The Influence and Path of Medical Insurance on the Allocation of Diversified Family Financial Assets under the Condition of Informatization

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Abstract. Through analyzing the impact of basic medical insurance on household financial asset allocation, empirical test was conducted based on IV-Probit and IV-Tobit models and multiple mediating effect models. The heterogeneity of basic medical insurance on various types of financial assets is mainly reflected in the difference of insurance types. For risk and guarantee financial assets, compulsory insurance has a significant promoting effect and obvious complementary effect, while voluntary insurance has a significant crowding out effect and substitution effect, resulting in a certain inhibitory effect. Basic medical insurance can improve the investment in financial assets by improving the level of network utilization and enhancing the utilization rate of medical services by families. The mediating effect is different among different medical insurance. The mediating effect of network utilization rate of compulsory insurance and medical service utilization rate of compulsory insurance are significant, but the mediating effect of voluntary insurance is limited.

Keywords: Health insurance; Household financial assets; Network utilization level; Utilization rate of medical service

1 Introduction

Under the condition of informatization development, households' participation in financial asset allocation will be affected by factors such as medical care, pension and network utilization level [1]. And medical insurance provides medical security for residents by compensating the economic loss caused by illness [2]. The insured medical insurance satisfies the necessary medical service demand by paying certain premiums, so as to smooth and balance the consumption, savings and investment of residents throughout the life cycle [3], thus influencing the investment decision of financial assets. The report of the 20th National Congress of the Party pointed out that it is necessary to improve the financing and treatment adjustment mechanism of basic medical insurance, promote the provincial pooling of basic medical insurance, promote the orderly connection of multi-level medical security, and promote the expansion of high-quality medical resources and the balanced regional layout. In November 2022, the "14th Five-Year Plan for National Health Informatization" was released, emphasizing the need to accelerate the construction of national health informatization,

improve the national health informatization standard system, and improve the health and medical big data resource element system.

Previous studies on the relationship between medical insurance and household financial asset allocation mainly focused on the impact on the allocation status, holding ratio and investment scale of risky financial assets such as stocks, and did not make necessary distinctions on the types of basic medical insurance, with little consideration for the development of informatization. This paper studies the difference of influence of different types of medical insurance on diversified financial asset investment, and examines the mediating effects such as the degree of network utilization, so as to reflect the relationship between medical insurance and household financial asset allocation and the transmission influence mechanism.

2 Theoretical analysis and research hypothesis

As for the classification of financial assets held by households, refer to the research method proposed by Lu Yajuan and Zhang Jingjing (2018) [4], which divides financial assets into three categories: robust, risky and guarantee according to the holding intention and risk size. Among them, households hold risky financial assets in order to pursue high returns, but need to bear higher potential loss risks. Households holding robust financial assets aim to avoid large fluctuations in the size of assets and pursue stable returns; Households hold protected financial assets to protect against external shocks from adverse events such as health shocks, illness treatment, elderly care, and accidents. On this basis, this paper puts forward three hypotheses:

H1. Participation in basic medical insurance has different impacts on different types of financial assets. Participation in basic medical insurance can promote the allocation of robust and risky financial assets, but may have a negative effect on guaranteed financial assets.

H2. Participation in compulsory insurance represented by urban employment insurance will have a significant positive promoting effect on household allocation of various financial assets, participation in voluntary insurance represented by urban and rural medical insurance can also promote household investment in robust financial assets, but it will have a negative inhibiting effect on risk and guarantee financial assets.

H3. The basic medical insurance plays a role in the family's investment in financial assets by improving the level of network utilization and the utilization rate of family medical services.

3 Variable selection and model design

3.1 Data source and variable selection

The data used in this paper are the statistical data of the third phase of China Household Finance Survey (CHFS) in 2017, 2019 and 2021. According to the family code and individual number, the data in the family and individual papers are matched to form panel data. The samples of households with the head of household over the age of 16 are retained, and a total of 40011 family samples are obtained.

