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Age structure of the population and the choice of household financial assets

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ABSTRACT

China is undergoing changes in its demographic structure, and the burden of raising children and caring for the elderly is negatively affecting the welfare of Chinese families. Optimising the financial structure of households may be an effective solution. Using data from the 2017 Chinese Household Finance Survey, in this study, we empirically analyse how the age structure of the population affects a household's finances by applying probit and tobit models. It was found that an increase in the proportion of infants in a family has a crowding-out effect on its investment in risky and deposit assets, and an increase in the proportion of elderly family members encourages the replacement of risky assets with savings. Further mechanism tests showed that the presence of infants affects the choice of financial assets by crowding a family's labour or leisure time, increasing expenditures, and changing a family's cash demand, while the presence of the elderly changes household finances because a family's risk preferences are altered by the weakened cognitive abilities of the elderly. Finally, in this article, we advance some policy suggestions, such as regulating capital market management, increasing birth subsidies, and improving the financial literacy of the elderly, to ensure future pension security.

1. Introduction

In recent decades, the Chinese family has changed significantly from the perspective of the population structure, which is characterised by an aging population, low birth rate, and small average family size. On the one hand, according to data from the National Bureau of Statistics, the proportion of the population aged 65 and above in China has rapidly increased from 7.1% in 2001 to 11.4% in 2017, far exceeding the 7% aging standard proposed by the United Nations. On the other hand, because of family-planning policies, the Chinese fertility rate continues to decline. Although an overall two-child policy has been implemented, the number of births is still declining. After a drop of 630,000 in 2017, the number of births in 2018 dropped by 2 million

to 15.23 million.[1] The deepening problem of an aging population is not only causing a gap between social security income and expenditures in China, it is also leading to an increasing pension gap. It has also restrained families' reproductive behaviours due to the high cost of housing, education, and medical treatment; the heavy burden of pensions; and the high opportunity cost of having children. In this context, protecting the future security of pensions and increasing families' level of well-being is an economic and social issue worthy of study.

Optimising the financial structure of households could be an effective way to resolve this dilemma. Campbell, the president of the American Institute of Finance, pointed out that, no matter how risk-averse families are, if the premium of risk assets is positive, all families should hold risk assets to a greater or lesser extent (Campbell, 2006). At present, the investable assets of Chinese families are increasing yearly, and family wealth is accumulating rapidly. However, families' allocation ratio of wealth to financial assets is low, and the participation of families in the risky financial market is far lower than predicted by classical financial theories (Gan et al., 2016). In the current context of low fertility and rapid aging, optimising the financial structure of families would be a means of improving families' well-being and protecting the future security of pensions. Therefore, we must first address the adverse impact of aging-related changes in the demographic structure on households' allocation of financial assets; then, we can take targeted measures to optimise households' financial structure, which is the focus of this article. Considering that the change in the age structure has mainly been caused by low fertility rates and rapid aging, and infants and the elderly play an important role in the composition of the country's age structure, in this article, we have chosen infants and the elderly to represent the age structure of the population for our research.

In existing studies, the traditional life cycle asset selection model fails to consider the characteristics of families' age structure. Viceira (2001) constructed a dynamic life cycle asset selection model, introduced the factors of age structure and life expectancy, and devised a mathematical model for showing how a population's age structure affects families' allocation of financial assets, but this approach ignores the bequest problem. Cocco et al. (2005) and Zhao (2016) fully considered the factor of bequest motivation. They found that increased life expectancy and enhanced bequest motivation both cause investors to act cautious, but they failed to provide empirical evidence. This empirical research was mainly focused on the following three aspects. First, we examined the country's demographic structure and household debt levels. Based on either the macro or micro perspective, the relevant scholars have concluded that an increase in the elderly dependency ratio promotes the accumulation of family debt, while an increase in the child dependency ratio inhibits the development of the family credit market (Guo et al., 2015; Zhou & Wang, 2017). Second, the empirical findings from household financial survey data, time series data, and provincial panel data all show that an increased elderly population ratio has a constraining effect on the demand for life insurance products, while an increased number of children in families promotes the development of the life insurance market (Fan & Wang, 2015; Zhang, 2013; Zhang & Shang, 2011). Third, the population structure and household financial investments were examined. The relevant domestic studies show that, in the

presence of an increase in the proportion of elderly people in a population, the macro financial structure becomes more inclined toward utilisation of indirect financing, and households tend to reduce the proportion of risky assets.

