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Original Article

Reclassification Risk Management in the Health Insurance Market of Iran

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Abstract

Introduction: Reclassification risk in the health insurance market happens when premium prices are determined based on the health level. It is necessary for insurance applicants to manage this risk due to uncertainty about the individual's health status in later periods. Guaranteed renewable insurance fully covers this risk because the health level is not taken into account in calculating the premiums. This study is an attempt to calculate the welfare benefits resulting from the coverage of this risk by providing guaranteed renewable insurance in this market.

Methods: The economic welfare model in the form of computable general equilibrium has been used to measure welfare. The model is calibrated by the data of social accounting matrix and national health accounts in 2011. Social accounting matrix is extracted based on the latest input-output table for the economy of Iran presented in this year.

Results: The results show that, in general, the more guaranteed renewable insurance expands in the health insurance market, the greater the welfare effects will be; therefore, the elimination of basic insurance from this market and provision of the same insurance for all people in the form of guaranteed renewable insurance (complete elimination of reclassification risk) can increase economic welfare up to 6%.

Conclusion: Reclassification risk management by providing guaranteed renewable insurance in the health insurance market of Iran, due to increasing the welfare of the insured, will lead to the provision of a unit insurance plan and equal access to health services for all.

Keywords: Health insurance, Health policy, Risk management.

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Introduction

Health insurance contract compensates the financial loss of a specific group of diseases for individuals; in other words, individuals are exposed to risk that is transferred to the insurer by purchasing a health insurance contract and paying the insurance premiums. In fact, the demand for insurance is the demand for risk management (1).

To make the health insurance market more efficient, policymakers must determine the health insurance premium so that insurance applicants are protected against the risks. In this regard, the reclassification risk is the most important risk in which a severe health shock such as diabetes, heart disease, or cancer results in a growth in the insurance premium in the next period. Standard health insurance contracts, which do not protect individuals against this risk, are the most important examples of market failure in the health insurance market (2). The determination of insurance premiums for later periods, regardless of health status, is a feature of all insurance policies that protect insurance applicants against this risk. Guaranteed renewable (GR) health insurance is a new insurance policy that is explicitly introduced to eliminate this risk. This is a special type of prepaid insurance in which a part of the premium of the next period is prepaid in the premium of the first period. This prepayment guarantees that the person can renew his/her health insurance contract in the next period and the renewable insurance premium is not a function of his/her health level (3). In fact, the demand for GR insurance is the demand for reclassification risk management which results from a person's uncertainty about his/her health status in future.

There are two basic models for the health system financing in the world: The "Beveridge" and "Bismarck" models. In the Beveridge model,

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the government collects income taxes from people and is responsible for providing health services and financing. In the Bismarck model, all individuals in different occupations pay a percentage of their salary as insurance premiums to the Social Security Fund, so that they receive health services. Social Security Fund is responsible for providing health financing (4). GR insurance is a new insurance that can be defined as a branch of the Bismarck model and its advantage is that it can explicitly eliminate the reclassification risk for individuals.

Some studies proposed reclassification risk management with a variety of front-loaded insurances (5-7). Pauly et al. (1995) introduced GR insurance and its basic rules (8). Pauly et al. (1998) introduced group health insurance in the form of GR insurance (9). Feldman and Schultz (2004) compared the demands of people with different levels of health for GR insurance (10). Herring and Pauly (2006) believe that the individuals' age should be considered as an influential factor in determining GR insurance premiums (11). Abdus (2010) presented the mutual strategies of GR insurance applicants and suppliers in different situations based on the game theory (12). Pauly et al. (2011) showed that adverse selection, which is defined as a high likelihood of purchasing a health insurance plan by individuals with higher health risk, would not occur in the GR insurance plan (13). Nevertheless, Handel et al. (2015) considered this factor in calculating GR insurance premiums (14). Pashchenko and Porapakkarm (2015) modeled the U.S. health insurance market in the form of a general equilibrium model and measured the effect of the provision of GR insurance on household welfare (3). Handel et al. (2017) and Hendel (2017) introduced another type of health insurance called dynamic insurance for reclassification risk management (15, 16). Fleitas et al. (2020) demonstrated the insurer's costs of reclassification risk management (2). Ghaemi et al. (2020) showed that the implementation of GR policy can increase welfare by up to 3% using econometric policy evaluation through propensity score matching (17). Hofmann and Eugster (2020) examined the cost-effectiveness of GR insurance over a long period (18). In this regard, Hoy et al. (2020) showed that GR life insurance improved the well-being of applicants (19). Hobbins et al. (2020) showed that providing affordable insurance coverage for individuals eliminated the difference in the use of health services (20).