As for the selection of variables of various financial assets to be explained in this paper, according to the data of CHFS, the total amount of time deposits, bonds and Internet financial products is used to represent robust financial assets, and the sum of market values of stocks, funds, financial products, financial derivatives and gold is used to represent risky financial assets. The sum of premiums of commercial life insurance, commercial health insurance and other commercial insurance is used to represent guaranteed financial assets, and the holding intention and participation degree of financial assets are reflected from the two aspects of "whether to allocate financial assets" and "the quantity and scale of allocated financial assets".

For explanatory variables, dummy variables (Med_in) for basic medical insurance were set. If the resident holds one of the categories of public medical care, urban employment insurance, new rural cooperative medical care, urban residence insurance or urban and rural medical insurance, the value is 1, otherwise it is 0. In addition, the balance of residents' medical insurance Account is one of the important indicators to measure the medical security level and payment status of insured residents. While setting the variable Med_in, the interactive product term of Med_in and personal medical insurance account balance is increased to further test the impact of basic medical insurance on family financial assets.

As for the mediator variables, the ratio of network communication expenditure to total expenditure is selected as the proxy variable to measure the degree of residents' network utilization, and the ratio of hospitalization reimbursement expense to total hospitalization expense is selected as the proxy variable of the utilization index of medical services.

3.2 Model setting

As for the estimation of households' willingness to participate in financial assets, "whether to hold financial assets" is a binary selection variable, so the panel probit model is used for empirical test. The basic model is set as follows:

$$\Pr(\text{Fin\_P}_{i,t} = 1 \mid \text{Med\_in}_{i,t}, X_{i,t}) = \varphi(\alpha + \beta_1 \text{Med\_in}_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t}) \qquad (1)$$

$$\Pr(\text{Fin\_P}_{i,t} = 1 \mid \text{Med\_in}_{i,t}, X_{i,t}) = \varphi(\alpha + \beta_1 \text{Med\_in}_{i,t} \times \text{Account}_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t}) \qquad (2)$$

In formula (1) and formula (2), Fin_P is the dummy variable of household investment financial assets and Med_in the dummy variable of household insurance participation; $Med\_in \times Account$ is the interactive product of the balance of basic medical insurance and individual medical insurance account.

As for the estimation of the participation degree of household financial assets, since only the positive value of household financial assets can be observed, the observed value of households that do not hold various types of financial assets is displayed as 0, so the explained variable is regarded as the data being intercepted, and the panel Tobit model is used, which is set as follows:

$$\text{Fin\_Pd}_{i,t}^* = \alpha + \beta_2 \text{Med\_in}_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t}, \text{Fin\_Pd}_{i,t} = (0, \text{Fin\_Pd}_{i,t}^*) \qquad (3)$$

$$\text{Fin\_Pd}_{i,t}^* = \alpha + \beta_2 \text{Med\_in}_{i,t} \times \text{Account}_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t}, \text{Fin\_Pd}_{i,t} = (0, \text{Fin\_Pd}_{i,t}^*) \qquad (4)$$

In formula (3) and (4), the explained variable Fin_pd is the unobservable latent variable, representing the optimal allocation scale of various financial assets by households.

For the estimation of the mediating effect of medical insurance on household financial assets, referring to Preacher and Hayes (2008) [5] and building a multi-mediating effect model. The model Settings are as follows:

$$Fin_{i,t} = \beta_1 Med\_in_{i,t} + \gamma_1 X_{i,t} + \varepsilon_{i,t} \tag{5}$$

$$Mediator_{i,t} = \beta_2 Med\_in_{i,t} + \gamma_2 X_{i,t} + \varepsilon_{i,t} \tag{6}$$

$$Fin_{i,t} = \beta_3 Med\_in_{i,t} + \lambda Mediator_{i,t} + \gamma_3 X_{i,t} + \varepsilon_{i,t} \tag{7}$$

Among them, β_1 represents the total effect of basic medical insurance on various household financial asset allocation, β_2 represents the effect of basic medical insurance on mediator variables, β_3 represents the direct effect of basic medical insurance on various household financial assets after adding mediator variables, λ represents the effect of mediator variables on various household financial asset investment. $\beta_2\lambda$ represents the mediating effect of participating in basic medical insurance.