It can be inferred that, although some scholars have conducted theoretical research on how a population's age structure affects family finances, empirical evidence is relatively scarce. The empirical literature is focused more on the impact of aging, and the conclusions about how the presence of children affects families' financial asset portfolios are inconsistent. When analysing the influencing mechanism, these articles are based on risk preference factors, ignoring the background risks of household finances without consideration for whether the conclusion will change with a family's wealth level (Lan et al., 2018; Yu & Yao, 2019). In addition, there are few relevant studies on the impact of the birth of infants on family portfolios in the context of the full liberalisation of the two-child policy.

Therefore, from the perspective of the impact of infants and the elderly, in this study, we discuss the relationship between a population's age structure and financial asset selection at the family level. Unlike previous studies, this study makes the following contributions. First, in this study, we use the proportion of infants and the elderly in a population to measure the age structure of families, which allows full consideration of the background of low fertility rates and rapid aging; thus, the conclusions yielded can provide policy insights for improving families' well-being. Secondly, in this article, we use background risk to test the influencing mechanism of population structure on household finances, which helps to perfect the formation mechanism of a 'limited participation puzzle' and enrich the theory of household financial asset selection. Third, in this study, we examine whether the impact of a population's age structure on financial asset selection varies with the average level of family wealth, compensating for the lack of consideration given to family wealth in the relevant literature.

The remainder of this article proceeds as follows. Section 2 is an analysis of the theoretical mechanism driving the influence of a population's age structure on household finances; in it, we also propose the research hypothesis. Section 3 specifies the model, data, and variables used. Section 4 is a report of the empirical results regarding the influence of age structure on family finances and a discussion of its robustness and endogeneity. Section 5 includes empirical tests of the influencing mechanism of infants and the elderly on family finances and the hypothesis proposed above is verified. Finally, Section 6 concludes the article, highlights avenues for future research, and presents the practical implications of the findings.

2. Theoretical mechanism and research hypotheses

According to the life cycle theory, individuals rationally arrange consumption and savings according to various life stages: when they are young or old, their income is low, and their net savings are negative (McCarthy, 2004). In other words, from the perspective of the personal life cycle theory, changes in the child and elderly dependency ratios in a population's structure can significantly affect the financial assets of households. Tomić et al. (2019) found that age and family structure have an impact

on consumption behaviours. The following is a theoretical analysis of how the presence of infants and the elderly affects household finances.

2.1. Influence of infants on household finances

In the 1970s, the neoclassical school of economics proposed the classical labour supply theory. According to the theory, the individual labour supply paradigm involves arranging labour and allocating time under given time constraints to achieve maximum utility/satisfaction. In this article, we adapt the theory of personal labour supply to apply to the family, and we assume that family time can be divided into three components: labour, leisure, and time spent caring for infants. Suppose that, during a specific period of time, the total amount of time owned by a family is $\bar{L}$, the income from labour is Y, W stands for the labour wage level, the family's leisure time is l, and the time spent caring for infants is k(when there are no infants in the family or there are family members outside the labour force who can care for the infants, $k=0$). In this equation, it is assumed that infant care can benefit the family when $k>0$.

The utility function of the family can be expressed as follows: $U = U(Y, l, k)$

The constraints are as follows: $Y = w * (\bar{L} - l - k)$

Let $f(Y, l, k) = U(Y, l, k) + \lambda[Y + w * (l + k) - w * \bar{L}]$ when λ is the Lagrange multiplier.

The first order condition of $f(Y, l, k)$ is as follows:

$$\begin{cases} \partial f/\partial Y = \partial U/\partial Y + \lambda = 0 \\ \partial f/\partial l = \partial U/\partial l + \lambda w = 0 \\ \partial f/\partial k = \partial U/\partial k + \lambda w = 0 \\ \partial f/\partial \lambda = Y + w * (l + k) - w * \bar{L} = 0 \end{cases}$$

Assuming that the second-order condition can be satisfied, when the above equation is solved, and the labour supply principle of the family is $\partial U/\partial l = \partial U/\partial k = w * \partial U/\partial Y$, that is, when the marginal utility values of family leisure, infant care, and labour are equal, the utility of the family is considered maximised. When the marginal utility of infant care is high (it can be assumed that the marginal cost of hiring a nanny or caregiver will be high), according to the law of diminishing marginal utility, only by reducing leisure and working time and increasing the time spent caring for infants can the marginal utility of leisure and labour increase and the marginal utility of infant care decrease. Until the three are equal, the conditions for maximising family utility will not be satisfied.

