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RESEARCH PAPER

Economic Welfare Effect of Providing Guaranteed Renewable Insurance in the Health Insurance Market of Iran

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Abstract
Reclassification risk is a downside for the insurance applicants in the face of a sharp increase in premiums due to the deterioration of individual health conditions. Guaranteed renewable (GR) health insurance directly protects the applicants against the mentioned risk. The reason for this support is the existence of a prepayment in the first insurance premium. Instead, the premiums in the next years are independent of the applicant's future health. The current study aimed at evaluating the effect of providing this new insurance policy in the health insurance market of Iran on economic welfare of health insurance applicants. This evaluation was conducted in the form of two hypotheses, including "provision of GR insurance along with other insurance" and "the replacement of all insurance with GR insurance". The economic welfare at micro-level is measured by changes in household consumption. In an econometric model, the policy effect was evaluated through propensity score matching. In general, the provision of GR insurance in the health insurance market of Iran increased the welfare of insurance applicants. However, the welfare benefits are greater in the second hypothesis. If the integration plan for insurance funds be implemented, GR insurance can be a good alternative to all insurance funds due to the elimination of reclassification risk and the increase of the welfare of health insurance applicants.
Keywords: Health and Welfare Planning, Healthcare Financing, Health Insurance, Insurance Funds Integration, Reclassification Risk, Iran.
JEL Classification: I13, I18, I38.

Introduction

A major feature of the health insurance market is that different insurance schemes normally cover some risks for a limited time. For example, annual insurance coverage is conventionally provided by health insurance companies; nevertheless, in the second year, factors determining the cost of insurance premium may change. Specifically, the cost of premium may be higher at the beginning of the second year, compared to the first year, for a person that faced a risk. The change in premium may be significant in some cases. For instance, in individual health insurance programs, the incidence of chronic diseases can lead to a major change in premium. Unexpected change in insurance premium represents an additional risk for insurance claimants known as reclassification risk (Pauly et al., 1995). Therefore, any health insurance policy with the premium independent of the health of a person can protect the claimant against this risk.

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GR health insurance is defined specifically for this support. In this type of insurance, the purchaser insured needs to pay part of the premium in advance; this prepayment commits him/her to the contract. In return, it is guaranteed that the purchaser can renew the contract in the future, and the defined renewable premium will not depend on the person's health in the future. Therefore, the person is protected against reclassification risk. GR insurance provides more financial security for health insurance applicants, especially in the event of severe health shocks (Pashchenko and Porapakkarm, 2015).

In recent years, one of the most important events in health system of Iran has been the implementation of Iranian health system reform plan. In general, this plan has been implemented with the three objectives of financial protection of individuals, creation of justice in access to health services and promotion of service quality (Iranian Ministry of Health and Medical Education, 2014). The financial protection of individuals in the field of health is one of the tasks of the insurance system. Any health insurance plan (public or private health insurance) can provide financial security for individuals facing unexpected or serious diseases through the provision of health care coverage (OECD, 2018).

The present study tries to introduce GR insurance as a new insurance policy in health insurance market of Iran, so that it can provide more financial protection for health insurance applicants. On the other hand, one of the important reform policies in the health insurance market is the elimination of the reclassification risk for the insured person through provision of GR insurance. The present study evaluates the impact of policy on the welfare of insured people.

The second section includes previous studies on the topic and research hypotheses. In the third section, the research methodology including the theory of the effect of the purchase of GR insurance on the economic welfare of individuals, GR insurance premium sequence, data and research design is presented. In the fourth section, the results and discussion, and in Section 5, conclusion and policy recommendations are presented.

Literature Review

Some studies introduce a variety of pre-paid insurance contracts in order to protect insurance applicants from reclassification risk. Some of these studies are Cochrane (1995), Hendel and Lizzeri (2003) and Finkelstein et al. (2005).

Ordinary health insurance does not cover long-term illnesses, which means people will be forced to pay more premiums or lose their insurance in case of an acute illnesses. To solve this problem, Cochrane (1995) presented the idea of adding prepayment to standard premiums. This insurance subsidizes the health expenses of the individuals who have been suffering from acute illnesses for a long period of time. This expense is provided from prepayment and premium of people who have improved over time (and their health costs have been decreased). In this type of insurance, p_t is the insurance premium paid at time t and is defined as the expected amount of health expenses (x_t), as well as prepayment (y_t) at time *t*. This prepayment is based on the level of the individual's health at time *t*.

$$p_t = E_t\,(x_t + y_t) \tag{1}$$

Hendel and Lizzeri (2003) introduce life insurance contracts in the form of pre-paid contracts. In the first period, Q^1 and F^1 denote the life insurance premium and the amount of prepayment, respectively. Since the level of health in the second period is the main factor in determining the premium and prepayment, the life insurance premium vector can be defined as follows for the N period:

$$\left(Q_2^i, F_2^i\right) = (Q_2^1, F_2^1), \ldots, (Q_2^N, F_2^N) \tag{2}$$

By maximizing the expected utility of life insurance applicants, the following equation is achieved:

$$v'\left(F_2^i\right) = u'(y_2 + g - Q_2^i) \quad (3)$$

where Q_2^i represents the fair life insurance premium in different periods. Contracts with higher prepayments have fewer premiums during the period of insurance coverage[1]. The requirement for all employees of an enterprise to participate in this insurance plan is a prerequisite for this type of insurance, because otherwise, healthy individuals tend to eliminate themselves.

Finkelstein et al. (2005) showed that private health insurance in the USA cannot eliminate reclassification risk for health insurance applicants. Equation 4 shows the estimated model in this study.

$$Y = X\beta_1 + \beta_2 W + \varepsilon \quad (4)$$

where W indicates whether a person has canceled his/her health insurance in the second period. Vector X includes variables, which indicate whether a person has encountered a reclassification risk in the second period. Y shows the extent to which nursing services, as a health index, are used in the second period. Based on the results, people with a low health risk have canceled their health insurance in the second period, while those with a high health risk have continued their contract. Therefore, the private health insurance market fails to provide efficient insurance against the reclassification risk, and it is essential to define a type of health insurance coverage, which requires all insured people to continue their insurance contract. Accordingly, they introduced the long-term health insurance scheme as a prepayment contract and showed that the provision of this type of insurance in the health insurance market can completely eliminate this risk.

