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Master's Thesis of Public Administration

**Determinants of Private Health
Coverage Enrollment and Its Impact
on Health Care Utilization**

**- Analysis of moral hazard and adverse selection in
the health insurance market -**

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Determinants of Private Health Coverage Enrollment and Its Impact on Health Care Utilization

- Analysis of moral hazard and adverse selection in the health insurance market -

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Abstract

Determinants of Private Health Coverage Enrollment and Its Impact on Health Care Utilization

- Analysis of moral hazard and adverse selection in the health insurance market -

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This paper aims to identify demographic, socio-economic, and health determinants on the individual decision of being insured by private coverage. Based on the 2015 Korea Health Panel Survey, I applied logistic regression to disclose the determinants of holding private health coverages. Secondly, I tried to assess the presence of moral hazard by comparing health care utilization between the insured and the uninsured. For the same sample, I used a bivariate logistic model to compare the propensity of ever-use outpatient and inpatient care over the past year between insured and uninsured individuals. I then further studied whether the insured was likely to increase total outpatient visits and bed-days more than the uninsured by using Poisson regression.

As a result, the private health insurance system had limitations in providing the socially disadvantaged, such as the elderly, the disabled, and low-income class,

with better access to health care services. Meanwhile, people with doctor-diagnosed chronic diseases are more likely to be insured, which means adverse-selection may occur in private health insurance market.

I also found that private health coverage had a statistically significant association with both increased access and intensity of use for outpatient treatments. However, in terms of hospitalization, I could not find any statistical evidence that the insured is more likely to utilize inpatient care.

Keywords: health insurance, moral hazard, self-selection, inpatient, outpatient, health coverage

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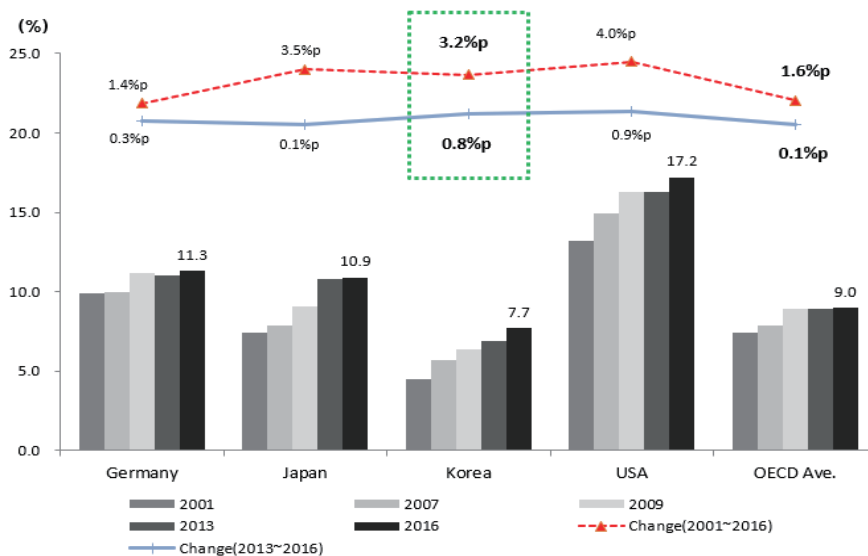
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Chapter1. Introduction

1.1. Background

The increasing health care expenditure (HCE) has become one of the most critical social problems in developed countries, including South Korea. According to the OECD health data, the share of health care expenditure in the Gross Domestic Product (GDP) of Korea has been increasing faster than average OECD member countries. The proportion of Korea's HCE to GDP has increased by 3.2%p from 2001 to 2016, while the average of OECD member states' HCE share in GDP has increased only 1.6%p during the same period. What's more, the increase of the ratio has been accelerating in recent several years. According to OECD statistics, the difference of Korea's HCE share in GDP was 0.8%p from 2014 to 2016, while the average change of OECD member states was only 0.1%p during the same period.