The above deduction shows that, to maximise the total utility of the family's resources, rational parents must sacrifice part of their labour or leisure time to care for their infants. The decrease in working time inevitably leads to a decrease in the family's total income and increase the family's income insecurity. The reduction in leisure time leads to a declining ability/desire to keep up with the latest news in the financial market and master the latest techniques. An increase in the number of infants in a family also increases its expenditures on household necessities (such as milk powder, diapers, and various less-elastic commodities), which results in added

expenses for the family and may lead to a decline in the family's wealth (Ji & Shi, 2020). In addition, due to the physical vulnerability of infants compared to adults, they present a greater risk in terms of healthcare-related costs. According to Keynesian money demand theory, this can enhance the transaction and prevention motivation of families, increase the demand for cash or currency, and eventually lead to reductions in households' investments in other financial assets. Therefore, in this study, we propose the following hypothesis.

> Hypothesis 1: An increase in the proportion of infants in families can reduce households' investments in financial assets by crowding out their labour or leisure time, increasing household expenditures, and increasing the demand for currency.

2.2. Influence of the elderly on household finances

There are several ways in which the presence of the elderly can influence household finances. First is to change risk preferences. According to the life cycle risk aversion theory (Bakshi & Chen, 1994), older people are more risk averse. People are willing to assume risks when they are young because they have a more stable income source, more abundant energy, and a healthier body; thus, they can pursue new endeavours to gain wealth. With increasing age, especially during old age, their physical condition begins to deteriorate, their income decreases, their energy gradually dissipates, their desire for wealth decreases, their aversion to risk increases, and their tolerance for risk weakens. This leads to a tendency to prefer more secure financial assets (Fan & Zhao, 2009). Their cognitive abilities also weaken with age. Investing in risky assets requires someone to be capable of judging the complex situation of the financial market and mastering the latest techniques, which is a continuous learning process. Possessing rich financial knowledge and high levels of financial literacy can reduce the risks associated with investments and improve the returns on them. Cognition and memory decline in older people, as does their ability to acquire new financial knowledge (Ramey et al., 2000). As a result, the elderly tend to prefer safer financial investments. Therefore, in this study, we propose another hypothesis.

> Hypothesis 2: An increase in the proportion of elderly family members can increase a family's likelihood of investing in safe assets and reduce investment in risky assets because of changed risk preferences resulting from weakened cognitive abilities.

3. Models and variables

3.1. Model setting

Whether a household participates in the financial market is a typical 0–1 variable, which is not suitable for estimation with the ordinary least squares method because the discrete explained variables are inevitably related to the error term, resulting in inconsistencies between the estimated results of the parameters and their real values. In addition, if the linear probability model is used, the error term follows a two-point distribution rather than a normal one, and there is a heteroscedasticity problem. Conversely, the discrete selection model is more appropriate in this case, reflecting

the research of Yin et al. (2014), and the probit model is used to analyse the influence of the population's age structure on deposits and risky market participation. The models used are as follows:

$$Y = 1(\alpha_1 Ratio\_infants + \alpha_2 Ratio\_elderly + X\beta + u > 0) \tag{1}$$

where $u \sim N(0, \sigma^2)$; a Y value equal to 1 means that a household is participating in a deposit (risky) market, and a value of 0 means that it is not; $Ratio\_Infants$ represents the proportion of infants in a family; $Ratio\_elderly$ represents the proportion of elderly people in a family; X is a control variable, including family characteristics and regional variables; and α_1, α_2, and β are the parameters.

The proportion of financial assets held by households belongs to the censored data, which are characterised by the fact that, for some observed data, the explained variables are compressed at a point. For example, in our observed data, a large proportion of the households held no financial assets, and there was a corner solution problem. In this case, the probability distribution of the explained variable becomes a mixed distribution composed of a discrete point and a continuous distribution. If the ordinary least squares method is used to estimate whether the whole sample was used or the subsample after the discrete point was removed, a consistent estimate cannot be obtained. Conversely, the tobit model is suitable for use in this situation. Based on the research of Yin et al. (2014), in this study, we used the tobit model to analyse the impact of households' demographic structure on the proportion of deposit (risky) assets among total financial assets. The model used is as follows:

$$y^* = \alpha_1 Ratio\_infants + \alpha_2 Ratio\_elderly + X\beta + u, Y = \max(0, y^*) \tag{2}$$

where Y represents the proportion of households' deposit (risky) assets among total financial assets, y^* represents the observed value of deposit (risky) assets among financial assets between (0, 1), and the other symbols have the same meaning as described above.

3.2. Data and variables

This study is based on survey data from the 2017 China Household Finance Survey (CHFS2017). The survey was conducted by the Survey and Research Centre for China Household Finance. The sample covers more than 40,000 families in 355 counties in 29 provinces in China and includes information on households' demographic characteristics, assets and liabilities, income, and expenditures.

