The Impact of Population Aging on Commercial Insurance Purchasing Behavior: Evidence from China

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Abstract: *As the problem of population aging in China exacerbates, the impact of population aging on commercial insurance purchase behavior has become an increasingly important issue. Based on CHFS data in 2017 and the Probit model, this paper empirically explores how population aging will affect commercial insurance purchasing behavior. It is found that with the increase of the proportion of the elderly aged 65 and above in the household, the possibility of the household purchasing commercial insurance is significantly reduced, which may further hinder the development of China's insurance market. Besides, the age of the head of household and whether the household is located in rural areas have a significant negative impact on the purchasing of commercial insurance. The marriage status of the head, education level of the head, family size, total assets, and financial market participation of the household have a significant positive impact on the purchasing of commercial insurance. Finally, based on the analysis and judgment of the regression results, this paper puts forward corresponding suggestions from the government, insurance companies, and households.*

Keywords: *Population Aging, Commercial Insurance, Probit Model, CHFS Data*

1. Introduction

After the Reform and Opening-up in 1978 and the restoration of commercial insurance in 1980, the scale of China's insurance industry has gradually expanded and now it has become the second-largest insurance market in the world. The government proposed that China should transform itself from a large insurance country into a powerful insurance country. This means that although China is the second-largest insurance market in the world, the insurance density and insurance depth are still far behind the level of developed countries. Only 14.99 percent of households in China are insured by commercial insurance, according to the China Household Finance Survey (CHFS), a 2017 survey by the China Household Finance Survey and Research Center. It is of great significance for the development of China's insurance industry to explore the fundamental causes of insufficient insurance consumer demand.

China began to enter the aging society in 2001. According to international standards, a country has entered a period of population aging when 7% of its population is 65 years or older. According to the National Bureau of Statistics (NBS), the number of people aged 65 and above in China reached 175.99 million in 2019, accounting for 12.6 percent of the country's total population. However, the combination of the low birth rate and the low death rate has made the problem of elderly care more and more important in China.

Insurance is an important part of the old-age security system. At present, China has initially established a three-pillar system of old-age security. The first pillar is social endowment insurance, the second is enterprise annuity and occupational annuity, and the third is commercial insurance. Social endowment insurance covers a wide range, but the degree of security is low, which cannot well meet the needs of people for pension. According to the Statistical Bulletin of the Ministry of Human Resources and Social Security (MOHRSS) in 2018, only 87,400 enterprises have established enterprise annuity or occupational annuity, and the scale of establishment is small, so it is difficult to rely on the second pillar to achieve pension security in a short time. As the third pillar of the pension system, commercial insurance plays a supplementary role in guaranteeing elderly people's lives in their later years.

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insurance in China, it is of great benefit to study the influencing factors of family demand for commercial insurance to alleviate the pressure of the elderly and promote the development of commercial insurance. This paper uses CHFS2017 data and establishes a Probit model to analyze the impact of aging on the purchasing behavior of commercial insurance by households, to provide suggestions and inspiration for the future development of commercial insurance from an empirical perspective.

2. Literature review

Many scholars have studied the factors that influence insurance purchasing behavior. Vince E. Showers & Joyce A. Shotick (1994) used relevant data from the United States to analyze the impact of household characteristics on insurance demand with the Tobit model. The study found that family income, the number of income recipients, the age of the head of the household, and the family size all have a significant positive impact on the insurance demand, but with the increase of the family size and the age of the head, the marginal growth of the household insurance consumption presents a decreasing trend. The study of Lin S. (2019) found that households with stronger residents' happiness have higher purchase intention of commercial insurance, and subjective happiness and attitude will have an interactive influence. Also, financial literacy and the use of the Internet (Ya G., 2019) have a positive impact on household commercial insurance purchasing behavior. Due to the existence of the gap between urban and rural resources, the demand for commercial insurance presents different situations between the two regions. Mark J. Browne, Kihong Kim. (1993), discusses the factors affecting demand difference countries, including the dependency ratio, national income, government spending on social security, inflation and the national religious beliefs, etc., finally found that national income and wealth and the insurance demand positively correlated relationship, inflation expectation is to exert a negative impact.

Some scholars have begun to explore the relationship between population and insurance purchasing behavior. For example, Jin X. (2019) used provincial panel data to analyze the impact of China's population structure on insurance demand and examined factors including the old-age dependency ratio, young child dependency ratio, population culture, family, urban and rural areas, and marriage structure, etc. Ding R. (2019) studied the influence of aging on the participation of urban and rural families in commercial insurance from three aging judgment indicators. The results showed that aging will reduce the willingness of urban and rural families to buy commercial insurance, and there are differences between urban and rural households. Minghua Z. (2014) believes that the impact of population aging on China's social security system, and then the population aging will bring great development opportunities to commercial insurance. Luman X. et al. (2014) analyzed the situation of population aging in China and proposed that population aging will stimulate the demand for commercial medical insurance. Kehang L. (2019) established the optimal fitting model and concluded that the demand for commercial health insurance in China increased with the deepening of aging.

