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Who is more important, parents or children? Economic and environmental factors and health insurance purchase

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ABSTRACT

The existing research indicates that insurance demand is affected by the policyholder's occupation, family economy, urbanization level, and insurance coverage. Using micro data of insurance purchase at the individual level, this study investigates the influence of economic and environmental factors on the priorities of health insurance purchase decision. The results reveal that the more developed the economy and the more financial knowledge people possess, the more the latter tend to prioritize health insurance for their children. Furthermore, the study investigates the influence of air pollution on the decision to purchase health insurance. If the air pollution level is high, policyholders prioritize obtaining insurance for their children. Our research on the order of insurance purchase indicates that Chinese families have a lack of support from their children, and the function of family pension is gradually weakening. Our research also reveals that families are willing to spend money on the insurance of their children. Therefore, to solve the problem of health and old-age security for the elderly, it is more effective to promote health insurance by considering families as a unit

1. Introduction

In the field of insurance research, insurance demand is an important topic, and its investigation has theoretical and practical significance. The existing research however does not distinguish the influence of various factors on the insurance demand of different policyholder relationships. This study examines the factors driving the priority of the insurance purchase, that is, which factors will make the insured prioritize buying insurance for their children or their parents. Understanding the priority of insurance purchase is not only helpful for the study of insurance behavior, but also for building good family relationships.

This study classifies policy data into four categories: (i) Priority is given to both parents and children, (ii) parents are prioritized, (iii) children are prioritized, and (iv) neither parents nor children are a priority (those who purchase insurance for themselves or their spouse). A multinomial logit regression model is used to analyze the factors influencing the priority of insurance purchase.

This study considers two types of factors, air pollution and the level of economic development. The regression results reveal that the more developed the economy and the more financial knowledge people possess, the more the latter tend to prioritize purchasing health

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insurance for their children. The higher the air pollution level, the more willing policyholders are to purchase insurance for their children.

Our study is most related with the literature on health insurance demand. Nyman (2003) suggests that the demand of commercial health insurance is different from the traditional insurance demand theory. The latter mainly uses risk aversion for analysis, whereas health insurance is used for income transfer. Cutler and Gruber (1996) demonstrate that the demand for commercial health insurance is negatively related to basic medical insurance coverage. Using a survey of the cities of Ningxia and Zhejiang, Wang and Rosenman (2007) reveal that the average demand for insurance is affected by education, family economy, and urbanization level in the city. Factors such as the urbanization process, occupation, adverse selection, and education level affect the demand of rural medical insurance in China (Liu et al., 2003). Meanwhile, Khwaja (2010) finds that education level reduces health insurance demand, while aging population increases it. Laura et al. (2020) determine that insurance knowledge is very important for insurance purchase decision.

Demographic factors also play an important role in determining the insurance demand. Nebolsina (2020) demonstrates that an increase of dependency ratio burden has a negative impact on insurance density. Some studies discuss the influence of youth dependency ratio and elderly dependency ratio on insurance demand. The former refers to the ratio of the number of dependents under 15 years old to the number of workers in the family, while the latter refers to the ratio of the number of dependents over 64 years old to the number of workers in the family. Truett and Truett (1990), and Browne and Kim (1993) find a significant positive correlation between youth dependency ratio and life insurance demand. Beck and Webb (2003) suggest that the youth dependency ratio (under 15 years old) has no significant impact on life insurance consumption, while the elderly dependency ratio (over 64 years old) has a greater impact on life insurance demand. Li et al. (2020) argue that the youth dependency ratio has a positive impact on the demand for family commercial insurance, while the elderly dependency ratio has a negative impact on such demand.

Most of these previous studies examine the insurance demand based on regional aggregate data. Differing from these, the current study examines the influence of various factors on the insurance demand at the individual level, and explores the influence of the elderly dependency ratio and the youth dependency ratio from the microeconomic perspective. The aforementioned factors, such as urbanization, basic medical insurance coverage, and education levels and occupation, may have different influences on the insurance demand of the policyholder, their parents, and children. Some of these factors may make people more willing to purchase insurance for their parents than for themselves. However, other factors may make people more willing to purchase insurance for their children. Specifically, do economic factors make the policyholder more willing to purchase insurance for their parents or children? In addition, air pollution increases health risks, and existing research indicates that it increases health insurance demand. In the case of serious air pollution, is there a sequence of the policyholder's insurance purchase behavior? Who are prioritized when purchasing insurance, parents or children?

This study analyzes the insurance demand based on individual level data and focuses on the priorities of insurance demand for different family members instead of the level of insurance demand. The aforementioned factors, such as urbanization, basic medical insurance coverage, and education levels and occupation, may have different influences on the insurance demand of the policyholder, their parents, and children. Some of these factors may make people more willing to purchase insurance for their parents than for their children. Conversely, other factors may make people more willing to purchase insurance for their children than for their parents. Our empirical results indicate that most people prioritize their children before their parents in health insurance purchase, which may suggest the policyholders value the health capital of the youth more than that of the elderly.

The rest of this paper is organized as follows. Section 2 reviews important literature and proposes our research hypothesis. Section 3 describes the processing method of the policy data in detail and introduces the data source of the control variables. The multi-classification logit regression model, which is used to analyze whether economic and environmental factors are related to insurance purchase decisions, is introduced in section 4. Finally, concluding remarks are presented in section 5.

2. Theory and hypotheses

Traditional insurance demand theory holds that, to avoid risks, people are willing to pay certain premiums in exchange for compensation for future uncertainty (Arrow, 1978). To avoid medical expenses and income losses due to illness, people relinquish part of their health expenses to purchase insurance so that transfer payments can be made when they are ill (Nyman, 2003). Income is a core variable in the insurance demand model. Fortune (1973)Lewis (1989), Beck and Webb (2003), Li et al. (2007), and Lee et al. (2010) confirm the positive impact of income on life insurance consumption. Higher salary also increases the value of health capital for the youth in developed areas.

