The Impact of the Development of Internet Insurance on People's Willingness to Purchase Supplementary Medical Insurance

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Abstract: The thirteen-fifth plan of the Chinese government started the "Internet+" initiative in 2016, encouraging internet-based innovation in various fields, including health insurance. In this paper, we apply a logit model to estimate the impact of the development of Internet insurance on the participation rate of supplementary medical insurance based on the data from The Peking University Digital Financial Inclusion Index of China and the Chinese Family Panel Studies (CFPS) from 2014 to 2018. First, we find that Internet insurance promotes growth in the participation rate of supplementary insurance in China. Second, the study finds possible channels through which such an effect operates: as Internet insurance develops, people will be more risk-averse. And since people are more risk averse, they are more willing to purchase supplementary medical insurance to transfer their risks. Finally, people of different incomes and ages usually get different exposures to Internet insurance and have different responses to the development of Internet insurance. The findings provide evidence of how Internet insurance can positively affect the supplementary medical insurance market. In order to encourage Internet insurance, regulations by the government, engagement by the insurers, and recognition by the general public towards the Internet are important.

1. Introduction

The "health poverty trap" has attracted much attention for a long time, which refers to the phenomenon that the family gets poorer over generations due to diseases. For the poor, health shocks can be devastating. Although the Basis Medical Insurance (BMI) system seems to alleviate these shocks, the market of supplementary medical insurance for the lower-income groups is underdeveloped. In specific, people with lower incomes tend to be less likely to purchase supplementary medical insurance than those with higher incomes (Saver and Doescher, 2000). During the past three years of the pandemic, those with lower incomes have greatly suffered from illness while probably strapped for cash. Thus, it is of great necessity to improve the purchase rate of supplementary medical insurance in low-income markets.

As the economy boomed, the demand for healthcare services in China surged drastically in the past few decades. At the same time, the disparity between the rich and the poor was aggravated (Choi et al., 2018). Although social health insurance schemes were launched (e.g., the Urban Employee Basic Medical Insurance or UEBMI, and the Urban-Rural Resident Basic Medical Insurance or URRBMI), there are still problems with the insufficient reimbursement rate (Dong, 2009). Thus, supplementary medical insurance plays a complementary role. However, the growing supplementary medical insurance market usually did not provide sufficient financial protection and did not cover the people with the greatest need, who are usually the poor or migrants from rural areas to cities (Jin et al., 2016).

Since the Internet was developed in the 1960s, the insurance industry has grown rapidly. First, a new kind of insurance product was developed, which is cyber insurance. As the Internet developed, cyber risks increased, leading to serious impacts on business and society (World Economic Forum, 2014). Corporations were busy looking for a way to transfer their risks suffering from cyberattacks. Thus, cyber insurance policies have gained increasing popularity (Mansfield-Devine, 2016) since 1998 (Majuca et al., 2006). Second, the Internet becomes a source of extra information for consumers,

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which lowers the cost of search dramatically. Insurance-oriented websites acted as a comparison device for people who wanted to purchase term life insurance (Brown and Goolsbee, 2002). The increase in Internet usage reduced the price of term life insurance and the price dispersion also fell (Brown and Goolsbee, 2002).

When we trace back to more recent times, health insurance can also be traded online as well, which we call Internet insurance in this paper. The development of Internet insurance reduces the cost of insurance companies to obtain customers and provides access for consumers to buy supplementary medical insurance more conveniently. The Internet insurance industry boomed in 2015, but after that, the bringing in of new regulations tended to oppress the growth of Internet insurance. During the pandemic, people gained more awareness the Internet insurance and may vitalize the Internet insurance market (Jing, 2021).

In this passage, we mainly discuss how the development of Internet insurance affects different people's willingness to purchase supplementary medical insurance and how other factors contribute to the participation rate under an Internet insurance background. The remainder of the paper is organized as follows. In section 2, we give a brief literature review. In section 3, we introduce our methodology and data. Section 4 is about the basic results, and we determine that the mediating effect of risk aversion does exist. Two groups of heterogeneity tests on income and age will also be carried out. Section 5 is a further analysis. The discussion and the conclusion will be covered in sections 6 and 7, respectively.