Pauly et al. (1995) developed a GR health insurance scheme and its premium sequence. To illustrate the decline in GR insurance premiums over time, this study addressed the sequences of GR insurance premiums theoretically (not quantitatively) for three years (Equations 5-7):

$$P_1 = [P_L L][1 + (P_H - P_L) + (1 - P_L)(P_H - P_L)] \quad (5)$$

$$P_2 = [P_L L][1 + (P_H - P_L)] \quad (6)$$

$$P_3 = P_L L \quad (7)$$

where P_1 to P_3 represent the insurance premium for the first year to the third year; P_L and P_H represent the probability of being ill in the first period and the probability of illness in the next two periods, respectively; and L shows the losses caused by the disease. P_1 consists of three sections: expected losses for healthy people ($P_L L$); expected losses for the elders in the first and second periods ($P_L L(P_H - P_L)$); and expected losses for those who are elders in the first period, but sick in the second period ($P_L L(1 - P_L)(P_H - P_L)$). P_2 consists of the first two sections, while P_3 only includes the first section. In addition, this sequence can be extended to the N period.

This study indicates that generally the GR premium in the first period is greater than the

1. Due to prepayment, the insurance applicant will have an income equal to $y - g$ in the first period and $y + g$ in the second period. g shows the revenue growth due to the reduction in the paid insurance premium.

standard premium as prepayment, but it decreases to less than the standard insurance.

Pauly et al. (1998) examined the effects of guaranteed renewability of group insurance. They considered a group of risk-averse individuals with a diverse health level and different expected health costs. The results of their study indicated that the provision of GR insurance for this group of individuals could reduce the operating costs of the insurance company by pooling the risk.

Feldman and Schultz (2004) examined the differences between demands of healthy and unhealthy insureds for GR insurance. The results of that study showed that everyone (with different levels of health) would prefer to take part in GR insurance, because GR premium does not depend on the level of people's health and it decreases over time.

Herring and Pauly (2006) calculated the premium of GR insurance based on age. They showed that optimal premiums should increase with advancing age, because as age increases, medical expenses increment and individuals move from the low-risk group to the high-risk group. Equation 8 shows the probability of a low-risk (*L*) person at the age of *T* becoming a high-risk (*H*) person:

$$P_{H,T} = (N_{H,T+1} - (1 - D_{H,T})N_{H,T})/(1 - D_{L,T})N_{L,T} \quad (8)$$

where $N_{i,T}$ is the number of individuals of risk-type *i* at age *T*, and $D_{i,T}$ is the mortality rate of risk type *i* at age *T*. Accordingly, the amount of the GR premium prepayment must be determined in such a way that it can cover the costs caused by becoming high-risk individuals.

Abdus (2010) modeled the interactions between GR insurance organizations and individuals in the form of game theory.

Pauly et al. (2011) showed that the adverse selection (the tendency of patients to participate in an insurance plan) will not occur in GR insurance, because at any time, the risk level of insurance applicants is visible to the insurance organizations. However, Handel et al. (2015) showed that the amount of prepayment (in determining the optimal premium of GR insurance) should be calculated by considering the two factors of adverse selection and reclassification risk.

If we have two *H* and *L* insurance policies with high and low coverage of treatment costs and with insurance premiums of P_H and P_L, the insurance applicant will act according to its degree of risk aversion (θ): If $\theta < P_H - P_L$, the applicant chooses the *L* policy and, if $\theta > P_H - P_L$, the applicant chooses the *H* policy. If $\theta = P_H - P_L$, the two policies are indifferent. On the other hand, the insurer takes into account the health expenses of the applicant as $m = \varphi\varepsilon_b + (1 - \varphi)\varepsilon_a$ in the provision of GR insurance coverage, where φ shows the available information about the individual's health status at the time of the contract and ε_b and ε_a show the reality of the individual's health before and after the insurance contract. The adverse selection occurs when the individual is more aware of his/her reality of ε_b than the insurance company, but the insurer determines the amount of the GR prepayment in the first period based on the level of people's health to fully reflect the reality of ε_b and prevent the occurrence of adverse selection.

Pashchenko and Porapakkarm (2015) examined the welfare effects of providing GR insurance in the health insurance market of the USA, using a general equilibrium model. The country's health insurance market includes the four insurance plans of Employer Sponsored Health Insurance (for employees), Medicaid (for people with less salary), Medicare (for retired people) and Government Sponsored Health Insurance (for people who suffer from income shock or increased medical expenses).

Equation 9 shows how to calculate the GR insurance premium in this model.

$$P_1^{GR} = P_L + (1 - \nu)(P_H - P_2^{GR}) \quad (9)$$

where the P_1^{GR} shows GR insurance premium in the first period, P_L indicates the standard

premium in the first period, ν shows the probability of being healthy in the second period, P_H indicates the standard premium in the second period if the person becomes ill, and P_2^{GR} shows GR insurance premium in the second period. In fact, $(1-\nu)(P_H - P_2^{GR})$ is the prepayment of the GR insurance premium in the first year.

They found that the provision of GR insurance together with other insurances in this market will increase the welfare of insurance applicants by 0.06%, and replacing it with all the existing insurance plans will increase by 4.16%.

Some studies introduced dynamic contracts for reclassification risk coverage. Handel et al. (2017) and Hendel (2017) are two examples. Dynamic health insurance contracts focus on a sustainable relationship between insurance applicants and the insurance company over time. Therefore, the dynamics requires the information revelation. These studies have shown that these contracts can significantly reduce reclassification risk.

We considered dynamic insurance in period T $(t = 1, \dots, T)$. λ_t indicates people's health status at time t. As λ_t increases, people's health status starts to deteriorate. $F_t(\lambda_t)$ indicates the probability of occurrence of health status λ_t. m_t, $E[m_t|\lambda_t]$, c_t, y_t and S_t show the medical expenses, the premium, the consumption of consumer, the income of consumer and the amount of insurance coverage loss at the time of *t*, respectively. $u(.)$ shows consumer utility function. In this case, the optimal dynamic insurance coverage is obtained from the relation 10.

$$max_{ct(.)} \quad \int u\big(c_t(m_t)\big)dF_t(m_t|\lambda_t)$$
$$s.t. \quad \int c_t(m_t)dF_t(m_t|\lambda_t) \leq S_t + y_t - E[m_t|\lambda_t] \tag{10}$$

In this equation, S_t or the amount of dynamic insurance coverage is obtained to continue the contract in the next period. It can be confirmed that dynamic premium is determined independent of m_t in the next period; therefore, dynamic insurance protects insurance applicants against the reclassification risk (Handel et al., 2017).