The theoretical model of life insurance demand proposed by Yaari (1965) and Lewis (1989) examines the influence of economic growth (or real income) on the insurance market; there may be a causal relationship between economic growth and the life insurance market. Browne and Kim (1993) find that national income, social expenditure, and expected inflation rate affect the average life insurance consumption in developed and developing countries. Ward and Zurbruegg (2000) study the causal relationship between insurance industry growth and economic growth. In the long run, there is a two-way causal relationship between real insurance premium and real GDP in Australia, Canada, Italy, and Japan, while there is a one-way causal relationship in France.

People from a region of high economic development usually have higher incomes and more financial knowledge. With the increasing diversity and complexity of financial products, financial knowledge becomes increasingly important to consumers, and the importance of financial education also increases OECD(2005), Bayer, Bernheim, and Scholz (2009) argue that, compared with education, access to financial knowledge can improve the quality of personal financial decision-making. Financial knowledge increases the possibility of investing in the stock market (Van Rooij et al., 2012); therefore, the existence or lack of a financial account can be used to reflect the level of financial knowledge and test the impact of such level on insurance purchase decision.

Mackenzie (2006) argues that potential buyers' lack of understanding of life insurance will have a negative impact on the demand for insurance products. Policyholders need to understand the regulatory issues related to life insurance business to make wise decisions when purchasing such products. Lin, Hsiao, and Yeh (2017) suggest that people with higher financial knowledge are more likely to purchase life insurance, and consultation with financial advisors and conversation with family and friends are positively correlated with the demand for such insurance.

From the perspective of income and expenditure on insurance, there should be no difference in the setting of fair premium to prioritize the purchase of insurance for parents or children. However, considering the other benefits of preserving the health of children and parents, purchasing insurance for children can be considered an investment. From the perspective of future investment income and considering the future growth of children, insurance can obtain investment returns over a longer period, and the expected investment income will be higher. Therefore, people who think more about the future and value economic returns are more likely to give priority to purchasing insurance for their children. People with high financial knowledge value future economic and other benefits. We therefore propose the following hypotheses:

Hypothesis 1A: For people in economically developed areas, the priority is to purchase insurance for their children.

Hypothesis 1B: For people with a high level of financial knowledge, the priority is to purchase insurance for their children.

Insurance theory predicts that higher severity and higher probability of loss will lead to more insurance demand. As suggested by Hypotheses 1A and 1B, the potential loss caused by health shock would be more severe for the youth than the elderly. To examine the consequence of higher probability of health shock, the insurance behavior in the days with higher air pollution is analyzed. It is well known that air pollution seriously endangers human health, increasing incidence rate and mortality (Ebenstein, Fan, Greenstone, He, & Zhou, 2017; Yin et al., 2017; Chen et al., 2013). Air pollution increases medical expenditure as a result of its health hazards (Barwick, 2018; Barwick, Li, Rao, & Zahur, 2017; Deschênes, Greenstone, & Shapiro, 2017; Narayan & Narayan, 2008; Sheng & Zhang, 2019; Yang & Zhang, 2018; Xia, Xing, Xu, & Pan, 2020).

The health risks caused by air pollution are now being recognized. In China, residents began to buy masks (Zhang and Mu, 2018) and air purifiers (Ito and Zhang, 2020) to prevent harm from air pollution through personal defense (Sun, Kahn, and Zheng, 2017). Yang and Liu (2018) highlight that the expenditure on personal defense, such as masks and air purifiers, has exacerbated the health inequality in China. Air pollution also has unexpected effects on other human decisions. Li, Lien, and Yuan (2021) find a robust positive correlation between air pollution and lottery gambling and study the mechanism of this relationship. Gao et al. (2021) demonstrate that air pollution can affect the accuracy of analysts' predictions.

Given other conditions, the higher a certain risk, the stronger the motivation to purchase the corresponding insurance (Chang et al., 2018). Therefore, the subjective probability judgment of disease occurrence will affect the insurance demand. When haze aggravates, people believe that the probability of haze occurring will increase in the future, which will lead to an increase in disease risk and stimulate insurance purchase. For age-related reasons, one's parents and children are usually more vulnerable to pollution. Therefore, if policyholders are limited to the consideration of insurance itself and not its other benefits, we propose the following hypotheses:

Hypothesis 2A: If the air pollution level is high, people are more willing to purchase insurance for their parents and children than for themselves.

Considering the future benefits of health insurance, it can provide a longer-term guarantee of benefits for children than parents; hence, we propose the following hypothesis:

Hypothesis 2B: If the air pollution level is high, people give priority to purchasing insurance for their children over their parents.

3. Data and descriptive statistics

3.1. Data and variables

3.1.1. Dependent variable: Priority of policyholders in purchasing insurance

This study analyzes the data from the serious illness insurance policies of a Chinese insurance company from 2014 to 2016, which includes information on the purchase date. To determine the order in which the insured purchase insurance for their parents and children, we follow the steps outlined below.

First, the policy data for those who did not purchase insurance for "parents" or "children" are $prior_{i,t} = 4$. If the policyholders purchased multiple policies, only the earliest policy is retained. This is used as the reference standard in the regression. Next, we determine the data of the policyholders who purchased only one insurance policy, that is, the customer number of a policyholder corresponds to only one insurance contract number. If the insured relationship is "parent," $prior_{i,t} = 2$; if the insured relationship is "child," $prior_{i,t} = 3$. If the policyholder who purchased only one insurance policy did not purchase for parents and children simultaneously, $prior_{i,t} = 1$.

