the random disturbance term satisfies the classical basic assumptions, the model can be directly estimated using the OLS method. The model equation is as follows:

$$y_{it} = X_{it}\beta + \alpha + \varepsilon_{it} \qquad \text{Equation 4.2}$$

The fixed effects model takes into account individual effects and assumes no structural changes, while assuming a correlation between individual effects and some explanatory variables. Under this assumption, each cross-sectional unit has a different intercept term, where $\alpha_i \neq \alpha_j, \beta_i = \beta_j = \beta$. The heterogeneity in intercept terms is not random, but rather depends on the different individual effects. Therefore, the model equation can be written in the following form:

$$y_{it} = X_{it}\beta + \alpha_i + \varepsilon_{it} \qquad \text{Equation 4.3}$$

$$corr(\alpha_i, X_{it}) \neq 0 \qquad \text{Equation 4.4}$$

The model that includes both individual fixed effects and time fixed effects is referred to as a two-way fixed effects model, where time fixed effects λ_t are directly added to the individual fixed effects model.

The random effects model, like the fixed effects model, considers the issue of individual effects, but the difference lies in the assumption that the random effects model assumes that α_i and all explanatory variables are uncorrelated, meaning that the

heterogeneity of intercept terms for different individuals is reflected in the disturbance term. The model equation can be expressed as follows:

$$y_{it} = X_{it}\beta + \alpha_i + \varepsilon_{it} \quad \text{Equation 4.5}$$

$$corr(\alpha_i, X_{it}) = 0 \quad \text{Equation 4.6}$$

Formulas 4.3 and 4.5 may appear similar at first glance, but they differ in their underlying meanings, primarily in their treatment of individual effects. The fixed effects model assumes that individual effects within a group are fixed and do not vary, with individual differences reflected in specific intercept terms for each individual. On the other hand, the random effects model assumes that all individuals have the same intercept term, with individual differences being random and reflected in the specification of random disturbance terms.

There is no standard sense of goodness or badness for panel models, as each model has its own strengths and weaknesses. The pooled regression model involves pooling all data together and conducting an OLS regression as if it were cross-sectional data, resulting in a direct estimation, but under a restrictive assumption. In practice, assuming that the individual effects of different entities are the same may be unrealistic. The fixed effects model obtains the unobservable differences between individuals by setting up dummy variables, but this results in a loss of many degrees of freedom because more parameters need to be estimated. The random effects model requires stronger assumptions than the fixed effects model, as it assumes that the explanatory variables are uncorrelated with unobservable individual differences, and thus we need to make a trade-off between these two models.

When facing individual heterogeneity, a choice must be made between fixed effects and random effects models. In this study, the Hausman test was used to choose between

FEM and REM (Hausman, 1978). The null hypothesis, that is, individual effects are uncorrelated with all explanatory variables, suggests that the random effects model is more appropriate. If the null hypothesis is true, both the random effects estimator and the fixed effects estimator converge to the true parameters, and the random effects model is more efficient than the fixed effects model. Conversely, if the difference between the two is significant, the null hypothesis is rejected, and the fixed effects model is considered more appropriate. Hausman constructed a Wald statistic:

$$H = \left(\hat{\beta}_{fe} - \hat{\beta}_{re}\right)' \left[Var\left(\hat{\beta}_{fe}\right) - Var\left(\hat{\beta}_{re}\right)\right]^{-1} \quad \text{Equation 4.7}$$

$$\left(\hat{\beta}_{fe} - \hat{\beta}_{re}\right) \xrightarrow{d} \chi^2(K)$$

Here, K denotes the dimension of $\hat{\beta}_{FE}$, which corresponds to the number of explanatory variables in x_{it} that vary with time. If this test statistic exceeds the critical value, the null hypothesis is rejected. Otherwise, the null hypothesis is accepted.

Breusch and Pagan (1980) proposed an LM test based on the residuals of a panel random effects model to test the null hypothesis of random effects. The hypothesis is constructed as follows:

$$H_0: \sigma_\alpha^2 = 0; H_1: \sigma_\alpha^2 \neq 0$$

The corresponding test statistic LM is:

$$LM = \frac{NT}{2(T-1)} \left[\frac{\sum_{i=1}^{N}[\sum_{t=1}^{T} e_{it}]^2}{\sum_{i=1}^{N}[\sum_{t=1}^{T} e_{it}^2]}\right]^2 \quad \text{Equation 4.8}$$

Under the null hypothesis, this test statistic follows a chi-squared distribution with one degree of freedom. Rejecting the null hypothesis indicates the presence of random effects.

This study employs a joint significance test to examine the existence of time fixed effects in the model (Chen, 2010). This is a test where, under the null hypothesis, the test statistic follows an F distribution. First, an unconstrained model with k variables is established:

$$y = \beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k + u \qquad \text{Equation 4.9}$$

At this point, if we assume that there are q exclusionary constraints to be tested, the null hypothesis can be expressed as:

$$H_0: \beta_{k-q+1} = 0, \cdots, \beta_k = 0$$

This imposes q exclusionary constraints on Equation 4.9, and the constrained model is:

$$y = \beta_0 + \beta_1 x_1 + \cdots + \beta_{k-q} x_{k-q} + u \qquad \text{Equation 4.10}$$

When the unconstrained model is transformed into the constrained model, the relative increase in SSR is meaningful for testing the hypothesis. The F statistic is defined as:

$$F = \frac{(SSR_r - SSR_{ur})/q}{SSR_{ur}/(n-k-1)} \qquad \text{Equation 4.11}$$

Here, SSR_r is the sum of squared residuals of the constrained model, SSR_{ur} is the sum of squared residuals of the unconstrained model, q is the difference in degrees of freedom between the constrained and unconstrained models, and $n-k-1$ represents the degrees of freedom of the unconstrained model.

Under the null hypothesis, this test statistic follows an F distribution with $(q, n - k - 1)$ degrees of freedom. Rejecting the null hypothesis indicates that the variables $x_{k-q+1}, \cdots, x_k$ are jointly statistically significant at an appropriate level of significance. Conversely, if the null hypothesis is not rejected, these variables are jointly insignificant.

4.6.2 Probit Model

The Probit model is a statistical model used for binary classification problems, with its primary purpose being to establish the relationship between independent variables and the probability of an event occurring. The Probit model holds significant importance and relevance in empirical research as it can be employed for the analysis and prediction of binary categorical events. In many empirical studies, one often encounters explanatory variables that are dichotomous, taking only two possible values, either 1 or 0. Examples of such situations include disease onset versus non-onset, product purchase versus non-purchase, and voting support versus non-support, among others. When estimating using a linear probability model in such cases, it may result in predicted values greater than 1 or less than 0, which clearly does not align with practical reality. The Probit model allows for the establishment of nonlinear relationships. This implies that researchers can more accurately capture the influence of different independent variables on the probability of the event, rather than being restricted to a linear relationship. The invention of the Probit model is commonly attributed to Gaddum and Bliss, as they introduced the Probit method (Wang, 2008). Gaddum (1933) and Bliss (1934) provided the concept of successfully transforming the probability of an event into corresponding normal deviates. In the book 'Probit Analysis' published by Finney (1971), the Probit method found wide application in addressing binary outcome problems caused by one or multiple factors.

Because the decision of whether a household participates in risk financial asset investment is a binary choice, it is therefore appropriate to employ the Probit model for empirical research. Therefore, we construct an equation system to model discrete variables. The first step is to construct an auxiliary continuous variable $y*$:

$$y_i^* = x_i'\beta + \varepsilon_i (i = 1, \cdots, n) \quad \text{Equation 4.12}$$

The second step is to set up a piecewise function that relates the auxiliary continuous variable to the dependent variable.

$$y_i = \begin{cases} 1, & y_i^* > 0 \\ 0, y_i^* \leq 0 \end{cases} \quad \text{Equation 4.13}$$

Derive the probability of $yi = 1$ based on Equation 4.11 and Equation 4.12.

$$P(y_i = 1|x_i) \quad \text{Equation 4.14}$$

$$= P(y_i^* > 0|x_i)$$

$$= P(x_i'\beta + \varepsilon_i > 0|x_i)$$

$$= P(\varepsilon_i > -x_i'\beta|x_i)$$

Assuming $\varepsilon_i \sim N(0, \sigma^2)$, we obtain the general form of the Probit model.

$$P(y_i = 1|x_i) \quad \text{Equation 4.15}$$

$$= P(\varepsilon_i > -x_i'\beta|x_i)$$

$$= P(\varepsilon_i < x_i'\beta)$$

$$= \Phi(x_i'\beta)$$

$$= \int_{-\infty}^{x_i'\beta} \phi(t)dt$$

4.6.3 Tobit Model

The Tobit model, also known as the limited dependent variable model, is a model where the dependent variable takes on values under certain constraints. This model essentially consists of two types of equations and primarily investigates how continuous variables change under certain choice behaviours. What distinguishes this model is its dual structure, comprising a choice equation model that represents the constraints and a continuous variable equation model that reflects the variable under these constraints (Zhou & Li, 2012). Unlike discrete choice models and typical continuous variable choice models, the Tobit model is distinct in that its dependent variable is constrained. When conducting regression, the dependent variable may be subject to certain limitations, such that when $y_i \geq c (y_i \leq c)$, all $y_i$values are collapsed into c. This type of data is referred to as censored data. In this case, the probability distribution of y_i becomes a mixture distribution composed of a discrete point and a continuous distribution. Without loss of generality, we assume that the censoring point is at $c = 0$ for convenience of analysis. The Tobit model is highly valuable for handling this type of data as it allows for more precise estimation of model parameters, enabling researchers to better understand the relationship between the underlying distribution and observed data. This, in turn, provides a deeper empirical analysis and predictive capacity. Since Tobin's seminal work in 1958 on dependent variables with upper, lower, or censored characteristics, the academic community has shown significant interest in such models. In commemoration of Tobin's contributions to this field, scholars have termed models involving restricted properties and choice behaviour of the dependent

variable as Tobit models. Amemiya (1973) employed maximum likelihood estimation under the assumption of normally distributed model errors with known error distribution functions, yielding estimates that exhibit consistency and asymptotic normality. Subsequently, Gronau (1974) incorporated considerations of selective bias into the Tobit regression model, expanding it into a system of simultaneous equations.

The depth of household participation in risky financial assets is often zero for many households due to their non-investment in such assets. In other words, the dependent variable is compressed at a single point for numerous observations. Consequently, this thesis employs the Tobit model for empirical investigation. The model is formulated as follows:

$$y_i^* = x_i'\beta + \varepsilon_i \qquad \text{Equation 4.16}$$

$$\varepsilon_i | x_i \sim N(0, \sigma^2)$$

$$y_i = \begin{cases} 1, y_i^* > 0 \\ 0, y_i^* \leq 0 \end{cases} \qquad \text{Equation 4.17}$$

4.6.4 Poisson Model

During the process of investigating real-world issues, one may encounter a class of data that takes on non-negative integer values such as 1, 2, 3, and so on. These data represent discrete random variables measuring the occurrence of events and are commonly referred to as count data. In such cases, researchers often employ the Poisson regression model. The Poisson regression model is primarily suited for dependent variables that are count variables and follow a Poisson distribution. The Poisson distribution was first introduced by the French mathematician Simeon Denis Poisson (1781-1840) in 1837 and is a commonly used discrete probability distribution in probability theory (Stigler, 1982). The Poisson regression model is built upon the foundation of the Poisson distribution (Cameron & Trivedi, 2013).

The significance of the Poisson model lies in its capacity to provide a robust tool for describing and analysing patterns of occurrence in discrete events. By applying the Poisson model in empirical research, a more in-depth empirical analysis and predictive capability can be achieved. The risk attitude is measured on a scale from 1 to 3, and therefore, this study employs a Poisson model to empirically investigate the mediating effect of risk attitude. The model is formulated as follows:

$$P(Y_i = y_i|x_i) = \frac{e^{-\lambda_i}{\lambda_i}^{y_i}}{y_i!}(y_i = 0,1,2\cdots) \quad \text{Equation 4.18}$$

$\lambda_i > 0$ represents the Poisson arrival rate, which indicates the average number of events occurring and depends on the independent variable x_i.

4.7 Empirical Model Specification

Empirical Model Specification typically begins with empirical data from the real world, followed by considerations for constructing a model to elucidate these data. The specification of this model involves selecting the independent and dependent variables that should be incorporated and determining the functional relationships between them. These specifications are grounded in economic theories, social science theories, or hypotheses pertaining to the research question. Empirical Model Specification constitutes a pivotal step in empirical research, as it amalgamates theory and data, enabling researchers to quantify and validate theories, gain further insights into economic and social phenomena, and offer support for policymaking and decision-making.

4.7.1 Population Ageing and Savings Rate

To investigate the relationship between ageing and household saving rates, this study uses survey data from 2015, 2017, and 2019 to construct a balanced panel and employs a

static panel model for empirical testing. Additionally, to ensure the robustness of the empirical results, two measures of household saving rates are used in this study. The specific model is as follows, where λ represents time fixed effects. Omitted variables are an important cause of endogeneity (Shao & Hu, 2013). Introducing time fixed effects can address the issue of omitted variables that do not vary with individuals but vary over time Chen (2010). SR represents the dependent variable, while PEP and AGE are the core explanatory variables. X represents control variables. The specific variable names are listed in Table 4.3.

$$SR_{it} = \alpha PEP_{it} + \beta X_{it} + u_i + \lambda_t + \varepsilon_{it} \quad \text{Equation 4.19}$$

$$SR_{it} = \alpha AGE_{it} + \beta X_{it} + u_i + \lambda_t + \varepsilon_{it} \quad \text{Equation 4.20}$$

4.7.2 Population Ageing and Household Financial Asset Allocation

To examine the relationship between ageing and household financial asset allocation, this study conducted empirical research using both cross-sectional data for three years and balanced panel data constructed from three years of cross-sectional data. Firstly, based on the characteristics of the data, an empirical model was constructed using cross-sectional data. This study measured household financial asset allocation behaviour from two dimensions: whether or not to participate and participation depth. Given that participation in risky financial asset investment is a binary decision, the Probit model was employed for empirical analysis. The Probit model is expressed as follows, where Y is a binary variable that takes the value 1 if households invested in risky financial assets, and 0 if they did not participate in such investments.

$$Y_i = 1(\alpha PEP_i + \beta X_i + \varepsilon_i > 0) \quad \text{Equation 4.21}$$

$$Y_i = 1(\alpha AEG_i + \beta X_i + \varepsilon_i > 0) \quad \text{Equation 4.22}$$

As many households do not invest in risky financial assets, the participation depth in such assets takes the value of zero. That is, for many observations, the dependent variable is compressed onto a single point. Therefore, this thesis selects the Tobit model for empirical analysis. The Tobit model is as follows, where Z represents the participation depth of households in risky financial assets, and z represents the part of the assets where the proportion of risky assets is greater than zero.

$$z_i = \alpha PEP_i + \beta X_i + \varepsilon_i \quad \text{Equation 4.23}$$

$$Z_i = max(0, z_i) \quad \text{Equation 4.24}$$

$$z_i = \alpha AGE_i + \beta X_i + \varepsilon_i \quad \text{Equation 4.25}$$

$$Z_i = max(0, z_i) \quad \text{Equation 4.26}$$

In addition, this study also utilized the survey follow-up data from 2015, 2017, and 2019 to construct a balanced panel for empirical analysis. Panel Probit and Panel Tobit cannot use fixed effects model for regression, while the fixed effects model can control for individual fixed effects and time fixed effects to solve the endogeneity problem caused by omitted variables Chen (2010). In addition, the empirical results obtained from Panel Probit showed convergence not achieved, so this study chose a static linear panel model for robustness check. The empirical model is as follows, where λ represents time fixed effects, and RFAP and RFAD are the dependent variables.

$$RFAP_{it} = \alpha PEP_{it} + \beta X_{it} + u_i + \lambda_t + \varepsilon_{it} \quad \text{Equation 4.27}$$

$$RFAP_{it} = \alpha AGE_{it} + \beta X_{it} + u_i + \lambda_t + \varepsilon_{it} \quad \text{Equation 4.28}$$

$$RFAD_{it} = \alpha PEP_{it} + \beta X_{it} + u_i + \lambda_t + \varepsilon_{it} \quad \text{Equation 4.29}$$

$$RFAD_{it} = \alpha AGE_{it} + \beta X_{it} + u_i + \lambda_t + \varepsilon_{it}$$ Equation 4.30

4.7.3 Moderating Effect Model

Moderation effect is an important methodological concept in social science research, which is a critical means for exploring the relationship between multiple variables (Jiang, 2022). Based on theoretical and mechanistic analysis, this study suggests that financial literacy can moderate the relationship between ageing and financial asset allocation.