The present study tries to examine the welfare effects of direct reclassification risk coverage through the provision of GR insurance by using the "Computable General Equilibrium" (CGE) method. Compared to previous studies, this study is an attempt to use the economic welfare model directly to measure welfare. It also models the health sector with equations related to health insurance, premium, out-of-pocket payments, and household consumption of health goods and services.

The present study divided the basic insurance in the health insurance market of Iran into four main groups: Social Security Insurance (SS), Health Insurance (HI), Armed Forces Social Security Insurance (AF), and other health insurances (OT). GR insurance, which is an innovative insurance policy, can be presented in the form of three scenarios in this market to manage the reclassification risk: 1) GR insurance should be provided along with other types of insurance, 2) GR insurance is a substitute for SS insurance, 3) GR insurance is a substitute for all available insurance plans in this market. The current study aims to measures the effect of the implementation of each policy on the economic welfare of households.

Methods

Theoretical Background

The household's consumption of health goods and services varies based on the kind of household insurance. This together with health insurance ins (HH_{ins}) is a function of the household out-of-pocket payment (OOP_{ins}), household, government, and employer insurance premiums (HP_{ins}, GP_{ins}, EP_{ins}) in the insurance policy ins, and net household income (Inc) (21).

$$HH_{ins} = HH(OOP_{ins}, HP_{ins}, GP_{ins}, EP_{ins}, Inc) \quad (1)$$

Data

In CGE model, it is first essential to measure the exogenous variables and coefficients using real data during two stages. At first, social accounting matrix (SAM) is prepared using macroeconomic data for the base year. This symmetric matrix represents the relationship between production activities, goods, factors of production, and inputs in an economy. Then, the calibration method was applied to calculate the values of exogenous variables and coefficients based on SAM (22).

In this research, SAM is extracted based on the latest input-output table (23), insurance industry statistical yearbook (24), national health accounts (NHA) (25), and production and import tax statistics (26) in 2011.

GR insurance data are prepared as follows. Household income and expenditure survey in 2011

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demonstrate that health expenditures of 28.5% of households were higher than the average amount of health expenditures in the year (27). Similar to Ghaemi et al. (2020), the present study has assumed that this group of households participates in GR policy because they are more likely to get sick in the next period and GR will protect them against reclassification risk compared to previous standard insurance. Based on this assumption, GR insurance data is added to other health insurance centers. 28.5% of the payment of health insurance companies for health expenses belonged to GR insurance, which is deducted from the payment of other kinds of insurance for health expenses in proportion to the share of insurance.

It is one of the main assumptions of the model and is expected to affect the results of model simulation. Therefore, the sensitivity analysis of the simulation results with respect to the assumed values for the participation rate in the GR policy will be performed.

In model calibration, in addition to calculating exogenous variables and parameters based on SAM and NHA, some parameters are derived from previous studies (28), including elasticity of substitution between domestic and imported goods and elasticity of transformation between domestic and exported goods for developing countries which are equal to 1.83 and 0.92, respectively (29, 30).

Model Structure

In this study, economic activities are divided into agriculture (Agr), industry (Ind), services except health services (Ser), and health goods and services (H), using International Standard Industrial Classification of All Economic Activities (31). Factors of production include labor (L) and capital (C) and institutions include households, governments, enterprises, and the rest of the world and employers; also, insurance companies are added to the above list in the health sector.

The basic model of CGE in this study is the "Economic Welfare Model" because it directly evaluates the impact of a policy on household economic welfare (22). The software used is GAMS. The system of simultaneous equations is a combination of economic welfare model and equations of the health sector and health insurance. Briefly, only household behavior and economic welfare equations are presented (For other equations, refer to Hosoe et al. (2010)). In this model, sets are defined as follows: $i,j \in \{Agr, Ind, Ser, H\}$ include activities (In this model, sets i and j, in addition to activities, represent the goods and services produced in each activity), $i1 \in \{Agr, Ind, Ser\}\ (i1 \subset i)$ includes activities except health goods and services, $h \in \{L, C\}$ includes factors of production, $Ins \in \{SS, HI, AF, OT, GR\}$, $Ins \in \{GR, HI, AF, OT\}$ and $Ins \in \{GR\}$ include health insurance plans in the first to third scenarios, respectively.