The remaining policyholders in the dataset are those with two or more insurance policies, at least one of which is for "parents" or "children." If such policyholders purchased several insurance policies, all of which are for "parents" or none of which are for "children," that is, if the insurance purchased is only for "parents" and not for "children," then $prior_{i,t} = 2$, and only the first insurance policy for parents is retained. Similarly, if the insurance is purchased only for "children," $prior_{i,t} = 3$. For policyholders who purchased insurance for both parents and children, it is necessary to consider two situations. If they purchased insurance for "parents" and "children" simultaneously, $prior_{i,t} = 1$. If they purchased insurance for parents first, then $prior_{i,t} = 2$. If they purchased insurance for children first, $prior_{i,t} = 3$, and only the first insurance is retained.

3.1.2. Explanatory variable

The level of economic development of a country/region will affect the insurance demand of that country/region (Li et al., 2007; Beck and Webb, 2003; Ward and Zurbruegg, 2000). To test Hypothesis 1B, we use the level of economic development of the city where the policyholder lives as an explanatory variable. The annual data of cities are from the China City Statistical Yearbook, mainly related to the level of urban economic development. The per capita GDP level (*GDP*), the proportion of the secondary industry in GDP (*indus2*), and the proportion of the tertiary industry in GDP (*indus3*) of the cities where policyholders are located can all reflect the economic development level of the region. The subsequent empirical research uses these three variables for regression to examine the impact of economic development level on insurance purchase priority. The GDP per capita (*GDP*) reflects the level of social and economic development, while the proportion of the three largest industries reflects the economic structure.

Next, this study also uses the survey data from the China Household Finance Survey (CHFS) database and uses the questionnaire results of "Whether to take economic and financial courses?" to determine the financial knowledge level variables (*finan*) in each province. As a complex financial product, insurance purchase decision will be affected by the level of financial knowledge of individuals and people around them. This problem is therefore used to measure the level of financial knowledge of the environment in which the policyholder lives, to study the influence of the level of financial knowledge on the purchase decision. In addition, the results of "Whether there is a stock account?" are used to calculate the variables (*stock*), reflecting the level of financial knowledge.

Finally, we also examine the impact of air pollution (*AQI*) on insurance purchase priority to test Hypothesis 2B. The air pollution level of the city where the policyholder is located is measured by the air quality condition of the period before the policyholder purchases the insurance. Specifically, *AQIm_n* is the number of days that the AQI value of the city exceeds *m* in the *n* weeks before insurance purchase, and the threshold value is *m*. If the AQI value is greater than *m*, the air condition of the city on that day is polluted, otherwise it is not polluted. In this study, *m* is 150, the robustness test is 200, *n* is 1–4 weeks, the results of different *n* are consistent, which can show the robustness of the empirical results.

3.1.3. Control variables

Fortune (1973), Lewis (1989), Browne and Kim (1993), and Beck and Webb (2003) confirm a positive correlation between life insurance demand and income. Lin, Hsiao, and Yeh (2017) also highlight that personal income is the main factor affecting the demand for life insurance, and income has a significant relationship with premium expenditure (Hammond, Houston, & Melander, 1967). Truett et al. (1990) argue that demand depends on insurance price and personal income level. Truett and Truett (1990) prove that the income elasticity of life insurance demand in Mexico is much higher than that in the United States. The increase in income tends to increase the ability to allocate a higher part of income to retirement- and investment-related life insurance products, so the demand for life insurance will increase with the increase of income level.

According to the cohort analysis, Chen, Wong, and Lee (2001) provide evidence that gender effects have an impact on individual needs. Nosi et al. (2014) found that gender has a moderating effect on annuity purchase intention. Gandolfi (1996) and others highlight that there are significant differences in the demand of husbands and wives for life insurance function. Based on a study in Taiwan, Lin et al. (2017) reveal that women are more likely to buy life insurance than men. However, according to a survey of Italian families, Luciano et al. (2016) find that women are less likely to be insured than men because they are more risk averse. Financial knowledge and risk aversion can also explain the gender differences in deciding to invest in risky assets. This gender difference may be due to women's lower knowledge of financial products (Van Rooij, Lusardi, and Alessie, 2012; Prast et al., 2015) or their higher risk aversion Croson and Gneezy (2009), Dohmen et al. (2011)

Lewis (1989) argues that the consumer's age and gender would affect their consumption and savings (including life insurance). Age is one of the important factors affecting the demand for life insurance (Truett and Truett, 1990). Lin et al. (2017) suggest that age, marital status, working status, and other personal characteristics are also the main factors affecting the demand for life insurance. Hammond, Houston, and Melander (1967) highlight that the occupation of the head of the household is closely related to the premium expenditure. That is, gender (*gender*), age (*age*), occupation (*occup*), income (*income*), and other personal characteristics will affect the insurance demand. The current study analyzes the data from the serious illness insurance policies of a Chinese insurance company from 2014 to 2016, which includes information on the income, gender, age, and occupation of the insured. In the empirical study, we control these personal characteristics variables for regression to obtain more reliable results.

The study found that temperature and other environmental factors also affect people's consumption behavior. Conlin et al. (2007) reveal that the lower the temperature, the more likely low-temperature goods are to be returned. Busse et al. (2015) demonstrate that weather factors such as temperature and rainfall can affect the purchase of car models. They argue that the reason for this correlation is projection bias. After controlling the above variables, we also control the meteorological conditions of the policyholder's city. Control variable data of the city where the policyholder is located include daily meteorological data, namely, daily average temperature (*temp*), relative humidity (*humidity*), rainfall (*rain*), and sunshine hours (*sunlight*).