In addition, because the questions about household financial knowledge in the CHFS questionnaire have been different in each survey year and some questions on financial knowledge are missing in the data, this study, where feasible, selects two questions from the 2019 CHFS questionnaire related to calculating interest rates and inflation rates to examine respondents' financial literacy levels. To test the moderation effect of financial literacy, this study introduces an interaction term between financial literacy and the age of the household head in the above model, and the interaction term is centralized, and the model is constructed as follows:

$$Y_i = 1(\alpha_1 AGE_i + \alpha_2 FL_i + \alpha_3 AGE_i * FL_i + \beta X_i + \varepsilon_i > 0)$$ Equation 4.31

$$z_i = \alpha_1 AGE_i + \alpha_2 FL_i + \alpha_3 AGE_i * FL_i + \beta X_i + \varepsilon_i$$ Equation 4.32

$$Z_i = max(0, z_i)$$ Equation 4.33

$$Y_i = 1(\alpha_1 PEP_i + \alpha_2 FL_i + \alpha_3 PEP_i * FL_i + \beta X_i + \varepsilon_i > 0)$$ Equation 4.34

$$z_i = \alpha_1 PEP_i + \alpha_2 FL_i + \alpha_3 PEP_i * FL_i + \beta X_i + \varepsilon_i$$ Equation 4.35

$$Z_i = max(0, z_i)$$ Equation 4.36

4.7.4 Mediating Effect Model

Mediation effect is also an important methodological concept in social science research (Jiang, 2022). Through theoretical and mechanistic analysis, this study believes that ageing can affect household financial asset allocation by influencing attitudes. Many research findings show that there is a positive correlation between willingness to take risks and investment in risky assets (Mou & CHOO, 2023; Bucciol et al., 2019; Barasinska et al., 2012; Hu & Zang, 2016; Yilmazer & Lich, 2015). Therefore, this study only empirically examines the relationship between ageing and risk attitude. The value of risk attitude ranges from 1 to 3, so this study uses the Poisson model for empirical research. In addition, there was a significant amount of missing data for the risk attitude question in the 2017 survey questionnaire. Therefore, this study uses survey data from 2015 and 2019. The Poisson model is as follows.

$$P(RA_i = n_i | PEP_i, X_i) = \frac{e^{-\lambda_i} {\lambda_i}^{n_i}}{n_i!} (n_i = 1,2,3) \quad \text{Equation 4.37}$$

$$P(RA_i = n_i | AGE_i, X_i) = \frac{e^{-\lambda_i} {\lambda_i}^{n_i}}{n_i!} (n_i = 1,2,3) \quad \text{Equation 4.38}$$

4.8 Chapter Summary

This chapter discusses the data sources and their characteristics utilized in this study, the selection process, definitions, and computation methods for dependent and independent variables, the selection process, definitions, and computation methods for moderating and mediating variables, as well as the selection process, definitions, and computation methods

for control variables. Additionally, it provides a detailed explanation of the empirical model methodology employed in this study and the specific empirical model used.

CHAPTER 5

RESULTS AND DISCUSSIONS

5.1 Introduction

The structure of this chapter is as follows. The second section presents empirical results on the impact of ageing on household savings rates. The third section reports empirical results on the impact of ageing on household financial asset allocation. The fourth section reports empirical regression results on the moderating effect of financial literacy. The fifth section reports empirical regression results on the mediating effect of risk preferences.

5.2 Population Ageing and Savings Rate

This section begins with a discussion of the correlation and descriptive statistics between ageing and household savings rates. Subsequently, empirical research is conducted to investigate the impact of ageing on household savings rates. Finally, to ensure the robustness of the empirical findings, this study employs an alternative method to calculate household savings rates and conducts further empirical research.

5.2.1 Correlation Analysis and Descriptive Statistics

Table 5.1 displays the correlation analysis and descriptive statistics of the relationship between ageing and household savings rates. The correlation coefficients are all within reasonable ranges. As the correlation analysis shows, the proportion of the elderly population is negatively correlated with household savings rates, and the age of the household head is also negatively correlated with household savings rates. With respect to the control variables, the level of education of the household head, marital status being

married, good health status of the household head, male gender of the household head, and household net assets are all positively correlated with household savings rates. The child dependency ratio is negatively correlated with household savings rates.

The descriptive statistics in the table include the mean, standard deviation, maximum and minimum values. According to Table 5.1, the mean and standard deviation of China's household savings rate are 0.08 and 0.61, respectively. In terms of the ageing indicators, the average proportion of the elderly population in Chinese households is 0.25, and the average age of the household head is 56.74.

Table 5.1: Correlation Analysis and Descriptive Statistics of Variables

	SR	PEP	AGE	EDU	CRR	HHG	MS	HS	HNW
SR	1.00								
PEP	-0.04*	1.00							
	(0.00)								
AGE	-0.01	0.67*	1.00						
	(0.29)	(0.00)							
EDU	0.13*	-0.16*	-0.30*	1.00					
	(0.00)	(0.00)	(0.00)						
CRR	-0.02*	-0.31*	-0.38*	0.06*	1.00				
	(0.00)	(0.00)	(0.00)	(0.00)					
HHG	0.02*	-0.06*	-0.05*	-0.00	0.05*	1.00			
	(0.03)	(0.00)	(0.00)	(0.75)	(0.00)				
MS	0.05*	-0.14*	-0.15*	0.09*	0.10*	0.31*	1.00		
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)			
HS	0.12*	-0.12*	-0.20*	0.19*	0.07*	0.05*	0.06*	1.00	
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		
HNW	0.04*	0.00	0.00	0.08*	-0.01	-0.03*	0.02*	0.03*	1.00
	(0.00)	(0.79)	(0.84)	(0.00)	(0.07)	(0.00)	(0.03)	(0.00)	
Mean	0.08	0.25	56.74	3.19	0.09	0.78	0.88	3.35	0.96
SD	0.61	0.37	13.12	1.23	0.15	0.41	0.33	0.97	5.32
Min	-2	0	4	1	0	0	0	1	-1.78
Max	0.98	1	100	8	0.80	1	1	5	733.94

Note: *indicate statistical significance at the 5% levels.

5.2.2 The Estimation Results of Static Linear Panel Data Models

In this subsection, we first use the savings rate (SR) calculated using the first method as the core dependent variable for empirical research, and the results are shown in Tables 5.2 and 5.3. In Table 5.2, the independent variable is PEP, and the dependent variable is SR. To avoid the problem of multicollinearity, we first calculate the VIF values. The results show that the maximum VIF value is 1.15 and the mean is 1.09, indicating no serious collinearity issues. The LM test shows that the random-effects model (REM) is preferred over the pooled ordinary least squares (POLS) model. The Hausman test shows that the fixed-effects model (FEM) is preferred over REM. FEM can address the omitted variable problem that varies across individuals but not over time, which is an important cause of endogeneity. If a model considers both individual fixed effects and time fixed effects, it can be called a two-way fixed effects model. From the regression results, all annual dummy variables are significant. In addition, this subsection checks whether there are time fixed effects in the model by testing the joint significance of all annual dummy variables. The test strongly rejects the null hypothesis of no time effects, so time fixed effects should be included in the model. Next, the use of the cluster option helps to rectify the model for both heteroscedasticity and serial correlation problems (Hoechle, 2007). The last column in Table 5.2 reports the regression results obtained by re-estimating the model using clustered robust standard errors.

From the regression results, it is evident that the increasing proportion of the elderly population has a significant negative impact on household savings rates. For every ten-percentage point increase in the elderly population proportion, household savings rates decline by 1.32 percentage points. This finding aligns with prior research (Ji & Che, 2019; Zhao et al., 2017; Wang, 2021; Dong et al., 2013). However, previous studies predominantly relied on provincial-level panel data or national-level panel data, which had limited detailed

information. In this study, micro-level household data were employed for empirical analysis. Microdata offers finer granularity of information and provide a wealth of details, which is advantageous for more precise causal inference (Crato & Paruolo, 2019). From the perspective of controlling variables, increasing the household head's education level, increasing the child-rearing ratio, having a married household head, and having a healthy household head all have significant positive effects on household savings rates. The household head's gender being male and having a higher net worth have a positive impact on the household savings rate, but they are not significant.

Table 5.2: Results of Static Linear Panel Data Models for SR and PEP

	POLS	RE	FE	Cluster Robust Standard Errors
PEP	-0.028**	-0.034***	-0.132***	-0.132***
	(-2.28)	(-2.58)	(-4.63)	(-4.39)
EDU	0.053***	0.051***	0.016*	0.016*
	(14.94)	(13.28)	(1.81)	(1.74)
CRR	-0.186***	-0.157***	0.135**	0.135**
	(-6.18)	(-4.85)	(2.29)	(2.13)
HHG	-0.006	-0.004	0.018	0.018
	(-0.53)	(-0.38)	(1.07)	(1.08)
MS	0.071***	0.069***	0.062**	0.062**
	(5.26)	(4.80)	(2.50)	(2.33)
HS	0.060***	0.055***	0.030***	0.030***
	(13.52)	(12.04)	(4.80)	(4.63)
HNW	0.003***	0.002***	0.001	0.001
	(3.63)	(3.13)	(0.82)	(1.20)
2017.year	0.056***	0.057***	0.065***	0.065***
	(5.46)	(5.95)	(6.74)	(6.83)
2019.year	-0.072***	-0.071***	-0.055***	-0.055***
	(-6.99)	(-7.38)	(-5.53)	(-5.30)
LM Test		385.14***		
		(0.00)		
Hausman Test			114.75***	
			(0.00)	
Joint Significance Test			77.72***	
			(0.00)	
N	20862	20862	20862	20862

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

In Table 5.3, the independent variable is AGE, and the dependent variable is SR. In previous studies, due to limitations imposed by macroeconomic data, the independent variables were primarily the proportion of the elderly population in a single province or a nation. Household heads, being the principal earners and decision-makers in household financial matters, exert a significant influence on household economic behaviour. Leveraging the advantages of micro-level household data, this study selects the age of the household head as the independent variable to investigate its relationship with household savings rates. The maximum value of the VIF is 1.32 and the average value is 1.14, indicating that there is no serious problem of multicollinearity. Based on the results of the LM test and the Hausman test, FEM should be selected. The result of joint significance shows that the time effect of the model is significant. The last column reports the regression results obtained by re-estimating using clustered robust standard errors.

According to the regression results, although the increase in household head age has a negative effect on household savings rates, this effect is not significant. From the perspective of controlling variables, increasing the child-rearing ratio, having a married household head, and having a healthy household head all have significant positive effects on household savings rates. An increase in the household head’s education level, the household head's gender being male, and household net worth all have a positive impact on the household savings rate, but they are not significant.

Table 5.3: Results of Static Linear Panel Data Models for SR and AGE

	POLS	RE	FE	Cluster Robust Standard Errors
AGE	0.002***	0.002***	-0.001	-0.001
	(6.68)	(5.80)	(-1.58)	(-1.49)
EDU	0.060***	0.059***	0.013	0.013
	(16.62)	(14.84)	(1.34)	(1.30)
CRR	-0.090***	-0.067**	0.174***	0.174***
	(-2.91)	(-2.04)	(2.98)	(2.78)
HHG	-0.006	-0.004	0.020	0.020
	(-0.53)	(-0.40)	(1.19)	(1.20)
MS	0.082***	0.080***	0.062**	0.062**
	(6.05)	(5.55)	(2.49)	(2.31)
HS	0.065***	0.059***	0.030***	0.030***
	(14.52)	(12.93)	(4.69)	(4.52)
HNW	0.003***	0.002***	0.001	0.001
	(3.47)	(3.00)	(0.86)	(1.22)
2017.year	0.051***	0.051***	0.060***	0.060***
	(4.95)	(5.39)	(6.28)	(6.36)
2019.year	-0.082***	-0.081***	-0.063***	-0.063***
	(-7.93)	(-8.40)	(-6.26)	(-5.99)
LM Test		371.84***		
		(0.00)		
Hausman Test			106.07***	
			(0.00)	
Joint Significance Test			81.15***	
			(0.00)	
N	20862	20862	20862	20862

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

5.2.3 The Estimation Results for Replacing the Dependent Variable

In order to ensure the robustness of the empirical findings, the present study adopted a second approach to calculate household savings rates. Specifically, the study calculated the savings rate by subtracting medical and education expenditures from total household expenses. The results of the empirical regression analysis are presented in Tables 5.4 and 5.5.

In Table 5.4, the independent variable is PEP, and the dependent variable is SRA. The study first calculated the VIF values, which showed a maximum value of 1.16 and a

mean of 1.09, indicating no serious collinearity problems. Based on the results of the LM Test and Hausman Test, FEM was chosen. The results of the joint significance test showed that the time effects of the model were significant. The final column reports the regression results obtained using cluster-robust standard errors, which remained robust to the results of the initial estimation.