Figure1 Share of health care expenditure in GDP (OECD health data 2017)



In the meantime, the coverage ratio of Korean National Health Insurance (NHI), the NHI's expenditure to gross national health care cost, has stayed at about 63% since 2010. The flat trend means that the incremental economic burden for health care utilization has been taken mainly by the individual, other than the public safety-net. According to OECD health data, Korea has the second largest ratio of out-of-pocket expenditure to total health care cost, next to Mexico, among OECD members as of 2014.

In response to increasing demand for health care and limited coverage ratio to increasing medical cost, Korean governments announced new public health insurance policy directions to extend the coverage of NHI. The primary purpose of new policies is to ensure the NHI covers much broader essential health care services, except for plastic surgery and esthetic treatment. According to the Ministry of Health and Welfare (MHW), the NHI reform allows essential health care treatments, such as MRI and Ultrasonography, to be entitled to the NHI coverage through regular reviews on and continuous entitlement for medical treatments uncovered by the NHI. Furthermore, the government has re-designed payment structures of the NHI so that the socially-disadvantaged have easier access to health care services with a low out-of-pocket cost. For instance, the NHI's out-of-pocket cost ratio for the elderly who get dental implants has become lowered from 20~50% to 10%. Besides, the NHI covers all essential medical supports for pregnant women, including intrauterine insemination and in vitro fertilization-embryo transfer. The MHW projected that the reform eventually increases the NHI's coverage ratio from 63% to 70% within five years and costs approximately 30.6 trillion won by 2022.

1.2. Korean health insurance system

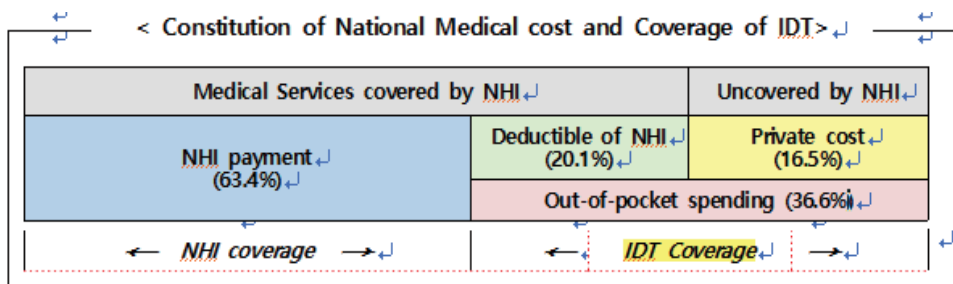
The extended public health insurance system is expected to enhance overall access to health care, but concurrently, it could entail a substantial financial burden to the whole population. According to the National Assembly Budget Office (NABO), the fiscal deficit of NHI would reach \$14.7 billion in 2022 and \$22.1 billion in 2027, which is increased by \$3.7 billion and \$9.9 billion, respectively, from the previous projection in 2016. The NABO expected that the accumulation of fiscal deficit would accelerate along with the rapidly aging population, which eventually raises the premium of mandate national health insurance or additional tax payments (National Assembly Budget Office, 2017). For the incremental financial deficit of NHI, one of the structural reasons pointed out by experts was the moral hazard by private insurance holders, which refers to insurance holders' additional health care utilization. Structurally, the NHI, mandate to the whole population, incorporated cost-sharing scheme as 5-40% of the total cost for each essential medical treatment to prevent moral hazard problem (Ministry of Health and Welfare, n.d.). However, the NHI's cost sharing settings could be ineffective because private health insurances overlappingly cover the insurance holders' out-of-pocket payment of the treatments entitled to NHI coverage (Jung et al., 2011).

Korean private health insurance can be divided into two types: indemnity type (IDT) and fixed amount type (FAT). The IDT refers to insurance that covers people's actual medical costs except for its pre-imposed out-of-pocket payment, which usually set as some proportion of total expenditure. Meanwhile, FAT refers to insurance that provides people with a fixed amount of insurance money for their disease or medical service utilization regardless of how much they paid for the

treatments. Both types cover insurance holders' out-of-pocket cost for the medical treatments, non-covered part by the NHI: the IDT directly curtails the out-of-pocket payment ratio of NHI coverage, and the FAT indirectly reduce out-of-pocket costs by the fixed insurance money.