2. Literature Review

Supplementary insurance mainly refers to insurance other than public insurance, which is not mandatory. According to previous studies, household income is one of the most important factors influencing the demand for supplementary medical insurance (Motlagh et al., 2015). The demand is also associated with age. It peaks in middle age when savings and income are highest (Motlagh et al., 2015). Individuals who are female, high-educated, with better economic status, and with greater expected medical expenses tend to purchase more supplementary medical insurance (Motlagh et al., 2015).

Internet insurance has changed the structure of sales channels, innovated the products and services, and changed the pricing model (Chen et al., 2019), which can better meet individuals' needs (Li and Wan, 2014). Customers may tend to purchase more insurance online as there is less hindrance when finding insurance portals and the insurer's websites (Flanagan, 2012). Whereas Internet insurance has just come a few years, laws on privacy and regulations are remained to get improved (Chen et al., 2019).

At the same time, there are several reasons both from the demand side and the supply side for the problem that people with lower incomes seldom purchase supplementary medical insurance. From the demand side, poorer individuals hardly buy supplementary medical insurance due to their lower demands (Banerjee et al., 2014). Firstly, financial restrictions play an important role. Those with lower incomes usually expect lower premiums and lower deductibles, but most supplementary insurance products, such as some private insurance, are relatively high in those two fees, expelling low-income people from choosing them. Secondly, those with lower incomes may have poorer knowledge about the principle of insurance (Abhijit and Esther, 2012), and the policy of supplementary insurance. Thirdly, time discounting cannot be ignored. The reimbursement only occurs when the insured person gets sick, presumably in a very distant future. Under this consideration, poor people often prefer not to buy supplementary medical insurance at an earlier stage (Abhijit and Esther, 2012).

From the supply side, insurance companies are sometimes not willing to offer supplementary insurance products to low-income people. Firstly, low-income customers may be faced with more risks related to diseases partly due to their poor working environment. For example, according to Hemström (2005), the working environment is an important mediator between income and health condition. Secondly, the lower income groups scarcely pay attention to their health conditions. They often greatly rely on informal and cheaper health providers. For instance, the utilization of informal

healthcare providers was estimated to be 60%–77% in Bangladesh (Sudhinaraset et al., 2013). Thirdly, insurance companies are difficult to get enough information to judge the real risk level of the low-income population. Therefore, adverse selection may frequently occur and oppress the growth of the supplementary medical insurance market. In addition, moral hazards may also exist. The poorer usually prefer treatment rather than prevention (Abhijit and Esther, 2012). After paying for insurance products, people may be less concerned about their health.

The development of Internet insurance may provide a possible solution from the demand side. It provides more chances for low-income people to get knowledge about and get access to health insurance through mobile phones and the internet (Yu et al., 2022). It has been proved that the Internet has a significant positive effect on households' private health insurance participation (Liu et al., 2022; Xu et al., 2022). In former studies, the effect of the internet depends on the content of the information provided, whether it is positive or negative, and whether people trust it (Liu et al., 2022), and its positive influence is more significant on rural residents rather than on urban residents (Xu et al., 2022).

With a greater number of potential customers, insurance companies can offer products with lower premiums for the low-income population.[1] Other measures can be useful as well. First, family members can be bundled together to purchase a supplementary insurance product at a relatively lower premium (Fischer et al., 2018). Second, sharing information between the insurers and the doctors can be helpful to alleviate adverse selection. Insurers can get more information about their low-income customers from their medical service providers so that they can make better judgments on the price of insurance and be more willing to offer suitable products.] In this paper, we try to figure out whether the recent development of Internet insurance did encourage more people to buy supplementary medical insurance.

3. Data and Methodology

3.1. Data and Variables

In this paper, we use data from *Chinese Family Panel Studies* (CFPS) to determine the main factors influencing individuals' willingness to purchase supplementary medical insurance. It has been conducted by the Institute of Social Science Survey (ISSS) from Peking University since 2010. This survey aims to reflect the altering of society, economy, population, and education on the level of individuals, families, and communities. The study collects samples from 25 provinces nationwide.

Here, we use the insurance development index under the category of the *Peking University Digital Financial Inclusion Index of China*, which details the data of each province from 2011 to 2020. The Internet insurance development index is based on the number of Internet insurance users, the number of insurance policies per capita, and the amount of insurance per capita.[2] We divide each index by 100 to create a treated index. We use this treated index (denoted as Index1) as the independent variable. In the robustness check, we also generate a lagged variable of the index (denoted as Index2) to further examine the effect of Internet insurance on supplementary insurance.