Table 5.4: Results of Static Linear Panel Data Models for SRA and PEP

	POLS	RE	FE	Cluster Robust Standard Errors
PEP	0.005	-0.004	-0.128***	-0.128***
	(0.42)	(-0.33)	(-4.86)	(-4.41)
EDU	0.053***	0.050***	-0.001	-0.001
	(15.88)	(13.82)	(-0.10)	(-0.10)
CRR	-0.142***	-0.119***	0.120**	0.120**
	(-5.08)	(-3.99)	(2.19)	(2.03)
HHG	-0.007	-0.007	0.013	0.013
	(-0.68)	(-0.63)	(0.82)	(0.81)
MS	0.068***	0.066***	0.056**	0.056**
	(5.36)	(4.88)	(2.38)	(2.20)
HS	0.023***	0.021***	0.005	0.005
	(5.70)	(4.85)	(0.88)	(0.85)
HNW	0.003***	0.002***	0.001	0.001
	(3.30)	(2.86)	(0.69)	(1.20)
2017.year	0.089***	0.090***	0.100***	0.100***
	(9.32)	(10.10)	(11.05)	(11.16)
2019.year	-0.035***	-0.033***	-0.014	-0.014
	(-3.62)	(-3.72)	(-1.55)	(-1.50)
LM Test		394.01***		
		(0.00)		
Hausman Test			126.66***	
			(0.00)	
Joint Significance Test			96.94***	
			(0.00)	
N	22683	22683	22683	22683

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

From the regression results, it can be seen that an increase in the proportion of elderly population has a negative effect on household savings rates, which is significant at the 1% level. Specifically, for every ten percentage points increase in the proportion of elderly

population, household savings rates decrease by 1.28 percentage points. From a controlled variables perspective, an increase in the child-rearing ratio and the marital status of the household head being married both have a significantly positive impact on the household savings rate. The household head's education level has a slightly negative effect on the household savings rate, but it is not significant. The household head's gender being male, good health status of the household head, and household net worth have a positive impact on the household savings rate, but they are not significant.

In Table 5.5, the independent variable is AGE, and the dependent variable is SRA. The maximum value of VIF is 1.33, and the average value is 1.14, indicating that there is no severe collinearity problem. Based on the results of the LM Test and the Hausman Test, FEM should be selected. The results of joint significance show that the model's time effect is significant. The last column reports the regression results obtained by using cluster-robust standard errors for re-estimation, and the empirical results remain robust. From the regression results, it can be seen that an increase in the household head's age has a negative effect on the household savings rate, but it is not significant.

The empirical regression results after replacing the dependent variable are consistent with the original empirical regression results, which confirms the robustness of the core conclusion of this thesis, namely, that population ageing reduces the household savings rate.

Table 5.5: Results of Static Linear Panel Data Models for SRA and AGE

	POLS	RE	FE	Cluster Robust Standard Errors
AGE	0.003***	0.003***	-0.001	-0.001
	(8.98)	(7.84)	(-1.41)	(-1.31)
EDU	0.061***	0.058***	-0.003	-0.003
	(17.90)	(15.75)	(-0.30)	(-0.30)
CRR	-0.051*	-0.034	0.161***	0.161***
	(-1.77)	(-1.12)	(2.96)	(2.74)
HHG	-0.008	-0.008	0.015	0.015
	(-0.78)	(-0.74)	(0.95)	(0.94)
MS	0.078***	0.076***	0.057**	0.057**
	(6.14)	(5.65)	(2.44)	(2.25)
HS	0.028***	0.025***	0.005	0.005
	(6.88)	(5.93)	(0.80)	(0.78)
HNW	0.002***	0.002***	0.001	0.001
	(3.11)	(2.71)	(0.73)	(1.23)
2017.year	0.085***	0.085***	0.095***	0.095***
	(8.85)	(9.55)	(10.51)	(10.61)
2019.year	-0.043***	-0.042***	-0.023**	-0.023**
	(-4.52)	(-4.72)	(-2.46)	(-2.36)
LM Test		373.86***		
		(0.00)		
Hausman Test			107.58***	
			(0.00)	
Joint Significance Test			97.57***	
			(0.00)	
N	22683	22683	22683	22683

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

5.3 Population Ageing and Household Financial Asset Allocation

This section begins with an analysis of the correlation and descriptive statistics between ageing and household financial asset allocation. Subsequently, using three years of cross-sectional data, this section empirically examines the impact of ageing on household participation in risk financial asset allocation and the level of participation. Finally, to ensure the robustness of the empirical findings, this study conducts robustness tests using panel data.

5.3.1 Correlation Analysis and Descriptive Statistics

Table 5.6 presents the correlation analysis and descriptive statistics of the relationship between population ageing and household financial asset allocation. The correlation coefficients are all within a reasonable range, as shown by the results of the correlation analysis. As demonstrated by the correlation analysis, there exists a negative correlation between the proportion of elderly population and the likelihood of households to participate in risky financial asset investments, as well as between the age of household heads and such participation. Similarly, the depth of participation in risky financial asset investments by households also exhibits a negative correlation with the proportion of elderly population and the age of household heads.

From a controlled variables perspective, the education level of the household head, an increase in the child-rearing ratio, marital status being married, good health status of the household head, and household net worth all exhibit a positive correlation with household participation in risky financial asset investment. The gender of the household head being male displays a weak negative correlation with household participation in risky financial asset investment. Similarly, the education level of the household head, an increase in the child-rearing ratio, marital status being married, good health status of the household head, and household net worth all display a positive correlation with the depth of household participation in risky financial asset. The gender of the household head being male exhibits a weak negative correlation with the depth of household participation in risky financial asset. Based on the descriptive statistics of the variables, the mean value of households' participation in risky financial asset investment is 0.51, while the average value of the depth of participation of Chinese households in risky financial assets is 0.14.

Table 5.6: Correlation Analysis and Descriptive statistics of variables

	RFAP	RFAD	PEP	AGE	EDU	CRR	HHG	MS	HS	HNW	FL	RISK
RFAP	1.00											
RFAD	0.49*	1.00										
	(0.00)											
PEP	-0.40*	-0.17*	1.00									
	(0.00)	(0.00)										
AGE	-0.48*	-0.21*	0.69*	1.00								
	(0.00)	(0.00)	(0.00)									
EDU	0.40*	0.25*	-0.22*	-0.35*	1.00							
	(0.00)	(0.00)	(0.00)	(0.00)								
CRR	0.23*	0.09*	-0.32*	-0.40*	0.09*	1.00						
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)							
HHG	-0.01	-0.04*	-0.07*	-0.04*	0.01	0.06*	1.00					
	(0.30)	(0.00)	(0.00)	(0.00)	(0.09)	(0.00)						
MS	0.09*	0.03*	-0.14*	-0.10*	0.08*	0.12*	0.31*	1.00				
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)					
HS	0.25*	0.12*	-0.15*	-0.25*	0.26*	0.11*	0.05*	0.07*	1.00			
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)				
HNW	0.03*	0.03*	-0.01	-0.01	0.05*	-0.00	-0.01	0.01	0.02*	1.00		
	(0.00)	(0.00)	(0.15)	(0.14)	(0.00)	(0.44)	(0.14)	(0.06)	(0.00)			
FL	0.34*	0.20*	-0.12*	-0.20*	0.39*	0.06*	-0.02*	0.04*	0.16*	0.03*	1.00	
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		
RISK	0.24*	0.16*	-0.16*	-0.24*	0.21*	0.10*	0.01	-0.00	0.11*	0.01*	0.26*	1.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.13)	(0.74)	(0.00)	(0.02)	(0.00)	
Mean	0.51	0.14	0.27	56.59	3.13	0.09	0.75	0.84	3.25	1	-0.00	1.22
SD	0.50	0.27	0.39	13.67	1.28	0.16	0.43	0.36	1.01	12.33	1	0.52
Min	0	0	0	18	1	0	0	0	1	-13.39	-0.93	1
Max	1	1	1	101	8	0.83	1	1	5	2099.57	1.75	3

Note: *indicate statistical significance at the 5% levels.

5.3.2 Ageing and Household Participation in Risky Asset Allocation

In this section, we conduct an empirical analysis of the influence of ageing on households' participation in risky financial asset allocation using cross-sectional data from three years. The regression results obtained from the 2019 dataset are presented in Table 5.7.

Based on the Probit model, the regression results indicate that the impact of population ageing on household participation in risky financial asset investment is significantly negative, regardless of whether the age of the household head or the proportion of elderly population in the total household population is used as a proxy indicator.

According to the average marginal effect of the impact, for every one percentage point increase in the proportion of elderly population in 2019, there is a -0.35% decrease in the probability of household participation in risky financial asset investment. Similarly, for every one-year increase in the age of the household head, there is a -1.2% decrease in the probability of household participation in risky financial asset investment.

From the perspective of control variables, an increase in the education level of the head of household, an increase in the child support ratio, being married as the marital status of the head of household, and good health of the head of household all have a significant positive impact on household participation in risky financial asset allocation. Net assets of the household also have a positive impact on household participation in risky financial asset allocation, though the effect is not significant. In contrast, being male as the gender of the head of household has a significant negative impact on household participation in risky financial asset allocation.

Table 5.7: Ageing and Household Participation in Risky Asset Allocation, 2019

	2019 Probit	2019 Probit
PEP	-1.189***	
	(-54.04)	
AGE		-0.042***
		(-54.59)
EDU	0.395***	0.354***
	(55.28)	(46.14)
CRR	1.029***	0.696***
	(19.26)	(11.79)
HHG	-0.187***	-0.173***
	(-9.61)	(-8.81)
MS	0.098***	0.108***
	(4.25)	(4.45)
HS	0.187***	0.142***
	(23.14)	(17.36)
HNW	0.001	0.001
	(0.56)	(0.55)
N	33120	33120

Note: Robust standard errors are given in parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5.8 presents the regression results using data from 2017. The results based on the Probit model show that an increase in the proportion of elderly population has a negative effect on household participation in risk financial asset allocation, and this effect is significant at the 1% level. Additionally, an increase in the age of the head of household also has a negative effect on household participation in risk financial asset allocation, and this effect is significant at the 1% level.

Table 5.9 presents the regression results using data from 2015. The regression results indicate that ageing has a significant negative impact on household participation in risk financial asset allocation.

Table 5.8: Ageing and Household Participation in Risky Asset Allocation, 2017

	2017 Probit	2017 Probit
PEP	-0.280***	
	(-10.44)	
AGE		-0.009***
		(-12.44)
EDU	0.360***	0.341***
	(50.33)	(45.83)
CRR	-0.119**	-0.247***
	(-2.09)	(-4.12)
HHG	-0.151***	-0.152***
	(-6.83)	(-6.89)
MS	-0.000	0.037
	(-0.00)	(1.38)
HS	0.094***	0.079***
	(10.59)	(8.85)
HNW	0.161***	0.165***
	(19.52)	(19.71)
N	39151	39151

Note: Robust standard errors are given in parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5.9: Ageing and Household Participation in Risky Asset Allocation, 2015

	2015 Probit	2015 Probit
PEP	-0.229***	
	(-7.12)	
AGE		-0.007***
		(-9.84)
EDU	0.413***	0.394***
	(55.82)	(50.84)
CRR	-0.247***	-0.368***
	(-4.03)	(-5.76)
HHG	-0.220***	-0.215***
	(-10.57)	(-10.29)
MS	0.013	0.049*
	(0.48)	(1.76)
HS	0.074***	0.061***
	(7.49)	(6.03)
HNW	0.187***	0.191***
	(18.73)	(18.65)
N	35606	35606

Note: Robust standard errors are given in parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

5.3.3 Ageing and Depth of Household Financial Risk Asset Allocation

This section presents an empirical study using cross-sectional data spanning three years to examine the impact of ageing on the depth of risky financial asset allocation. Table 5.10 presents the regression results using data from 2019.

The regression results based on the Tobit model indicate a significant negative impact of population ageing on the depth of risky financial asset allocation. This holds true regardless of whether the age of the head of household or the proportion of elderly individuals in the total household population is used as a proxy. Based on the average marginal effect, it can be inferred that an increase of one percentage point in the proportion of elderly individuals in 2019 would lead to a decrease of -0.36% in the depth of risky financial asset allocation. Additionally, an increase of one year in the age of the head of household would result in a decrease of -0.9% in t the depth of risky financial asset allocation.

From the perspective of control variables, an increase in the education level of the head of household, an increase in the child support ratio, being married as the marital status of the head of household, and good health of the head of household have a significant positive impact on the depth of household allocation to risky financial assets. Net assets of the household also have a positive impact on the depth of household allocation to risky financial assets, though the effect is not significant. In contrast, being male as the gender of the head of household has a significant negative impact on the depth of household allocation to risky financial assets.

Table 5.10: Ageing and Depth of Household Financial Risk Asset Allocation, 2019

	2019 Tobit	2019 Tobit
PEP	-0.355***	
	(-36.73)	
AGE		-0.009***
		(-34.97)
EDU	0.109***	0.095***
	(45.96)	(38.44)
CRR	0.161***	0.088***
	(9.20)	(4.67)
HHG	-0.073***	-0.066***
	(-10.24)	(-9.31)
MS	0.046***	0.070***
	(5.12)	(7.70)
HS	0.046***	0.036***
	(15.03)	(11.79)
HNW	0.001	0.001
	(0.89)	(0.91)
N	33120	33120

Note: Robust standard errors are given in parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5.11 presents the regression results using data from 2017. Based on the Tobit regression, an increase in the proportion of older people has a significant negative effect on the depth of household allocation to risky financial assets and is significant at the 1% level. Similarly, an increase in the age of the household head has a significant negative effect on the depth of household allocation to risky financial assets and is also significant at the 1% level.

Table 5.12 presents the regression results using the 2015 data. The results show that ageing has a significant negative effect on the depth of risky financial asset allocation.