In this study, there are four dependent variables: *deposit, risky, ratio _ deposit,* and *ratio _ risky*. Households' financial assets are divided into 'safe' and 'risky' ones. According to the Report on the Allocation Risk of Household Financial Assets, deposits, stocks, and financial products ranked as the top three asset categories in 2015, accounting for 45.8%, 11.4%, and 7.1% of assets, respectively. Therefore, deposits were selected to represent safe assets in this study, and the risky assets included stocks, financial products, financial derivatives, and gold. *Deposit* indicates whether a family holds a fixed deposit at a bank; it takes 1 for holding and 0 otherwise. *Risky*

indicates whether a family holds risky assets and takes 1 for holding and 0 otherwise. *Ratio_deposit* indicates the ratio of deposits to household financial assets. *Ratio_risky* represents the proportion of risky assets to a household's total financial assets.

The key explanatory variables are *Ratio_elderly* and *Ratio_Infants*. *Ratio_elderly* represents the proportion of the population aged 60 years and above in a family; *Ratio_infants* represents the proportion of the population aged three years and below in a family. Studies have shown that education level, marital status, gender, age, family size, and geographical location have different effects on a family's financial structure: high education levels can reduce the information cost and increase returns on financial investments (Cooper & Zhu, 2016). Education level also affects intergenerational differences in family income (Liu & Faye, 2021); there is a large difference in choices related to risky financial assets between married and single people. Addoum et al. (2017) found that the investments in stocks of retired couples tended to decrease significantly, while those of single people did not change significantly; it was also shown that men are more willing to assume risks than women, and their investment-error tolerance rate is higher (Bucciol et al., 2017; Guiso & Zaccaria, 2021). Mumtaz and Smith (2021) found that different demographics engage in different behaviours; regional financial development can promote investment by families in risky assets by reducing market friction on the supply side and improving families' financial literacy on the demand side (Lu et al., 2019). According to the life cycle theory, risk preferences change with age, and having family members working in the financial industry often gives their family members an information advantage and increases their probability of participating in the stock market. Therefore, the following control variables were selected in this study: *education*, *marital status* (married = 1), *gender* (male = 1), *age*, *size*, *location* (rural area = 1), *Jobfin* (yes = 1), *net assets*, and *per income*. In terms of *per income*, because income from financial assets can have an endogenous impact on a family's financial decision-making processes, property-related income, such as dividends and interest, is not included in the calculation of family income. In terms of data processing, Winsor tailing was carried out on households' *net assets*, *per income*, and total expenditures at the 1% level. After eliminating the samples lacking complete information, a total of 18,972 family samples were obtained. The details of the variables are listed in Table 1.

4. Empirical analysis

4.1. Benchmark regression

In this study, probit and tobit models were used to test the influence of the population's age structure on families' financial market participation and asset allocation, respectively. Table 2 presents the estimated results. Columns (1) and (2) show the impact of the population's age structure on risky and deposit market participation, respectively. Columns (3) and (4) show the impact of age structure on the proportion of these two assets to the total financial assets of households, respectively. In columns (1)–(4), the proportion of infants is significantly negative at the level of at least 5%. The proportion of the elderly in columns (1) and (3) is significantly negative at the

Table 1. Descriptive statistics of the data.

Type	Variable	Description	Obs	Mean	S.D.	Min	Max
Dependent Variable	Deposit	Household owns deposit assets or not	18972	0.17	0.37	0	1
	Risky	Household owns risky assets or not	18972	0.06	0.23	0	1
	Ratio_deposit	Ratio of deposits	18972	0.10	0.26	0	1
	Ratio_risky	Ratio of risky assets	18972	0.02	0.10	0	1
Explanatory Variables	Ratio_elderly	Proportion of elderly	18972	0.40	0.43	0	1
	Ratio_infants	Proportion of infants	18972	0.02	0.06	0	0.50
Control Variable	Education	Education level of head of household	18972	9.07	4.24	0	22
	Marital status	Marital status of head of household	18972	0.79	0.41	0	1
	Gender	Gender of head of household	18972	0.74	0.44	0	1
	Age	Age of head of household	18972	56.82	14.35	18	117
	Size	Household size	18972	2.88	1.51	1	15
	Location	Whether household location is in rural or urban area	18972	0.35	0.48	0	1
	Jobfin	Whether a family member works in finance	18972	0.03	0.17	0	1
	Net assets	Net assets of household	18972	74.06	105.30	0.13	400.41
	Per income	Per capita income of household	18972	2.44	2.36	0.06	8.81
Influencing Mechanism Variables	Ratio_labour	Ratio of labour market participation to number of family members	18972	0.25	0.31	0	1
	Per_hours	Per capita working hours	18972	11.82	16.36	0	140
	Ratio_exp	Ratio of expenditures to income	14124	1.19	3.90	0.01	53.52
	Ratio_cash	Ratio of cash to total income	18972	0.25	1.64	0	59.50
	Risk attitude	Risk preferences of head of household	15547	1.92	1.19	1	5
	F_attention	Financial attention level	17973	2.02	1.12	1	5
	F_literacy	Financial literacy level	18972	2.06	1.46	0	6

Source: Authors' research.

level of at least 5%, and the proportion of the elderly in columns (2) and (4) is significantly positive at the 1% level.