Fleitas et al. (2019) provided a solution to financially meet reclassification risk. Receiving more prepayment is solution used by the insurance company.

Other studies have been also carried out on the topic of the present study. Kermani and Ghaderi (2004) showed that health insurance premium is an important factor in choosing the type of health insurance and demand for healthcare services. Yavari and Mehrnoosh (2006) showed that health expenditure, which is partly financed by health insurance, is an economic variable, affecting life expectancy. Moreover, Sepehrdoust (2009) reported that having proper health insurance coverage affects equitable access to healthcare services. Sirag et al. (2017) also showed that the quality of governance influences the financing of the health sector in a way that the low quality of governance in one country reduces the health insurance coverage and increases the household out-of-pocket payment.

Then, the current state of the health insurance market in Iran is analyzed and the necessity of provision of GR insurance is expressed in this market.

In the health insurance market of Iran, the organizations providing the basic insurance consist of Iran Health Insurance Organization, Iranian Social Security Organization, the Iran Armed Forces Insurance Organization, and Imam Khomeini Relief Foundation (Iranian Ministry of Health and Medical Education, 2014).

Various insurance funds in this market, the decentralized decision-making system for financing health services, and the difference in levels and types of services offered by health insurance organizations are among the most important problems of Iran's insurance market. The solution to these problems is the integration of basic health insurance funds. By the integration of insurance funds, all people use equal insurance coverage and receive similar benefits. The most important results of the integration of insurance funds are strengthening policy making in the field of insurance, controlling the health costs, improving the efficiency

of health insurance funds and promoting the equalization in the use of health services (Maher et al., 2017). In addition, the importance of the integration of health insurance funds has been emphasized in the fifth and sixth five-year development plans of the Islamic Republic of Iran. According to paragraph 2 of Article 38 of the Fifth Development Plan Act, it is required that the government integrate all health insurance funds that are subject to the State and Government Service Management Act (Plan and Budget Organization of Iran, 2010). Furthermore, according to paragraph 8 of Article 70 of the Sixth Development Plan Act, the government is required to act in the framework of law in order to establish a unified procedure between funds and health insurance organizations Plan and Budget Organization of Iran, 2017).

GR insurance can be a good alternative to all insurance funds after the implementation of the integration plan. Because this insurance, by definition, will have more financial protection for health insurance applicants, it will protect them against reclassification risk and, most importantly, can affect their welfare.

The replacement of GR insurance in health insurance market of Iran is also important in achieving sustainable development. Sustainable Development Goals (SDGs) is a general framework that provides a set of goals to achieve a better and more sustainable future for everyone. The third goal of SDGs is good health and well-being. One of the targets of this goal is to achieve universal health coverage (UHC) (United Nations, 2019). UHC is the reception of health services by all individuals and countries without being afraid of financial problems (World Health Organization, 2019b). The UHC has two objectives: increasing financial protection and improving access to quality services (Plan and Budget Organization of Iran, 2019a). One of the most important problems in achieving UHC's objectives in Iran is the variety of insurance organizations and funds (Letafat et al., 2018). The replacement of GR insurance with all insurance funds in Iran, through financial support of the individuals who have unexpected and sudden illness, can help the health system of Iran to achieve its UHC objectives and move towards sustainable development.

In addition to the full replacement of all insurance funds with GR insurance, this insurance can be provided along with other types of health insurance in the health insurance market of Iran. Therefore, health insurance applicants, especially those with a higher possibility of reclassification risk, can better choose between the existing insurance plans and GR insurance. This choice can be made based on some factors such as the health level of individuals, the probability of a health shock, insurance coverage and premium sequence.

Provision of GR insurance in the health insurance market can be an important reform policy in the health system of Iran, with the aim of increasing the welfare of insured people. Compared to previous studies, this study attempted to define the sequence of GR insurance premium with respect to the nature of this type of insurance. Next, a completely different approach, involving the econometric assessment of the effect of policy by propensity score matching (PSM), was used to examine the welfare effects of the government's implementation of the policy. In this study, treatment and control groups are defined based on the healthcare expenses of the individuals.

In this study, two hypotheses are considered:

Hypothesis 1: Provision of GR insurance along with other health insurance plans in the health insurance market of Iran increases the welfare of health insurance applicants.

Hypothesis 2: The replacement of all insurance funds with GR insurance in the health insurance market of Iran increases the welfare of health insurance applicants.

The results of this study can help policy-makers in decision-making regarding strategic planning and operating policies for health insurance market of Iran. Because reclassification risk is completely eliminated by introducing GR insurance in this market, health insurance applicants are protected financially, their welfare is increased, and if the integration plan for insurance funds runs, GR insurance can be a good alternative to all insurance plans.

Methodology

Theoretical Background

In the literature of microeconomics of insurance, Rees and Wambach (2008) presented the model of demand for insurance coverage. This model can be generalized to specific insurance markets, including the health insurance market. In the following, this model is presented in detail.

The two main factors of the model of demand for health insurance coverage are premium and insurance coverage. In this model, the health insurance applicant continues to buy insurance coverage until its expected utility maximizes.

It is assumed that $\bar{u}$ is the expected utility, W_0 is the initial wealth, P is the premium, L is treatment cost, C is health insurance coverage, π is the probability of occurrence of the disease, and p is the premium rate ($P = pC$ or $p = {}^{P}/_{C}$). In the event of a disease, the treatment cost is L. Thus, the wealth of the health insurance applicant will be $W_0 - P$ if the disease does not occur and will be $W_0 - P - L + C$ if the disease occurs.