According to the answers from the participants to the question "whether or not to purchase a 'supplementary medical insurance'" in CFPS, we create a dummy variable as the dependent variable. That is mentioned in QP605 in the questionnaire of 2018 and PP605 in the questionnaire of 2014 and 2016.

Then we explain the control variables. "Age" represents the age of the individual. "Average income" represents the annual total income of the family per capita. "Importance of the Internet" shows how important people think of using the internet to gain information. There is a ranking from 1 to 5, in which 5 refers to "very important". "Pension" shows whether the individual participates in the public pension system.

Table 1 is the descriptive statistics. We find that the mean of participation rate is only 1.3%. This

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[2] Considering that this index is usually a three-digit number, a one-unit increase may only cause a really subtle change to the dependent variable.

indicates that the domestic market for supplementary medical insurance is still underdeveloped. Moreover, there is a significant increase of about 60 on the index of Internet insurance in a single year, indicating that Chinese Internet insurance develops rapidly. Furthermore, the mean of the Importance of the Internet is 2.382 while the median is only 1. This phenomenon reveals that more than 50% of those participants do not treat the internet as a main source of information.

Table 1: Descriptive Statistics.

Variable	N	Mean	Median	S.D.	Min	Max
The participation rate of supplementary medical insurance	61607	0.0130	0	0.111	0	1
Index1	61607	5.444	5.169	1.037	4.155	8.496
Index2	61607	4.795	4.541	1.254	3.068	7.854
Age	61602	46.28	48	17.08	2	97
Average Income	59812	16458	10000	33869	0.167	4.168e+06
Importance of the Internet	61499	2.382	1	1.583	0	5
Free medical care (FMC)	61607	0.0230	0	0.150	0	1
Basic medical insurance for urban employees (UEBMI)	61607	0.129	0	0.336	0	1
Basic medical insurance for urban-rural residents (URRBMI)	61607	0.0840	0	0.277	0	1
New rural cooperative medical system (NCMS)	61607	0.661	1	0.473	0	1
Pension	46795	0.873	1	0.333	0	1
Risk Aversion	20247	2.231	1	1.769	1	6

3.2. Empirical Strategy

As the dependent variable (whether buy supplementary medical insurance or not) is a dummy, we use a multinomial logistic regression model. Multinomial logistic model can be regarded as a simultaneous estimation, formed by pairing various selection behaviors in the explained variables.

$$ln\left(\frac{\pi_{ij}}{\pi_{ib}}\right) = ln\left(\frac{P(y_i = j \mid x)}{P(y_i = b \mid x)}\right) = x_i'\beta_j$$

where “j” represents the number of possible values for the independent variable, which, in our essay, will be 0 or 1 (0 for not participating and 1 for participating). “b” is the base group. Thus, if , then the left-hand side equals 0 and equals 0 as well. This means that compare with the dependent variable’s value, log odds are always equal. We perform margin effects after that. And the marginal change does not always have the same sign as .

4. Results

4.1. Main Results

We aim to verify that flourishing Internet insurance does boost people’s willingness to purchase supplementary insurance, especially among the poorer ones. We apply the logit model to figure out the relationship between the independent variable and the dependent variable. Table 2 is the main results.

In Table 2, we find that when the index rises for 1 unit, the participation rate increases by about 0.157% significantly (margin effect). This indicates that the development of Internet insurance does have a positive effect on the participation rate of supplementary medical insurance.

The coefficient of Importance of the Internet is also positive. Positive information can promote people’s purchase of private insurance(Liu et al, 2022). It is probable that this belief helps them to get more exposure to more advertisements or discussions that contain positive information about supplementary medical insurance and thus makes them more interested in buying them. Furthermore, the coefficient of FMC, UEBMI, URRBMI, and NCMS is all significant, suggesting that there is a

"crowding-out effect" between basic medical insurance and supplementary medical insurance. Moreover, participating in pension will increase the participation rate of supplementary insurance by 1.32%.

4.2. The Mediating Effect

Risk aversion is a pivotal factor in whether or not to purchase supplementary medical insurance. In this paper, we try to observe whether there is a mediator, risk aversion, that is affected by the development of Internet insurance while also influencing the participation rate of supplementary insurance. We analyze the relationship between the index, the risk aversion, and the participation rate using data from 2018.[3]

Risk aversion is an important factor when it comes to whether to purchase insurance or not. Theoretically, people who are more risk-averse tend to buy more insurance to transfer their risks. Thus, we intend to verify that the development of Internet insurance makes people be exposed to more information, and become more risk-averse. As a result, people may increase their purchase of supplementary medical insurance.