Combined with the current aging situation in China, this paper discusses the factors that affect the purchasing behavior of household commercial insurance from a new perspective, which is beneficial to the development of commercial insurance in China and to relieve the pressure of the aging population. The possible innovation of this paper is to explore the impact of aging on household commercial insurance demand in China by using the data of national representative households at the micro-level and selecting two different indicators.

3. Data, variable selection, and descriptive statistical analysis

3.1 Data Sources

This paper selects the data of the national household finance survey conducted by the China Household Finance Survey and Research Center of Southwestern University of Finance and Economics in 2017. This survey has been conducted every two years since 2011, and there have been four rounds of surveys so far. The project recruited college students as drafters, visiting investigators, and measurement and control personnel. In 2017, the survey was conducted in 29 provinces, including autonomous regions and municipalities directly under the central government, and 355 counties and 1428 village (neighborhood) committees were visited. A total of 40,011 households were collected, which was representative of the national household and traceable for follow-up.

3.2 Variable Selection

3.2.1 Explained variable

This paper studies the impact of population aging on commercial insurance purchasing behavior, so the explained variable is whether the household has commercial insurance. The CHFS2017 has questions one by one for the usage of household members to purchase commercial insurance, but the research object of this paper is the influencing factors of the whole family purchasing commercial insurance, therefore, as long as households surveyed have any household members buy any kind of commercial insurance will treat the household holds commercial insurance. When the variable have_ins is 1, it means that the household has commercial insurance. When the variable have_ins is 0, it means that the household does not have any commercial insurance.

3.2.2 Core explanatory variables

The main research purpose of this paper is to explore the impact of aging on the purchase of commercial insurance by households. Therefore, two core explanatory variables are set. One is whether there are elderly people aged 65 or above in a household, and the other is the proportion of elderly people aged 65 or above in a household. When the value of the variable old is 1, it means that there are elderly people aged 65 and above in the household, and 0 of old means that there are no elderly people in the household. The pro_old variable counts the proportion of the elderly population aged 65 or above in the household, and the specific value represents the current situation of aging in a household.

3.2.3 Control variables

In reference to previous studies, this paper controls the following factors that may influence households to take out commercial insurance policy. It can be divided into individual statistical characteristics, household statistical characteristics, and the holding situation of social security.

3.3 Control Variables Analysis

3.3.1 Personal statistical characteristics

The age, gender, and education level of the head of the household were included as influencing factors. The age of the head of household is represented by head_age. According to the actual age of the head of the household. The head_gen represents the gender of the head of the household. According to the general rule, the male is assigned 1 and the female is assigned 0. Head_ mar is the marital status of the head of household, we put the "single", "married", "cohabitation", "separation", "divorce", " widowed", and "remarried" assignment 1,2,3,4,5,6, and 7 respectively. Head_edu refers to the education level of the head of the household. Referred to the study of Ding R. (2019), we set the "illiteracy", "primary school", "high school, technical secondary school, or vocational high school", "junior college/vocational high school", "undergraduate", "master", and "doctor" as 0,6,9,12,15,16,19, and 22 respectively.

3.3.2 Household statistical characteristics

Fam_size is used to represent the family size, which is calculated according to the actual household population. Total_asset refers to the total assets owned by a household. According to the interpretation of data provided by the China Household Financial Survey and Research Center, the total assets of a household include non-financial assets and financial assets. Non-financial assets include agricultural assets, industrial and commercial assets, land assets, real estate, vehicle assets, and other non-financial assets. Financial assets include social security account balance, cash, deposits, stocks, funds, bonds, derivatives, financial management, foreign currency assets, gold, other financial assets, and loans. Considering the possible differences between urban and rural areas, this paper also sets the variable "rual" to study the difference of commercial insurance purchase intention between urban and rural households, rural values 1 means of households in rural areas, and taking 0 represents households in urban areas. Hongyang W. (2017) believes that according to international experience, with the growth of total household financial assets, the proportion of household commercial insurance is bound to increase, but at present, there is a lack of sufficient empirical test in China. In the second part of the Chinese Household Finance Survey Questionnaire, Assets and Liabilities, there is a special section to investigate the holding situation of household financial assets. This paper also explores the relationship between family financial market participation and households' commercial insurance purchasing behavior. When the value of variable " finance " is 1, it means that the household holds stocks, funds, or financial products, etc. If the value is 0, it means that the household does not participate in the relevant financial market.