Therefore, the expected utility of this person is defined as:

$$\bar{u} = (1-\pi)u(W_0 - P) + \pi u(W_0 - P - L + C) \quad (11)$$

Now the issue of the insurance applicant means the maximization of the expected utility in relative to the $P = pC$ constraint:

$$\max_{c \geq 0} \bar{u} = (1-\pi)u(W_0 - pC) + \pi u(W_0 - L + (1-p)C) \quad (12)$$

By using the conditions of Kuhn-Tucker, we have:

$$\bar{u}_c(C^*) = -p(1-\pi)u'(W_0 - pC^*) + (1-p)\pi u'(W_0 - L + (1-p)C^*) \leq 0 \quad (13)$$

The second order condition also equals:

$$\bar{u}_{cc}(C) = p^2(1-\pi)u''(W_0 - pC) + (1-p)^2\pi u''(W_0 - L + (1-p)C) < 0 \quad (14)$$

If the utility function is strictly concave relative to C, then the above condition will be met.

It is assumed that in Equation 13, the optimal insurance coverage is positive; therefore, we will have:

$$C^* > 0 \Longrightarrow \frac{u'(W_0 - L + (1-p)C^*)}{u'(W_0 - pC^*)} = \frac{p}{1-p}\frac{1-\pi}{\pi} \quad (15)$$

The premium rate can be determined in three ways: the premium rate equals to the probability of occurrence of the disease ($p = \pi$), it is more than it ($p > \pi$) or it is less than it ($p < \pi$).

At any of the above-mentioned premium rates, the insurance applicant will choose the optimum health insurance coverage according to the Equation 15:

$$p = \pi \Longrightarrow \frac{u'(W_0 - L + (1-p)C^*)}{u'(W_0 - pC^*)} = 1 \Longrightarrow u'(W_0 - pC^*) = u'(W_0 - L + (1-p)C^*) \Longrightarrow C^* = L \quad (16)$$

$$p > \pi \Longrightarrow \frac{u'(W_0 - L + (1-p)C^*)}{u'(W_0 - pC^*)} > 1 \Longrightarrow u'(W_0 - pC^*) < u'(W_0 - L + (1-p)C^*) \Longrightarrow C^* < L \quad (17)$$

$$p < \pi \Rightarrow \frac{u'(W_0 - L + (1-p)C^*)}{u'(W_0 - pC^*)} < 1 \Rightarrow u'(W_0 - pC^*) > u'(W_0 - L + (1-p)C^*) \Rightarrow C^* > L \quad (18)$$

Based on the equations 16-18, the insurance applicant compares the premium rate to the probability of occurrence of the disease for buying the optimal health insurance coverage. If $p = \pi$, the health insurance applicant will choose the full coverage, if $p > \pi$, he buys less coverage (partial coverage) and if $p < \pi$, he buys higher coverage (over insurance). In other words, the health insurance applicant chooses the insurance contract whose premium and coverage maximize his utility.

Therefore, based on this model, participation in a health insurance plan can affect the utility of the individuals.

On the other hand, by definition, utility is the direct criterion to measure economic welfare (Hosoe et al., 2010). Since utility is the satisfaction arising from consumption of goods and services (Varian, 1992), the present study attempted at evaluating changes in economic welfare due to provision of GR insurance in the health insurance market of Iran with reference to changes in household consumption.

GR Insurance Premiums Sequence

In brief, the difference between GR insurance and the standard health insurance is in premium; in the GR premiums sequence, the higher the prepayment of the first period (surplus on the standard premium), the more GR insurance premiums are reduced compared to the standard insurance in subsequent periods. According to Table 1, considering the three-period time frame in the current study, three scenarios were defined and the GR premium was considered proportional to the standard premium. In the first, second, and third scenarios, due to prepayment, GR premiums in the first year were 50%, 40%, and 30% higher than the standard insurance, respectively. Instead, in the first scenario, in comparison to other scenarios, due to higher prepayment in the first year, the decrease in the GR premium in the next years was greater.

Table 1. Guaranteed Renewable Insurance Premiums Sequence

		GR Premiums		
		First year	**Second year**	**Third year**
Scenario	**1**	1.5 I	0.5 I	0.1 I
	2	1.4 I	0.6 I	0.2 I
	3	1.3 I	0.7 I	0.3 I

I, Standard Insurance Premium; GR, Guaranteed Renewable
Source: Research finding.

Data

In the current study, the household income and expenditure survey (HIES) dataset was used. It includes sociodemographic characteristics, consumption expenditure, and income proportional to household members living in urban and rural areas. The samples included all the heads of household living in urban areas from 2013 to 2016. Table 2 shows the variables of HIES used in this study (Statistical Center of Iran, 2013-2016).

Table 2. Variables Description

Variables	**Measurement unit**
Total household consumption expenditure per annum	Iranian Rial

Total household income per annum	Iranian Rial
Age of household head	the number of years
Gender of household head	Male=1 and Female=2
Marital status of household head	Married couple=1, Widowed=2, Divorced=3 and Unmarried= 4
Educational level of household head	Elementary school=11, Guidance school=21, middle school=31, Diploma and Pre-university degree=41, Associate's degree=51, Bachelor's degree=52, Master's degree and Professional Doctorate=53 and Ph.D.=61
Education status of household head	If he/she is currently studying=1 and isn't studying=2.
Employment of household head	Employed=1, Unemployed=2, Making money without job=3, Studying=4, Housekeeper=5, other=6

Source: Statistical Center of Iran, 2013-2016.

Research Design

Impact evaluation is a method to assess the consequences of a policy (treatment) after implementation or predicting the policy impacts before its implementation (Khandker et al., 2009). Since GR insurance policy is not yet implemented in Iran, the current study aimed at predicting the welfare effects of this policy.

In all evaluation approaches, there are two time periods, pre-intervention and post-intervention, and two groups per period. The treatment group is exposed to policy in the second period, but not in the first one, while the control group is not exposed to the policy during either period (Haddad, 2015). Since the treatment and control groups may vary in ways that may influence their trends over time, PSM is the best method to evaluate policy and handle this confounding factor (Stuart et al., 2014).