The overlapping coverage has long been pointed out as a significant incongruity that emasculates the cost sharing system of the NHI that is supposed to prevent moral hazard and causes private insurance owners' excessive medical treatments. Mainly, indemnity health insurance, by which nearly 33 million people are insured as of 2016, has been considered as a significant cause of excessive medical utilization and fiscal deterioration of the NHI. The Figure2 below describes the overall coverage of the NHI and IDT type private insurance.

Figure2 Constitution of national medical cost and coverage of IDT insurance



1.3. Development of government policy

In the Korean health management system, the NHI has undoubtedly played as a backbone of social safety-net, providing people with essential living standards. The NHI, firstly created as health coverage for employees in 1977, has been providing the whole population with essential health insurance since 1989. The

improvement is exceptionally rapid as compared to many other countries with a universal public health insurance system. For example, Germany took 127 years to settle public health insurance that fully covers the whole nation. Japan took 36 years for it (Jung et al. 2018). According to the World Health Organization (WHO), the universal public health insurance is categorized by the coverage scope; the NHI covering parts of medical services under the 'Fee-for-Service' system belongs to a complimentary insurance system (Jung et al. 2018). Under the supplementary public insurance system with a coverage gap, various new health care services uncovered by the NHI emerged as the technological progress in the medical industry. The coverage gap for new treatments facilitated private health insurance developments, such as indemnity health insurance filling the NHI's coverage gap in terms of scope and scale (Jung et al. 2018). With the rapid changes of health care industry, discussions on policy alternatives to supplement the NHI's low coverage ratio, 61.8 percent as of 2004, began in earnest (Jung et al. 2018).

The discussions proceeded from two different perspectives: expanding the NHI's coverage scope and fostering a sound private health insurance industry to complement the NHI's coverage. The former has a limitation in the increase of considerable financial burden. Meanwhile, the latter was challenged by concerns that private health coverage would not play a complementary role as a social safety-net due to structural problems. In 2005, to address the issue, president Noh created the presidential committee for health care service developments', in which many experts and relevant governments discussed the strategic policy alternatives for a harmonious structure between the NHI and private health insurance market. The discussion included the recalibration of the regulatory frameworks for private health coverages to supplement the NHI in increasing the access to medical services.

According to the press release by the prime minister's office in 2006, the committee deliberated and discussed various agenda (as shown in Table1); primary examples are as follows. Many experts teased out the private insurers' cream-skimming, such as irrationally discriminatory underwriting for the socially vulnerable people in health insurance enrollment and turning down consumer's claims without any ground. Notably, the structural incongruity that the indemnity-type private health coverage without out-of-pocket payment, even for the services partially covered by the NHI, caused unnecessary health care utilization and the waste of the NHI budget.

Based on the collective analysis, the committee reviewed various policy alternatives and proposed policy recommendations, including:

- Create a regulation for the private health insurance to cover only the medical treatments that were not entitled to be insured by the NHI
- Impose mandatory cost-sharing part on the IDT private health insurances to mitigate moral hazard effects
- Construct the collaborative governance structure to enhance information sharing between financial and health authorities.

Table1 Major issues in 2006 presidential committee for health care industry developments

Objective	Status	Authority
Coverage adjustment of IDT private insurance : prohibiting IDT from covers the out-of-pocket payment set by the NHI	Modified (completed)	MHW MoFE FSC
Standardization of private health insurance : regulating IDT insurance into single structure coverage : imposing mandatory deductibles on IDT coverage - imposed 10% deductibles in 2009, 20% in 2013 : regulating private insurers' excessive coverage by FAT - limit inpatient benefit under 30 thousand won per day - regulate overlapping coverage of FAT	Completed Completed Completed	MoFE FSC MHW
Delegating the inspection on private health insurance money claim to HIRAS: prevent insurers from wasteful insurance dividend	Suspended	HIRAS
Sharing medical information and insurance statistics between private and public insurers	On-going (Partially impleted)	NHIS MoFE FSC

* Source: committee meeting for medical service developments (2006. 10. 24) and

* MoF: Ministry of Finance and Economy / FSC: Financial Supervisory Commission

HIRAS: Heath Insurance Review and Assessment Service

NHIS: National Health Insurance Service

Governments have gradually introduced some of them, not all, since 2009, hoping that they increase overall access to health care services as well as enhance the NHI more cost-effective.