3.3.3 The holding situation of social security

The holding situation of social security will also affect the purchase of commercial insurance by households. There are questions in the questionnaire to ask the types of social endowment insurance and social medical insurance that family members participate in one by one. Therefore, as long as one family member participates in any social endowment insurance and social medical insurance, the household is considered to have social endowment insurance and social medical insurance. Variables se_ins and sm_ins represent whether a household holds social endowment insurance and social medical insurance. If the value is 1, it has, while 0 does not.

Table 1 Variable Table.

Variables	Definition	Assignment
have_ins	Whether the household has commercial insurance	1-have; 0-otherwise
old	Whether the household has an elderly person over 65 years old	1-have; 0- otherwise
pro_old	The proportion of the elderly in the household population	the number of elderly population / the number of the household population
head_age	Age of head of household	The actual age of the head of household
head_gen	Gender of the head of household	1-male; 0-female
Head_mar	Marital status of head of household	"single" "married" "cohabitation" "separation" "divorce" " widowed" "remarried"-1,2,3,4,5,6,7
head_edu	The educational level of head of household	"illiteracy", "primary school", "high school ", "junior college ", "undergraduate ", "master ", "doctor "-0,6,9,12,15,16,19,22
fam_size	The size of a family	The actual population of family
total_asset	Total household asset	The actual asset of household
finance	Whether households hold financial assets	1-hold; 0- otherwise
rural	Whether the household is a rural household	1-yes; 0-no
se_ins	Whether households hold social endowment insurance	1-hold; 0- otherwise
sm_ins	Whether households hold social medical insurance	1-hold; 0- otherwise

3.4 Descriptive Statistical Analysis

Descriptive statistical analysis of variables. As it can be seen from Table.2, a total of 40,011 households were sampled in this paper, with good national representation. From the perspective of individual statistical characteristics, the average age of the head of the household is 55 years old, the youngest head of the household is only 3 years old, and the oldest is 117 years old. About 80 percent of households are headed by men, reflecting the current reality in China. On average, the head of the household has a junior high school education or above. However, only 12.3% of households participate in the financial market, indicating that China's financial participation is insufficient, and it is necessary to extensively publicize financial knowledge and cultivate national financial literacy. 38.7% of the households have elderly people aged 65 or above, and the average proportion of the elderly in the household is 24.1%, reflecting the current aging pressure in China. From the perspective of family size, the average number of a household is about 3, and the largest family size is 11 people. 31.8% of the 40,011 households were located in rural areas. When the survey was conducted in 2017, the average total asset of the household was 1,126,436.1 yuan. Since the total assets of households include non-financial assets and financial assets, the gap between the maximum and minimum values is too large. Therefore, the mean value may be greatly affected by the extreme value. Finally, it is worth mentioning that China's social endowment insurance and social medical insurance cover a wide range of households. 92.8% of the households have participated in social endowment insurance and 96.4% of the households have social medical insurance.

Descriptive statistical analysis of the elderly population and households holding commercial insurance. Since this paper mainly studies the impact of aging on the purchase of commercial endowment insurance by households, the relationship between the elderly population and household commercial insurance consumption is firstly observed from the perspective of descriptive statistics. The results are reflected in Table.3. It can be seen that only 3.67% of households with elderly people aged 65 and above have purchased commercial insurance. Whether there are elderly people aged 65 and above in the

household has a significant influence on the purchase of commercial insurance.

Table 2 Descriptive Statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
have_ins	39,240	.15	.357	0	1
old	40,011	.387	.487	0	1
pro_old	40,011	.241	.369	0	1
head_age	40,000	55.202	14.249	3	117
head_gen	40,010	.793	.405	0	1
head_mar	39,966	2.399	1.237	1	7
head_edu	39,958	9.274	4.162	0	22
fam_size	40,011	3.174	1.552	1	15
total_asset	40,011	1,126,436.1	2,308,232.5	0	30,000,000
finance	40,011	.123	.328	0	1
rural	40,011	.318	.466	0	1
sm_ins	39,793	.964	.185	0	1
se_ins	37,882	.928	.258	0	1

Table 3 Elderly Population & Commercial Insurance.

	old=1	old=0
have_ins=1	3.67%	11.32%
have_ins=0	35.01%	50.01%
Obs	15,175	24,065

The relationship between the proportion of elderly people in a household and the purchasing behavior in commercial insurance is statistically significant, as shown in Table.4 below. First of all, only 14.99% of households have commercial insurance, indicating that the current consumer demand for commercial insurance in China is insufficient. Secondly, with the increasing proportion of the elderly population in the household, the situation of purchasing commercial insurance in the household has decreased significantly. Especially when the proportion of the elderly population reaches 75%, the number of families choosing not to buy commercial insurance increases greatly, which is probably due to the excessive pressure of family labor to support the elderly and children.