The policyholder purchases health insurance to provide protection. The medical and health level of the city where the policyholder is located provides protection for the treatment of diseases, which may affect the policyholder's insurance purchase decision. Therefore, the medical and health level of the city where the policyholder is located is controlled, and the number of medical beds per 10,000 people (*bed*) is often used as the substitute variable of the medical and health level. The number of medical beds per 10,000 (ten thousand) people (*bed*) reflects the level of medical and health care in cities, and the public health level has a certain impact on people's commercial insurance purchase decision. In addition, the insurance demand and consumption level may also be related, because the level of economic development will affect the insurance demand and consumption level. Hence, the consumption level (*consum*) is also included in the regression.

In the follow-up study, the two variables are regressed to test the robustness. The insurance coverage level in the province where

the policyholder is located reflects the insurance development level via the insurance density (*insurelevel1*) and comprehensiveness (*insurelevel2*). The variables, definitions, and data sources used in this study are reported in Table 1.

3.2. Descriptive statistics

The descriptive statistics of the relevant main variables are presented in Table 2. Among them, the income of the policyholder is logarithmic income, and the original income unit is 10,000 yuan. For those who have incomes of<10,000 yuan, the value after the logarithm is negative.

Descriptive statistics provide the mean value, variance, and number of observations of each variable. *AQI150_i* means the threshold value is 150. If the AQI value is greater than 150, the air condition of the city on that day is polluted, otherwise it is not polluted. *AQI150_i* refers to the number of days of air pollution in the city *i* weeks before the insurance purchase. The average air quality index value of the preceding two weeks is over 150 days (*AQI150_2*), with an average of 1.3 and a standard deviation of 2.4. The average AQI value over 150 days (moderate pollution) in the previous four weeks (*AQI150_4*) is 2.5, and the standard deviation is 4.2. The average AQI of the previous four weeks, with a standard deviation of 32 and an average of 89, indicates that the AQI has not fluctuated in the past period, and the pollution in seriously polluted cities is sustained.

4. Empirical analysis

4.1. Multinomial logit regression model

To analyze which factors affect the priority of insurance purchase, the following multinomial logit regression model is used to analyze the insurance purchase priority:

$$prior_{i,t} = \alpha_0 + \alpha_1 AQI_{j,t} + \alpha_1 X_{j,t} + \alpha_2 Z_{i,t} + \gamma_c + \theta_y + \varepsilon_{i,t}, \quad (1)$$

where *i* indexes policyholder, city *j*, and day *t*. The dependent variable in this multinomial logit regression is a quaternion variable ($prior_{i,t}$), which corresponds to the four purchase options of the policyholder *i*. The first is to purchase insurance for parents and children simultaneously ($prior_{i,t} = 1$), the second is for parents first or only for parents ($prior_{i,t} = 2$), the third is for children first or only for children ($prior_{i,t} = 3$), and the fourth is not to purchase insurance for parents or children ($prior_{i,t} = 4$. e.g., only for themselves or their spouse). The fourth type is selected as the reference group, also known as the benchmark group. The regression results reveal that, compared with the reference group, the influence of each variable on other groups is observed.

$AQI_{j,t}$ is a variable that reflects the level of air pollution in city *j* on day *t*. $X_{j,t}$ is a vector of meteorological controls for city *j* in day *t*. $Z_{i,t}$ is a vector of personal characteristics controls for policyholder *i* on day *t*, and $\varepsilon_{i,t}$is an error term. The meteorological controls

Table 1
Source and meaning of variables.

Personal variable	Variable definition	Data sources
prior	The order of the priority for the policyholder to purchase insurance is as follows: for policyholders who prioritize purchasing insurance for their parents and children, prior = 1for policyholders who prioritize purchasing insurance for their parents, prior = 2.for policyholders who prioritize purchasing insurance for their children, prior = 3.for other situations (i.e., priority given neither to parents nor children), prior = 4.	Data from the seriousillness insurance policy
occup	Occupation of policyholder	
age	Age of the policyholder at the time of the purchase of the insurance	
income	Income of the policyholder	
gender	Gender of all insured, 1 for male and 0 for female	
Urban variables		
AQI	Daily air quality index	EnvironmentalMonitoring ofChina
temp	Average daily temperature	ChinaMeteorologicalData Network
humidity	Average humidity per day	
rain	Rainfall per day	
sunlight	Sunshine duration per day	
bed	Number of medical beds per 10,000 people	China CityStatisticalYearbook
GDP	GDP per capita	
indus2	Proportion of secondary industry	
indus3	Proportion of tertiary industry	
Province variables		
Consum	Consumption as a percentage of income	China Household Finance Survey
finan	Have you ever taken economic and financial courses?	database
stock	Whether there is a stock account	
Insurelevel1	Insurance density	Statisticalyearbook
Insurelevel2	Insurance depth	

Table 2
Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
AQI150_1	2,460,647	0.681	1.364	0.000	7.000
AQI150_2	2,435,101	1.319	2.365	0.000	14.000
AQI150_4	2,380,506	2.508	4.152	0.000	26.000
AQI200_4	2,380,506	1.056	2.637	0.000	24.000
AQImean_4	2,460,647	89.322	32.217	27.679	259.429
Income	2,460,647	2.126	0.807	−9.210	6.215
gender	2,460,647	0.379	0.485	0.000	1.000
age	2,460,647	37.200	8.986	16.000	114.000
bed	2,460,647	3.912	0.341	3.167	4.920
GDP	2,460,647	1.744	0.747	−1.905	3.898
indus2	2,460,647	49.588	13.589	10.140	83.430
indus3	2,460,647	49.283	12.944	16.570	86.370
temp	2,460,608	17.411	9.767	−13.200	31.400
humidity	2,460,562	0.715	0.164	0.260	0.980
rain	2,382,153	3.287	8.620	0.000	54.400
sun	2,460,419	5.209	4.076	0.000	12.533

include daily average temperature, humidity, rainfall, and sunshine duration. Variables $temp_{i,t}$, $humidity_{i,t}$, $rain_{i,t}$, and $sunlight_{i,t}$ are the weather condition variables on day t in city j of purchase, which is used to control the influence of weather conditions on the purchase decision.