Table 5.11: Ageing and Depth of Household Financial Risk Asset Allocation, 2017

	2017 Tobit	2017 Tobit
PEP	-0.127***	
	(-7.01)	
AGE		-0.004***
		(-8.98)
EDU	0.228***	0.219***
	(51.46)	(46.66)
CRR	-0.121***	-0.182***
	(-3.28)	(-4.72)
HHG	-0.095***	-0.095***
	(-6.68)	(-6.71)
MS	-0.003	0.016
	(-0.17)	(0.90)
HS	0.060***	0.053***
	(10.18)	(8.92)
HNW	0.082***	0.084***
	(22.70)	(22.54)
N	39151	39151

Note: Robust standard errors are given in parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5.12: Ageing and Depth of Household Financial Risk Asset Allocation, 2015

	2015 Tobit	2015 Tobit
PEP	-0.077***	
	(-3.54)	
AGE		-0.002***
		(-4.52)
EDU	0.260***	0.255***
	(57.29)	(52.64)
CRR	-0.209***	-0.242***
	(-5.02)	(-5.63)
HHG	-0.145***	-0.143***
	(-10.51)	(-10.38)
MS	0.055***	0.068***
	(3.02)	(3.66)
HS	0.046***	0.042***
	(6.83)	(6.18)
HNW	0.098***	0.099***
	(23.58)	(23.60)
N	35606	35606

Note: Robust standard errors are given in parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The empirical regression results based on three years of cross-sectional data consistently reveal a significant negative impact of ageing on household participation in and the depth of risk financial asset allocation. This finding is in line with prior research (Wang, 2016; Chen, 2018; Shi & Shen, 2021; Lu & He, 2022). Most of the studies have primarily focused on whether households engage in risk financial allocation as the core dependent variable. Additionally, previous research has mostly relied on one-year cross-sectional data for empirical investigations without utilizing panel data. Panel data can better address endogeneity issues and contribute to the robustness of empirical results. This study will continue to employ panel data for further empirical research.

5.3.4 The estimation results of Static Linear Panel Data Models

In this section, we conducted a robustness test on the impact of ageing on household financial asset allocation using panel data. We first conducted an empirical study on the relationship between ageing and whether households participate in financial risk asset allocation. The regression results are shown in Tables 5.13 and 5.14.

In Table 5.13, the independent variable is PEP, and the dependent variable is RFAP. We first calculated the VIF values, and the results showed that the maximum VIF value was 1.16 and the mean was 1.10, indicating that there were no serious collinearity issues. The LM Test results showed that REM was selected over POLS, while the Hausman Test results showed that FEM was selected over REM. Therefore, FEM was ultimately chosen. This section tested whether the model had time fixed effects by testing the joint significance of all annual dummy variables. The results strongly rejected the null hypothesis of no time effect, indicating that time fixed effects should be added to the model. The last column

reports the regression results obtained through re-estimation using clustered robust standard errors, and the empirical results remain robust.

From the regression results, it can be seen that the increasing proportion of elderly population has a negative impact on whether households participate in financial risk asset allocation, and it is significant at the 1% level.

Table 5.13: Results of Static Linear Panel Data Models for RFAP and PEP

	POLS	RE	FE	Cluster Robust Standard Errors
PEP	-0.138***	-0.152***	-0.257***	-0.257***
	(-24.91)	(-24.83)	(-21.57)	(-24.00)
EDU	0.102***	0.096***	0.024***	0.024***
	(61.32)	(52.08)	(6.30)	(5.86)
CRR	0.088***	0.080***	0.065***	0.065***
	(6.76)	(5.68)	(2.71)	(2.63)
HHG	-0.058***	-0.051***	0.008	0.008
	(-11.78)	(-9.80)	(1.11)	(1.02)
MS	0.026***	0.027***	0.036***	0.036***
	(4.41)	(4.13)	(3.52)	(3.51)
HS	0.028***	0.024***	0.008***	0.008***
	(14.66)	(12.10)	(2.87)	(2.95)
HNW	0.006***	0.004***	0.000	0.000
	(12.18)	(9.30)	(0.74)	(0.45)
2017.year	0.006	0.007	0.013***	0.013***
	(1.29)	(1.64)	(3.18)	(4.40)
2019.year	0.357***	0.359***	0.375***	0.375***
	(76.96)	(85.41)	(87.18)	(76.10)
LM Test		1146.06***		
		(0.00)		
Hausman Test			791.23***	
			(0.00)	
Joint Significance Test			4990.83***	
			(0.00)	
N	35367	35367	35367	35367

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

In Table 5.14, the independent variable is AGE, and the dependent variable is RFAP. The maximum VIF value is 1.31, with an average value of 1.14, indicating that there is no serious issue of collinearity. According to the results of the LM test and the Hausman test,

FEM should be selected. The joint significance test result shows that the model's time effect is significant. The last column reports the regression results obtained by using clustered robust standard errors for re-estimation, and the empirical results are still robust.

From the regression results, the increase in the age of the head of household has a negative impact on whether the household participates in financial risk asset allocation and is significant at the 1% level. Whether using the age of the head of household or the proportion of elderly individuals as the explanatory variable, ageing has a significant negative impact on whether the household participates in financial risk allocation.

Table 5.14: Results of Static Linear Panel Data Models for RFAP and AGE

	POLS	RE	FE	Cluster Robust Standard Errors
AGE	-0.004***	-0.004***	-0.003***	-0.003***
	(-24.12)	(-20.66)	(-7.24)	(-7.10)
EDU	0.097***	0.092***	0.020***	0.020***
	(56.99)	(48.96)	(4.87)	(4.59)
CRR	0.067***	0.081***	0.146***	0.146***
	(5.02)	(5.62)	(6.10)	(5.93)
HHG	-0.056***	-0.048***	0.013*	0.013
	(-11.28)	(-9.40)	(1.75)	(1.61)
MS	0.029***	0.030***	0.042***	0.042***
	(4.80)	(4.67)	(4.04)	(4.04)
HS	0.025***	0.022***	0.007**	0.007**
	(12.83)	(10.84)	(2.43)	(2.50)
HNW	0.006***	0.004***	0.000	0.000
	(12.54)	(9.78)	(0.95)	(0.53)
2017.year	0.005	0.004	0.003	0.003
	(0.98)	(1.04)	(0.83)	(1.18)
2019.year	0.356***	0.356***	0.359***	0.359***
	(76.68)	(84.01)	(82.70)	(74.17)
LM Test		980.02***		
		(0.00)		
Hausman Test			802.50***	
			(0.00)	
Joint Significance Test			4588.89**	
			(0.00)	
N	35367	35367	35367	35367

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

In this section, we further conducted empirical research on the impact of ageing on household financial risk asset allocation. The regression results are shown in Tables 5.15 and 5.16. In Table 5.15, the independent variable is PEP, and the dependent variable is RFAD. The maximum VIF is 1.16, and the average value is 1.10, indicating that there is no serious collinearity problem. The LM Test result suggests choosing REM over POLS, and the Hausman Test result suggests choosing FEM over REM. Therefore, FEM is selected as the final model. In this section, we test the joint significance of all annual dummy variables to determine whether the model has time fixed effects. The test results strongly reject the null hypothesis of no time effects, so time fixed effects should be included in the model.

The last column reports the regression results obtained by re-estimating using cluster-robust standard errors, which remain robust. Based on the regression results, it is evident that an increase in the proportion of elderly individuals has a negative and significant effect on the depth of household financial risk asset allocation, at the 1% significance level.

Table 5.15: Results of Static Linear Panel Data Models for RFAD and PEP

	POLS	RE	FE	Cluster Robust Standard Errors
PEP	-0.020***	-0.027***	-0.061***	-0.061***
	(-6.74)	(-7.98)	(-9.89)	(-10.62)
EDU	0.043***	0.038***	0.007***	0.007***
	(47.19)	(37.37)	(3.49)	(3.07)
CRR	0.015**	0.019**	0.048***	0.048***
	(2.17)	(2.46)	(3.86)	(3.91)
HHG	-0.031***	-0.027***	-0.005	-0.005
	(-11.42)	(-9.56)	(-1.19)	(-1.03)
MS	0.008**	0.008**	0.010*	0.010*
	(2.43)	(2.15)	(1.81)	(1.79)
HS	0.006***	0.004***	-0.001	-0.001
	(5.26)	(3.51)	(-0.68)	(-0.70)
HNW	0.003***	0.002***	0.000	0.000
	(11.87)	(8.05)	(0.57)	(0.58)
2017.year	-0.000	0.000	0.003	0.003*
	(-0.11)	(0.13)	(1.25)	(1.71)
2019.year	0.073***	0.074***	0.080***	0.080***
	(28.78)	(33.97)	(35.98)	(30.49)
LM Test		2397.06***		
		(0.00)		
Hausman Test			561.40***	
			(0.00)	
Joint Significance Test			851.82***	
			(0.00)	
N	35367	35367	35367	35367

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

In Table 5.16, the independent variable is AGE, and the dependent variable is RFAD. The maximum VIF is 1.31, and the average value is 1.14, significantly lower than 10, indicating that there is no serious collinearity problem. Based on the results of the LM Test and the Hausman Test, FEM is chosen. The joint significance test result shows that the time effect of the model is significant. The last column reports the regression results obtained by re-estimating using cluster-robust standard errors, which remain robust.

Based on the regression results, it is evident that an increase in the age of the household head has a negative and significant effect on the depth of risky financial asset

allocation, at the 1% significance level. Whether using the age of the head of household or the proportion of elderly individuals as the explanatory variable, ageing has a significant negative effect on the depth of risky financial asset allocation, which confirms the robustness of the research conclusion in this thesis.

Table 5.16: Results of Static Linear Panel Data Models for RFAD and AGE

	POLS	RE	FE	Cluster Robust Standard Errors
AGE	-0.000***	-0.000***	-0.001***	-0.001***
	(-5.20)	(-4.20)	(-4.14)	(-3.97)
EDU	0.042***	0.038***	0.005**	0.005**
	(45.60)	(36.21)	(2.52)	(2.29)
CRR	0.016**	0.026***	0.066***	0.066***
	(2.17)	(3.27)	(5.37)	(5.46)
HHG	-0.030***	-0.026***	-0.003	-0.003
	(-11.30)	(-9.42)	(-0.83)	(-0.72)
MS	0.009***	0.009**	0.011**	0.011**
	(2.64)	(2.50)	(1.99)	(1.97)
HS	0.005***	0.004***	-0.001	-0.001
	(4.93)	(3.38)	(-0.96)	(-0.99)
HNW	0.003***	0.002***	0.000	0.000
	(11.93)	(8.12)	(0.67)	(0.64)
2017.year	-0.001	-0.001	0.001	0.001
	(-0.26)	(-0.24)	(0.28)	(0.39)
2019.year	0.072***	0.073***	0.077***	0.077***
	(28.59)	(33.39)	(34.41)	(29.92)
LM Test		2369.21***		
		(0.00)		
Hausman Test			542.54***	
			(0.00)	
Joint Significance Test			796.17***	
			(0.00)	
N	35367	35367	35367	35367

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

5.4 Moderating Effect of Financial Literacy

Due to the fact that the questions related to household financial literacy in the CHFS survey have been different over the years and some of the questions on financial literacy have missing data, this study selected two questions from the 2019 CHFS survey questionnaire on calculating interest rates and inflation rates to examine the financial literacy level of respondents, as data availability permitted.

The regression results are shown in Table 5.17. In columns (1) and (2), the interaction term between the ageing index and financial literacy is positive and significant, indicating that an improvement in financial literacy can mitigate the negative impact of ageing on households' participation in risky financial asset allocation. In columns (3) and (4), the interaction term between the ageing index and financial literacy is positive and significant, indicating that an improvement in financial literacy can mitigate the negative impact of ageing on households' depth of risky financial asset allocation, and the empirical results are significant at the 1% level. From the perspective of controlling variables, the improvement of financial literacy has a significant positive impact on households' participation in risk financial asset allocation and asset allocation depth.

Table 5.17: Moderating Effect of Financial Literacy

	（1）	（2）	（3）	（4）
	RFAP	RFAP	RFAD	RFAD
PEP	-1.232***		-0.375***	
	(-53.98)		(-37.60)	
AGE		-0.042***		-0.010***
		(-54.53)		(-36.59)
FL	0.331***	0.322***	0.098***	0.095***
	(38.55)	(36.64)	(31.29)	(30.91)
PEP#FL	0.058***		0.139***	
	(2.63)		(15.48)	
AGE#FL		0.001*		0.004***
		(1.92)		(19.93)
EDU	0.314***	0.275***	0.083***	0.073***
	(42.05)	(34.38)	(34.10)	(28.83)
CRR	1.065***	0.742***	0.161***	0.096***
	(19.62)	(12.34)	(9.31)	(5.15)
HHG	-0.166***	-0.149***	-0.067***	-0.059***
	(-8.36)	(-7.46)	(-9.52)	(-8.51)
MS	0.088***	0.096***	0.039***	0.054***
	(3.71)	(3.89)	(4.27)	(6.03)
HS	0.172***	0.126***	0.042***	0.031***
	(20.94)	(15.16)	(13.53)	(9.79)
HNW	0.001	0.001	0.000	0.001
	(0.58)	(0.57)	(0.89)	(0.89)
N	33120	33120	33120	33120

Note: Robust standard errors are given in parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

5.5 Mediating Effect of Risk Attitude

Numerous research findings suggest a positive correlation between risk-taking willingness and investment in risky assets (Mou & CHOO, 2023; Bucciol et al., 2019; Hu & Zang, 2016; Yilmazer and Lich, 2015; Barasinska et al., 2012). Therefore, this subsection conducts an empirical study on the relationship between ageing and risk attitudes. In addition, there is a significant amount of missing household survey data for the risk attitude question in the 2017 survey. Therefore, this subsection reports regression results for 2019 and 2015. The empirical regression results for 2019 are shown in Table 5.18.

The regression results indicate that the increase in the proportion of elderly population has a negative impact on risk attitude and is significant at the 1% level. The ageing of household heads also has a negative impact on risk attitude and is significant at the 1% level. This suggests that ageing can affect household risk asset allocation by reducing risk tolerance.

Table 5.18: Ageing and Risk Attitudes, 2019

	2019 Poisson	2019 Poisson
PEP	-0.120***	
	(-22.23)	
AGE		-0.006***
		(-28.39)
EDU	0.054***	0.043***
	(27.29)	(21.55)
CRR	0.138***	0.047***
	(8.44)	(2.77)
HHG	0.007	0.009*
	(1.29)	(1.70)
MS	-0.046***	-0.038***
	(-6.81)	(-5.78)
HS	0.020***	0.012***
	(8.60)	(5.25)
HNW	0.000	0.000
	(0.64)	(0.71)
N	33120	33120

Note: Robust standard errors are given in parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The empirical results of the regression analysis for 2015 are presented in Table 5.19. The regression results show that an increase in the proportion of elderly population has a negative and significant effect on risk attitude at the 1% level. Ageing of the household head has a negative and significant impact on risk attitude at the 1% level as well. From the perspective of control variables, an increase in the education level of the household head, an increase in the child dependency ratio, good health status of the household head, and the

male gender of the household head have a positive impact on risk attitude and are significant at the 1% level. Being married has a negative impact on risk attitude and is significant at the 1% level.