4 Empirical analysis

4.1 The impact of basic medical insurance on household financial asset allocation

Considering the endogenous problem, there is a certain two-way causal relationship between family insurance participation and family investment in guaranteed financial assets due to the substitution effect. Therefore, this paper adopts the method of instrumental variables. Considering that different provinces still have differences in the pooling level of medical insurance, pooling at different levels of provincial, municipal and county levels can easily lead to certain differences in the regional participation rate. Therefore, this paper selects the participation rate of family medical insurance as the instrumental variable of the explanatory variable of insurance participation to estimate. As shown in Table 1, Wald test values, as the original hypothesis of the exophyticity of insured variables, show that they are all significant at the 1% confidence level, and the one-stage values in the two-stage estimation method are also significant, so the problem of weak instrumental variables will not be generated. Insurance participation has an obvious promoting effect on the robust and risky financial assets, while for the guaranteed financial assets, the medical insurance variable has the same direction as the estimated coefficient of its interaction term, showing a certain negative inhibitory effect.

Table 1. The impact of basic medical insurance on the participation of various financial assets

IV-Probit	Risky financial assets		Robust financial assets		Guaranteed financial assets	
Med_in	-1.534*** (-5.413)		0.285*** (7.053)		-0.631*** (-2.582)	
Med_in*Account		-0.675*** (-3.868)		0.161*** (6.848)		-0.278** (-2.320)
Observations	81,239	81,239	81,239	81,239	81,239	81,239
First-stage F	144.74***	509.71***	3743.34***	568.62***	144.62***	510.72***
Wald test	33.18***	32.93***	43.65***	43.11***	7.01***	6.99***

IV-Tobit	Risky financial assets		Robust financial assets		Guaranteed financial assets	
Med_in	-16.853*** (-3.7516)		3.343*** (9.1520)		-6.695* (-1.8547)	
Med_in*Account		-7.216*** (-3.0304)		1.823*** (8.5831)		-2.866* (-1.6952)
Observations	81,239	81,239	81,239	81,239	81,239	81,239
First-stage F	144.74***	509.71***	3743.34***	568.62***	144.62***	510.72***
Wald test	16.32***	15.37***	29.03***	48.01***	4.71**	3.72*

[a]The control variables of the model include nearly 20 items, such as income, health status, gender, age, household registration, asset-liability ratio, family size, province, and the proportion of food expenditure, which are not listed in the table considering the length of the paper.

[b] ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively.

4.2 The impact of different types of medical insurance on household financial asset investment

Basic medical insurance can be divided into public medical insurance, urban employee medical insurance, new rural cooperative medical insurance, urban resident insurance and urban and rural medical insurance according to whether they are employed or not and the types of employment. Among them, public medical insurance and urban employee medical insurance are enjoyed by on-job employees and belong to compulsory payment type, while the new rural cooperative medical insurance, urban resident insurance and urban and rural medical insurance are voluntarily insured by non-employee residents and belong to voluntary payment type. Therefore, according to the willingness of the insured, the medical insurance is divided into compulsory insurance and voluntary insurance.

According to the data of CHFS, among the insured groups, compulsory insurance such as public medical care and urban employment insurance accounted for 26.18%, and voluntary insurance such as new rural cooperative medical care, urban residence insurance and urban and rural medical insurance accounted for 73.82%, which accounted for a higher proportion of voluntary insurance in the sample group. Because voluntary insurance was weaker than compulsory insurance in terms of outpatient treatment, starting line, ceiling line and reimbursement ratio, It may not be able to effectively reduce the economic impact on clinics caused by illness, and the crowding out effect caused by medical insurance payment may be more obvious [6]. Therefore, the heterogeneity of financial assets affected by basic medical insurance may be related to the type of basic medical insurance. This part further analyzes the impact of different types of medical insurance on family financial assets.