The personal characteristics controls include variables $age_{i,t}$, $gender_{i,t}$, $income_{i,t}$, and $occup_{i,t}$, which represent the personal information data provided in the policy data, that is, the age, gender, income, and occupation of policyholder i, respectively. The policyholders' occupations are divided into 24 categories, which are put into the regression equation as dummy variables.

Szablicki (2002) uses Asia, Africa, and Latin America as control variables to study the relationship between economic growth and the life insurance market. Beck and Webb (2003) also use regional dummy variables and highlight that Latin America, Africa, and Asia are positively correlated with life insurance activities. The current study uses a fixed effect panel model to investigate the priority of insurance purchase; the regression also includes the city fixed effect γ_c and time fixed effect (year*month) $\theta_y$and controls the day of the week when the policyholders purchase the insurance.

To further investigate the relationship between urban characteristics and purchase decision, we analyze the regression results, including the fixed effect of cities, and find that the policyholders who are more willing to purchase insurance for parents are mostly in underdeveloped cities. Based on this observation, we focus on the relationship between the city's economic situation and the aforementioned four types of purchase decisions. The variables of urban economic development level are added. The regression equation is as follows:

Table 3
Relationship between economic development level and insurance purchase decision.

	(1)			(2)		
Variable	1	2	3	1	2	3
AQI150_4	0.007	−0.007***	0.007***	0.007	−0.007***	0.007***
	(0.013)	(0.002)	(0.000)	(0.013)	(0.002)	(0.000)
Income	0.850***	0.215***	0.155***	0.854***	0.217***	0.158***
	(0.050)	(0.011)	(0.002)	(0.050)	(0.011)	(0.002)
gender	0.044	0.125***	−0.338***	0.044	0.125***	−0.338***
	(0.092)	(0.011)	(0.003)	(0.092)	(0.011)	(0.003)
age	−0.148***	−0.222***	−0.017***	−0.148***	−0.222***	−0.017***
	(0.007)	(0.001)	(0.000)	(0.007)	(0.001)	(0.000)
bed	0.192	0.098***	0.431***	0.272	0.131***	0.478***
	(0.219)	(0.026)	(0.007)	(0.252)	(0.029)	(0.007)
GDP	−0.144	−0.196***	0.030***	0.006	−0.122***	0.186***
	(0.107)	(0.013)	(0.003)	(0.174)	(0.019)	(0.007)
GDP^2				−0.052	−0.025***	−0.048***
				(0.048)	(0.006)	(0.002)
indus2	−0.013	−0.021***	0.002***	−0.012	−0.021***	0.002***
	(0.013)	(0.001)	(0.000)	(0.013)	(0.001)	(0.000)
indus3	−0.017	−0.021***	0.006***	−0.017	−0.021***	0.006***
	(0.013)	(0.001)	(0.000)	(0.013)	(0.001)	(0.000)
	(0.015)	(0.002)	(0.000)	(0.015)	(0.002)	(0.000)
Constant	−3.877**	4.871***	−2.623***	−4.308**	4.683***	−2.936***
	(1.731)	(0.194)	(0.060)	(1.817)	(0.204)	(0.062)
Time fixed	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,303,112	2,303,112	2,303,112	2,303,112	2,303,112	2,303,112

Robust standard errors are in parentheses, ***, **, and * = $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

$$prior_{i,t} = \alpha_0 + \alpha_1 AQI_{j,t} + \alpha_2 X_{j,t} + \alpha_3 Z_{i,t} + \alpha_4 GDP_{j,t} + \alpha_5 indus2_{j,t} + \alpha_6 indus3_{j,t} + \alpha_7 bed_{j,t} + \alpha_8 consum_{k,t} + \alpha_9 stock_{k,t} + \alpha_{10} Insurelevel_{k,t} + \gamma_c + \theta_y + \varepsilon_{i,t}. \quad (2)$$

$GDP_{i,t}$, $indus2_{i,t}$, $indus3_{i,t}$,$bed_{i,t}$ reflects the level of urban economic development, such as per capita GDP and tertiary industrial structure. The regression results of the multi-classification logistic model are discussed in detail below.

4.2. Empirical results

4.2.1. Economic factors

The regression was conducted using the personal characteristics data of the policyholder and the air quality, weather, and economic development data of the city where they are located to examine the influencing factors of the insurance purchase decision. The first three columns in Table 3 present the regression results of Model 1. The first column is purchasing insurance for parents and children simultaneously, the second is purchasing insurance for parents first, and the third is purchasing insurance for children first. The air pollution level in the preceding four weeks is significantly negative in the second column and positive in the third column. It indicates that the more serious the air pollution level, the more willing the policyholders are to purchase health insurance for their children, and not for their parents. People with higher risk awareness are more concerned about the health of their children.

The regression coefficient of income is significantly positive, indicating that the higher the income of the policyholder, the more willing they are to purchase insurance for their parents and children, especially simultaneously. The regression reveals that those with higher income have more money to purchase health insurance for their families, and they are more likely to purchase health insurance for all family members together.

The policyholder's gender is denoted by 1 for males and 0 for females, the regression coefficient of the second column is significantly positive and that of the third column is significantly negative, which indicates that men are more willing to purchase insurance for their parents than for their children. Previous studies demonstrate that gender will affect the possibility of insurance purchase (Chen et al., 2001; Nosi et al., 2014; Luciano et al., 2016; Lin et al., 2017). Our regression results also indicate that gender has an impact on the priority of insurance purchase.