This result shows that the influence of a population's age structure on both market participation and the proportion of households holding a type of asset is homogeneous. As the proportion of infants increases, the probability and proportion of households holding risky assets decrease, and the amounts of deposit assets are similar. As the proportion of elderly family members increases, the probability and proportion of households holding risky assets decrease, while the probability and proportion of households holding deposit assets increase. The conclusions above preliminarily verify the hypothesis mentioned above; the influencing mechanism of infants and the elderly will be tested in the following section.

The following is an illustration of the estimated results for the control variables in Table 2. As the age of the head of household increases, the amount of assets devoted by households to risky assets decreases, and their preference for deposit assets increases. An increase in a household's per capita income or net assets increases the probability of a family participating in the financial market, which reflects the fact that a family's income has an impact on the behaviours of family members (Radetić-Paić & Černe, 2020). Married people are more likely to participate in the financial

Table 2. Influence of the population's age structure on households' financial asset selection.

	Risky (1) Probit	Deposit (2) Probit	Ratio_risky (3) Tobit	Ratio_deposit (4) Tobit
Ratio_infants	−0.599**	−0.673***	−0.501***	−0.644***
	(0.282)	(0.192)	(0.193)	(0.181)
Ratio_elderly	−0.146***	0.412***	−0.081**	0.409***
	(0.055)	(0.038)	(0.034)	(0.028)
Age	−0.006***	0.006***	−0.002	0.006***
	(0.002)	(0.001)	(0.001)	(0.001)
Per income	0.057***	0.051***	0.031***	0.046***
	(0.007)	(0.007)	(0.006)	(0.005)
Net assets	0.002***	0.001***	0.002***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Size	−0.018	0.016	−0.007	0.009
	(0.013)	(0.012)	(0.013)	(0.009)
Gender	0.056	0.044	−0.003	0.038
	(0.057)	(0.040)	(0.029)	(0.026)
Marital status	0.127**	0.199***	0.052	0.191***
	(0.050)	(0.037)	(0.037)	(0.031)
Education	0.084***	0.034***	−0.479***	−0.122***
	(0.006)	(0.004)	(0.059)	(0.026)
Location	−0.679***	−0.119***	0.055***	0.029***
	(0.091)	(0.035)	(0.004)	(0.003)
Jobfin	0.285***	−0.158**	0.161***	−0.165***
	(0.075)	(0.076)	(0.051)	(0.061)
Constant	−2.975***	−1.931***	0.715***	0.969***
	(0.090)	(0.076)	(0.021)	(0.015)
N	18972	18972	18972	18972
Pseudo R^2	0.264	0.073	0.244	0.059

Note: The standard errors of robustness clustering at the provincial level are shown in parentheses;.
***, * *, and * are significant at the 1, 5, and 10% levels, respectively. The regression coefficients are reported in the table. The same is reflected below. Source: Authors' research.

market, which may be due to the more abundant financial resources of married couples. Interestingly, higher levels of education appear to encourage heads of household to acquire financial assets, but the effect on the proportion of risky and deposit assets is negative. It is worth noting that the probability of rural households participating in risky and deposit markets is lower than that of urban ones, which reflects the fact that the probability of household participation in the financial market is affected by the development of inclusive financing.

4.2. Heterogeneity analysis

Families' wealth levels are closely related to their well-being. Increased wealth can promote higher levels of household consumption, thus bringing a higher utility level to families (Huang & Tu, 2009). However, some scholars have found that, due to increased financial leverage, wealthy families tend to have a faster growth rate of wealth, which perpetuates an ever-widening wealth gap between families (Wu et al., 2016). Therefore, it is important to question whether the age structure of the population is the cause of the widening wealth gap. In other words, does the age structure of a population have the same effect on the financial asset selection of families with different wealth levels? To answer this question, the sample in this study was divided into three groups according to families' levels of net assets, and the influence of infants and the elderly on choices related to families' financial assets was tested. The results are shown in Table 3.

Table 3. Influence of a population's age structure on households' choices related to financial assets according to wealth level.