The regression results of the impact of voluntary insurance and compulsory insurance on the robust financial assets show that the impact of compulsory insurance and voluntary insurance on the investment of robust financial assets is the same, and both can significantly improve the investment allocation of such financial assets.

The difference of the impact of compulsory insurance and voluntary insurance on financial assets is mainly reflected in the investment of risk and guarantee financial assets. Table 2

shows the regression results of the impact of voluntary insurance and compulsory insurance on risk and guarantee financial assets. Participation in compulsory insurance can also stimulate household investment in risk and guarantee financial assets, with obvious complementary effect and significant positive promotion effect. However, participating in voluntary insurance has obvious crowding out effect on risky financial assets, which will reduce household's holding allocation. The negative impact of participating in voluntary insurance on guaranteed financial assets is also relatively significant, showing a certain substitution effect.

Table 2. The impact of basic medical insurance on household participation in risky financial assets and guaranteed financial assets

IV-Probit	Risky financial assets				Guaranteed financial assets			
	Compulsory insurance		voluntary insurance		Compulsory insurance		voluntary insurance	
Med_in	0.390*** (7.764)		-0.967*** (-3.473)		0.075** (2.524)		-1.519** (-2.160)	
Med_in*Account		0.102*** (7.383)		-0.350** (-3.306)		0.011*** (4.184)		-0.325* (-1.869)
Observations	23,511	23,511	64,554	64,554	23,489	23,489	64,520	64,520
First-stage F	1930.91***	381.87***	169.44***	87.08***	3672.57***	133.90***	554.01***	257.20***
Wald test	9.69***	25.11***	10.60***	14.08***	10.58***	9.30**	5.85**	5.55**

IV-Tobit	Risky financial assets				Guaranteed financial assets			
	Compulsory insurance		voluntary insurance		Compulsory insurance		voluntary insurance	
Med_in	5.904*** (8.393)		-10.389* (-1.937)		2.092*** (3.868)		-29.202*** (-2.764)	
Med_in*Account		1.544*** (7.995)		-3.737* (-1.911)		1.418*** (3.724)		-0.325* (-1.869)
Observations	23,511	23,511	64,554	64,554	23,489	23,489	64,520	64,520
First-stage F	1930.91***	381.87***	169.44***	87.08***	3672.57***	133.90***	553.83***	257.21***
Wald test	19.84***	34.32***	3.25*	4.54**	2.79*	10.16***	10.22***	9.79***

4.3 Mediation analysis of the influence of basic medical insurance on household financial asset investment

On the one hand, with the continuous advancement of national health informatization, the informatization level of medical insurance and medical facilities continues to improve, and participating in medical insurance will help improve the informatization utilization level of residents' network. With reference to the research methods of Wang Wen and Sang Lin (2020) [7], Liu Xueying and Wang Yake (2021) [8], the ratio of network communication expenditure to total expenditure is selected to measure the level of network information utilization. On the other hand, residents' participation in basic medical insurance can enhance residents' utilization of medical and health services such as outpatient and hospitalization to a certain extent, thus improving families' participation in various financial asset investments. Referring to the research method of Chen Hao et al. (2020) [9], the ratio of hospitalization reimbursement to total hospitalization expenses is selected as an indicator to measure the level

of family utilization of medical insurance. In order to verify the mediation mechanism, this paper establishes a multi-mediation effect model. Since Sobel test needs to meet the requirement that the product term of the estimated coefficients conforms to the hypothesis of normal distribution and the data conforms to the characteristics of large samples, there are certain limitations, which can be overcome by Bootstrap method. At the same time, the estimation and calculation of confidence interval of coefficient product are more accurate than Sobel test method, so Bootstrap method is used for test (Wen Zhonglin and Ye Baojuan, 2014)[10]. In this paper, based on Mplus software combined with structural equation model, the multi-mediating effect model was tested by non-parametric percentile Bootstrap method (N=5000) .