- Household Behavior

Equation 2 shows household consumption of non-healthcare goods and services.

$$X_{i1}^{p} = \frac{\alpha_{i1}}{p_{i1}^{q}} \left(\sum_h p_h^f FF_h - S^p - T^d \right) \forall_{i1} \qquad (2)$$

where X_{i1}^{p} is household consumption of the i1-th good, α_{i1} shows share parameter of the i1-th good in the utility function, p_{i1}^{q} is the price of the i1-th good, p_h^f is the price of the h-th factor of production, S^p shows household saving, T^d indicates the income tax (22).

Based on Equations 1 and 2, the function of household's consumption of health goods and services with different kinds of insurance is defined as Equation 3.

$$X_{H,Ins}^{p} = \omega_{Ins} OOP_{Ins} + \Delta_{Ins} HP_{Ins} + \Lambda_{Ins} GP_{Ins} + \kappa_{Ins} EP_{Ins} + \frac{\alpha_{H,Ins}}{p_{H,Ins}^{q}} \left(\sum_h p_h^f FF_h - S^p - T^d \right) \qquad (3)$$

$$\left(\sum_{Ins} \alpha_{H,Ins} = \alpha_H \,,\ \sum_{i1} \alpha_{i1} + \alpha_H = 1, \right.$$

$$\left. \sum_{ins} (\Delta_{Ins} + \Lambda_{Ins} + \kappa_{Ins}) = 1 \right)$$

where $X_{H,Ins}^{p}$ is household consumption of health goods and services (with different health insurances). Also, OOP_{Ins}, HP_{Ins}, GP_{Ins} and EP_{Ins} are household out-of-pocket payment, household, government and employer premiums, respectively. ω_{Ins}, Δ_{Ins}, Λ_{Ins} and κ_{Ins} show share parameter of out-of-pocket payment, share of household, government and employer premiums in any health insurance, respectively. $\alpha_{H,Ins}$ and $p_{H,Ins}^{q}$ indicate the share parameter of health goods and services in household utility function and the price of health goods and services consumed by household in various health insurances, respectively.

- Economic Welfare

Utility is the direct criteria for measuring economic welfare. The household utility function, with the Cobb-Douglas functional form, is obtained from consumption of health goods and services and other goods and services (Equations 4).

$$UU = \prod_{i1} (X_{i1}^{p})^{\alpha_{i1}} * \prod_{H,Ins} (X_{H,Ins}^{p})^{\alpha_{H,Ins}} \qquad (4)$$

This function is not measurable in terms of

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monetary units and cannot be considered as a criterion for economic welfare; therefore, instead of it, the household expenditure function in terms of utility is used. To derive this function, it is necessary to minimize the household consumption expenditure function to achieve a certain level of utility.

$$\underset{X^p}{\text{minimize}}\, ep = \sum_{i1} p_{i1}^{q} X_{i1}^{p} + \sum_{H,Ins} p_{H,Ins}^{q} X_{H,Ins}^{p}$$

$$\text{S.T.} \prod_{i1} (X_{i1}^{p})^{\alpha_{i1}} * \prod_{H,Ins} (X_{H,Ins}^{p})^{\alpha_{HIns}} = UU \quad (5)$$

First order condition presents the expenditure function in terms of utility.

$$ep = \frac{UU}{\prod_{i1}(\frac{\alpha_{i1}}{p_{i1}^{q}})^{\alpha_{i1}} * \prod_{H,Ins}(\frac{\alpha_{HIns}}{p_{H,Ins}^{q}})^{\alpha_{HIns}}} \quad (6)$$

"Equivalent Variation" (EV) is the index of change in welfare and indicates a change in the level of household utility due to the implementation of a GR health insurance policy if prices are stable.

$$EV = eq(p^{q0}, UU^{1}) - eq(p^{q0}, UU^{0}) \quad (7)$$

UU^0 is the initial household utility level (before the implementation of the GR health insurance policy) and UU^1 is the utility level after the implementation of the policy (22).

Table 1 shows the value of the model parameters obtained from the calibration process for Scenario 1.

Simulation Design

The CGE model measures the effect of a policy. Thus, it is essential to simulate different kinds of equilibrium in the model which are achievable by solving the basic model under different scenarios for the model parameters. Finally, the effect of the policy is measured by comparing these equilibriums (22).