In academia, a variety of studies have also discussed government policy options for the harmonious structure between public and private health insurance systems. Lee et al. (2011) suggested that the government should control private health coverage from the perspective of public health enhancement. They argued that governments regulate private insurers to develop health coverages specified for the

socially vulnerable classes and regulate private health insurance to uncover the out-of-pocket payments set by the NHI. Kim et al. (2012) argued that governments should reform the public health insurance system so that the NHI benefits are concentrated on the socially vulnerable in the rapidly aging society; furthermore, for the rest, the policy on the private health insurance market should focus on expanding various opportunities for people to choose to cover their health risks. They also emphasized that governments should adjust the cost-sharing system to prevent the insured from excessive use of health care services, and concurrently develop incentive mechanism to increase the insurance holders' effort to stay healthy.

Jung et al. (2018) introduced policy alternatives from the study on foreign health insurance system. They argued that the private health insurance system should be a supplementary social safety net for the NHI's financial sustainability. One of the most critical policies should be enhancing the accessibility of socially vulnerable class to private coverage by mitigating private insurers' cream-skimming. Besides, governments should consider various incentive mechanisms for private health coverage to play as a supplementary social safety-net. According to Jung et al. (2018), Australia prohibits private insurers from rejecting health coverage enrollment by law and regulates them to provide coverage for their entire life. Besides, it has an income-based rebate system to refund some of the insurance premiums for private health coverage to motivate people to purchase individual health coverage and the disincentive scheme that imposes additional insurance premiums for those who are insured by private health coverage after the age of 30.

1.4. Research Purpose

This paper's primary purpose is to provide empirical grounds to draw policy implications for the long-term development of the national health insurance system. Firstly, this paper will disclose socio-economic determinants that significantly affect the propensity of holding additional private health insurance to universal public insurance, NHI. This examination shows whether regulatory policies have been effective in enhancing the private health insurance market to become a complementary social safety-net for the socially underserved and sheds light on what the relevant authorities should consider in developing public and private health insurance policies. For example, if the elderly have been suffering from being covered by the private insurance market due to private insurer's cream-skimming, the NHI should develop unique public insurance programs to provide them with affordable lifetime health care services by resolving market failure.

The analysis will also show whether regulatory changes in cost-sharing systems, for instance, mandating private health insurers to set 10~20% of total payments as out of pocket costs, have come to be effective in reducing excessive healthcare utilization. The comparison of the health care utilization between those with private coverages and otherwise provides the financial authority with policy grounds for long-term private health insurance industry reform. For example, the FSC should extend the out-of-pocket payment of Indemnity health insurance and reorganize its overlapping coverage with the NHI for the long-term fiscal soundness of NHI. Along with the coverage adjustments, governments should activate the "InsureTech" to incentivize private insurers to differentiate insurance premiums by insurance holders' effort to maintain or enhance their health. Finally, this study also

fills the periodical gap between previous literature and recent when various institutional changes have been made.

Chapter2. Theoretical discussion and literature review

2.1 Moral hazard and Self-selection

In the health care market with intrinsic information asymmetry, moral hazard and self-selection have been recognized as major contributors to market failure (Hsiao WC., 1995; Wong et al., 2010; Park & Jeong, 2011). The moral hazard mainly refers to "the distortion in consumer demand for health services because of the insured's lower out-of-pocket payments by insurance than otherwise" (Wong et al., 2010). The self-selection refers to the phenomenon, "where only the sick would choose to be insured," so-called adverse-selection, and "where oppositely the insurers would select only the lowest risk individuals for coverage," so-called advantageous-selection (Wong et al., 2010).