	Risky	Deposit	Ratio_risky	Ratio_deposit
Panel A: Households with low net worth				
	(1)	(2)	(3)	(4)
Ratio_infants	0.357	−0.655**	−0.641	−0.496**
	(1.150)	(0.280)	(1.203)	(0.202)
Ratio_elderly	0.261	0.432***	0.493	0.555***
	(0.201)	(0.076)	(0.351)	(0.095)
N	6324	6324	6324	6324
R^2	0.168	0.097	0.155	0.084
Panel B: Households with moderate net worth				
	(5)	(6)	(7)	(8)
Ratio_infants	0.148	−0.674***	0.023	−0.693**
	(0.485)	(0.255)	(0.481)	(0.337)
Ratio_elderly	−0.172	0.455***	−0.092	0.478***
	(0.119)	(0.056)	(0.090)	(0.051)
N	6324	6324	6324	6324
R^2	0.163	0.041	0.150	0.037
Panel C: Households with high net worth				
	(9)	(10)	(11)	(12)
Ratio_infants	−0.939***	−0.371	−0.599***	−0.529
	(0.298)	(0.502)	(0.204)	(0.759)
Ratio_elderly	−0.179***	0.469***	−0.104***	0.394***
	(0.057)	(0.056)	(0.038)	(0.035)
N	6324	6324	6324	6324
R^2	0.145	0.031	0.126	0.029

Source: Authors' research.

The results in Table 3 show that, the richer a family is, the greater the impact of infants on investment in risky assets is, and the lower their impact is on deposit assets. Taking care of infants takes up a family's work or leisure time, and investments in risky assets require a lot of energy. Therefore, investment in risky assets has a crowding-out effect. Generally, the richer a family is, the more types of financial assets it holds. An increase in spending on the care of infants is negligible for wealthy families. Therefore, the increase in the proportion of infants in Panel C would not significantly reduce household investments in deposit assets. The presence of elderly family members has no significant impact on investments in risky assets among middle- and low-income families, but it significantly reduces investments in risky assets among well-off families. This reflects the fact that, the richer a family is, the more likely it is to invest in risky assets. The results show that the influence of a population's age structure on financial assets is not the same in families with various levels of wealth.

4.3. Robustness test

To avoid drawing accidental conclusions, the data and variables in the benchmark regression were changed as follows: (1) Risky assets were replaced by stocks, and the proportion of risky assets was replaced by the proportion of stocks; (2) Considering the increase in average life expectancy, the benchmark for defining the 'elderly' was raised from 60 to 65 years of age; and (3) The proportion of infants was replaced by the number of infants. Table 4 presents the results. The conclusions of this study did not change substantially.

Table 4. Robustness test results.

	(1) Stocks	(2) Deposit	(3) Ratio_stocks	(4) Ratio_deposit
Number of infants	−0.185***	−0.175***	−0.139***	−0.165***
	(0.062)	(0.046)	(0.051)	(0.043)
Ratio_elderly (≥65)	−0.223***	0.378***	−0.114***	0.370***
	(0.083)	(0.032)	(0.039)	(0.028)
Control variable	Yes	Yes	Yes	Yes
N	18972	18972	18972	18972
Pseudo R^2	0.274	0.071	0.256	0.057

Source: Authors' research.

4.4. Endogeneity discussion

The previous regression results did not consider control variables that could have endogeneity problems, such as the causality between the allocation of financial assets and the net assets of households. In other words, the scale of a household's net assets may affect choices regarding the investment of financial assets, and investment profits may affect the scale of a household's net assets. If this effect exists, the benchmark regression results will be biased. Therefore, referring to the treatment methods of Fan and Wang (2015), in this study, we used the mean value of a community's households' net assets as the instrumental variable for net assets for the regression. The implicit assumption of this method is that the investment situation of a family's financial assets will not affect the average net assets of other families within the same community. Table 5 presents the regression results.

The Wald test of exogeneity in Table 5 shows that the results in columns (1) and (3) contradict the original hypothesis without endogeneity at the 1% level, while those in columns (2) and (4) cannot be used as the basis for rejecting it. This shows that a household's net assets have an endogenous impact on investment in risky assets, while there is no endogenous effect on investment in deposit assets. It can be concluded that the regression results of the core explanatory variables are essentially consistent with those in the previous paper, showing that the previous conclusions are robust.

5. Influencing mechanism

5.1. Impact of infants on households' allocation of financial assets

As stated above, the mechanism through which infants influence families' allocation of financial assets is as follows. On the one hand, with an increase in the number of infants in a family, the family's labour supply, leisure time, and income decrease. On the other hand, the presence of infants increases the household's material needs and the need for cash, which finally leads to a decline in the household's investment in various financial assets. To verify whether this mechanism is tenable, in this study, we selected four indicators as explanatory variables: the proportion of employed people within a family, the average time spent working per week, the proportion of total household expenditures to total income, and the proportion of cash to total income. The regression results of these variables on the proportion of infants within a family are shown in Table 6.