The regression coefficient of the insured age is significantly negative, indicating that the older the policyholder, the less willing they are to purchase insurance for their parents and children. One potential reason is that the higher the policyholders' age, the more likely it is that their parents have already passed away and their children are economically independent. At this time, the policyholder should pay more attention to purchasing insurance for their spouse and themselves to avoid the potential economic burden on their small family caused by treatment for major diseases. The occupation of the policyholder is also related to the purchase decision. The regression results including policyholders' occupations as control variables show significant occupation-specific effects. Due to the limitation of space, the regression results are omitted. People in some occupations are inclined to purchase insurance for their children, while others are willing to purchase insurance for their parents.

Table 4
AQI threshold selection and regression results.

	(3)			(4)		
Variable	1	2	3	1	2	3
AQI200_4	0.007	−0.015***	0.013***			
	(0.021)	(0.002)	(0.001)			
AQImean_4				0.003	0.000	0.001***
				−0.002	(0.000)	(0.000)
income	0.853***	0.217***	0.158***	0.860***	0.216***	0.158***
	(0.050)	(0.011)	(0.002)	(0.048)	(0.010)	(0.002)
gender	0.044	0.125***	−0.338***	0.036	0.125***	−0.339***
	(0.092)	(0.011)	(0.003)	(0.090)	(0.011)	(0.003)
age	−0.148***	−0.222***	−0.017***	−0.149***	−0.222***	−0.018***
	(0.007)	(0.001)	(0.000)	(0.007)	(0.001)	(0.000)
bed	0.273	0.127***	0.481***	0.252	0.134***	0.461***
	(0.252)	(0.029)	(0.007)	(0.249)	(0.029)	(0.007)
GDP	0.006	−0.122***	0.187***	−0.055	−0.126***	0.189***
	(0.174)	(0.019)	(0.007)	(0.155)	(0.019)	(0.007)
GDP^2	−0.052	−0.025***	−0.048***	−0.028	−0.023***	−0.045***
	(0.048)	(0.006)	(0.002)	(0.046)	(0.006)	(0.002)
indus2	−0.012	−0.021***	0.002***	−0.015	−0.023***	0.002***
	(0.013)	(0.001)	(0.000)	(0.012)	(0.001)	(0.000)
indus3	−0.017	−0.021***	0.006***	−0.019	−0.022***	0.006***
	(0.013)	(0.001)	(0.000)	(0.012)	(0.001)	(0.000)
Constant	−4.312**	4.725***	−2.955***	−4.924***	4.485***	−2.902***
	(1.819)	(0.204)	(0.062)	(1.619)	(0.174)	(0.054)
Time fixed	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,303,112	2,303,112	2,303,112	2,381,868	2,381,868	2,381,868

Robust standard errors are in parentheses, ***, **, and * = $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

In Model 1, three variables reflect the level of urban economic development of the policyholder's region: per capita GDP and the proportions of the secondary and tertiary industries. The regression coefficients of the first, second, and third columns were not significant, significantly negative, and significantly positive, respectively. People living in cities with a high economic development level and a high level of secondary/tertiary industry development are more likely to purchase insurance for their children and less for their parents. Thus, Hypothesis 1A is supported.

The last three columns in Table 3 present the regression results of Model 2, in which a variable based on Model 1 is added, that is, the quadratic term of per capita GDP of the city where the policyholder is located. After the second term of GDP per capita is added, the regression results of the primary term are unchanged, and those of the secondary term are significantly negative. As the per capita GDP level of the policyholder's city increases, the willingness to purchase policies for their parents decreases, and the willingness to purchase policies for children first increases and then decreases. The regression results of other variables are consistent with those of Model 1.

4.2.2. Air pollution factors

The regression results of Model 3 are obtained by replacing the variables of the AQI index in Model 2 with the days when the AQI index was over 200 in the preceding four weeks as the variable of air pollution level. To obtain Model 4, the AQI mean value of the preceding four weeks is taken as the variable of the air pollution level.

The regression results of Models 3 and 4 are identical to those of Model 2, and the absolute value of the regression coefficient is different only for the air pollution level. The regression coefficient of the second column of Model 4 is 0 and is not significant.

The regression coefficients of the other variables are consistent with those of Model 2, and only the coefficient values are slightly different. The regression results are not related to the choice of the air pollution level variables, and the higher the air pollution level, the more willing policyholders are to purchase insurance for their children. This indicates that Hypothesis 2B is supported, while Hypothesis 2A does not find support.

Based on the regression results in Tables 3 and 4, the regression was performed with the same threshold and different observation times. The AQI index threshold was 150, but the observation time was one and two weeks for Models 5 and 6, respectively.

The regression results in Table 5 are consistent with those of Model 2, excluding the absolute value of the coefficient, which is slightly different. The results are not related to the threshold of air pollution level and the selection of observation time, which further demonstrates the robustness of the results. In the regression, the AQI index of the variables that reflect the air pollution level is 150, which is the threshold, and the observation time of the data is four weeks.

The regression results in Tables 3–5 indicate that in cities with a high economic development level, policyholders are more willing to purchase insurance for their children than parents, which supports Hypothesis 1A. If the level of air pollution is high, the policyholder prioritizes insurance for children, not for parents, and the result is robust. Hypothesis 2B is therefore supported, while Hypothesis 2A does not find support.

Table 5
AQI time-long selection and regression results.