The Moral hazard is theoretically divided into two types of behavioral distortions: ex-ante and ex-post moral hazard (Zweifel et al. 2000). The ex-ante moral hazard refers to the insured individual's reduction of preventive effort in response to insurance coverage on health care service. On the other hand, the ex-post moral hazard is an increase in the demand for medical services because the insured takes lower out of pocket payments at point-of-care, thereby encouraging the

additional use of services than otherwise. According to Zweifel et al. (2000), the former is barely proved and has limited empirical evidence, while the latter has been proved empirically in many cases (Zweifel et al. 2000). Accordingly, this paper focus on studying the ex-post moral hazard.

In theory, moral hazard by private health insurance can cause harmful effects on the fiscal soundness of NHI (Park et al. 2011). People with additional private coverage face lower out-of-pocket costs than those covered by only the NHI, and as a result, they have an incentive to increase the use of medical services. Eventually, the additional use of health care services would increase the NHI's expenditure of insurance money for medical treatments entitled to be covered by the NHI. In a nutshell, the overlapping coverage of private health insurance emasculates the deductible settings imposed by the NHI to prevent moral hazard effects, thereby narrowing down the long-term policy room for the socially disadvantaged.

The self-selection is the flip-side phenomenon of moral hazard in the health care market. The actual realization of self-selection differs from markets by the relative extent between adverse and advantageous selection. For example, in the private health insurance system in which insurance companies strongly screen out individuals with high health risk by meticulous and strict underwriting criteria, the advantageous selection is stronger than adverse selection. Self-selection makes the empirical study on the moral hazard complicated. That's because inappropriate modelling and insufficient consideration of self-selection to the empirical model would overestimate or exaggerate the moral hazard effect of private health insurance (Savage E et al. 1989). That is because if people who have a higher risk of using health care service purchased private insurances, the relatively more use of health services would not have been caused by moral hazard but by the adverse selection.

Therefore, in the empirical estimation and interpretation of the moral hazard effect, it is essential to control the self-selection clearly.

2.2 Empirical studies on health care system

Studies on foreign health care systems

Various empirical studies examined the health care system based on country-specific survey data. Early research that dealt with the Medicare, US national health insurance program providing health coverage for Americans aged 65 and older, and Medigap, private health insurance plans satisfying criteria imposed by US government authorities showed different results about whether there exists a difference in the use of medical treatments between the policyholders and otherwise. The difference in health care expenditure between private insurance purchaser and otherwise in those studies has shown to be ranged from 0% to 30~40% in health care utilization (Link et al., 1980; McCall et al., 1991; Chulis et al., 1993; Christenson et al., 1997; Khandker et al., 1999; Atherly, 1999). However, not only did these studies provide unclear evidence on the difference caused by the Moral hazard effect, but they also did not incorporate the self-selection clearly in their empirical model.

The empirical studies on health insurance and medical utilization in the 2000s considered self-selection issues in their model. Buchmueller et al. (2004) and Salib & Ventelou(2007) analyzed the determinants of French private health insurance based on national survey ESPS conducted in 1998. France has partial public health insurance with private payments accounting for about 25% of all health care expenditures. In the study, the employment, income level, and tobacco consumption were statistically significant in determining the propensity to hold

private health insurance. In contrast, health-related factors such as 'self-assessed health status' were shown to be insignificant factors on the individual decision to be covered by private insurance. Moreover, they found that individuals with supplemental private coverage are likely to use more physician visits than those with only public programs.

Sapelli & Vial(2004), who analyzed the Chilean health care system using the 1996 CASEN survey, a biannual National Socioeconomic Survey, assessed the self-selection and moral hazard of dependent employees and independent workers. In Chile, the former mandatorily choose between public health insurance or private insurance, while the latter voluntarily chose whether they are insured or not. According to Sapelli et al. (2004), independent workers who have a high risk of health care utilization are more likely to be insured by private and public insurance (Adverse selection), and by which they used more health care services (Moral Hazard).

On the other hand, for dependent workers, insurers screened, the adverse-selection was present against public insurance based on observable variables (by insurers and researchers), but not present against private insurance. That's because private insurance has risk-adjusted premiums to screen out the high risk of using health services. However, the differentiated price policy did not prevent the moral hazard for physician visits while did in hospitalization days. They concluded that insignificance of moral hazard in hospitalization is due to the low price elasticity of demand for it.