Table 5. Regression results of instrumental variables.

	Risky (1) IVProbit	Deposit (2) IVProbit	Ratio_risky (3) IVTobit	Ratio_deposit (4) IVTobit
Ratio_infants	−0.286*	−0.672***	−0.486**	−0.644***
	(0.167)	(0.194)	(0.248)	(0.181)
Ratio_elderly (≥65)	−0.206***	0.403***	−0.283***	0.401***
	(0.029)	(0.036)	(0.051)	(0.032)
Net assets	0.011***	0.002	0.017***	0.002
	(0.000)	(0.001)	(0.002)	(0.001)
Control variable	Yes	Yes	Yes	Yes
N	18972	18972	18972	18972
Wald test of Exogeneity chi^2(1)	130.31	0.25	51.15	0.27
Wald test of exogeneity P value	0.000	0.618	0.000	0.607

Source: Authors' research.

Table 6. Influencing mechanism of the effect of infants on households' allocation of financial assets.

	(1) Ratio_labour	(2) Per_hours	(3) Ratio_ exp	(4) Ratio_cash
Ratio_infants	−0.347***	−17.827***	1.224**	0.611***
	(0.031)	(1.640)	(0.440)	(0.121)
Control variable	Yes	Yes	Yes	Yes
N	18972	18972	14124	18972
R^2	0.336	0.244	0.075	0.021

Source: Authors' research.

At the significance level of 1%, column (1) shows that an increase in the proportion of infants in a family leads to a decrease in the proportion of employed people, while column (2) shows that an increase in the proportion of infants squeezes the labour supply time of the family, thus reducing its total income. At the 5% significance level, column (3) shows that an increase in the proportion of infants in a family increases the proportion of total household expenditures to total income. This reflects the fact that the presence of infants causes a decrease in family income and an increase in expenditures, which is consistent with the results of the previous theoretical analysis. In addition, column (4) shows that an increase in the proportion of infants leads to an increase in the proportion of cash to total income in households. This shows that an increase in the proportion of infants enhances the transaction and prevention motivation of families; that is, because the liquidity preferences of families are changed, families tend to reduce the allocation of wealth to other financial assets. The conclusions above indicate that Hypothesis 1 is supported.

To further verify the mechanism by which the presence of infants affects the allocation of households' financial assets, in this study, we classified the samples according to whether there were people over 60 years old within a family. Generally, the presence of infants in families with elderly people has less of an impact on the labour supply because those over 60 have reached the legal retirement age; thus, they can care for infants, allowing the younger adults to participate in the labour force. As shown in Table 7, in the sample with no people aged 60 and above (panel A), the influence of infants on the holding and proportion of investments is significantly negative at the 5% level, regardless of whether we are examining risky or deposit assets. However, in the sample of families with people aged 60 and above in the household (panel B), the impact of infants is not significant for risky or deposit

Table 7. Impact of care provided by the elderly for infants on financial assets.

	Risky	Deposit	Ratio_risky	Ratio_deposit
Panel A: No elderly people are present to care for infants				
	(1)	(2)	(3)	(4)
Ratio_infants	−0.708**	−0.566***	−0.811***	−0.566***
	(0.293)	(0.187)	(0.287)	(0.187)
N	8808	8808	8808	8808
R^2	0.252	0.050	0.247	0.050
Panel B: Elderly people are present to care for infants				
	(5)	(6)	(7)	(8)
Ratio_infants	−0.760	−0.548	−0.687	−0.549
	(0.600)	(0.439)	(0.635)	(0.439)
N	10164	10164	10164	10164
R^2	0.255	0.094	0.248	0.094

Source: Authors' research.

assets. This further proves that there are, indeed, channels through which infants influence the allocation of households' financial assets by crowding out families' labour or leisure time.

5.2. Impact of elderly people on households' allocation of financial assets

The theoretical analysis above shows that the presence of the elderly influences the allocation of families' financial assets through the changes in their risk preferences resulting from declining cognitive abilities. To verify the existence of this influencing mechanism, for this study, we selected explained variables from these two perspectives for regression, and the core explanatory variable was whether a head of household was considered 'old'. There were two questions related to risk-related attitudes on the questionnaire, the responses to which are expressed as *Invest attitude* and *Lottery choice*. Cognitive ability was measured by *F_literacy* and *F_attention*. Financial literacy was measured using the sum of the correct answers to three questions about the 'interest rate, inflation, and investment risk' on the questionnaire (Yin et al., 2014). The higher the financial attention value was, the more attention the head of household was assumed to pay to financial information.