The basic principles of the impact evaluation of a policy are presented in the Roy-Rubin model. In this model, T_i is a binary variable, if the individual *i* is exposed to policy, it will be 1, otherwise it will be 0. Accordingly, $Y_i(T_i)$ represents the outcome variable for the *i*-th individual, in which $i = 1, \dots, N$ (N = total population). In this case, the treatment effect on person *i* is defined as:

$$\tau_i = Y_i(1) - Y_i(0) \tag{19}$$

τ_i cannot be computed because only one of the variables $Y_i(T_i)$ is visible to each individual at one particular time. For the invisible outcome variable, the counterfactual value must be considered. Therefore, the average treatment effect should be calculated by considering all the individuals. Average treatment effect on the treated (ATT) is the parameter of interest in the PSM model, which is defined as:

$$\tau_{ATT} = E(\tau|T = 1) = E(Y(1)|T = 1) - E(Y(0)|T = 1) \tag{20}$$

In fact, τ_{ATT} represents the difference in economic welfare (outcome variable) among those who participated in GR insurance policy and the counterfactual value of this variable if they did not participate in GR insurance policy. In Equation 20, the expression $E(Y(0)|T = 1)$ is not visible because the counterfactual value of the outcome variable for those who received GR insurance would not be visible if they did not receive it. The expression $E(Y(0)|T = 0)$ is not an appropriate alternative for the above expression, because if $E(Y(0)|T = 1) = E(Y(0)|T = 0)$, the outcome variable for the members of the treatment and control groups,

even in the absence of the GR policy, will be different, which will create the self-selection bias (SB). SB is defined as:

$$SB = E(Y(0)|T = 1) - E(Y(0)|T = 0) \quad (21)$$

If the ATT equation is rewritten as follows:

$$E(Y(1)|T = 1) - E(Y(0)|T = 0) = \tau_{ATT} + E(Y(0)|T = 1) - E(Y(0)|T = 0) \quad (22)$$

τ_{ATT} will be correctly calculated if (Caliendo and Kopeinig, 2008):

$$SB = E(Y(0)|T = 1) - E(Y(0)|T = 0) = 0 \quad (23)$$

PSM creates a control group, based on a probability model of participation in treatment *T*, and condition on characteristic *X*, or the propensity score:

$$P(X) = \Pr(T = 1|X) \quad (24)$$

The probability function of participating in treatment is estimated in the form of a Logit or Probit model. Then, participants are matched with nonparticipants with regard to this probability, using different algorithms. These algorithms include nearest-neighbor matching, caliper and radius matching, stratification and interval matching and kernel and local linear matching (Khandker et al., 2009). In this study, the kernel and local linear matching algorithm is used because in this algorithm, a weighted average of all nonparticipants is used to create the counterfactual match for each participant in GR policy. In addition, the Logit model is applied to estimate the probability function of participating in the GR policy.

The PSM can overcome the SB problem by matching conditional on covariate variables *(X)*. Therefore, the PSM estimation of ATT, as the mean difference in outcome *Y* across the two groups if participants were in a treated area, without SB, is as follows (Caliendo and Kopeinig, 2008):

$$\tau_{ATT}^{PSM} = E_{P(X)|T=1}\{E[Y(1)|T = 1, P(X)] - E[Y(0)|T = 0, P(X)]\} \quad (25)$$

where *Y(1)* represents the logarithm of the household consumption (outcome variable) for participants in GR insurance policy and *Y(0)* for nonparticipants. *X* refers to conditional variables consisting of demographic and household socioeconomic status variables (logarithm of the total household income, age, gender, marital status, educational level, education status, and employment status of the household head).

The validity of PSM depends on two assumptions (Khandker et al., 2009):

(a) Conditional independence assumption:

Based on this assumption, outcomes *Y(0)* and *Y(1)* are independent of GR policy *(T)* assignment by taking into account the set of visible variables *X*:

$$Y(0), Y(1) \perp T|P(X), \forall X \quad (26)$$

In fact, this assumption ensures that all the variables affecting GR insurance policy should be considered. This assumption is examined through the balancing test to verify the mean equivalence of the control and treatment groups.

(b) Common support assumption:

This assumption ensures a sizable overlap in the propensity scores of the participants and

nonparticipants:

$$0 < P(T = 1|X) < 1 \quad (27)$$

The assumption suggests that members of the control group are near the distribution of the propensity score of the members of the treatment group and are properly selected.

Treatment and Control Groups

It was required to define the treatment and control groups in both hypotheses to calculate the ATT for each scenario from 2014 to 2016 (post-intervention), as compared to 2013 (pre-intervention).

If GR insurance policy was adopted in 2014 alongside other standard health insurances in the health insurance market of Iran, heads of household could freely choose to buy GR insurance or extend their previous standard insurance contract.

In the insurance literature, the term "adverse selection" indicates that since individuals, compared to the insurance company, are more aware of their health status (i e, information asymmetry), individuals that are more likely to be sick have a greater willingness to be covered by health insurance (Pindyck and Rubinfeld, 2015). It is obvious that a typical insurance scheme that provides the same health coverage with less insurance premium is in priority. Due to the fact that the GR insurance premium declined over the years to less than the standard insurance premium, it is assumed that in 2014, people with total health care expenditures (including out-of-pocket payments and health insurance premiums) higher than the average total health care expenditures for that year (as those who are more likely to have a disease), instead of continuing the previous standard insurance contract, would purchase the GR contract for the three periods (until 2016) (the treatment group), while others would continue using the previous standard contract (the control group).

In the hypothesis of completely placing GR insurance in the health insurance market, if this policy was adopted in 2014, all the insured individuals could replace their previous standard insurance with GR insurance during a three-year period (2014-2016). All the individuals with insurance were regarded as the treatment group and the same people with their previous status (with standard insurance) were regarded as the control group. In fact, this will measure the change in the welfare of individuals with GR insurance (during 2014-2016) compared to the conditions they had in standard insurance (in 2013).

In case of the treatment group, changes in GR insurance premiums, compared to the standard insurance premium, were applied based on the three scenarios presented in Table 1 for three years (2014-2016) in both hypotheses.