This study has tried to measure the welfare effects of GR policy in the form of three scenarios. The difference between GR insurance and a standard insurance is in the household premium. Therefore, Δ_{Ins} is a simulation parameter. Based on the three conditions of the prepayment of GR premium in the first year (50%, 40%, and 30% more than the standard premium, respectively), Ghaemi et al. (2020) compared the household premium for GR with the standard premium for three years (The results can be generalized to N periods). The higher the prepayment in the first year, the greater reduction the GR premium will experience relative to the standard premium in subsequent years (Table 2).

Thus, the baseline scenario is the use of standard insurance, and the policy scenario is the conversion of the standard premium into GR premium for households for three periods in the three conditions.

Results

Welfare Effect

The results of the model simulation are presented in Table 3. In general, the EV indexes are positive for all years and conditions. The rate of increase in welfare increases over time in each scenario and condition because there is the prepayment of GR premium in the first year and then a reduction in

Table 1: Model Parameters in the Calibration Process (Scenario 1)

Health Insurance Plans	SS	HI	AF	OT	GR
$\alpha_{H,Ins}$	0.008	0.005	0.001	0.023	0.015
ω_{Ins}	0.145	0.097	0.025	0.448	0.285
Δ_{Ins}	0.229	0.341	0.370	0.165	0.229
π_{Ins}	0.115	0.546	0.039	0.806	0.115
κ_{Ins}	0.655	0.113	0.591	0.029	0.655

H: Health sector; Ins: Health insurance plans (SS: Social Security Insurance, HI: Health Insurance, AF: Armed Forces Social Security Insurance, OT: Other Health Insurance, GR: Guaranteed Renewable Insurance), $\alpha_{H,Ins}$: The share of household consumption of health goods and services, ω_{Ins}, Δ_{Ins}, π_{Ins} and κ_{Ins}: Share parameters of out-of-pocket payment and household, government and employer premiums, respectively.

Table 2: GR Insurance Premiums Sequence (17)

		Year		
		1	2	3
Condition	1	1.5 P	0.5 P	0.1 P
	2	1.4 P	0.6 P	0.2 P
	3	1.3 P	0.7 P	0.3 P

P: Standard Insurance Premium

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Table 3: Welfare Effects of Reclassification Risk Coverage in the Health Insurance Market of Iran

Scenario	Condition	First year	Second year	Third year
1	1	0.002	0.012	0.027
	2	0.003	0.014	0.022
	3	0.011	0.019	0.021
2	1	0.008	0.027	0.054
	2	0.012	0.023	0.031
	3	0.016	0.020	0.021
3	1	0.016	0.039	0.062
	2	0.020	0.024	0.037
	3	0.023	0.023	0.027

the premium in subsequent years, in comparison with the standard premium. Prepayment reduces consumption in the first year and consequently reduces the level of household utility; however, the reduction of premiums will lead to an increase in the level of household utility in the subsequent years. Hence, the welfare effects are less in the first year and increase in the following years.

In addition, there are more welfare effects in the first condition in comparison with others at the end of the period. Higher prepayment of GR premium (in the first year) in the first condition leads to a further reduction of the GR premium in the following years resulting in higher welfare effects at the end of the period.

In the first scenario, GR insurance is offered alongside other health types of insurance. The results showed that the current insurance organizations in the health insurance market of Iran (SS, HI, AF and OT) have indirectly been able to provide acceptable reclassification risk coverage because the welfare benefits from access to GR insurance are less and up to 2.7% in this scenario. This is due to the fact that the premium is determined by the relevant laws (not the individual's level of health) in all current types of insurance.

In the second scenario, the SS organization, the main organization in indirect coverage of this risk, is eliminated from the health insurance market. Therefore, it is more significant to provide GR insurance in the health insurance market as the explicit insurance to cover this risk which creates more welfare effects than Scenario 1 (up to 5.4%).

In the third scenario, all kinds of basic health insurance are excluded from the health insurance market. Therefore, no insurance will indirectly cover reclassification risk. Accordingly, in this scenario, the value of GR insurance is extremely high, and welfare effects in this scenario will be greater than those in Scenarios 1 and 2. Accordingly, the third scenario can be considered as the optimal policy to explicitly manage this risk in the health insurance market, so that it can increase the welfare of health insurance applicants up to 6.2%.