As can be seen from Table 8, the influence of being elderly on risk preferences was significantly negative, as was the impact on cognitive ability. Specifically, in terms of risk preferences, column (1) shows that, compared with young and middle-aged people, the elderly showed a significantly reduced preference for risky investments. Column (2) shows that the elderly were more averse to uncertainty than young and middle-aged people. Column (3) shows that being elderly had a negative correlation with financial literacy; column (4) shows that the elderly paid significantly less attention to financial topics than younger people. All the results above show that advanced age has an impact on households' allocation of financial assets through changes in risk preferences resulting from declining cognitive abilities. Therefore, Hypothesis 2 was verified.

6. Conclusions and suggestions

The research results of this study are as follows: (1) an increase in the proportion of infants worsens the financial situation of families and reduces investment in both

Table 8. Influencing mechanism of the effect of elderly people on households' allocation of financial assets.

	(1) Invest attitude	(2) Lottery choice	(3) F_literacy	(4) F_attention
Elderly	−0.500***	−0.065***	−0.316***	−0.068***
	(0.026)	(0.010)	(0.019)	(0.017)
Control variable	Yes	Yes	Yes	Yes
N	15547	15956	18972	17973
R^2	0.110	0.013	0.169	0.116

Source: Authors' research.

deposit and risky assets; (2) Advanced age encourages heads of household to invest in safe assets instead of risky ones; (3) In rich families, the influence of infants and the elderly on investment in risky assets is especially obvious; in poor families, the impact of infants on deposits is more obvious; (4) The mechanism through which the presence of infants affects families' finances mainly stems from their tendency to squeeze a family's labour and leisure time, worsen the balance of payments, and change liquidity preferences; and (5) The mechanism through which advanced age affects a family's finances mainly stems from elderly people's tendency to have a reduced preference for risk and impaired cognitive abilities. In the context of low fertility rates and rapid aging, optimising the structure of families' financial assets is of vital importance for both improving families' well-being and ensuring future pension security.

It should be noted that, in the empirical results showing the influence of advanced age on household finances, owing to the cross-sectional survey data in this study, it was difficult to distinguish between the proportion stemming from the aging effect and that from the intergenerational difference effect.[2] Although a variety of indicators were used to measure the influencing mechanism, the research results of this study should be further updated with the addition of micro-level household data in the future.

6.1. Practical implications

Against the background of shrinking family sizes and an increasing pension burden, citizens' level of risk tolerance and demand for financial assets have been negatively impacted. When formulating long-term economic policies, the government should pay attention to the evolving trends in the age structure of the population and take steps to alleviate the impact of the increased pension burden on the financial market (Wang et al., 2019). This study shows that changes in the population's age structure are having a negative impact on household finances. Although we cannot alter the trend in the population's age structure in the short term, the impact may be partially mitigated by taking the following measures.

First, the government should strengthen the standardised management of the capital market and lower the financial investment threshold. Investment in risky assets by families is inseparable from their ability to judge complex situations in the financial market. A lot of time and energy are required to learn and master the latest financial information. This study showed that caring for infants tends to squeeze a family's time resources, and the cognitive abilities of the elderly tend to decline over time. Therefore, the government should increase the transparency of information and

reduce the threshold for participation in risky markets and the time cost of acquiring financial information to alleviate the phenomenon of 'limited participation'.

Second, the government should increase birth subsidies. The results of this study show that the increased expenditures involved in caring for infants are an important factor contributing to reduced investment in financial assets by families. Against the background of a low fertility rate and a declining birth rate in China, an increase in maternity allowances would not only encourage families to have more children and alleviate the future population crisis, it would also reduce the crowding-out effect of infants on households' investment in financial assets. Optimising households' financial investments and improving families' well-being will be of vital importance to the country's future economic health.

Finally, more attention should be paid to the financial investments of the elderly, thus the dissemination of financial knowledge to the elderly should be encouraged and the supply of financial products targeted to the elderly should be increased. David-West et al. (2020) pointed out that changes in the age structure of a population change the demand for financial services. In the context of an increasing proportion of the elderly, improvements in financial literacy can partly offset the negative effects of aging on venture capital investment. The government should provide training on financial asset investment for the elderly; increase citizens' understanding of stocks, funds, risks, and returns; and encourage elderly people to optimise their allocation of financial assets. Eventually, their dependence on government pensions would decline, and future pension security would be guaranteed.

Notes

1. Zeping Ren, Evergrande Research Institute. 'the Chinese Finance Report 2020: The challenges of fewer children and aging', http://finance.sina.com.cn/china/gncj/2020-02-25/doc-iimxyqvz5539802.shtml
2. The aging effect refers to the fact that, with increased age, households tend to increase investment in safe assets and reduce investment in risky ones. The intergenerational difference effect refers to the fact that people born in different times have different investment characteristics due to exposure to different growth and education environments.

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