Table 4 Proportion of Elderly Population & Commercial Insurance.

pro_old	0-24%	25%-49%	50%-74%	75%-100%
have_ins=1	12.11%	1.65%	0.67%	0.56%
have_ins=0	54.36%	8.21%	6.68%	15.73%
Obs	26,086	3,870	2,882	6,193

4. Empirical analysis

This section introduces the model used in this paper and analyzes the regression results. It is no longer a simple unary linear regression problem to study whether a household owns commercial insurance. The have_ins value is 0 or 1, which is a binary regression problem. Therefore, the Probit model is used in this paper. Based on the existing research literature, the following model is constructed to analyze the impact of aging on purchasing behavior of commercial insurance.

$$\text{Probit (have\_ins=1)} = \alpha + \beta 1 \cdot \text{old} + \beta 1 \cdot \text{pro\_old} + \gamma \cdot X_i + \varepsilon \tag{1}$$

Have_ins is set as 1 to indicate that the household has commercial insurance, the core explanatory variables are old and pro_old, X_i represents the control variables mentioned above, and ε represents the random disturbance term.

This paper uses the CHFS2017 data and uses Stata.14 to process the data and variables. After passing the multicollinearity test (VIF), we conducted Probit regression, and the regression results are shown in Table.5.

Table 5 Probit Model Regression Results.

have_ins	Coef.	St. Err.	T-value	P-value	[95% Conf. Interval]		Sig
old	.115	.036	3.24	.001	.046	.185	***
pro_old	-.552	.061	-9.08	0	-.671	-.433	***
head_age	-.012	.001	-13.39	0	-.013	-.01	***
head_gen	-.029	.023	-1.28	.199	-.073	.015	
Head_mar	.033	.009	3.86	0	.016	.05	***
head_edu	.02	.003	7.58	0	.015	.026	***
fam_size	.058	.007	8.47	0	.045	.072	***
ln(total_asset)	.121	.006	20.30	0	.11	.133	***
finance	.459	.024	19.14	0	.412	.506	***
rural	-.059	.023	-2.63	.009	-.103	-.015	***
sm_ins	-.067	.056	-1.19	.234	-.177	.043	
se_ins	.165	.04	4.12	0	.086	.243	***
Constant	-2.535	.105	-24.19	0	-2.74	-2.33	***
Mean dependent var			0.150	SD dependent var			0.357
Pseudo r-squared			0.118	Number of obs			36935
Chi-square			3699.866	Prob > chi2			0.000
Akaike crit. (AIC)			27564.661	Bayesian crit. (BIC)			27675.381

*** p<.01, ** p<.05, * p<.1

First, the results of the Probit regression show that except head_gen and sm_ins variables, which are not significant at the significance level of 1%, the other variables all have a significant influence on the household purchasing behavior of commercial insurance. The gender of the head of a household has no significant influence. The reason may be that whether a household purchases commercial insurance or not is mainly due to the cognition and recognition of insurance, and the purchase of commercial insurance requires comprehensive consideration of all aspects of the household, and gender difference is not a significant influence reason. However, it can be seen that the possibility of buying commercial insurance is negative when the household head is male. This may be because about 80% of households are headed by men. It is generally believed that women have a more cautious attitude towards risk, so the possibility of purchasing commercial insurance for men decreases accordingly. Whether a household has social health insurance or not has no significant effect on the purchase of commercial insurance. According to Zhang Lei et al. (2020), this may be because there is a surrogate relationship between social medical insurance and commercial insurance to some extent. Therefore, households that purchase social medical insurance no longer participate in commercial insurance.

