Applied Economics Studies, Iran (AESI) **21**

Volume 9, Number 33, Spring 2020

Adverse Selection Test in Iran's Basic Health Insurance Market

Arabian, N.[1], Khodaparast Mashhadi, M.[2*], Homayounifar, Feizi, M.[3], Fakoor, V.[4]

Abstract

Adverse selection appears when insured persons have information about their risk that is not observed by insurers. Under these circumstances, insurers are unable to identify customer risk and they are forced to offer the same contract based on the average of all their customers. It is clear that offering such a similar contract will be relatively more attractive to high-risk customers. In contrast, it is not very pleasant for customers who are exposed to lower risk. This will gradually drive low-risk customers out of the insurance industry. The end result will be that such a situation will prevent a stable balance in the market and it allows the market to collapse completely. In the present study, the phenomenon of adverse selection, which is one of the side effects of asymmetric information, in the basic health insurance market in Iran, is studied and tested. To test the research hypothesis, that is, to confirm the existence of an adverse selection, household budget data between 1993 and 1994 were used. Attempts have been made to make the model under the least parametric assumptions, to be able to test adverse selection in health insurance. Also, unlike all previous models, the uncertainty of repayment and its amount was considered in this model, which is much more consistent with reality. The results confirmed the adverse selection in health insurance, health care and social security in Iran.

Keywords:

JEL Classifications: C14, D82, I11.

1. Theoretical background

Bajari et al.'s (2014) model was used for the adverse selection test. Bajari et al.'s Model was developed by Bloomust (1997), Cardon and Handel (2001), and Spence and Zechaser (1971). This model was selected because it uses the least assumptions and the drawbacks of previous models have been resolved and it is more flexible.

1. PhD student in Economics, Ferdowsi University Of Mashhad, International Campus **Email:** nasimmehdi_im@yahoo.com
2. Associate Professor, Department of Economics, Ferdowsi University of Mashhad **Email:** m_khodaparast@um.ac.ir
3. Associate Professor, Department of Economics, Ferdowsi University of Mashhad **Email:** homayounifar@um.ac.ir
4. Assistant Professor, Department of Economics, Ferdowsi University of Mashhad **Email:** feizi@um.ac.ir
5. Assistant Professor, Department of Economics, Ferdowsi University of Mashhad **Email:** fakoor@math.um.ac.ir

The level of consumer utility is as follows:

$$U(c,m;\theta,\gamma) = F(c,(1-\theta),\gamma_1) + H(m,\theta,\gamma_2) \quad (1)$$

In relation (1), $F(.)$ indicates the level of utility of the consumption of compound goods and $H(.)$ denotes the utility resulting from the consumption of health services, θ shows the parameter of the level of health γ_1 and γ_2 is the risk aversion. The hidden health parameter, θ, is located between $[0,1]$, and indicates the importance that the consumer gives to the consumption of medical services in relation to other goods. If θ is close to 1, the consumer will increase the value of the health product, m and $(1-\theta)$, the consumption status of the compound product will decrease. γ_1 and γ_2 shows the parameter and, consequently, multilateral risk aversion according to total consumption and health.

Budget constraints are costs that consumers spend on compound goods plus health goods, which should be less equal to their income, y, after deducting premiums, P_j . j . It is the insurance plan that the individual chooses.

$$c + m(1-a_j) \le y - p_j \quad (1)$$

2. Estimation

We used a two-step semi-parametric estimation strategy to obtain the parameters of the consumer utility equation and the distribution of the hidden health status. Observations include individual "s correspondence in program *j* for the year *t*. The statistical population of the study for the adverse selection test and the moral hazard of information included all the insurers of basic health insurance. A statistical sample of the household budget questionnaire was obtained, which is collected annually by the Statistics Center of Iran. The period under study was 2014 and 2015. The reason for choosing this course is that the government has been creating health insurance since 2014, and this research seeks to examine asymmetric information after the implementation of this program. Also, information on the costs of each type of insurance and the amount of repayments was obtained from the statistics and data of the Central Insurance Organization of Iran. In the Iranian health insurance market, people have one type of insurance according to their type of job: a) government employees are covered by health insurance; b) workers and employers are covered by the Social Security Organization; c) the self-employed are covered by health services; d) Freelancers are under the auspices of the Social Security Organization; and e) Health insurance. In this study, the test of adverse selection and moral hazard was performed in three insurance policies: health services, social security and health. Variables included income, y , premiums, p_j , consumer health

expenses, m consumer health reimbursement, $f_j(a_j|m)$ and conditional distribution probability distribution, $\frac{\partial f_j(a_j|m)}{\partial m}$ that can be directly calcualted from $f_j(a_j|m)$ the amount of damages paid to the insured. The probability of repayment is based on the estimated health costs that can be estimated. Unknown values are in the risk parameter or γ_1 and γ_2 which is calculated using the estimator GMM .