Irene O.L. et al. (2010) measured moral hazard and adverse selection in the mixed health care system of HongKong by propensity scoring method. They analyzed the data derived from a Thematic Household Survey in 2005,

commissioned by the Food and Health Bureau. In their empirical analysis, they divided health insurance into three types, self-purchased (SB), employment-based (EB), and welfare-associated public benefits (WB), and categorized medical service suppliers into two types, public medical institution and private one. According to their study, in the use of public medical institutions, there was no moral hazard effect and adverse selection. However, for the use of private hospitals, EB and WB cause more utilization of outpatient and inpatient services, but the SB significantly increased the propensity in ever use of outpatient service in private institutions. Additionally, SB does not affect the number of outpatient visits, ever use of inpatient service, and bed-days.

As we can see above researches on different health care systems, the presence of moral hazard and self-selection varies from country to country. In addition to the above studies, there exist many other empirical studies, such as King & Mossialos (2005), that figured out determinants of private health insurance in the UK with free medical services and Holly (1998) that tested the existence of self-selection in Switzerland.

Studies on the Korean health care system

There exist some empirical studies that analyzed the Korean health care system, which was getting active since 2008. However, they showed different conclusions about this issue. Jung et al. (2006) tried to find the difference between private insurance holders and those without private coverage for the use of outpatient and inpatient services. They analyzed 620,534 claims by 33,342 people with additional private coverages and 225,011 claims by 66,602 people without private insurances. They estimated the effects of private health insurance on outpatient visits

and spending, inpatient days and spending, and concluded that it only significantly increased outpatient visits and spending. However, this research has some limitations. Firstly, it did not model self-selection in the empirical estimation and not control significant socio-demographic variables suggested in many international studies. The second limitation was that the OLS regression on count data applied in his paper would be biased because the number of outpatient visits and of bed-days are not continuous variables but count data. Finally, data used in the analysis are from only two major insurance companies as of 2001 because of the lack of public data (Yoon 2008).

On the other hand, Yoon (2008) reached different conclusions about the determinants of private health insurance and the difference in health care utilization between private insurance holders and otherwise. It analyzed medical treatment claims enrolled in Health Insurance Review and Assessment Service (HIRAS) from 2004 to 2006 by matching them with individual socio-economic data subtracted from the NHI database and private health insurance information from 45 insurers. In her study, she concluded that income-level does not affect the propensity for individuals to be insured privately (self-selection). Furthermore, no substantial difference was observed in the use of health care services. This study has some limitations, including improperly controlled self-selection problem in the analysis model (Park et al. 2011).

After the Korea Health Panel survey (KHP) data constructed in 2008, Park et al. (2011) analyzed KHP data collected for the 1st half of 2008 to find empirical evidence of the moral hazard. Its conclusion, which contradicted Yoon's research in some aspects, was that low-income class, the elderly, the disabled, the unemployed, and people with chronic disease are less likely to be covered by private insurance. Furthermore, due to private insurance companies' intense screening

process on people with a high risk of medical utilization, an advantageous selection by unobserved factors was shown to be stronger than adverse selection. Lastly, it concluded that private insurance holders are more likely to ever use outpatient services than otherwise.

This study also has some limitations as follows from current perspectives. First of all, it did not empirically analyzed inpatient services and the outpatient counts. Secondly, the data used in the study did not reflect the outcome of regulations introduced to relieve the moral hazard of private insurance since 2009. The 3rd point was that it did not control some critical health factors, which was proved to be statistically significant in previous literature, such as self-assessed health status and smoking habits.