	(5)			(6)		
Variable	1	2	3	1	2	3
AQI150_1	−0.022	−0.011**	0.012***			
	(0.038)	(0.005)	(0.001)			
AQI150_2				−0.014	−0.012***	0.008***
				(0.022)	(0.003)	(0.001)
income	0.855***	0.216***	0.157***	0.860***	0.218***	0.158***
	(0.049)	(0.010)	(0.002)	(0.049)	(0.010)	(0.002)
gender	0.038	0.126***	−0.339***	0.043	0.125***	−0.339***
	(0.090)	(0.011)	(0.003)	(0.091)	(0.011)	(0.003)
age	−0.149***	−0.222***	−0.018***	−0.149***	−0.222***	−0.017***
	(0.007)	(0.001)	(0.000)	(0.007)	(0.001)	(0.000)
bed	0.270	0.134***	0.464***	0.275	0.129***	0.467***
	(0.246)	(0.029)	(0.007)	(0.248)	(0.029)	(0.007)
GDP	−0.054	−0.126***	0.191***	−0.049	−0.125***	0.191***
	(0.156)	(0.019)	(0.007)	(0.157)	(0.019)	(0.007)
GDP^2	−0.032	−0.024***	−0.046***	−0.037	−0.023***	−0.047***
	(0.045)	(0.006)	(0.002)	(0.045)	(0.006)	(0.002)
indus2	−0.010	−0.022***	0.003***	−0.010	−0.022***	0.003***
	(0.012)	(0.001)	(0.000)	(0.012)	(0.001)	(0.000)
indus3	−0.014	−0.022***	0.007***	−0.014	−0.021***	0.007***
	(0.012)	(0.001)	(0.000)	(0.012)	(0.001)	(0.000)
Constant	−4.863***	4.505***	−2.895***	−4.606***	4.537***	−2.921***
	(1.656)	(0.173)	(0.054)	(1.665)	(0.176)	(0.054)
Time fixed	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,381,868	2,381,868	2,381,868	2,356,801	2,356,801	2,356,801

Robust standard errors are in parentheses, ***, **, and * = $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

Table 6
Financial knowledge level and insurance purchase decision.

	(1)			(2)		
Variable	1	2	3	1	2	3
finan	0.015	−0.015***	0.039***			
	(0.018)	(0.002)	(0.001)			
stock				0.009	−0.014***	0.012***
				(0.010)	(0.001)	(0.000)
AQI150_4	0.004	−0.009***	0.004***	0.003	−0.007***	0.006***
	(0.014)	(0.002)	(0.000)	(0.014)	(0.002)	(0.000)
income	0.885***	0.234***	0.168***	0.885***	0.234***	0.165***
	(0.050)	(0.011)	(0.002)	(0.050)	(0.011)	(0.002)
gender	0.042	0.123***	−0.337***	0.042	0.124***	−0.337***
	(0.092)	(0.011)	(0.003)	(0.092)	(0.011)	(0.003)
age	−0.150***	−0.222***	−0.017***	−0.150***	−0.223***	−0.017***
	(0.007)	(0.001)	(0.000)	(0.007)	(0.001)	(0.000)
bed	0.212	0.053*	0.539***	0.217	0.023	0.537***
	(0.265)	(0.031)	(0.008)	(0.265)	(0.031)	(0.008)
GDP	0.032	−0.127***	0.222***	0.049	−0.163***	0.226***
	(0.196)	(0.021)	(0.007)	(0.206)	(0.020)	(0.007)
GDP^2	−0.054	0.001	−0.076***	−0.057	0.011*	−0.074***
	(0.054)	(0.007)	(0.002)	(0.055)	(0.007)	(0.002)
indus2	−0.008	−0.019***	0.002***	−0.009	−0.018***	0.004***
	(0.014)	(0.001)	(0.000)	(0.014)	(0.001)	(0.000)
indus3	−0.013	−0.016***	0.005***	−0.013	−0.015***	0.007***
	(0.015)	(0.001)	(0.000)	(0.015)	(0.001)	(0.000)
Constant	−4.553**	4.745***	−3.339***	−4.594**	4.865***	−3.370***
	(1.947)	(0.217)	(0.064)	(1.924)	(0.216)	(0.064)
Observations	2,280,328	2,280,328	2,280,328	2,280,328	2,280,328	2,280,328

Robust standard errors are in parentheses, ***, **, and * = $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

4.2.3. Robustness check

To further examine the robustness of the research conclusion, we introduce the data of the CHFS. Financial knowledge affects the purchase decision of insurance products. The variable "Whether to take economic and financial courses?" in the CHFS database(Gan et al., 2016) is used to calculate the variable of financial knowledge level (*finan*) in each province. Studies have shown that cultural factors can affect insurance demand (Park et al., 2002; Chui and Kwok, 2008; Wang et al., 2020). Hence, in the robustness check, we

Table 7
Insurance development level and insurance purchase decision.

	(1)			(2)		
Variable	1	2	3	1	2	3
insurelevel1	0.007	0.002*	0.004***			
	(0.009)	(0.001)	(0.000)			
insurelevel2				0.003	0.007***	0.006***
				(0.013)	(0.002)	(0.000)
stock	0.008	−0.015***	0.011***	0.009	−0.015***	0.011***
	(0.010)	(0.001)	(0.000)	(0.010)	(0.001)	(0.000)
AQI150_4	0.002	−0.007***	0.005***	0.003	−0.008***	0.005***
	(0.014)	(0.002)	(0.000)	(0.014)	(0.002)	(0.000)
income	0.883***	0.233***	0.164***	0.885***	0.234***	0.165***
	(0.051)	(0.011)	(0.002)	(0.050)	(0.011)	(0.002)
gender	0.042	0.124***	−0.336***	0.042	0.124***	−0.337***
	(0.092)	(0.011)	(0.003)	(0.092)	(0.011)	(0.003)
age	−0.150***	−0.223***	−0.017***	−0.150***	−0.223***	−0.017***
	(0.007)	(0.001)	(0.000)	(0.007)	(0.001)	(0.000)
bed	0.143	0.002	0.494***	0.197	−0.024	0.502***
	(0.281)	(0.034)	(0.008)	(0.278)	(0.033)	(0.008)
GDP	0.038	−0.165***	0.216***	0.046	−0.169***	0.217***
	(0.201)	(0.020)	(0.007)	(0.207)	(0.020)	(0.007)
GDP^2	−0.073	0.006	−0.084***	−0.063	−0.000	−0.083***
	(0.057)	(0.007)	(0.002)	(0.057)	(0.007)	(0.002)
indus2	−0.008	−0.018***	0.004***	−0.008	−0.017***	0.005***
	(0.014)	(0.001)	(0.000)	(0.015)	(0.001)	(0.000)
indus3	−0.014	−0.016***	0.006***	−0.013	−0.016***	0.006***
	(0.014)	(0.001)	(0.000)	(0.015)	(0.001)	(0.000)
Constant	−4.355**	4.931***	−3.227***	−4.541**	4.982***	−3.282***
	(1.950)	(0.219)	(0.065)	(1.940)	(0.217)	(0.065)
Observations	2,280,328	2,280,328	2,280,328	2,280,328	2,280,328	2,280,328

Robust standard errors are in parentheses, ***, **, and * = $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

Table 8
Consumption level and insurance purchase decision.