Table 5.19: Ageing and Risk Attitudes, 2015

	2015 Poisson	2015 Poisson
PEP	-0.178***	
	(-25.49)	
AGE		-0.006***
		(-33.63)
EDU	0.063***	0.045***
	(33.12)	(22.51)
CRR	0.162***	0.073***
	(9.77)	(4.32)
HHG	0.036***	0.040***
	(6.25)	(7.06)
MS	-0.087***	-0.067***
	(-12.05)	(-9.60)
HS	0.027***	0.016***
	(10.46)	(6.03)
HNW	0.023***	0.026***
	(14.81)	(16.52)
N	35606	35606

Note: Robust standard errors are given in parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

5.6 Chapter Summary

This chapter presents the empirical analysis based on the empirical model from Chapter 4 and provides the empirical findings. In the study of ageing and household savings rate, the empirical results show that an increase in the proportion of the elderly population has a significant negative impact on household savings rate. In the study of ageing and household financial asset allocation, ageing has a significant negative impact on whether households participate in risky financial asset allocation and the depth of allocation. From the perspective of the influencing mechanism, as the age of the head of the household

increases and the proportion of the elderly population in the household grows, the risk aversion of the household intensifies, and this increased risk aversion inhibits household investments in risky financial assets. With the improvement of financial literacy, the inhibitory effect of ageing on investments in risky financial assets gradually weakens. The empirical analysis results confirm the theoretical hypotheses proposed in this study.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter first presents the conclusions of the study, followed by policy recommendations. Limitations and research prospects are provided at the end. The structure is as follows. The second part of this chapter reports the conclusions of the study. The third part presents policy recommendations. The fourth part discusses the limitations of the study and provides suggestions for future research.

6.2 Conclusion of the Study

This study focuses on the rapid increase in China's population ageing and analyses how it affects household financial asset allocation at a micro level. To accomplish this, we utilized micro household financial data obtained from CHFS. The use of micro household financial data is essential for accurately characterizing household economics and financial behaviour.

Household financial decision-making primarily entails two key elements: how to allocate resources between saving and consumption, known as the household savings rate, and the investment choices made by households. These two aspects correspond to the first specific objective and the second specific objective, respectively. Thus, this study employs two core explanatory variables, namely the household savings rate and the allocation of financial assets.

To investigate the impact of ageing on household savings rate, we employ a two-way fixed-effects model, ensuring the empirical validity of our findings. To ensure the robustness

of our results, this thesis vary the method of calculating the household savings rate and conduct a re-examination.

This study measures household financial asset allocation behaviour from two dimensions: participation in risky financial asset allocation and depth of risky financial asset allocation. This study employs Probit and Tobit models to empirically test the impact of ageing on household risky financial asset allocation and depth of allocation. To ensure the robustness of the empirical results, this study further examines the effects using a two-way fixed-effects model.

Furthermore, individuals with high financial literacy tend to have a deeper understanding of various investment tools, risks and returns, and how to diversify their asset allocation to reduce risk. A household with good financial literacy can better control its financial situation, make rational long-term plans, and are more likely to achieve its financial goals. Therefore, this study examines the moderating effect of financial literacy. Risk attitude affects a household's investment portfolio choice. If a household has a higher risk preference, they may be more willing to invest in high-risk, high-return financial products. Age is an important factor that affects risk attitude. Therefore, this study examines the mediating effect of risk attitude. In the Chinese context, previous studies have had limited involvement in examining the mechanisms of influence. The third and fourth specific objectives provide an explanation of the impact mechanism of ageing on household financial asset allocation from a micro perspective.

The research findings can be summarized as follows. The first specific objective of the study was to analyse the impact of ageing on household savings rate. Using a Two-way FE model, the study empirically demonstrated that an increase in the proportion of elderly

population has a significant negative impact on household savings rate. Additionally, the age of the household head also exerts a negative influence on the savings rate, although it is not statistically significant. This suggests the presence of significant life-cycle effects in the variation of household savings rates in China. Furthermore, the conclusions remain robust even after changing the core explanatory variables.

The second specific objective was to examine the impact of ageing on household financial asset allocation. This study empirically tested the effects of ageing on whether households participate in risk financial asset allocation and the depth of their allocation, using Probit and Tobit models, respectively. The findings indicate a significant negative impact of ageing on both the likelihood of households participating in risk financial asset allocation and the extent of their allocation. The empirical results from the Two-way FE model also support these conclusions.

The third specific objective was to investigate the moderating effect of financial literacy on the relationship between ageing and household financial asset allocation. The study found that as financial literacy improves, the inhibitory effect of ageing on risky financial asset investment gradually diminishes. The final specific objective was to explore the mediating effect of risk attitudes on the relationship between ageing and household financial asset allocation. The research revealed that an increase in the age of the household head and a higher proportion of elderly population in the household enhance the household's risk aversion, and increased risk aversion inhibits the investment in risky financial assets by the household.

In summary, our empirical analysis validates the theoretical hypotheses and accomplishes the research objectives. Given the context of rapid ageing currently underway

in China, examining the impact of ageing on household savings and investment behavior is of utmost importance. Our study offers valuable insights for policymakers and financial institutions.

6.3 Policy Recommendations

The growth of population ageing is expected to lead to a decrease in the savings rate of Chinese households, as elderly individuals require more savings to meet their daily living expenses and healthcare costs. Historically, a key driver of economic growth in China has been the conversion of high savings into high investment. Although this model is no longer suitable for China's economic development, a decrease in the savings rate may still result in insufficient investment. In this context, the government needs to take measures to mitigate the impact of ageing on household savings rates.

One feasible measure to alleviate the financial pressure on the elderly is to expand the coverage and improve the protection level of the social security system. To achieve this, the government needs to increase the welfare level for the elderly. The government can raise the level of basic pension to ensure that the elderly have sufficient economic security. Additionally, the government can consider providing additional pension support based on the financial situation of the elderly to help them meet their living needs.

The government can provide free or low-cost training courses to help the elderly learn new skills. This can help them acquire more skills and knowledge, improve their employability, and increase their income levels. The elderly often faces issues of loneliness and social isolation, and the government can improve their quality of life and mental health by providing social support such as social activities and community services. Additionally, the government can encourage social groups and volunteer organizations to provide social

support for the elderly. At the same time, strengthening financial literacy and education, and guiding residents to manage their finances and investments reasonably, is also an important way to mitigate the impact of ageing on household savings rates. In summary, the government should take multiple measures and adopt comprehensive strategies to address the impact of ageing on household savings rates, achieve sustainable economic development.

In addition, to alleviate the impact of ageing on household savings rates, it is also possible to strengthen the management and planning of savings within the household. For example, families can develop detailed savings plans and budgets, plan for different stages of life and medical expenses, reduce ineffective spending and waste, thereby optimizing the structure and efficiency of household savings. In addition, promoting savings collaboration and joint financial management among household members can foster mutual assistance and support among them, and achieve joint management of household finances.

The population ageing has a significant negative impact on household participation in risk financial asset allocation. Financial institutions and governments need to take measures to mitigate these negative effects. Due to the homogeneity of investment categories in financial markets, the lack of personalized financial investment categories and services often makes it difficult for older people to meet their investment needs. Therefore, financial institutions should strengthen innovation in financial investment categories and provide products that are more in line with the investment needs of the elderly.

Specifically, financial institutions can introduce investment products that are moderately risky and have longer terms to meet the needs of the elderly for stable investments. In addition, financial institutions can create investment products such as funds, financial management, and insurance that are suitable for the characteristics and needs of the

elderly. For example, products related to the needs of the elderly such as medical insurance and long-term care insurance can be introduced. At the same time, financial institutions can provide more caring services for the investment characteristics of the elderly. For example, providing more detailed product introductions, investment risk assessments, investment return expectations, and other information to help the elderly better understand and evaluate their investment risks and returns. In addition, financial institutions can provide more convenient services for the elderly, such as telephone banking and online banking, to make it easier for the elderly to invest and manage their finances.

Compared to developed countries, China's financial market has developed relatively late and still faces some shortcomings and challenges. Therefore, in order to promote the development of the financial market, it is necessary to continuously improve the construction of the financial market, increase the direct investment channels for residents, and enhance the construction of multi-level capital markets that are suitable for different investment needs.

An important issue in the construction of financial markets is the protection of the rights and interests of individual investors. Currently, many individual investors lack professional financial knowledge and have weak abilities to identify financial fraud, making them susceptible to the influence of some financial scams. At the same time, the policies and laws in China for protecting individual investors are not yet perfect, which also increases the risks and uncertainties for individual investors. To address these issues, the government should strengthen the regulation of financial markets and enhance the power and capacity of financial regulatory departments. Furthermore, it is necessary to further improve the legal system for financial regulation, formulate more detailed and stringent laws and regulations for investor protection, and provide better protection for investors.

In addition, the government should also encourage financial institutions to carry out investor education and financial literacy promotion activities, helping individual investors to improve their financial knowledge, enhance their risk awareness and identification abilities. In addition to protecting the rights and interests of investors, the government should also strive to improve the infrastructure and mechanisms of financial markets and promote the internationalization of financial markets. This includes strengthening the construction of various markets such as securities markets, bond markets, futures markets, promoting the development of cross-border financial services, and improving the international competitiveness and attractiveness of financial markets.

The government can support the development of financial technology and innovation to provide better financial products and services for the elderly. In this regard, the government can take various measures. Firstly, the government can support and encourage the development of new financial formats by formulating relevant policies. For example, the government can reduce regulatory restrictions on finance, and encourage the development of fintech companies. The government can also provide more financial support, such as supporting internet finance companies through loans, tax incentives, and other means.

Secondly, the government can support the development of new financial formats by establishing relevant financial infrastructure. For example, the government can establish a digital financial service platform to provide necessary support and convenience for fintech companies and internet finance companies. The government can also establish corresponding legal and regulatory frameworks to ensure the healthy and sustainable development of new financial formats.

Lastly, the government can support the development of new financial formats by cultivating talent. The government can provide more training and education opportunities to cultivate more talents in fintech and internet finance. The government can also encourage more people to engage in fintech and internet finance research by establishing research institutions, scholarships, and other means.

The ageing of the population can reduce households' risk preferences. When a household has a large elderly population, the resulting increase in caregiving responsibilities creates a greater financial burden on the household due to the need for additional resources to cover the costs of eldercare and medical treatment. This increase in the burden of support can result in more background risks for households, which decreases their willingness to bear risks and prompts them to choose relatively safer investment categories, reducing their allocation of risky financial assets. Therefore, it is necessary for the government to improve the social security system.

The government should prioritize the enhancement of the fundamental pension system to ensure the elderly have adequate financial support after retirement. Moreover, it is crucial to bolster the establishment of a multi-pillar pension system, which involves extending the scope of occupational pensions and promoting commercial pension insurance by improving tax benefits based on the prevailing circumstances.

As elderly people gradually face more health problems due to ageing, they need more medical services and medical security. Hence, it is imperative for the government to expedite the enhancement of the medical security system, which encompasses augmenting the scope of medical insurance coverage and elevating the standard of medical facilities, in order to alleviate the medical expenses burden faced by the elderly population. Specifically, the

government can expand the coverage of medical insurance and increase the number of elderly beneficiaries. At the same time, the government can increase the protection of medical insurance by raising the reimbursement ratio and reducing the cost burden for the elderly. In addition, the government can improve the quality of medical services by investing more in medical institutions, improving medical facilities and equipment, and enhancing the efficiency and quality of medical services. Finally, the government should allocate educational resources reasonably to reduce the educational burden on families.

The improvement of the social security system can provide older adults with a more stable income source and comprehensive medical security, reducing their risks in life and health. This reduction in background risk can increase the elderly's risk-bearing capacity and risk preference because they can participate more willingly in risky investments without considering their own risks too much, aiming to obtain higher returns. At the same time, with the increase in investment behaviour of the elderly, this will also promote the development and optimization of financial markets, providing strong support for high-quality economic growth.

Elderly individuals may be less inclined to invest in financial assets with higher risks due to a lack of financial literacy. Due to the complexity of the financial market and the diversity of investment products, many older adults lack sufficient financial knowledge to understand different financial products and make effective risk assessments and investment decisions. Therefore, individuals need to continuously learn and accumulate financial knowledge to improve their financial literacy and better manage their personal assets to achieve financial goals.

In order to enhance the financial literacy of the elderly, the government can enhance the dissemination of financial knowledge. The government can impart financial knowledge, financial management skills, and risk awareness to the elderly through various forms of financial education activities, courses, and lectures. In addition, the government can also use various channels such as the Internet, television, radio, newspapers, and magazines to promote financial knowledge and financial management skills to the elderly, thereby enhancing their financial literacy and risk awareness.

Financial institutions can provide more useful investment advice and financial knowledge in the design and sales process of investment products for the elderly. They can design products that are moderately risky and have stable returns for the elderly, and provide detailed investment risk assessments and return expectations, allowing the elderly to better understand their investment risks and returns. In addition, financial institutions can provide online investment education courses and other financial knowledge learning tools to help the elderly improve their financial literacy and investment capabilities.

In conclusion, by continuously enhancing their financial knowledge and improving financial literacy, the elderly can better manage personal assets, allocate investment portfolios rationally, and increase investment returns while reducing risks. Governments and financial institutions can provide more financial knowledge and financial services for the elderly through various channels, helping them achieve financial goals more effectively.

6.4 Limitation of the Study

The micro-level household information survey projects based on the Chinese context started relatively late. Currently, the number of micro household surveys is limited, and the time span is short.

Household financial assets are a complex and diverse class of assets, which can be classified in various ways. Two common methods of classification are based on liquidity and risk level. Liquid financial assets can be easily converted into cash, while non-liquid financial assets cannot. Risky financial assets are those that are subject to greater volatility and potential loss, while non-risky financial assets are more stable and secure. Financial assets can also be classified by their type, such as cash, deposits, funds, and stocks, among others. However, for the purposes of this study, we have chosen to focus on the classification of financial assets based on their risk level. This allows us to investigate the impact of ageing on financial asset allocation.

Commercial insurance is an important asset allocation category for residents, and it is of great significance for managing financial risks and accumulating wealth. However, in China, research on the influencing factors of commercial insurance allocation is relatively scarce, which may be due to various reasons such as data scarcity and statistical methods.

6.5 Suggestions for Future Research

As more micro-data survey projects are launched and the time span is extended in the future, researchers can conduct more comprehensive and accurate research by using data from different survey projects and longer time spans. This will help deepen our understanding of the financial behaviour and decisions of the elderly and promote better satisfaction of their financial needs in the financial market.

Future research can explore other classification methods to gain a more comprehensive understanding of financial asset allocation patterns. By employing different classification methods, we can gain new insights into the factors that influence financial asset allocation decisions and how these decisions change over time.

To enhance the global contribution of future research, elements of the Sustainable Development Goals (SDGs) can be integrated into the research to gain a more comprehensive understanding of the relationship between ageing and household financial asset allocation. The emphasis should be on how these relationships interrelate with the global sustainable development objectives outlined in the SDGs.