Econometric Strategy

Considering the novelty of our research topic in Iran's economy, the choice of econometric model and strategy is different from other empirical studies. According to the approach for evaluating the policy effect and comparing the welfare of participants (treatment group) with others (control group) in GR insurance policy, Equation 25 is the key research equation, derived from a study by Caliendo and Kopeinig (2008). However, this study did not explicitly describe the effective variables in people's participation in GR policy. Based on the literature on GR insurance, the present study addressed a set of socioeconomic and demographic variables (e.g., household income, age, gender, marital status, educational level, education status, and employment status of the household head) as influential factors in the participation or non-participation of individuals in GR policy and measured the impact of the implementation of this policy (ATT).

In economics, welfare is measured by change in household consumption basket.

Accordingly, household consumption expenditure during 2013-2016 was adjusted by using the consumer price index for urban households[1].

Conditional variables for the treatment and control groups were analyzed by descriptive statistics in all the scenarios in both hypotheses. In Table 3, the descriptive statistics of conditional variables are presented for Scenario 1 of Hypothesis 1. In this table, the overlap in variables' distribution between treatment and control individuals indicates the establishment of common support assumption. These results are also included in the descriptive statistics of conditional variables for other scenarios in both hypotheses.

Table 3. Sample Descriptive Statistics for Conditional Variables for the Treatment and Control Groups in Scenario 1 of Hypothesis 1

	Code	2014		2015		2016	
		T Mean[2] (Std.Dev.)	**C Mean (Std.Dev.)**	**T Mean (Std.Dev.)**	**C Mean (Std.Dev.)**	**T Mean (Std.Dev.)**	**C Mean (Std.Dev.)**
Ln household income		21.30 (1.13)	20.85 (1.08)	21.31 (0.99)	21.10 (1.18)	21.34 (1.13)	20.95 (1.05)
Age of head		53.18 (12.38)	49.40 (13.26)	52.42 (13.47)	53.73 (12.46)	54.9 (13.38)	52.26 (12.24)
Gender of head		1.14 (0.35)	1.10 (0.30)	1.10 (0.30)	1.14 (0.34)	1.07 (0.25)	1.06 (0.24)
Marital status of head	2	0.1407 (0.34)	0.1057 (0.30)	0.0855 (0.27)	0.1377 (0.34)	0.0655 (0.24)	0.0631 (0.24)
	3	0.0119 (0.10)	0.0063 (0.07)	0.0160 (0.12)	0.0042 (0.06)	0.0096 (0.09)	0.0087 (0.09)
	4	0.0104 (0.10)	0.0021 (0.04)	0.0401 (0.19)	0.0084 (0.09)	0.0084 (0.09)	0.0021 (0.04)
Educational level of head		191.28 (185.2)	111.45 (146.32)	148.19 (171.95)	106.20 (145.82)	135.08 (170.36)	108.80 (141.87)
Education status of head		1.98 (0.12)	1.99 (0.05)	1.94 (0.22)	1.99 (0.07)	1.97 (0.16)	2.00 (0.00)
Employment status of head	2	0.0029 (0.05)	0.0486 (0.21)	0.0093 (0.09)	0.0508 (0.21)	0.0084 (0.09)	0.0522 (0.22)
	3	0.2410 (0.42)	0.1649 (0.37)	0.1671 (0.37)	0.1271 (0.33)	0.2167 (0.41)	0.1546 (0.36)
	4	0.0000 (0.00)	0.0000 (0.00)	0.0307 (0.17)	0.0000 (0.00)	0.0000 (0.00)	0.0000 (0.00)
	5	0.0074 (0.08)	0.0042 (0.06)	0.0040 (0.06)	0.0084 (0.09)	0.0072 (0.08)	0.0065 (0.08)
	6	0.0044 (0.06)	0.0000 (0.00)	0.0053 (0.07)	0.0000 (0.00)	0.0024 (0.04)	0.0021 (0.04)

T, Treatment Group; C, Control Group
Source: Research finding.

1. 2011 is assumed as base year.
2. In 2014, for instance, for the members of the treatment group, the average of logarithm of household income was 21.3 Rials and the average of household head age was 53.18 years. 14% of the heads of households were female and the rest (86%) were male. 14.07% of them were widowed, 1.19% were single because of divorce, 1.04% were unmarried and the rest (83.7%) were married. The average level of their education was 191.28, indicating almost a Bachelor's degree. Almost 2% of them were currently studying. 0.29% of them were unemployed, 24.1% had unemployed income, 0.74% were housewives, 0.44% were others and the rest (74.43%) were employed.

Balancing tests were performed for conditional variables for all the years in all the scenarios in both hypotheses. For example, the results of the balancing test for conditional variables in 2014 in Scenario 1 of Hypothesis 1 are presented in Table A1. When some of the variables were not balanced, the product variables or their squares were added to the model. According to the results, one cannot reject the null hypothesis of equality of means between control and treatment groups for each of the conditional variables. Therefore, the assumption of conditional independence was established. This assumption is confirmed for other years in Scenario 1 and also for Scenarios 2 and 3, in both hypotheses. In addition, in all cases, the bias percentage is very small, which implies a proper estimation of the effect of GR policy on economic welfare.

The propensity score graphs for the treatment and control groups in Scenario 1 of Hypothesis 1 are presented in Figure A1. This graph is used to assess the establishment of common support assumption. This assumption is valid up to an acceptable level in all cases because in 2015, for all individuals and in 2014 and 2016, for a large part of the treatment group, there are individuals in the control group so that they are equally matched. In the two mentioned years, only a small portion of observations in the treatment group is excluded from the sample because the same control group for them was not found. This assumption is also valid for other scenarios, in both hypotheses, to an acceptable level.

Results & Discussion

According to the validity of these two assumptions, the results are presented in Table 4. Generally, the provision of GR insurance in the health insurance market of Iran (for the studied years and scenarios in both hypotheses) led to a slight increase in household consumption (as a welfare indicator).

In all the scenarios in both hypotheses, ATT increased over time. For example, in the first scenario of hypothesis 1, in the first year (2014), the increase in household consumption following the provision of GR insurance was 0.716%, while it was 1.085% in the last year (2016). This suggested that the provision of GR insurance would have more welfare effects in the long run.