3. Estimation of the risk parameter using the GMM method

For each individual, i, in a given plan j, in a given year t, there is an expression of hidden health status. The term health status of individuals in relation to the definition of a hypothesis is used to estimate the utility parameters using the GMM framework. It is assumed that the distribution of hidden health status does not change over time.

Table 1: Estimation of risk values for composite goods and health services

Grid Size	Type of Insurance	$\widehat{\gamma_1}$	$\widehat{\gamma_2}$
20	Health insurance	6	3.894737
	Social security	6	2.842105
	health Service	5.473684	3.894737
40	Health insurance	6	3.692308
	Social security	6	3.179487
	health Service	5.615385	4.076923
50	Health insurance	6	3.244898
	Social security	6	2.836735
	health Service	5.285714	3.653061

The range of risk coefficients between [5.2-6] for γ_1 and [2.83-3.89] for γ_2 c shows that people are more risk averse to compound goods than health goods.

Estimation of θ In this method, the simple form of consumer utility, which is suitable for the general utility framework, is considered:

$$U(c,m;\theta,\gamma)=(1-\theta)\frac{c^{1-\gamma_1}}{1-\gamma_1}+\theta\frac{m^{1-\gamma_2}}{1-\gamma_2}. \quad (3)$$

In this case, the expected utility is equal to:

$$U(c,m;\theta,\gamma)=(1-\theta)\frac{c^{1-\gamma_1}}{1-\gamma_1}+\theta\frac{m^{1-\gamma_2}}{1-\gamma_2}. \quad (4)$$

The consumer maximizes his or her expected utility by choosing to spend on health care. It is derived from the expected utility and set to zero. The first order condition is sorted and θ extracted:

$$\hat{\theta}_i = \frac{\hat{I}}{\hat{I} - \frac{(1-\hat{\gamma}_2)}{m_{ijt}^{\hat{\gamma}_2}}}, \tag{5}$$

$$\hat{I} = \int [-(1-\hat{\gamma}_1)(1-\hat{a}_{jt})(y_{it} - p_{jt} - m_{ijt}(1-\hat{a}_{jt}))^{-\hat{\gamma}_1} \hat{f}_{jt}(a_{jt}|m_{jt}) + (y_{it} - p_{jt} - m_{ijt}(1-\hat{a}_{jt}))^{1-\hat{\gamma}_1} \frac{\partial \hat{f}_{jt}(a_{jt}|m_{jt})}{\partial m_{jt}}] da_{jt}. \tag{6}$$

Where:

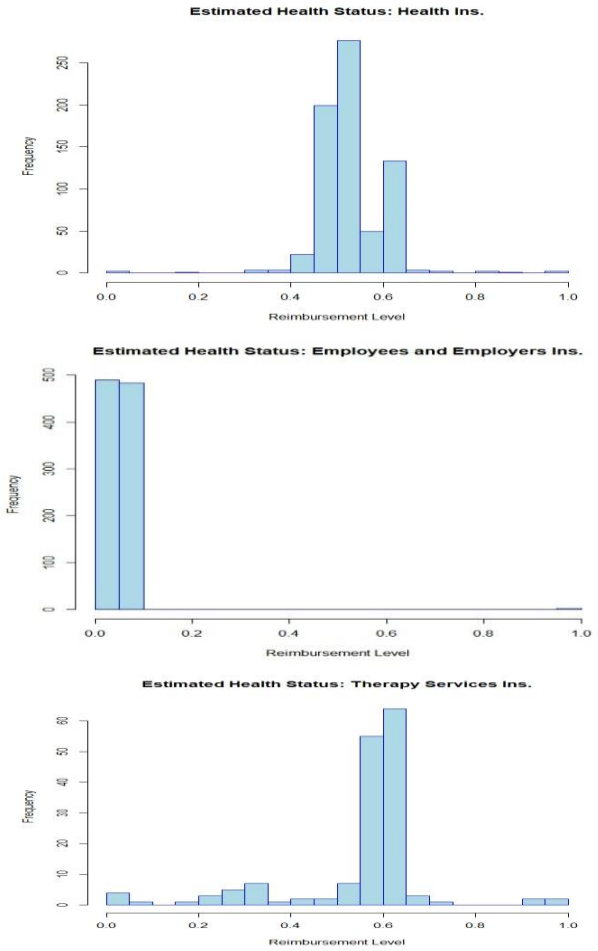

Figure 1: t-distribution function in all three insurance plans (health insurance, social security and health services)

Figure 1 shows the t-distribution function in the three insurance schemes. The t-distribution in health insurance is rounded to 0.4 to 0.5. In health insurance, the distribution of t is 0.5 to 0.7, and in social security insurance, it is 0.1. This means that the level of desirability of health care services for health care providers is the highest compared to other insurances, followed by health insurance and, finally, social security insurance.

4. Adverse selection test

Some insurance schemes are more generous than others, and this is attractive to insurers. If the distribution of hidden health status is the same between different plans, it means that there is no adverse selection and vice versa. The H_0 hypothesis is that the distribution of hidden health status within a project is similar to other projects. The $H1$ hypothesis is that the distribution between plans is different.