The index used to measure risk aversion is a series of numbers from 1 to 6, in which 1 represents the most risk-averse individuals and 6 represents the most risk-loving individuals. CFPS develop this index by using 5 multiple-choice questions about flipping a coin in the 2018 questionnaire.[4]

Table 3: The mediating effect.

Step1	**Risk aversion**
Index1	-.03512** (.0167465)
Number of obs	15,969

Step 2	**Participation rate**
Index1	.00157*** (.0005889)
Number of obs	45,460

Step 3	**Participation rate**
Index1	-.00022 (.0011066)
Risk aversion	-.00003 .0005575
Number of obs	15,969

Note: The values in the brackets are the standard error. *, **, *** represents "p<0.1", "p<0.05" and "p<0.01", respectively. Individual fixed effect and year fixed effect are both controlled.

As we can see in Table 3, the coefficient of the direct relation between Internet insurance and risk aversion, and the coefficient of the direct relationship between risk aversion and the participation rate of supplementary insurance, are all negative, which means that the more Internet insurance develops, the more risk-averse people will be, and thus the more supplementary medical insurance people will purchase. We could conclude that there should be a weak mediating effect of risk preference when discussing the relationship between the development of Internet insurance and the participation rate of supplementary insurance.

4.3. Heterogeneity Analysis

4.3.1. Population with Different Incomes

In this part, we focus on the low-income population. We first get the average income respectively by using the annual total income of a family per capita. Using the method from the National Bureau of Statistics, we determine the low-income groups by dividing residents into quintiles. We first screen

[3] We conduct this research mainly based on data from 2018, as risk aversion level is only tested in the 2018 questionnaire.

[4] Risk aversion is a dummy variable as it has only 6 values (from 1 to 6). However, here we can treat them as continuous variable and it will not affect the conclusion we get.

participants within the lower 20% in each province in the base year of 2014. Then, we trace these people for the years 2016 and 2018, observing their decisions in purchasing supplementary insurance.

Table 4: Heterogeneity Analysis by Income.

Variables	**Participation rate**	
Type	Low-income	Others
Index1	.0005932 (.0009297)	.0016133** (.0007053)
Age	-.0000367 (.0000683)	-.0001669*** (.0000547)
Average income	2.03e-09 (1.14e-08)	6.03e-08*** (1.19e-08)
Importance of Internet	.0018332*** (.0006857)	.004059*** (.0005233)
FMC	.002226 (.0037026)	-.0057495** (.0026864)
UEBMI	-.0081577*** (.0030293)	-.0158893*** (.0019974)
URRBMI	-.0084679** (.0032656)	-.0217867*** (.0027105)
NCMS	-.0162355*** (.0028261)	-.0303044*** (.002269)
Pension	.0078531** (.0036325)	.014358*** (.0030555)
Number of obs	9,126	36,334

Note: The individual fixed effect and the year fixed effect are both controlled. The values in the brackets are the standard error. *, **, *** represents "p<0.1", "p<0.05" and "p<0.01", respectively. Individual fixed effect and year fixed effect are both controlled.

In Table 4, the coefficients of the index appear to be insignificant for the low-income population but significant for others. We conclude that the Internet insurance's development does not significantly affect the participation rate of supplementary insurance in low-income groups. While in the other groups, the development of Internet insurance seems to be more significant. That is probably because low-income people do not get much access to the internet as internet usage was greatly associated with socioeconomic status(Hong et al, 2017). And the low-income population does not usually have high socioeconomic status. Thus, they get little access to the internet.

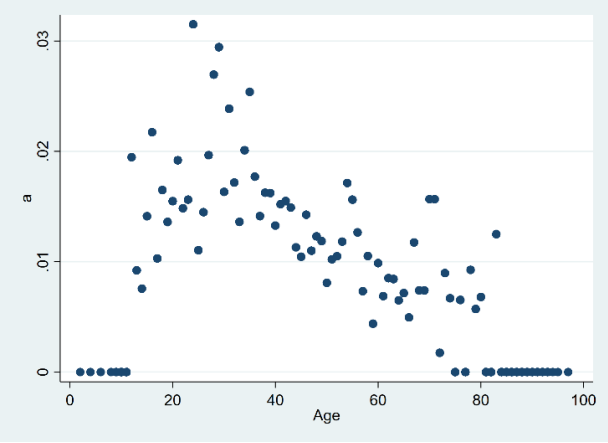

Fig.1: Change in the participation rate over age.