Chapter3. Data and Model

3.1 Data

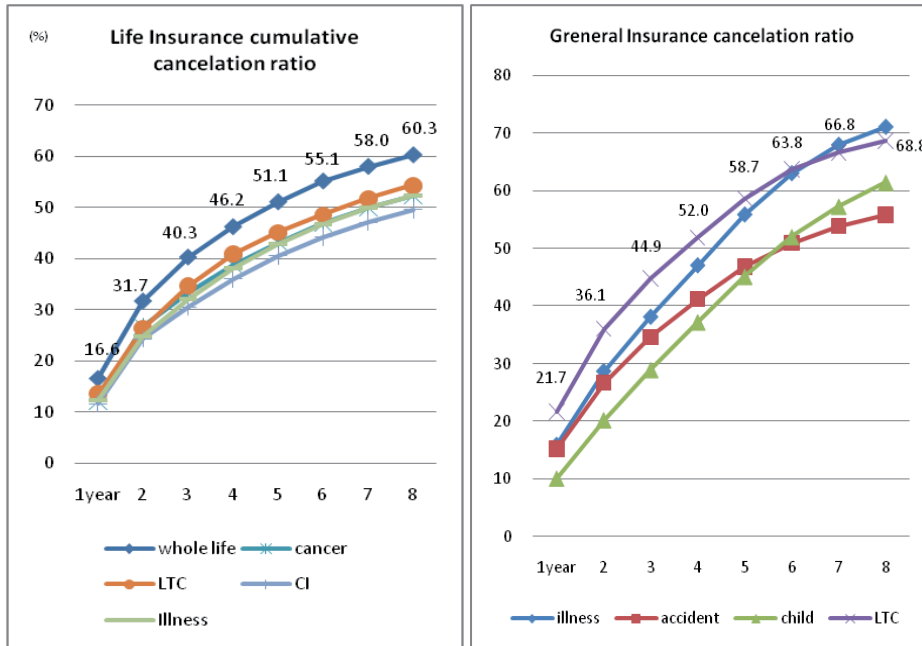
This study analyzes the Korea Health Panel (KHP) data in 2015. The KHP survey, in which the sample was stratified by region, has been conducted by the National Health Insurance Service and the Korea Institute for Health and Social Affairs since 2008. This nationwide survey annually measures the various demographic and socio-economic status of nearly 4,642 household and its 18,130 members (as of 2015), including whether them to be insured by private health insurance, its coverage type, their ever use of outpatient and total visits, ever use of inpatient service and total bed-days, and health-related lifestyle factors. To analyze

individual decision of health coverage enrollment and health care utilization, this study focuses on 14,099 subjects aged over 18 and used their health-related habits, such as self-perception on their health status, information of diagnosed chronic diseases, smoking status as tools to control potential self-selection effect.

By the way, analysis of this type of panel data requires careful consideration of sample consistency data in addressing subjects' private health insurance information, because the little consistency in health insurance holding status makes it hard to apply pooling methods to the analysis. According to the Korea Insurance Development Institute, the cumulative ratio of canceling private health insurance within three years from the initiation reaches almost 40% on average from 2008 to 2017. For instance, the 3rd year cancellation ratio of private health coverage sold by life insurance companies, which is an average during past ten years, is 40.3% in whole life insurance, 38.8% in cancer benefits, 41.0% in long-term care insurance, 36.2% in critical illness benefits and 32.1% illness insurance. Also, the cumulative 3rd year cancellation ratio of insurance sold by general insurance companies is 34.7% in accident insurance, 38.1% in illness insurance, 44.9% in long-term care insurance. This high cancellation may be indicative of inconsistency in individuals' status of being covered by private health insurance.

Given above high cancellation ratios, even though it did not consider insurance transfers, analyzing KHP data by pooling method may not be valid due to possible inconsistency in data set. Therefore, this paper adopted the year-by-year regression analysis on the KHP survey to acquire concrete and reasonable results.

Figure 3 Cumulative cancellation ratio of private health insurance



3.2 Model and Methodology

(1) Logistic Regression: determinants of private health insurance

To find determinants of individual decision to hold additional private health insurance, I used the multivariable logistic regression model. I assumed that the choice of holding private health insurance depends on the difference in individual utility between holding health insurance and otherwise, and the utility is determined by socioeconomic, demographic, and health-related variables. Following equations demonstrates the process, in which U_i^* is individual net utility, Y_i is whether to hold

private health insurance or not during the past 1 year, and the error term follows the logistic distribution.

$$U_i^* = X\beta_i + \epsilon_i \quad (1)$$

$$Y_i = 1(U_i^* > 0)$$

$$f(\epsilon) = \frac{e^\epsilon}{(1+e^\epsilon)^2}, i = 1, 2, \dots, n$$

In this model, independent variables consist of socio-economic and demographic factors, such as household income, sex, age, the presence of spouse, education level, employment status, residential region, the special clauses of the NHI, the disabilities, a chronic disease. For improvements from the previous literature analyzing the KHP, this paper additionally controlled various health needs factors, such as self-assessed health status, smoking habits, and intake of health supplements.