There are many factors that influence commercial insurance allocation, including personal factors, household factors, and social factors. Personal factors mainly include age, gender, income, occupation, and the like; household factors mainly include household structure and income; and social factors mainly include culture, education, risk attitudes, and the like. In addition, the attributes of commercial insurance itself, product design, insurance company image, and other factors will also affect the allocation of commercial insurance. To study the influencing factors of commercial insurance allocation, it is necessary to start from multiple aspects. Firstly, it is necessary to collect a large amount of data, including personal, household, and social factors, to establish relevant models and analytical frameworks. Secondly, appropriate statistical methods and models should be applied to identify and analyse the interactions between influencing factors.

Finally, to better understand the characteristics of various types of commercial insurance, it is important to classify them for research purposes. Furthermore, studying the factors that influence the allocation of commercial insurance will be an important area of research in the future. By conducting in-depth research on these factors, insurance companies and policy makers can make better-informed decisions to meet the insurance needs of residents and promote sustainable development of the insurance industry.

6.6 Chapter Summary

This chapter presents empirical research findings on the impact of ageing on household savings rates and financial asset allocation. Subsequently, based on the empirical results, policy recommendations are provided. These policy recommendations include strengthening the social security system to alleviate the economic burden on the elderly, enhancing the financial literacy of the elderly, promoting financial institution innovation to offer financial products suitable for the elderly, and reinforcing financial market regulations to protect the rights of individual investors. The chapter concludes by acknowledging the limitations of the study and suggesting directions for future research.

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APPENDICES

Table A: Summary of Literature Review

Name of Authors / Year	Methodology	Findings / Conclusion
Addoum (2017)	● Static Linear Panel Model ● Two-way Fixed Effects Model regression ● Robustness Test	● If, on average, wives exhibit higher risk aversion than husbands, transferring control of household resources to wives is associated with an increase in latent household risk aversion. ● This increase leads to a decrease in the proportion of stocks in the household financial investment portfolio. ● This hypothesis is validated by examining families' investment portfolio choices at retirement. ● The results indicate that couples significantly reduce their allocation to stocks after retirement, while singles maintain a relatively stable allocation to stocks. ● Further analysis suggests that this effect is associated with an increase in risk aversion at the household level. ● These findings suggest that the allocation of bargaining power within households can lead to changes in risk aversion at the household level.
Almenberg & Dreber (2015)	● Probit Model Regression ● OLS Regression	● The paper explores the connection between financial literacy and economic decision-making. ● Previous research on stock market participation has focused on advanced financial literacy, which might be influenced by stock market experience. ● Basic financial literacy, on the other hand, is likely unrelated to stock market participation for most individuals.

Table A continued

	•	• The study in a random Swedish sample found that controlling for basic financial literacy reduces the gender gap in stock market participation, even after considering advanced financial literacy. • When it comes to risk attitudes, the gender gap remains significant even when financial literacy is considered.
Bodie et al. (1992)	• Mathematical Model Analysis • Numerical Example	• Labor supply flexibility is significant in household asset allocation. • Human capital plays a crucial role in explaining investment, labour, and consumption behaviour. • Ignoring human capital as a factor in economic analysis is problematic, especially for young individuals with high labour flexibility. • Individuals tend to become more conservative in their investments as they approach retirement. • Labor flexibility influences an individual's risk-taking in financial investments. • Labor supply flexibility stabilizes an individual's labour behaviour and can lead to more stable consumption in the face of financial shocks. • The riskiness of an individual's human capital affects their investment in risky assets. • Future research will explore the impact of labour flexibility on investment in education and training and how employers design contractual relations related to human capital.

Table A continued

Benartzi & Thaler (2007)		• Retirement savings can be challenging due to a lack of training and passive decision-making among employees. • Effective interventions like small plan design changes, sensible default options, and automated portfolio adjustments can assist less experienced investors. • These features benefit both less sophisticated and more experienced investors by providing support without limiting flexibility.
Baptista (2012)	• Mathematical Model Analysis	• This paper extends Das et al.'s model to account for background risk. • The contribution includes an analytical characterization of optimal portfolios within accounts and the aggregate portfolio, showing that they can deviate from the mean-variance frontier under general conditions. • These results have practical implications for both investors and financial advisers. • For investors, it emphasizes the importance of recognizing background risk when determining optimal portfolios within accounts. • Financial advisers can use these results to identify optimal portfolios for clients with mental accounts and background risk, acknowledging that the composition of optimal portfolios may significantly depend on background risk.
Betermier et al. (2012)	• Cross-section analysis • Two-step Estimation • Panel Data Analysis • Fixed Effects • Controls for Endogeneity	• Previous research on the impact of labour income risk on portfolio holdings has yielded inconsistent results. • Some evidence suggests that individuals hedge against human capital risk.

Table A continued

		● However, at the individual stock level, households tend to own stocks closely related to their labour income. ● This study utilizes a unique Swedish panel dataset and focuses on households that changed industries between 1999 and 2002 to investigate how industry changes affect their portfolio holdings of high-risk assets. ● The results indicate that households do indeed hedge against labour income risk, and the effect is economically significant, with households shifting from the lowest wage volatility industry to the highest wage volatility industry reducing their high-risk asset holdings by 35%.
Bogan & Fertig (2013)	● Static Linear Panel Model ● Fixed Effects Model Regression ● Subgroup Regression	● This paper examines the role of mental health and cognitive functioning in household investment decisions. ● In general, households affected by mental health issues tend to decrease their investments in risky assets. ● Various mental health conditions can reduce the probability of holding risky assets by up to 19%. ● Single women diagnosed with psychological disorders tend to increase their investments in safer assets. ● Furthermore, we also find a correlation between cognitive functioning issues and an increase in financial assets allocated to retirement accounts.
Berkowitz & Qiu (2006)	● Static Linear Panel Model ● Random Effects Model Regression ● Probit Model Regression Tobit Model Regression	● This study investigates how health events impact household wealth and financial portfolio choices. ● The effect of health events on household wealth, both financial and non-financial, displays asymmetry.

Table A continued

		● The diagnosis of a new illness in a household member results in a decline in wealth, with a more pronounced impact on financial wealth compared to non-financial wealth. ● This asymmetrical impact can be attributed to liquidity effects and eligibility requirements for public insurance.
Bakshi & Chen (1994)	● Curve Fitting Analysis ● Dynamic Panel Model ● Generalized Method of Moments ● Hansen-Jagannathan Bound Tests	● Changes in the age structure affect capital market prices in multiple ways, such as altering asset demand and risk premiums. ● The ageing population leads to higher risk aversion and increased risk premiums in the market. ● Demographic changes, particularly related to the baby boom generation and increased life expectancy, predict future stock returns. ● Long swings in stock and housing market prices are generated by the baby boom generation and increased life expectancy.
Brunetti & Torricelli (2010)	● Curve Fitting Analysis	● Empirical literature supports the impact of age on household portfolio choices, but the specific age profile is still debated. ● Italy's ageing population, especially in the last decade, makes it suitable for analysing age-based household portfolio choices. ● This study uses Bank of Italy SHIW data but differs in period (1995-2006), risk asset classification, and separating households into age and NW quartiles. ● Italian household portfolios underwent significant changes from 1995 to 2006 due to market conditions, reduced government bond yields, privatization, stock market growth.

Table A continued

Bucciol et al. (2019)	● Logit Model regression ● Heterogeneity Analysis	● Using SHARE survey data from 2006 and 2013, examines the influence of financial risk attitude and trust in others on portfolio choices in European countries. ● Financial risk attitude is crucial in explaining portfolio choices. ● Trust matters, particularly for risk-averse households, where higher trust leads to more frequent investment in risky assets. ● Trust acts as a substitute for risk tolerance but has a smaller quantitative effect on risky asset investment.
Barasinska et al. (2012)	● Curve Fitting Analysis ● Ordered Logistic Regression ● Multinomial Logistic Regression	● This study investigates the relationship between self-reported risk aversion and the composition of financial portfolios held by private households. ● Accounting for a wide range of socioeconomic and demographic characteristics of households, we observe a positive correlation between the probability of holding incomplete portfolios and the level of risk aversion. ● This finding contradicts the mean-variance theory of Markowitz (1952) and the Capital Asset Pricing Model, both of which suggest diversification as the optimal strategy regardless of the investor's risk aversion.
Cocco (2005)	● Mathematical Model Analysis	● This paper examines portfolio choices involving housing, a significant asset for many investors. ● Owning a home impacts asset accumulation and the allocation of investments in stocks and Treasury bills. ● In early life and with low financial net worth, housing reduces liquidity and diminishes the benefits of stock market participation.

Table A continued

		● House price risk discourages investment in stocks, particularly for those with lower financial net worth. ● The model explains the positive correlation between leverage and stockholdings, as investors with more leverage tend to rely on capitalized labour income, leading to a shift towards stock investments.
Catherine (2022)	● Mathematical Model Analysis ● Numerical Simulation	● This paper develops a life-cycle model of portfolio choices that considers the link between market returns and the skewness of individual income shocks. ● The model explains (i) the low stock market participation of young households, (ii) the slight increase in the equity shares of participants until retirement, and (iii) why renters invest less in stocks than homeowners. ● With a relative risk aversion of 6 and an annual participation cost of $250, the model accurately reflects how wealth, participation, and conditional equity shares change over a person's lifetime. ● However, the cyclical nature of skewness only increases the equity premium by a maximum of 0.5 percentage points.
Chang et al. (2022)	● Instrumental Variable Estimation ● Robustness Test ● Heterogeneity across Groups ● Mathematical Model Analysis ● Numerical Simulation	● Household portfolio decisions are influenced by labour market risk. ● A study using data from Statistics Norway found a significant shift in risky investments when income volatility changes. ● Doubling the standard deviation of labour-income growth leads to a 4% reduction in risky investments on average. ● The study's unique approach, using individual-specific income volatility breaks and firm-side instrumental variables, resulted in larger estimates.

Table A continued

Chen et al. (2014)	● Ordered Probit Model Regression	● The findings reveal that the household life cycle significantly impacts asset allocation. Prior to age 65, individuals Favor various risky assets, but after 65, their preference for third-party custody and gold investments diminishes, and they show more interest in funds and wealth management investments. ● Household labour income risk and property risk also notably influence asset allocation. Lower household income leads to increased allocation to risky assets with rising income, while higher income levels result in reduced allocation to risky assets. ● Additional factors like gender, marital status, education level, age, wealth, annual income, and housing loans have varying effects on household asset allocation, contingent upon the type of risky assets.
Crainich et al. (2017)	● Mathematical Model Analysis	● The impact of health on portfolio decisions has been widely examined empirically. ● This paper introduces a theoretical model that considers individuals' asset choices using bivariate utility functions dependent on both wealth and health. ● The model relies heavily on the diffidence theorem to determine conditions where the proportion of wealth invested in risky assets decreases because of (1) declining health status and (2) increased health risk. ● These conditions are linked to changes in the intensity of correlation aversion and cross-prudence as wealth levels rise.

Table A continued

Chetty et al. (2017)	● OLS Regression ● Tobit Model Regression ● Instrumental Variable Estimation	● This study explores how housing affects portfolio choices. ● Increasing property value (mortgage debt) reduces the likelihood of investing in stocks and decreases the share of stocks in a household's portfolio. ● Home equity wealth increases stockholdings. ● The findings are consistent across various research designs and unlikely to be influenced by confounding factors. ● The interaction between housing and financial markets can impact the overall economy, as seen in the 2000s. ● Fluctuations in housing liquidity may influence financial portfolios over time. ● Commitments like mortgage payments and housing consumption adjustments affect risk aversion. ● Reducing transaction costs in housing and mortgage markets could improve overall welfare and encourage risk-taking in financial portfolios.
Choi & Robertson (2020)	● OLS Regression ● Tobit Model Regression ● Subgroup Regression	● Primary household financial decision-makers in the U.S. consider various factors when determining their stock investment allocation. ● Notable factors include background risks, investment horizon, rare disasters, transactional elements, and fixed costs of participating in the stock market. ● Belief in higher average returns from active equity mutual funds and advice from professional investment advisers are key drivers for investing in them. ● Households generally believe that past fund performance indicates stock-picking skill but do not think funds suffer from diseconomies of scale.

Table A continued

Chen (2018)	● Probit Model Regression ● Tobit Model Regression	● Based on data from the Chinese Household Finance Survey, this study provides support for the life-cycle hypothesis, which posits that as the household head's age exceeds 60 years or the proportion of elderly individuals in the household increases, the likelihood of household participation in risky asset investments decreases. ● The allocation of risk-free assets increases, while the allocation of risky assets decreases. Specifically, the ownership proportions of stocks and funds exhibit a declining trend as the population ages.
Cui & Liu (2019)	● Curve Fitting Analysis ● Probit Model Regression ● Tobit Model Regression ● Instrumental Variable Estimation ● Heterogeneity Analysis	● This paper utilizes CHARLS data to examine the influence of cognitive abilities on the limited participation of risk asset investments in Chinese middle-aged and elderly urban households. It explores the impact of cognitive abilities on the allocation of household financial assets. ● Cognitive abilities affect household involvement in the risk asset market by reducing information costs and influencing risk perception and tolerance, thus promoting investments in risk assets. ● The study addresses the endogeneity of cognitive abilities through instrumental variable methods and establishes that the cognitive abilities of household heads significantly increase both the total financial assets of the household and the probability of participation in the risk asset market.

Table A continued

Christelis et al. (2010)	• Curve Fitting Analysis • Probit Model Regression • Robustness Test	• We examine numeracy, verbal fluency, and memory as cognitive domains, finding that they all influence stock ownership independently of education. • The survey covers various aspects of elderly life in Europe, including health, socioeconomic status, social interaction, and inheritance intentions, helping us explain stock ownership diversity. • Cognitive impairments are associated with reduced stock ownership, with statistically significant and economically important effects. • We explore the impact of cognition on holding less information-intensive assets like bonds, revealing a weaker link, suggesting that cognitive abilities primarily affect stockholding due to information constraints, not overconfidence or high-risk propensity.
Duan & Duan (2021)	• Logit Model Regression • Tobit Model Regression • Heterogeneity Analysis • Robustness Test	• High housing value reduces participation in and ownership of risky financial assets among households. • Families owning multiple properties experience a smaller displacement effect from housing risk. • Holding housing debt mitigates the displacement effect of housing risk on stock market participation. • A higher proportion of income allocated to mortgage payments alleviates the displacement effect of housing risk on stock investments. • The displacement effect of housing risk on stock market participation varies with household head's age and income level.