4.3.2. Population with Different Ages

Then we consider the variable "age". In Fig.1, the y-axis represents the participation rate while the x-axis refers to age. We can see that there is an upward trend before 30 years old and a downward trend after that.

In Table 5, we can find that for the group with an age ≤ 30, the index significantly influences the participation rate. With each unit increase in the index, the participation rate rises by about 0.713%. However, for individuals in the group 30<age≤60, the index seems to have a weaker effect and for an

individual whose age is above 60, the index seems to be significant again. One possible reason for this is that younger people usually get more exposure to electronic devices and thus are more motivated. As for people over 60, one possible reason is that their offspring may act as their proxy and purchase supplementary insurance for them. Or adult children can influence their parents to purchase insurance by framing in terms of autonomy(Sperber et al, 2017).

Table 5: Heterogeneity Analysis by Age.

Variables	**Participation rate**		
Type	Age≤30	30<Age≤60	60<Age
Index	.00713** (.0029377)	.00024 (.0007984)	.00230*** (.0007656)
Age	.00132* (.00079)	-.00013 (.0000964)	-.00029** (.0001426)
Average income	4.24e-08 (4.95e-08)	8.60e-08*** (1.37e-08)	4.37e-10 1.68e-08
Importance of Internet	.01070*** (.0030164)	.00358*** (.0005583)	.00152*** (.0005537)
FMC	-.01945* (.0107065)	.00008 (.0030775)	-.00644** (.0029401)
UEBMI	-.05574*** (.0087256)	-.00871*** (.0023409)	-.01014*** (.0021434)
URRBMI	-.04422*** (.0118091)	-.01576*** (.0030023)	-.01597*** (.0032101)
NCMS	-.05066*** (.007881)	-.02621*** (.0026334)	-.02134*** (.0028131)
Pension	0(empty)	.01330*** (.0034274)	.00767*** (.0024026)
Number of obs	3,853	28,189	13,418

Note: The values in the brackets are the standard error. *, **, *** represents “p<0.1”, “p<0.05” and “p<0.01”, respectively. Individual fixed effect and year fixed effect are both controlled.

4.4. Robustness Test

Considering that individuals may not be sensitive to the progress of Internet insurance, we also analyze the circumstance where the index of the former year (Index2) is used.

Table 6: Robustness test with a lagged index.

Variables	**Participation rate**	
	(1)	(2)
Index1	.00157*** (.0005889)	.00097 (.0014555)
Index2		.00055 (.0012274)
Age	-.00015*** (.0000456)	-.00015*** (.0000456)
Average income	1.65e-08*** (4.46e-09)	1.66e-08*** (4.46e-09)
Importance of Internet	.00379*** (.000441)	.00379*** (.0004409)
FMC	-.00385* (.0022546)	-.00386* (.0022548)
UEBMI	-.0137*** (.0016647)	-.01364*** (.0016648)
URRBMI	-.0189*** (.0022545)	-.01883*** (.0022551)
NCMS	-.0281*** (.0018997)	-.02811*** (.0019009)
Pension	.0132*** (.0025482)	.013087*** (.0025565)
Number of obs	45,460	45,460

Note: The values in the brackets are the standard error. *, **, *** represents “p<0.1”, “p<0.05” and “p<0.01”, respectively. Individual fixed effect and year fixed effect are both controlled.

In Table 6, the coefficient of the Index1 is 0.157% and is significant. However, if we add index 2,

we find that neither the index of the present year nor the index of the past year is significant. Therefore, there is no time lag between the development of Internet insurance and people's purchase of supplementary medical insurance.

5. Further Analysis

We further examine how the development of Internet insurance affects other kinds of insurance (e.g., FMC, UEBMI, URRBMI, and NCMS). (see Table 7)

Table 7: The effect of Internet insurance on other medical insurance.