Variable	(1) 1	2	3
consum	0.005	−0.003***	0.000**
	(0.005)	(0.001)	(0.000)
insurelevel2	0.003	0.008***	0.006***
	(0.013)	(0.002)	(0.000)
stock	0.009	−0.015***	0.011***
	(0.010)	(0.001)	(0.000)
AQI150_4	0.003	−0.009***	0.005***
	(0.014)	(0.002)	(0.000)
income	0.886***	0.233***	0.165***
	(0.050)	(0.011)	(0.002)
gender	0.041	0.125***	−0.337***
	(0.092)	(0.011)	(0.003)
age	−0.150***	−0.223***	−0.017***
	(0.007)	(0.001)	(0.000)
bed	0.231	−0.041	0.505***
	(0.281)	(0.033)	(0.008)
GDP	0.030	−0.154***	0.216***
	(0.209)	(0.020)	(0.007)
indus2	−0.009	−0.016***	0.005***
	(0.015)	(0.001)	(0.000)
indus3	−0.013	−0.016***	0.006***
	(0.015)	(0.001)	(0.000)
Observations	2,280,328	2,280,328	2,280,328

Robust standard errors are in parentheses, ***, **, and * = $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively.

control for cultural variables.

Due to the limitation of space, the regression results of the related variables are omitted. The regression results are reported in Table 6, which indicates that the higher the level of people's financial knowledge, the more likely they are to purchase insurance for their children. In an economic discussion of welfare in different periods, people with relevant knowledge may plan more for the future and hence, are more willing to provide security for their children.

Generally, people who invest in the stock market have more financial knowledge than those who do not. Therefore, variables reflecting the level of financial knowledge (stock) are calculated using "whether there is a stock account." The regression results in Table 6 indicate that the results are consistent with the two variables that reflect the level of financial knowledge. The results reveal that sufficient financial knowledge makes people pay more attention to the future, and they are therefore more likely to provide a corresponding guarantee for their children. Hypothesis 1B is therefore supported.

Further, we control the insurance coverage level of the province where the policyholder is located. The regression results in Table 7 indicate that in provinces with a high level of insurance development, people are more willing to purchase insurance for their parents and children and provide similar security for close relatives.

In Model 1, the density of insurance is used to reflect the level of insurance development, that is, those located in provinces with higher per capita coverage are more willing to provide insurance for parents and children. In Model 2, the insurance depth is used to counter the insurance development level of the province, that is, the proportion of the premium in GDP of the province, and the regression results are still significantly positive. Consequently, the regression results are stable.

On this basis, we include the consumption level of provinces as explanatory variables. The regression results of Model 1 in Table 8 indicate that people in provinces with high consumption are more willing to purchase insurance for their children than for their parents.

5. Conclusions

The research on insurance demand is closely related to the supervision and development of the insurance industry and has an important practical significance. In addition, the particularity of insurance products implies that many complex factors affect insurance demand. The existing research indicates that the occupation, family economy, urbanization level, and insurance coverage of the policyholder's city affect insurance demand. Based on the above, this study examines the influence of gender, age, income, and occupation on insurance demand. In addition, the influence of insurance coverage (insurance density and insurance depth), economic development, and economic knowledge levels of the city where the policyholder is located on insurance demand is investigated. In particular, the research on insurance demand also distinguishes the influence on the insurance demand of different relatives. The influence of the aforementioned factors on the decision of the policyholder to purchase insurance for their parents and children is discussed.

A multinomial logit regression model is used to analyze the health insurance policy data of a large insurance company in China, which reveals that economic factors play an important role in people's economic decision-making. The research found that, the more developed the economy and the more financial knowledge people possess, the more the latter tend to purchase health insurance for

their children. The more serious the air pollution level, the more people tend to give priority to health insurance for their children. This study examines whether the economic and environmental factors will affect the purchase decision-making of commercial insurance, and the degree of influence, which provides reference and enlightenment for policymakers and insurance companies and can effectively implement stimulus policies to develop the insurance industry.

In China, those who purchase commercial health insurance are usually residents with adequate economic means. This study only reflects the insurance decisions of middle and high income people in various regions, which is a limitation. In addition, the survey data of the CHFS are obtained via a sampling survey, and the results do not have the bias of high income level and high education level, but the sample size is small. For these reasons, further research is needed to extend the conclusions of this study to the entire society. In addition, we find that men and women have different preferences in their decisions regarding insurance for their parents and children, and we speculate that this preference may be related to cultural background. A follow-up study could explore the influence of traditional culture on insurance demand in depth and examine the reasons for some interesting cultural phenomena.

China's aging society problem is becoming increasingly serious. As an important part of the old-age security system, the traditional family pension is also facing critical challenges. Our research on the order of insurance purchase also indicates that Chinese families lack support from their children, and the function of family pension is gradually weakening. However, our research also indicates that families are willing to spend money on insuring their children. Therefore, it is more effective to promote health insurance by considering families as a unit to solve the problem of health and old-age security for the elderly.

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