Table A continued

Fagereng et al. (2017)	• Heckman selection model • Treatment of Cohort Effects • Mathematical Model Analysis • Numerical Simulation	• In the last decade, scholars have used more complex models with realistic features to study life cycle portfolio allocations. • These models predict that households should reduce their stock market exposure as they approach retirement to compensate for the decline in human wealth. • However, empirical evidence supporting this rebalancing has been scarce, mainly due to data limitations. • Using comprehensive data from Norway, this study found that households do adjust their portfolios over the life cycle, consistent with model predictions. • They make adjustments in two ways: by changing the share of their investments in the stock market and deciding whether to stay in or exit the market. • As households accumulate assets, they enter the stock market and invest a significant portion of their financial wealth in stocks. • As retirement approaches, they gradually reduce their stock market exposure, and around retirement, they start exiting the stock market. • This unique adjustment pattern, both in terms of participation and portfolio share, cannot be explained by existing life-cycle models. • An extension of these models, considering small participation costs and a small probability of significant stock market losses.

Table A continued

Agarwal et al. (2022)	● Literature Review	● Households are crucial participants in the economy, providing land, labour, and capital in exchange for various incomes, which are then used to purchase goods and services. ● Household finance focuses on three main areas: a. How households make financial decisions related to saving, consumption, investment, housing, borrowing, and FinTech. b. How organizations offer goods and services to fulfil these financial functions. c. How external interventions from firms, governments, or other parties influence these financial activities. ● Despite its importance, household finance as a research field has seen significant growth only in recent decades due to increased household participation in financial markets, the impact of events like financial crises, the availability of detailed data, and regulatory changes driven by technological innovation.
Angerer & Lam (2009)	● NLSY79 Data Set ● Log-linear Specification ● Maximum Likelihood Method ● Subgroup Regression ● Changing the dependent and independent variables	● This study is the first to measure and distinguish between permanent and transitory income risks using household-level data. ● The findings indicate that permanent income risk significantly shifts a household's portfolio toward risk-free assets, while transitory income risk has little effect on portfolio allocation. ● Understanding portfolio choices in the presence of labour income risk is crucial for evaluating government policies like income taxation, social security, and unemployment insurance.

Table A continued

			• It is also essential for accurately assessing the welfare gains from international financial market integration, as it helps determine how international differences in risky asset shares are influenced by variations in uninsurable labour income risk.
Fukuda & Okumura (2021)	• Mathematical Model Analysis • Static Linear Panel Model • Two-way Fixed Effects Model regression		• The research investigates the repercussions of Japan's swift demographic ageing and population decline on the financial dynamics within its regions. • It is observed that until the mid-1990s, regions characterized by a high proportion of elderly residents tended to exhibit elevated savings rates and financial surpluses. • However, a significant shift occurred after the mid-1990s when the ageing population and diminishing birth rates rapidly intensified in various regions. This shift led to a reversal in the influence of ageing on savings rates, resulting in a deficit of capital in areas with an increasing elderly population. • Furthermore, the study corroborated these findings by analysing the loan-to-deposit ratio.
Gomes et al. (2021)	• Mathematical Model Analysis		• Household finance is a rapidly growing field, studying the financial decisions of households in complex and dynamic environments. • Household financial decisions include managing collateralized debt obligations, optimizing consumption and savings plans, and handling short-term and long-term financial needs. • Households often lack financial sophistication, and suppliers of financial products can exploit their decision-making errors.

Table A continued

		• Conflicts of interest, governance issues, and imperfect regulation in financial intermediaries can worsen these problems. • The field acknowledges important areas it can't fully cover, such as consumption choices, household heterogeneity, portfolio diversification, housing decisions, and policy and practical implications. • Notable developments include integrating household finance into asset pricing and macroeconomic models, using advanced empirical and theoretical methods, exploring regulatory applications, and assessing the impact of technology on household finance.
Gomes et al. (2008)	• Mathematical Model Analysis • Numerical Simulation • Comparative Statics	• This study examines optimal consumption, asset accumulation, and portfolio decisions within a life-cycle model with flexible labour supply. • The model considers wage rate uncertainty, variable labour supply, social security benefits, and the choice between safe bonds and risky equities. • The analysis reaffirms that young households tend to favour equities, but the optimal equity allocation decreases as retirement approaches. • Variable labour significantly impacts pre-retirement portfolio decisions, leading to higher equity holdings. • The study also assesses the welfare costs of restricting portfolio allocations to match common default investment choices in defined-contribution pension plans. • Life-cycle funds designed to align with investors' risk tolerance and investment horizon have minimal welfare costs, while other options can have substantial welfare costs.

Table A continued

Gomes & Smirnova (2022)	• Curve Fitting Analysis • OLS regression • Quartile Regressions • Instrumental Variable Estimation	• The study examines how people participate in the stock market and their risk preferences throughout their lives. • Stock market participation is highest during middle age, forming a hump-shaped pattern. • Risky investments decrease as people get older, with little change early in life. • The study separates time, age, and cohort effects using first differences, avoiding assumptions about these factors. • Age profiles of stock market participation and risk preferences are more reliable indicators of economic theories. • The findings support ideas like stock market participation costs, background risks, decreasing risk aversion, and human capital's impact on investment choices. • A structural life-cycle model confirms these implications.
Guiso et al. (1996)	• Tobit Model Regression • LAD Estimation	• Testing the impact of income risk, health risk, and borrowing constraints on the demand for risky assets using the 1989 Italian Survey of Household Income and Wealth. • Finding that background risk reduces willingness to bear other avoidable risks, leading to a lower proportion of risky assets. • Supporting models with decreasing prudence and explaining the equity premium puzzle. • Some evidence that borrowing constraints lead people to keep their wealth in safer, more liquid forms. • Italian households holding a small share of financial wealth in risky assets.

Table A continued

Gao et al. (2020)	● Probit Model Regression ● Tobit Model Regression ● Mechanism analysis ● Instrumental Variable Estimation ● Heterogeneity Analysis ● Robustness Test	● Owing to the fervent real estate market, households are depleting substantial liquid assets in the acquisition of residential properties, thereby reducing investments in risk assets. ● Households with limited liquid assets and elevated levels of indebtedness tend to exhibit a preference for channelling their funds into real estate investments, consequently decreasing their allocation to risk assets. ● High urban property prices exert considerable financial pressure on urban families, leading to a reduced inclination to invest in risk assets.
Georgarakos & Pasini (2011)	● Mathematical Model Analysis ● Probit Model Regression	● The paper assesses the impact of trust and sociability on stock market participation. ● Sociability encourages stockholding in Sweden, Denmark, and Switzerland. ● Trust variations boost stock ownership in countries like Austria, Spain, and Italy, especially for wealthier households. ● Specific trust in financial institutions affects stockholding independently of sociability. ● Advancing competition among banks can reduce costs and improve access to banking services. ● Promoting trust in financial institutions through transparency and investor protection is essential for fostering stock investment.
He et al. (2009)	● Probit Model Regression ● Subgroup Regression	● Residents facing higher labour income risk are less inclined to engage in risky financial asset investments, potentially increasing their overall risk, especially for retirees.

Table A continued

		● The influence of employment status on investment participation is not readily apparent, but among different occupational groups, engineering and management professionals are more willing to invest, while workers, business and service industry employees, and laid-off residents exhibit lower investment tendencies. ● Health conditions do not significantly affect residents' investment probabilities, but having medical insurance or commercial health insurance notably enhances investment likelihood, indicating that future health risks impact investment decisions. ● Commercial and real estate investments decrease the probability of residents participating in financial asset investments as they are perceived as alternative risk assets. ● The impact of risk aversion on investment participation is not statistically significant; however, after controlling for background risk factors, liquidity constraints no longer significantly affect investment probabilities.
Hu & Zang (2016)	● Probit Model Regression ● Linear Programming ● Quantile Regression ● Robustness Test	● This study utilizes 2012 survey data from urban Chinese residents to investigate the impact of risk attitude and financial education on household financial asset allocation. ● Risk attitude significantly affects the diversification level of household financial assets. Greater risk aversion leads to lower asset diversification, particularly when households hold more than three types of financial assets.

Table A continued

		● Risk attitude significantly influences household participation in formal financial markets, particularly in the case of the stock market. Higher risk aversion reduces the likelihood of household participation in stocks, funds, bonds, and savings-oriented insurance markets. ● Risk attitude has a negative impact on the proportion of stocks, funds, bonds, and savings-oriented insurance within household financial assets, indicating a tendency for households to reduce their investments in these assets.
Ji & Che (2019)	● Curve Fitting Analysis ● Static Linear Panel Model ● Pooled Regression ● Fixed Effects Model Regression	● Elderly dependency ratio is negatively correlated with the national savings rate. As the elderly dependency ratio increases, the savings rate decreases. ● The child dependency ratio exhibits an inverted "U"-shaped relationship with the national savings rate. A declining birth rate leads to a decrease in the child dependency ratio, resulting in a gradual increase in the savings rate. However, when the child dependency ratio is already low, further decreases can lead to an increase in the savings rate. ● The total dependency ratio is negatively associated with the national savings rate. In other words, as the total dependency ratio rises, the savings rate declines."
Jappelli & Padula (2015)	● Mathematical Model Analysis ● OLS Regression ● Tobit Model Regression	● This study examines the role of financial sophistication in limiting financial market participation. ● Empirical results suggest that financial literacy reduces participation costs and affects later financial literacy.

Table A continued

		● Policies promoting early financial education can have long-term effects on portfolio choices. ● The study also explores the influence of social security systems on financial literacy and investment decisions. ● Generous social security systems may reduce the incentive to invest in stocks and weaken the impact of initial financial literacy on stockholding decisions.
Koomson et al. (2022)	● Cross-sectional Regressions ● Subgroup Regression ● Robustness Test	● This paper investigates the impact of financial literacy training on household asset accumulation in Ghana. ● Financial assets, such as savings and account holdings, are measured. ● Durable assets and their components are also considered. ● The study uses a randomized controlled trial. ● Financial literacy training has a significant effect on accumulating both financial and durable assets.
Li et al. (2011)	● Literature Review	● Research in household finance is characterized by its complexity, with a substantial susceptibility to psychological and behavioural biases. ● Research directions encompass the investigation of the household life cycle, the holdings of non-liquid assets, and intertemporal optimization in household decision-making. ● The field of household finance in China has undergone rapid development, marked by the establishment of personal banking services, the diversification of financial asset choices, and the growth of consumer credit.

Table A continued

		● Academic research in this domain lags practical developments, particularly in the context of household consumption decisions. ● Future research directions should include an exploration of the reasons behind high household savings rates and government guidance, the issues in the credit card market, and the influence of financial product diversification on household investment decisions.
Li & Guo (2009)	● Probit Model Regression ● Subgroup Regression ● Robustness Test	● Social interaction levels reduce residents' subjective perception of stock investment risk. ● The impact of residents' risk attitudes on their potential stock market participation varies depending on their degree of social interaction, potentially leading to an absence of a significant influence of risk attitudes on whether residents invest in stocks. ●
Li & Cai (2016)	● Probit Model Regression ● Subgroup Regression ● Robustness Test	● There is no significant association between health condition and the probability of investing in risk assets, but having medical insurance can enhance the likelihood of investment. ● Human capital has a significantly quadratic effect on the investment probability, indicating that having an appropriate level of education and skills can increase the likelihood of investment. ● Entrepreneurship among residents does not have a significant impact on the probability of investing in risk assets. ● High income stability among residents can lead to an increased probability of investing in risk assets.

Table A continued

Lu & He (2022)	● Factor Analysis ● Probit Model Regression ● Instrumental Variable Estimation	● The research is based on data from the China Household Finance Survey (CHFS) conducted in 2019. ● A Probit model is utilized to examine the influence of population ageing and financial literacy on household financial asset allocation. ● It is discovered that population ageing exhibits an inverse "U"-shaped relationship with financial asset allocation. As the ageing population increases, investments in high-risk assets and current deposits decrease, while fixed-term deposits increase. ● Enhanced financial literacy serves to alleviate the homogenizing effect of ageing on household financial asset allocation.
Modigliani & Brumberg (1954)	● Mathematical Model Analysis ● OLS Regression	● A simple model of individual saving behaviour has been derived from the theory of consumer choice, which aligns with both cross-sectional and time-series analyses. ● This model confirms Keynes' propositions from "The General Theory" but departs from his idea that a greater proportion of income is saved as real income increases. ● Instead, it claims that the proportion of income saved is essentially independent of income, with variations attributed to fluctuations in income and the household's basic earning capacity. ● The primary purpose of saving is to provide a cushion against income variations throughout the household's life cycle. ● The assumption that the proportion of income saved must increase with income, often associated with Keynesian theory, is questioned in this analysis.

Table A continued

		• The paper refrains from discussing policy implications in detail but suggests that income redistribution may not effectively reduce the average propensity to save. • The study highlights the challenges of making inferences from cross-sectional data without a clear theoretical framework. • It emphasizes that the individual marginal propensity to save may not correspond to the cross-sectional rate of change and may have a complex relationship with the time-series marginal propensity and the time-series average propensity.
Zhao et al. (2017)	• Mathematical Model Analysis • Dynamic Panel Model • System GMM	• Population ageing and pension insurance significantly impact savings rates, leading to a decline in savings due to ageing. • Delayed retirement policies can address the slowing of capital accumulation caused by ageing and the difficulty of increasing labour productivity. • Flexible retirement systems benefit various demographic groups, mitigating the unfairness of retirement age policies. • Social pooling models of pension insurance have a substantial crowding-out effect on consumption, necessitating the establishment of a comprehensive social security system.

Table A continued

Mouna & Jarboui (2015)	● Five-point Scales ● OLS Regression	● This paper investigates the potential role of insufficient financial literacy as a factor contributing to low portfolio diversification. ● The findings indicate that investors' experience, level of financial literacy, age, cognitive biases, familiarity with assets, and portfolio size significantly influence the diversity of assets within their portfolios.
Mou & CHOO (2023)	● Factor Analysis ● Probit Model Regression ● Tobit Model Regression ● Heterogeneity Analysis	● Firstly, the results indicate that households deeply influenced by Confucian traditional culture are less likely to participate in financial markets, and they also have a lower allocation of risk assets. ● Secondly, patriarchal beliefs suppress women's labour force participation, increase the household's precautionary savings motive, and consequently reduce the household's allocation to risk assets. ● Thirdly, filial piety strengthens the risk-averse function of families, leading them to diversify risks within the household rather than through financial markets, thereby reducing household participation in financial markets. ● Lastly, a household-centric perspective enhances economic activities within families, giving rise to informal financial markets among relatives and diminishing the breadth and depth of participation in formal financial markets by households.
Nguyen & Nguyen (2020)	● Probit Model Regression ● Instrumental Variable Estimation	● This paper investigates the impact of financial literacy and peer influence on financial market participation. ● Advanced financial literacy and confidence in financial knowledge positively influence financial market participation.