Secondly, The core explanatory variable whether the family has the elderly has a significant positive impact on the purchase of commercial insurance, and the proportion of the elderly population in the household has a significant negative impact, which is consistent with the aforementioned descriptive statistical analysis results. When there are elderly people aged 65 and above in the household, the possibility of purchasing commercial insurance is positive. Although this effect is significant, this variable only judges whether there are elderly people aged 65 and above in the household, and does not consider the number and proportion of the elderly. This means that the insurance purchasing behavior may not occur because of the existence of the elderly, thus there is a certain deviation. But this positive effect is still worthy of our attention and research. With the increasing proportion of the elderly population in the household, the possibility of households purchasing commercial insurance has decreased significantly. The reasons can be summarized as follows: First, when the elderly population in a household increases, the labor force will decrease and the income source will also decrease. At the same time, the elderly will face an increase in the risk of senile diseases and the uncertain expenditure of the household may also increase. As a result, households do not have a corresponding commercial insurance payout. Second, the elderly have a weak sense of insurance protection and may lack insurance knowledge, so that they did not buy commercial insurance when they were young. Third, commercial insurance product clauses are designed to charge different premiums for the insured in different age groups. With the increase of age, commercial insurance premiums will also increase, and the high price of insurance may be the primary reason why the elderly do not join commercial insurance.

Finally, except for head_gen and sm_ins, all the control variables have significant effects on the purchase of commercial insurance by households. Specifically, the age of heads has a significant negative effect on the holding behavior of commercial insurance, that is, with the increase of the age of household head, the possibility of the household participating in commercial insurance decreases. The marital status

of the head of household also influences the purchasing behavior of commercial insurance, but the influence coefficient is quite small. Heads are more educated, and households are more likely to purchase commercial insurance. With the improvement of the education level, the head of the household may acquire and master more insurance knowledge, strengthen the recognition of insurance, and increase the possibility of participating in commercial insurance. Similarly, it is believed that households participating in the financial market have higher financial literacy and relatively comprehensive cognition of insurance, which promotes households' participation in commercial insurance. There is a significant positive correlation between the family size, total asset, and the purchase intention of commercial insurance. With the increase of the household population, the labor force also increases, and the household income increases, which improves the possibility of participating in commercial insurance. Households in rural areas may be due to fewer hardware facilities and resources than those in urban areas, lack of corresponding insurance purchase channels, and may also be caused by a low level of awareness of insurance. Finally, due to the low level of social endowment insurance, it cannot meet people's diversified insurance needs. Therefore, even households with social endowment insurance have a significantly positive possibility to purchase commercial insurance.

Referring to the existing kinds of literature using CHFS data for empirical analysis, it was found that all regression results passed the robustness test. Therefore, we omit the robustness test here and think that the probit model is robust in analyzing the variables and regression results that affect households purchasing behavior of commercial insurance.

5. Conclusions and Suggestions

Based on CHFS2017 data, this paper explores the factors that affect households' willingness to purchase commercial insurance from the perspective of aging. The study found that with the increase of the proportion of elderly people aged 65 and above in a household, the possibility of the household purchasing commercial insurance decreased significantly, indicating that the aging problem is troubling the allocation of household insurance resources in China. The age of heads and whether the household is located in rural areas have a significant negative impact on the household participation in commercial insurance. The marital status of the head, the education level of the head, family size, household total asset, household financial market participation, and other factors have a significant positive impact on the possibility of purchasing commercial insurance. Based on the empirical results, the following suggestions are proposed from the government, insurance companies, and households.

5.1 For the Government

Relevant government agencies should attach importance to insurance education and publicity in rural areas. The empirical results of the survey data show that households in rural areas are less likely to purchase commercial insurance, reflecting the fact that demand for commercial insurance in rural areas is low. Government agencies should put the publicity work of insurance knowledge in rural areas on the agenda, organize insurance professionals to visit villages and households to publicize and exchange insurance, improve rural people's cognition of insurance, and strive to enhance the awareness of rural households on insurance. Besides, only when households have sufficient disposable income are they likely to consider buying commercial insurance. Relevant agencies should strive to create and provide more job opportunities to increase household income, stabilize prices, increase household disposable income and ensure that more households have the conditions and ability to participate in commercial insurance.

5.2 For Insurance Companies

Aging is a good opportunity for the development of commercial insurance companies. Insurance companies should start from their perspective, standardize the daily exhibition activities of insurance sales staff, actively establish a positive image of insurance enterprises, optimize the design of insurance products, and cannot let the elderly withdraw from the commercial endowment insurance market because of high premiums. According to the current situation of commercial insurance demand, insurance companies innovate insurance products, design targeted diversified products to meet the needs of household commercial insurance, and provide more personalized insurance services. Also, insurance companies can cooperate with local government agencies to establish endowment communities suitable for the needs of the elderly, and actively contribute to the elderly to enjoy their old age.

5.3 For Households

Households should pay attention to the old-age problem, seek basic social support and join commercial insurance to provide additional help for the old-age life security. The above studies show that education level has a significant positive impact on households' willingness to purchase commercial insurance, and the higher education level leads to a higher ability to accept insurance clauses and insurance knowledge. Therefore, households should pay attention to the education of the next generation.

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