GR insurance is a pre-paid insurance policy. The higher the prepayment rate in the first year (scenario 1, in proportion to scenario 3 in both hypotheses), the higher the increase in household consumption in the last year (2016). For example, at the end of the first scenario of hypothesis 1, the increase in household consumption was 1.085%, while in the third scenario it was 0.937%. Furthermore, according to the first scenario, the replacement of GR insurance in the health insurance market (second hypothesis) can increase household welfare by 2.755%, which is more than the welfare effects of the third scenario. The reason is that with higher prepayment rate in the GR insurance premiums sequence, the premiums in the coming years reduces which increases consumption in the coming years.

In general, health insurance applicants gain more welfare benefits from replacement of GR insurance in the health insurance market of Iran compared to the provision of GR insurance along with other insurance plans, because the replacement of GR insurance means a complete elimination of the reclassification risk for health insurance applicants and this support for insurance applicants can increase their welfare by 2.755%.

Compared to other insurance types, GR insurance provides more financial support for people in terms of prevention, treatment, or rehabilitation. Therefore, this type of insurance can affect people's welfare by dramatically reducing the medical expenses.

Table 4. The Effect of the Provision of Guaranteed Renewable Insurance in the Health Insurance Market

of Iran on Household Consumption

Year	Total Household Consumption	Hypothesis 1			Hypothesis 2		
		Scenario					
		1	2	3	1	2	3
2014	Obs.	866	782	782	5873	5873	2648
	ATT	0.716	0.772	0.827	0.577	0.857	0.890
	S.E.	0.186	0.144	0.152	0.157	0.162	0.266
	P-value	0.000	0.000	0.000	0.000	0.000	0.000
2015	Obs.	994	876	876	6230	6230	6230
	ATT	0.771	0.784	0.828	1.119	1.041	1.075
	S.E.	0.173	0.176	0.168	0.142	0.142	0.142
	P-value	0.000	0.000	0.000	0.000	0.000	0.000
2016	Obs.	1063	1013	1013	2625	2625	7502
	ATT	1.085	0.950	0.937	2.755	1.193	1.091
	S.E.	0.194	0.198	0.219	0.248	0.267	0.132
	P-value	0.000	0.000	0.000	0.000	0.000	0.000

Source: Research finding.

Since the gender and educational level of the household heads are among the factors affecting the impact of GR policy implementation on household consumption, they were analyzed separately for the last year (2016) and the results are presented in Table 5. In all scenarios in both hypotheses, after providing GR insurance, households with female heads showed more welfare effects compared to households with male heads. Female-headed households were more uncertain about the future; thus, they were more likely to participate in new health financing approaches that could increase their welfare (including GR insurance). Accordingly, the provision of GR insurance could be of great importance from social support standpoint (support of female-headed households). Moreover, households whose head had academic education experienced more welfare effects. Since people with academic education are more aware of the new ways of health financing, including ways in which they can be protected against reclassification risk (including GR insurance) and are more likely to participate in these insurance schemes and benefit from their welfare.

Table 5. Heterogeneity in Total Household Consumption, in 2016

Hypothesis	Variables		Scenario											
			1				2				3			
			Obs.	ATT	S.E.	P-value	Obs.	ATT	S.E.	P-value	Obs.	ATT	S.E.	P-value
1	Head gender	Male	1029	0.892	0.185	0.000	982	0.829	0.218	0.000	982	0.747	0.235	0.000
		Female	34	1.065	0.450	0.006	31	0.854	0.492	0.019	31	0.813	0.482	0.019
	Educational level of head	Without AE	492	0.651	0.327	0.000	541	0.626	0.441	0.000	541	0.617	0.319	0.000
		With AE	793	0.935	0.184	0.002	354	0.644	0.189	0.000	354	0.633	0.162	0.000
2	Head gender	Male	2451	1.372	0.261	0.000	7119	1.053	0.139	0.000	7119	0.867	0.138	0.000
		Female	411	1.903	0.284	0.000	383	1.598	0.501	0.000	383	0.981	0.487	0.000
	Educational level of head	Without AE	-	-[1]	-	-	3595	1.127	0.175	0.000	3595	0.960	0.163	0.000
		With AE	2625	1.354	0.239	0.000	5945	1.343	0.156	0.000	5945	1.150	0.162	0.000

AE, Academic Education

1. In this case, convergence has not been achieved due to the lack of proper matching of the members of treatment and control groups.

Source: Research finding.

In the current study, a sequence of three-periods of GR insurance was considered, but the results can be generalized to a sequence of *N* periods of GR insurance.

The welfare benefits of access to GR insurance coverage, as a type of insurance for direct protection against reclassification risk, in all the scenarios, especially in the first hypothesis, were small. The underlying reason is that the current insurance organizations in the health insurance market of Iran indirectly offer good protection against reclassification risk. Iran Health Insurance Organization covers all people with no insurance coverage. In this insurance plan, the payable premium for each person per annum is determined based on the rate approved by the Council of Ministers (Iran Health Insurance Organization, 2019). In Iranian Social Security Organization and Iran Armed Forces Insurance Organization, according to Article 28 of the Social Security Act, premiums are 30% of the worker's salary, of which 20% is paid by the employer, 7% by the worker, and 3% by the government (Iranian Social Security Organization, 2014). According to Article 14 of the General Health Insurance Law, in case the insurance is provided by the Imam Khomeini Relief Foundation, the government pledges to provide a per capita health insurance premium to people who are unable to pay (Islamic Consultative Assembly of Iran, 1994). Since the premiums are independent of the health status of the individuals in all these cases, individuals with access to these markets are indirectly protected against the risk of fluctuations in premiums or against reclassification risk. However, the provision of GR insurance in the health insurance market of Iran, both due to direct support against reclassification risk and increased insureds' welfare, can be considered as a new policy to promote the health system financing.

Conclusion & Recommendations

One of the factors influencing the efficiency of the health insurance market is premium. The premium must be determined in such a way that it protects health insurance applicants against risk. Meanwhile, the most important protection is against a risk in which the occurrence of a severe health shock (such as diabetes, heart disease, or cancer) leads to an increase in premium over the next period and this risk is called reclassification risk. Health GR insurance is defined directly to protect insurance applicants against this risk. In this study, the effect of provision of this type of insurance in the health insurance market of Iran on the economic welfare of health insurance applicants was examined through two hypotheses: the provision of GR insurance along with other insurance plans and the replacement of all insurance with GR insurance. In general, the provision of GR insurance increases the welfare of health insurance applicants, but the welfare benefits are more in the second hypothesis.