Sensitivity Analysis

Sensitivity analysis in CGE models was performed to evaluate the robustness of the simulation results in relation to the assumptions of the model (22). A main assumption in the first scenario is the rate of participation in the GR policy, which is 28.5%. For sensitivity analysis, this study has doubled the participation rate (57%) once and has halved it (14.25%) the other time. The new simulation results are compared with the base situation.

Figure 1 illustrates the results of sensitivity analysis only for the last year in three years. In each condition, the model of increasing participation and that of reducing participation is positive and the same to change the simulation results for the base model. This indicates the robustness of the model to the assumption about the rate of participation in the GR policy.

Discussion

The results show that this risk coverage in the health insurance market of Iran can enhance the welfare of health insurance applicants. In general, the more GR insurance expands in this market, the greater the welfare effects will be. The welfare of individuals enhanced up to 6.2 by eliminating all basic health insurance in this market and providing the same insurance coverage for all people in the form of GR insurance.

Among previous studies, Pashchenko and Porapakkarm (2015) and Ghaemi et al. (2020) measured the welfare effects of providing GR insurance in the health insurance market. The first study shows that the more GR insurance replaces the basic health insurance available in the U.S. health insurance market, the greater the increase in welfare is. The results of the present study for Iran are also

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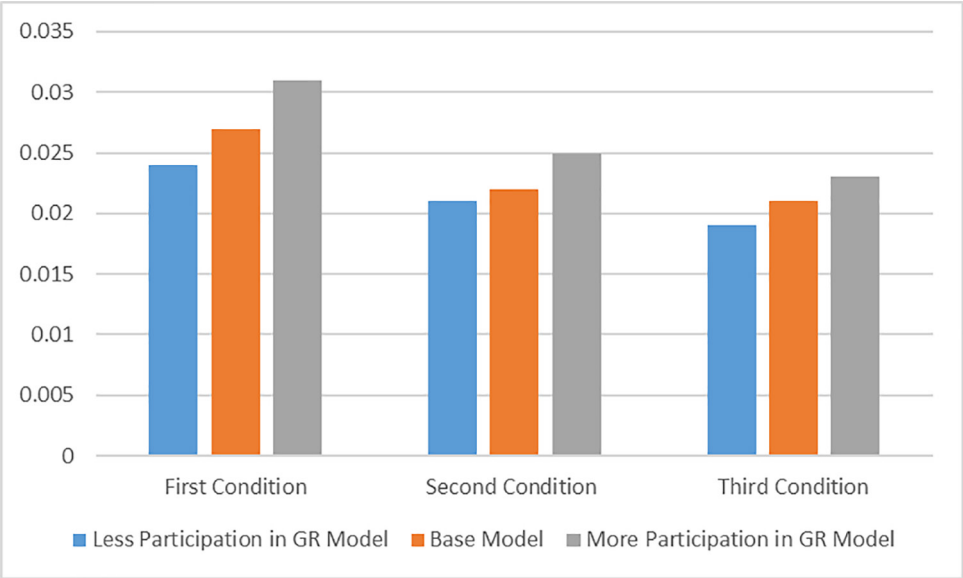

Figure 1: The Sensitivity Analysis of the Model Relative to the Level of Household Participation in GR Policy (Scenario 1).

in line with the results of the above-mentioned study. The second study shows that GR policy in the form of partial equilibrium can increase welfare by up to 3%. This study with the general equilibrium model estimated the welfare benefits of this policy higher than a partial equilibrium because this policy will affect household income by changing health insurance premiums. It can affect household savings and investment, government revenue from direct taxes, demand for domestic and imported goods, and consumption and household utility. A partial equilibrium model measures only the effect of policy on consumption and household utility and eliminates the effect on other markets.

Affordable health insurance for people is one of the main objectives in an advanced health care system. In Iran and similar economies, decision-makers will have more financial support for individuals, especially against the volatility risk of premium (reclassification risk) by providing GR insurance in the health insurance market which is a big step towards reforming the health system.

Conclusion

Since the optimal scenario is the elimination of all basic health insurance and the substitution of GR health insurance, it is recommended that decision-makers implement this policy in the health insurance market. This policy will manage reclassification risk and prevent unreasonable increases in premiums, increase the welfare of health insurance applicants, create the same health insurance coverage for everyone, provide justice and fairness in determination about the premiums, increase people's access to health insurance coverage and necessary health services, and affect the level of community health.

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