As shown in Table 3 of the multiple intermediary effect model of compulsory insurance, its influence on the participation degree of risky financial assets and guaranteed financial assets is mainly transmitted through the intermediary effect of the network utilization level, while its influence on the participation willingness of risky financial assets and guaranteed financial assets and the participation degree of stable financial assets is mainly transmitted through the direct effect of basic medical insurance. The mediating effect of network utilization level and medical service utilization meets the requirement of significance. Therefore, the impact of compulsory insurance on household financial assets mainly plays a role through two pathways: improving the utilization level of network and the utilization rate of medical services.

Table 3. Intermediary effects of compulsory insurance on household financial asset allocation

Category	Effect type	Average effect	Standard error	P	95% confidence interval		Proportion of total effect
					Lower	Upper	
Risky financial assets	Total effect	0.176	0.006	0.000	0.147	0.172	100.0%
	Direct effect	0.087	0.006	0.000	0.075	0.098	49.5%
	Network utilization level	0.080	0.003	0.000	0.074	0.087	45.8%
	Utilization of medical services	0.008	0.001	0.000	0.005	0.011	4.7%
Robust financial assets	Total effect	0.084	0.005	0.000	0.060	0.080	100.0%
	Direct effect	0.028	0.005	0.000	0.019	0.037	33.2%
	Network utilization level	0.007	0.001	0.000	0.005	0.009	8.5%
	Utilization of medical services	0.049	0.002	0.000	0.045	0.053	58.3%
Guaranteed financial assets	Total effect	0.059	0.005	0.000	0.011	0.032	100.0%
	Direct effect	0.033	0.005	0.000	0.022	0.044	55.6%
	Network utilization level	0.019	0.001	0.000	0.017	0.021	32.1%
	Utilization of medical services	0.007	0.001	0.000	0.005	0.010	12.2%

The results of multiple mediating effects analysis of voluntary insurance show that its influence on the participation intention and participation degree of risky and guaranteed

financial assets is mainly through direct effects, while its influence on the participation degree of robust financial assets is mainly through the mediating effect of network utilization level. The significance level of network utilization is high, but the significance level of medical service utilization is insufficient. Therefore, the effect of participating in voluntary insurance on household financial assets is mainly played by improving the utilization level of the network, and the transmission effect of improving the utilization rate of medical services is relatively limited, which is mainly caused by the difference in the compensation rate of voluntary insurance and compulsory insurance.

5 Conclusions

First, the impact of participating in basic medical insurance on various types of financial assets is different. Participating in basic medical insurance can significantly enhance the allocation of households to stable financial assets, while it has a certain inhibitory effect on risk and guarantee financial assets.

Second, the impact of basic medical insurance on the heterogeneity of various financial assets is mainly reflected in the difference of medical insurance types. The effects of compulsory insurance and voluntary insurance on the robust financial assets are consistent, and both can play a positive role. For risky financial assets, participation in compulsory insurance also has a significant promoting effect, while participation in voluntary insurance has a certain extrusion inhibition effect. For guaranteed financial assets, participation in compulsory insurance is a complementary effect, which will promote the allocation of households, while participation in voluntary insurance is a substitution effect, which will reduce the participation level of households.

Third, by constructing a multi-mediating effect model, it is found that basic medical insurance can exert mediating effect by improving the level of network utilization and increasing the utilization rate of medical services. However, the mediating effect of network utilization level and medical service utilization rate of compulsory insurance is both significant, and the mediating effect of network utilization level of voluntary insurance is also significant. The significance level of mediating effect of medical service utilization is limited.

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