As shown in Table 3, the H_0 hypothesis is rejected, meaning that there is a bad choice in all three insurance schemes, and insurers are looking to choose more attractive schemes.

Table 3: Adverse selection test in three health insurance, social security and health insurance plans

Year	Test Statistic	P-Value	Decision
H_0: The aggregate distribution function of social security and health insurance is the same			
H_1: The aggregate distribution function of social security and health insurance is not the same			
2014	0.9949	< 2.2e-16	Reject
2015	0.99526	< 2.2e-16	Reject
gate distribution function of health insurance and health services is the same			
H_1: The aggregate distribution function of health insurance and health services is not the same			
2014	0.012805	1	Reject
2015	0.0048265	1	Reject
H_0 : The aggregate distribution function of social security and health insurance is the same			
H_1: The aggregate distribution function of social security and health insurance is not the same			
2014	0.99795	<2.2e-16	Reject
2015	0.9952	<2.2e-16	Reject

5. Conclusion

The purpose of the present study was to gather information about the presence of asymmetric information in the basic health insurance market in Iran. The importance of this issue is that as long as no complication is identified, no

treatment can be sought for it. The data required for this study were calculated from household budget information between ۲۰۱٤ and ۲۰۱٥ based on the theoretical foundations of the Bajari et al. (2014) model. To this end, a demand model for medical services and other goods was created under the budget constraint. In addition, (1) attempts were made to have the model created under the least parametric assumptions that could well test poor choice in health insurance. (2) Also, unlike all previous models, the uncertainty of repayment and its amount was considered in this model, which is much more consistent with reality. The results confirmed the existence of poor selection in basic health insurance in Iran. The results also showed that in all three insurance plans, risk aversion of compound goods was higher than health care, meaning that people are more concerned about providing other goods, and probably because of low income levels, health products are still a luxury good.

Refrences

Akerlof, G. (1970). "The market for "Lemons": Quality Uncertainty and the market mechanism", *The Quarterly Journal Of Economics*, 84(3), 488-511.

Arrow, K. J. (1963). "Uncertainty and the welfare economics of medical care", *American Economic Review*, 53(5), 941-973.

Bajari, P., Dalton, Ch., Hong, H. & Khwaja, A. (2014). "Moral hazard, adverse selection, and health expenditures: A semiparametric analysis", *RAND Journal of Economics*, 45(4), 747-763.

Blomqvist, Ake G. (1997). "Optimal Nonlinear Health Insurance", *Journal of Health Economics*, 16(3), 303-321.

Cardon, J. H. and Hendel, I. (2001). "Asymmetric information in health insurance: evidence from the national medical expenditure survey", *RAND Journal of Economics*, 32(3), 408-427.

Cawley, J., Philipson, T. (1999). "An Empirical Examination of Information Barriers to Trade in Insurance", *American Economic Review*, 89(4), 827-846.

Cutler, D. and Reber, S. (1998). "Paying for health insurance: the tradeoff between competition and adverse selection". *Quarterly Journal of Economics* 113(2), 433-466.

Cutler, D. M. and Zeckhauser, R. J. (2000). "The anatomy of health insurance. in A.J. Culyer and J.P. Newhouse (eds.) Handbook of Health Economics", *1A, Amsterdam, North-Holland: Elsevier*, 563-643.

Ellis, R. P. (1989). "Employee Choice of Health Insurance", *The Review of Economics and Statistics*, 71(2), 215-223.

Evans, Xu. K., Carrin, DB., Aguilar-Rivera, G., Mylena, AM. A., Musgrove, P. & Evans. (2007). "Protecting households from catastrophic health spending". *Health Affairs*, 26, 972-983.

Finkelstein, A. and Poterba, J. (2004). "Adverse Selection in Insurance Markets: Policyholder Evidence from the U.K". *Annuity Market*, 112(1), 183-208.

Finkelstein, A., McGarry, K. (2006). "Multiple Dimensions of Private Information: Evidence from the Long-Term Care Insurance Market". *American Economic Review*, 96(4), 938-958.

Jutting, J. P. (2004). "Do Community-based Health Insurance Schemes Improve Poor People's Access to Health Care? Evidence From Rural Senegal". *World Development*, 32(2), 273-288.

Lammers, J. and Warmerdam, S. (2010). "Adverse selection in voluntary micro health insurance in Nigeria. University of Amsterdam, Amsterdam Institute for International Development. AIID Research Series 10-06.

Spence, M. and Zeckhauser, R. (1971). "Insurance, information, and individual action", *American Economic Review*, 61(2), 380-387.

Wagstaff, A., Lindelow, M., Jun, G., Ling, X. and Juncheng, Q. (2009). "Extending health insurance to the rural population: An impact evaluation of China's new cooperative medical scheme". *Journal of Health Economics*, 28(1), 1-19.

Zeckhauser, R. (1970). "Medical insurance: A case study of the tradeoff between risk spreading and appropriate incentives". *Journal of Economic Theory*, 2(1), 10-26.