Some studies, including the one conducted by Ranabhat et al. (2018), have shown a significant relationship between health insurance coverage and life expectancy index, as health insurance coverage and financial support can prevent or treat diseases and influence life expectancy. Therefore, in addition to the welfare of insured people, availability of GR insurance in the health insurance market of Iran can also affect the life expectancy index, which may be the subject of future studies.

If the provisions, such as changes to the laws of supply and demand for insurance and institutional reform, are prepared to provide GR insurance, policy suggestions to reform the structure of the health insurance market of Iran and similar economies are:

- Certainly, one of the most important goals of policy-makers in the health insurance market is to enhance the welfare of health insurance applicants. In order to achieve this goal, provision of health GR insurance is recommended in this market, because this insurance can increase their welfare by completely eliminating the reclassification risk to health insurance applicants. In addition, since welfare benefits of some groups in the

society such as female breadwinners are higher, the implementation of this policy can help policy makers to protect vulnerable groups of the society.

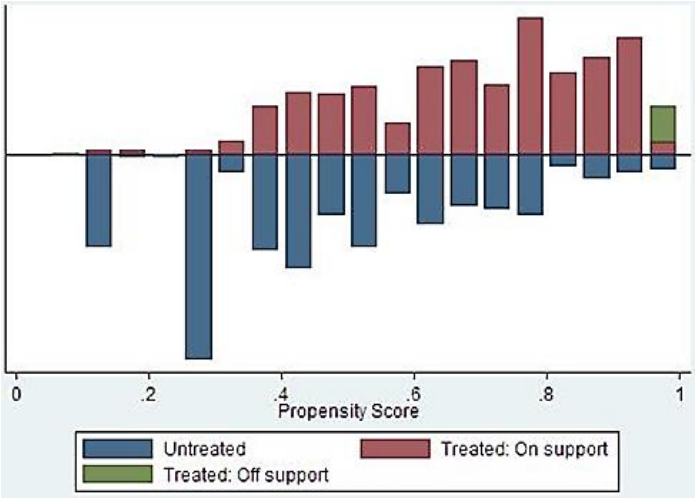
- If the integration plan for insurance funds is not implemented in health insurance market of Iran, provision of GR insurance along with other insurance is recommended, because in this case, individuals can choose between standard insurance and GR insurance based on some factors such as prepayment capability, health status, the probability of facing reclassification risk, insurance coverage, and the payable premiums sequence over the years.
- In the event of integration of insurance funds, an ideal suggestion for policy makers is the replacement of all insurance funds with GR insurance in health insurance market of Iran. Therefore, by eliminating the reclassification risk, the welfare of health insurance applicants can be increased by almost 3%. The integration of insurance funds also provides the realization of important goals such as eliminating overlap of insurance plans and providing justice in access to health services.
- Provision of GR insurance in health insurance market of Iran can also be proposed as a policy to move towards sustainable development, because this insurance can provide greater financial protection for the health insurance applicants by eliminating the reclassification risk, and the financial protection of individuals is one of the most important targets in SDGs.

Appendix

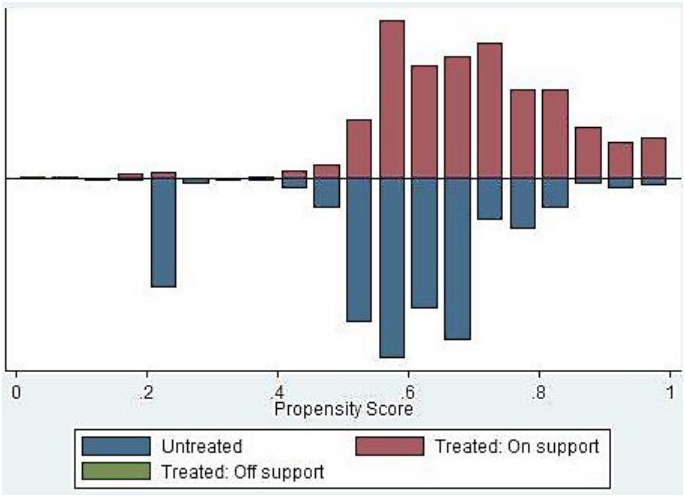
Table A1. The Results of Balancing Test on Conditional Variables in Scenario1 of Hypothesis1 (2014)

Variables	Mean		%bias	P-value
	Treated	Matched Controls		
Age of head	51.82	52.67	-7.5	0.215
Gender of head	1.09	1.07	7.7	0.270
Marital status of head	1.15	1.19	-10.6	0.141
Educational level of head	184.58	187.81	-1.9	0.776
Education status of head	1.98	1.99	-10.4	0.130
Employment status of head	1.40	1.43	-3.7	0.610
Ln household income*Age of head	1096.5	1101	-1.8	0.773
Gender of head* Employment of head	1.67	1.64	2.7	0.708

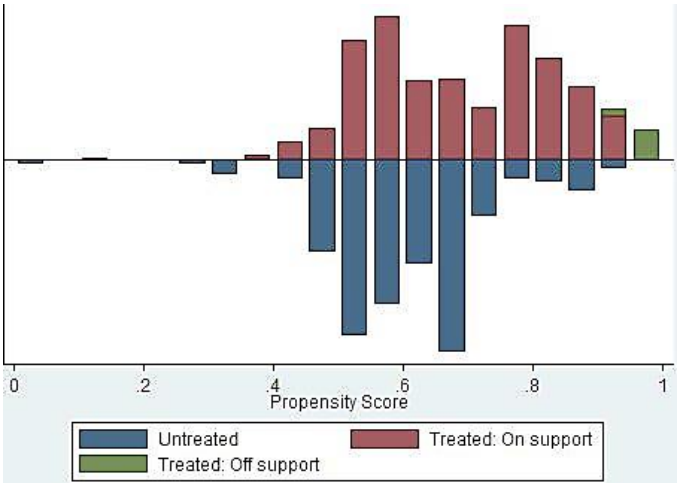
Source: Research finding.



2014



2015



2016

Figure A1. Propensity Score Graphs for Scenario 1 of Hypothesis 1
Source: Research finding.

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