Variable	FMC	UEBMI	URRBMI	NCMS
Index	.00096 (.0007272)	.00269** (.001118)	.01149*** (.0009058)	-.02239*** (.0013577)
Age	.00056*** (.0000555)	.00021** (.0000858)	.00013 (.0000781)	-.00090*** (.0000969)
Average income	6.10e-08*** (1.89e-08)	2.62e-07*** (3.06e-08)	5.12e-08*** (1.16e-08)	-7.95e-08** (3.63e-08)
Importance of Internet	.00735*** (.0005081)	.016680*** (.0007772)	.00472*** (.0006925)	-.00659*** (.0008579)
Supplementary insurance	-.00714** (.0034195)	-.05298*** (.0052704)	-.05853*** (.0055865)	-.13526*** (.0061066)
FMC		-.14222*** (.0035891)	-.10799*** (.0037873)	-.28075*** (.0073202)
UEBMI	-.06326*** (.0018614)		-.16549*** (.0023491)	-.32650*** (.0044163)
URRBMI	-.06072*** (.0024515)	-.20867*** (.0033835)		-.33412*** (.0061827)
NCMS	-.10800*** (.0032871)	-.27400*** (.0025903)	-.22364*** (.0033424)	
Pension	.00935*** (.001892)	.04957*** (.0026897)	.03121*** (.0022711)	.07518*** (.0027756)
Number of obs	45,460	45,460	45,460	45,460

Note: The values in the brackets are the standard error. *, **, *** represents "p<0.1", "p<0.05" and "p<0.01", respectively.

We change our dependent variable into the participation rate of FMC, UEBMI, URRBMI, and NCMS. When the participation rate of the supplementary insurance rises by 1%, the participation rates of FMC, UEBMI, URRBMI, and NCMS will decrease by 0.714%, 5.298%, 5.853%, and 13.526% respectively and all of them are significant. Thus, there is a crowding-out effect between the four medical insurances and supplementary insurance. This corroborates existing studies. For example, in America, about half of the increase in Medicaid coverage relates to a decrease in private insurance coverage (Cutler and Gruber, 1996).

6. Discussion

The reason why people are encouraged by the development of Internet insurance to purchase supplementary insurance might be that it helps them to reduce their search costs and simplify the procedures and help them to get reimbursements more quickly. Technologies applied in Internet insurance, such as big data simplifies the underwriting service process and brings great convenience to insurers and policyholders(Zheng & Guo, 2020). Moreover, the spread of positive information helps drive consumers to purchase private insurance(Liu et al, 2022). The more important people think of internet, the more exposure they are going to get. They are more likely to be affected by all kinds of positive information about insurance posted on these internet insurance websites and advertisements. Thus, they will be more willing to purchase supplementary medical insurance. The mediating effect can be a result of getting more exposure to Internet insurance may remind people of potential risks. And thus, they become more risk-averse and more willing to transfer their risks by means other than public insurance.

Then, it comes to the problem of why the participation rate of low-income population is not

significantly influenced by the growth of Internet insurance. One possible reason can be that Internet exposure may be significantly affected by the income, the literacy, and telecommunication infrastructures in the community (Li and Shiu, 2012), which are all greatly associated with socioeconomic status. But the poor usually do not have high socioeconomic status. Therefore, people with low incomes do not get much access to the Internet, let alone be affected by the development of Internet insurance.

7. Conclusion

In this paper, we examine the effect of Internet insurance on people's purchase of supplementary medical insurance. First, we find that Internet insurance development promotes growth in the participation rate of supplementary insurance in China. Second, there is the mediating effect of risk aversion. As Internet insurance develops, people will be more risk-averse. And since people are more risk averse, they are more willing to purchase supplementary medical insurance to transfer their risks. Third, the development of Internet insurance tends to have little influence on the participation rate of supplementary medical insurance in the low-income market. Fourth, other medical insurance has a crowding-out effect on supplementary medical insurance while pension has a positive correlation with it. Finally, the development of Internet insurance significantly promotes the participation of supplementary medical insurance for people under 30 and above 60.

There is some limitation of this essay. To begin with, more control variables can be added. For example, the number of children in the family should be considered. Moreover, when testing the mediating effect, since the risk aversion level is a series of integers with sequence, it is better to use an ordered logit model. Thirdly, our data is only on the province level, which can be general. It can be specified at the city level for future research. And future studies may concentrate on more mechanisms as well.

Based on this essay, Internet insurance should be encouraged. More regulations should be issued by the government to ensure Internet insurance market becomes more reliable. Insurers should be more actively engaged in the Internet insurance market, improving their sale system by applying digital technology such as big data. Besides, the more people recognize the value of Internet as a source of information, the more people can benefit from Internet insurance.

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