Table A continued

Peng (2022)	● Probit Model Regression ● Tobit Model Regression ● Instrumental Variable Estimation ● Robustness Test	● This paper utilizes the 2017 China Household Finance Survey data and employs the conditional mixed process method for instrumental variable estimation. ● The research reveals that unemployment insurance significantly increases the likelihood of households participating in the stock market (participation breadth) but has limited impact on the proportion of stock assets within households' financial portfolios (participation depth). ● Unemployment insurance fosters stock market participation among urban residents, those employed in the private sector, individuals with higher educational qualifications, and higher-income households, while it does not significantly affect stock market participation among rural residents, public sector employees, individuals with lower educational qualifications, and lower-income households. ● Unemployment insurance affects household stock market participation by reducing income background risk. This enhances our understanding of the unemployment insurance system and alleviates concerns regarding future income uncertainty among households.
Parker et al. (2022)	● Curve Fitting Analysis ● Cross-sectional Regressions ● Person Fixed Effect ● Subgroup Regression	● Portfolios of typical U.S. retirement investors have evolved over the last few decades. ● They now invest more in the stock market than in the 1990s and reduce stock investments as they age.

Table A continued

			• This change is linked to the rise of products like Target Date Funds (TDFs) and regulations like the Pension Protection Act (PPA) of 2006. • The adoption of TDFs in retirement plans has caused a shift in portfolio allocation, particularly for lower-income workers.
Palsson (1996)	• Mathematical Model Analysis • OLS Regression		• Relative risk aversion, as per a standard model of intertemporal choice, can be quantified in terms of the proportion of total wealth allocated to risky assets and the price of risk. • Given the diversity in households' portfolio compositions, it's essential to consider differences not only in the allocation of wealth to risky assets but also in the composition of these risky assets. • Calculations conducted on cross-sectional data consistently revealed a notably high aggregate relative risk aversion coefficient, irrespective of the chosen weighting scheme, suggesting that Swedish households exhibit a marked aversion to risk. • When a more precise specification and weighting scheme were employed, encompassing real assets, the average relative risk aversion confronting the market ranged between 10 and 15.
Pak & Babiarz (2018)	• Two-way Fixed Effects Model Regression • Instrumental Variable Estimation Robustness Test		• This study reexamined the link between cognitive abilities and household portfolio riskiness. Fixed effects models indicated cognitive decline was associated with a shift towards less risky assets in late-life portfolios. • To establish causality, we used an instrumental variable approach. However, results from these models suggested weaker and often negligible correlations between cognition and portfolio choice.

Table A continued

		• These findings remained robust under alternative identification strategies, and the lack of effect wasn't due to underrepresented subjects with cognitive impairment.
Rosen & Wu (2004)	• Probit Model Regression • Tobit Model Regression • Subgroup Regression	• The study reveals a robust relationship between health status and portfolio decisions. • Even after controlling for total net worth, household income, and various socio-demographic characteristics, poor health diminishes the likelihood of owning retirement accounts, bonds, and risky assets. • Individuals in poor health tend to possess relatively secure investment portfolios, with a higher proportion of wealth allocated to safe assets compared to households with good health, and a lower proportion in other asset categories.
Shi (2005)	• Literature Review	• The development of consumption function theory is characterized by a progressively deeper understanding of the internal and external factors influencing people's consumption behaviour. • This development has gone through three stages, corresponding to different assumptions about human behaviour: myopic, irrational consumers; forward-looking, fully rational consumers; forward-looking, bounded rationality (approximately rational) consumers. • Perception of income has shifted from determinism to uncertainty (risk).

Table A continued

		• Research methods have evolved from Keynes' "psychological law" to empirical analysis and, in the third stage, to econometric analysis, aiming to enhance the theoretical explanatory power. • It's essential to recognize that each consumption function theory has limited explanatory power as different backgrounds and external factors result in varying consumption functions.
Samuelson (1969)	• Mathematical Model Analysis	• The author argues that in a model with isoelastic marginal utilities, the concept of a businessman's risk, where risk tolerance changes with age, is invalid. • The elasticity of marginal utility, wealth, and capital market imperfections can affect the rational consumption and risk tolerance of individuals at different ages. • The analysis suggests that risk tolerance is higher with higher values of algebraically large y and that late in life, higher values of r and r* relative to p result in higher consumption. • The author points out that the ordering principle of selecting actions based on their probability of producing higher results may not be transitive, leading to inconsistencies in decision-making.
Strobl (2022)	• Lab Experiment • OLS Regression • Group Regression • Heterogeneity Analysis	• A lab experiment with Nairobi slum dwellers investigates whether the presence of background risk constrains investments and if insurance could encourage riskier, higher-yield choices. • Risk-averse subjects invest significantly less in profitable opportunities when faced with uninsurable background risk.

Table A continued

		• Imperfect understanding of insurance and a preference for certainty may contribute to these counterproductive effects. • Providing tools to handle background risk is crucial for fostering entrepreneurial risk-taking, income, and economic growth. • Mandatory health insurance programs should inform the population about insurance benefits and attributes to avoid misunderstandings.
Sui et al. (2021)	• Structural Equation Model	• The improvement of cultural qualities and material well-being encourages senior citizens to increase their investment in financial products, both risk-free and risky financial products. • Social security, psychological characteristics, health status, and household interactions are the primary factors contributing to the heterogeneity in financial behaviours. • Senior citizens with higher levels of social security inclination are more likely to invest in risky financial products. • Elderly individuals with fragile psychological traits tend to reduce their allocation to risk-free financial assets. • Health conditions negatively impact the allocation of risk-free financial assets by senior citizens.
Shi & Shen (2021)	• Probit Model Regression • Tobit Model Regression • Heterogeneity Analysis	• The proportion of the elderly population in households is more inclined towards regular deposits and less participation in the stock market. • Improving financial literacy, internet usage, and income levels can mitigate the negative impact of the elderly population on household stock investments.

Table A continued

		● There are significant regional differences in stock market demand, with the central and western regions showing relatively lower demand for stocks. ● Households with a higher proportion of young children are more willing to participate in the stock market, while households with boys tend to prefer holding regular deposits. ● The age of the household head exhibits a U-shaped relationship with willingness to participate in the stock market and a linear relationship with regular deposits.
Shen & Shi (2020)	● Probit Model Regression ● Tobit Model Regression ● Zero-inflated Poisson Model Regression ● Heterogeneity Analysis	● This study empirically examined the relationship between the age structure of household populations and their participation in financial markets as well as the allocation of financial assets, using the 2015 CHFS data. ● The findings revealed that the financial asset allocation of households exhibits a time-varying pattern with respect to age. Specifically, the proportions of stocks, risky assets, and diversified risky assets display a reverse "U"-shaped relationship with age, while the proportion of time deposits exhibits a monotonically increasing trend with age. ● It was observed that households in the age group of 55-64 are more likely to actively engage in investing in risky assets, particularly prior to retirement.
Tang & Hu (2020)	● OLS Regression ● Ologit Regression ● Robustness Test	● The relationship between the age structure of residents and their choices in household financial assets has been a significant topic of academic interest, particularly in the context of the increasingly severe ageing population.

Table A continued

			● Ageing tends to reduce households' investment in higher-risk assets like stocks and internet financial products, while increasing the likelihood of holding lower-risk assets such as fixed deposits and bank financial products. As residents' age increases, households tend to replace riskier financial assets with safer ones. ● Financial literacy significantly promotes household participation in financial markets. The enhancement of financial literacy can offset the negative effects of ageing on investments in high-risk assets and strengthen the promoting effect of ageing on investments in low-risk assets. However, the moderating effect on the former is greater than on the latter.
Wu et al. (2015)	● Literature Review		● From the perspective of household finance, research on asset allocation is a prominent area within the field of finance. Its primary objective is to optimize asset portfolios for wealth preservation and growth. ● Household finance research benefits from in-depth household survey data, more realistic model assumptions, and novel analytical approaches. ● This field encompasses not only investment but also consumption, requiring an analysis of household financial issues within the broader macroeconomic context.
Wu et al. (2014)	● OLS Regression ● Logit Model Regression ● Robustness Test		● The classical theory overlooks background risk and equates investment horizon with expected remaining lifespan. ● Empirical research indicates that investors' background risk is a critical factor affecting their investment horizon.

Table A continued

		• Investors tend to opt for short-term investments when facing substantial background risk to mitigate potential risks. • The investment horizon, to some extent, reflects the magnitude of background risk and significantly influences investors' participation behaviour.
Wu & Qi (2007)	• Probit Model Regression • Tobit Model Regression • Subgroup Regression	• Illiquid assets, particularly real estate investments, significantly influence both participation in the stock market and portfolio choices, primarily through "substitution" or "crowding-out" effects. • Investors rarely employ the stock market in their portfolio to hedge against future cash flow risks, indicating that the "life-cycle effect" among Chinese residents is not evident. • The "wealth effect" has a pronounced impact on Chinese residents' investments, increasing their probability of participating in the stock market and the depth of their investments.
Wu et al. (2011)	• Probit Model Regression • Tobit Model Regression • Mechanism analysis	• Health conditions do not significantly influence investors' decisions to participate in the stock market and the market for risky assets. • However, health conditions do impact the proportion of stocks and risky assets within the total household wealth, with poor health leading to lower allocations in these assets, even when considering insurance coverage and time horizon. • Investors' risk attitudes and bequest motives to some extent can explain the impact of health conditions on asset allocation.

Table A continued

Wang et al. (2023)	● Two-way Fixed Effects Model Regression ● Heterogeneity Analysis ● Robustness Test ●	● Overall, increasing housing liquidity significantly encourages households to increase their housing asset allocation. ● Restrictive transaction policies like purchase restrictions notably impede housing asset liquidity, reducing household investments in housing assets. ● Heterogeneous analysis reveals that different types of households react differently to increased housing liquidity in terms of housing asset allocation. ● Enhanced housing liquidity can moderate the impact of expected returns and risk attitudes on asset allocation. ● For households owning multiple properties, increased housing liquidity leads to higher investments in financial assets and promotes growth in consumption expenditure.
Wang (2021)	● Mathematical Model Analysis ● Dynamic Panel Model ● System Generalized Method of Moments ● Robustness Test	● By employing a three-period iterative model, this study investigates the relationship between demographic ageing, pension insurance, and household savings rate. ● The findings reveal that both demographic ageing and pension insurance contribute to a decline in overall household savings. ● Furthermore, it is observed that different forms of pension insurance accounts have varying effects on household income allocation, with the public account model encroaching on consumption to some extent, while the individual pension account model completely substitutes for savings.

Table A continued

Wang (2016)	• Probit Model Regression • Tobit Model Regression • Instrumental Variable Estimation • Heterogeneity Analysis	• Using data from the 2011 China Household Finance Survey (CHFS), this study examines the impact of household dependency burden on household participation in the financial market and asset allocation choices. • The study finds that an increased dependency burden reduces household participation in the financial market. On one hand, the likelihood of households holding risk assets and stocks decreases, and on the other hand, the proportion of these assets in the household portfolio decreases. • Both the child dependency ratio and the elderly dependency ratio have a negative impact on these behaviours, with the former having a greater influence. • When comparing urban and rural areas, the negative impact of an increased dependency burden on rural households is more pronounced, especially in terms of financial market participation and risk asset allocation. • Regional comparisons show that the impact of the dependency burden on household financial market participation is greater in the central and western regions compared to the eastern region.
Xing (2009)	• OLS Regression	• Savings constitute the largest proportion of financial assets in urban households. • Urban residents typically have a singular savings goal, with bank savings being their preferred financial instrument. • Real estate represents the primary form of tangible assets for these households.

Table A continued

Yilmazer & Lich (2015)	● Mathematical Model Analysis ● Random Effects Tobit Model Regression ● Random Effects ● Probit Regression	● This paper analyses household financial asset allocation using a non-unitary model that accounts for differences in risk preferences between spouses. ● The study tests the theoretical framework with data from the HRS and finds that households invest more in risky assets when the spouse with greater bargaining power has higher risk tolerance. ● Interestingly, there is no evidence of a direct link between bargaining power and risk tolerance across various model specifications. ● The research highlights that the risk preference of the household decision-maker, often the more educated partner, significantly influences portfolio decisions. ● The study suggests that couples may defer to the more educated partner's preferences, which indirectly reflects the influence of their informed decision-making on asset allocation.
Zhu (2020)		● Household is a personal, evolving experience, and the law must adapt. ● The Chinese Civil Code uses international and domestic legal insights to define household members' rights and obligations, balancing legal stability with real-life flexibility. ● Addressing issues involves adapting the household concept to legal goals and coordinating with special laws to maintain consistency.
Zhu et al. (2015)	● OLS Regression ● Robustness Test	● Gender significantly influences risk attitudes. ● Parents' educational background, occupation, and college major are important factors affecting risk attitudes.

Table A continued

		• Objective financial literacy has a significant positive impact on risk attitudes, while financial satisfaction has a negative impact, and subjective financial literacy has a certain positive influence. • Socialization that enhances financial literacy levels will increase individuals' sense of control over financial activities, leading to higher risk preferences, ultimately influencing individual financial decision-making behaviour.
Zhang & Zhao (2015)	• Tobit Model Regression	• Households with lower income risk tend to hold a higher proportion of risky financial assets, particularly those with relatively stable employment income. • Normal health conditions and the presence of medical insurance or the purchase of commercial health insurance significantly increase the investment ratio in risky financial assets for households. • Commercial and real estate investments decrease the investment ratio of households in risky financial assets, indicating a pronounced "crowding-out effect."
Zhang & He (2022)	• OLS Regression • Probit Model Regression • Tobit Model Regression • Instrumental Variable Estimation	• With the development of digital technology, social networks are gradually digitizing. • Through the analysis of Chinese household financial survey data, it has been observed that digitalized social networks have a positive impact on household risk financial asset allocation. • This is manifested in promoting participation in the risk financial market, deepening the level of engagement, and increasing asset diversification.

Table A continued

Zhou et al. (2023)	● Tobit Model Regression ● Subgroup Regression ● Instrumental Variable Estimation ● Robustness Test ● Mathematical Model Analysis	● The study analyses the mechanisms related to subjective expectations in the asset allocation of Chinese households and the direct impact relationships between different assets. ● The theoretical framework incorporates subjective expectations into the dynamic process of household asset allocation to derive a simultaneous relationship among risk-free assets, real estate, and risky assets, along with optimal asset allocation ratios. ● The empirical research employs microdata and establishes both a simplified TOBIT model and a simultaneous TOBIT model to estimate the marginal effects of subjective expectations on asset allocation ratios. Additionally, it investigates the "crowding-out effects" and asymmetry among different asset allocations.