(2) Self-selection and moral hazard in health care service utilization

(2)-1 Seemingly Unrelated Bivariate Logit with Endogeneity

To assess private insurance purchasers' moral hazard, I applied 'Seemingly Unrelated Bivariate Logistic Regression with Endogeneity (SUR with endogeneity)' to model ever use of outpatient episodes and hospitalization.

$$Y_{1i}^* = X\beta_i + \epsilon_{1i} \quad (2)$$

$$Y_{1i} = 1, \text{ if } (Y_{1i}^* > 0), \text{ otherwise } 0$$

$$Y_{2i}^* = Y_{1i}\alpha_i + X\beta_i + \epsilon_{2i} \quad (3)$$

$$Y_{2i} = 1, \text{ if } (Y_{2i}^* > 0), \text{ otherwise } 0$$

$$f(\epsilon) = \frac{e^\epsilon}{(1+e^\epsilon)^2}, i = 1, 2, \dots, n$$

In equation (2) modeling individual decision of health insurance holding, Y_{1i}^* is the difference of individual utility between individual insurance holding and otherwise, and Y_{1i} is whether individuals hold private health insurance. In equation (3) modeling individual decision of health care service utilization, Y_{2i}^* is the difference in utility between when an individual to use outpatient or inpatient and when not to so. Y_{2i} is whether an individual has ever used outpatient or inpatient within the past one year. The error terms of equation (2) and (3) follow the logistic distribution.

To minimize residual confounding by the self-selection in the comparison of the medical service utilization between the private insurance holders and otherwise, numerous objective and subjective health-related variables, such as doctor-diagnosed chronic disease, smoking status, intake of health supplements, and age were controlled in the regression model (Wong et al., 2010).

Given the self-selection by uncontrolled variables that those with high health risk are more likely to be insured, the coefficients of equation (2) and (3) were simultaneously estimated and the correlation between error terms of equation (2) and (3) was tested by a likelihood-ratio method (LR test). When the null hypothesis of

zero correlation between error terms is rejected, it implies the propensity of holding private health coverage is associated with health care service utilization. It implies the presence of self-selection by the unobserved(uncontrolled) factors, which is indicate of the relative size of adverse selection and advantageous selection (Chiappori and Slanie, 1997; Park et al., 2011).

(2)-2 The total count of outpatient visit and bed-days

The next step to measure the moral hazard of private insurance holders is comparing the total outpatient visits and total bed-days among ever users of them. This empirical analysis is testing whether private health insurance holders are likely to visit hospitals more often or hospitalize themselves longer than otherwise. To empirically analyze this type of moral hazard, I used the Poisson regression method that models total outpatient visits and total bed-days within the past year among ever users of them. Equation (5) is a Poisson regression whose link function is a natural log.

$$\log \mu_i = \log E(Y_i|X_i) = X\beta_i + \epsilon_i \quad (5)$$

$\epsilon \sim$ Poisson distribution whose mean and variance is $\exp(X\beta)$

3.3 Variable definition

Table2 shows definition of independent variables and basic statistics on them. It shows proportion of individual with private health insurance according to independent variables, including socio-economic and health-need factors.

Table2 Specific definition of independent variables and descriptive statistics

Variables	Category	Private Insurance Holder				Total
		Insured	%	No-insured	%	
Socio-economic and demographic variables						
Income level (Quintile)						
	1(low)	657	31.7%	1,413	68.3%	2,070
	2	1,604	62.0%	983	38.0%	2,587
	3	2,245	75.2%	742	24.8%	2,987
	4	2,623	82.6%	551	17.4%	3,174
	5(high)	2,822	86.0%	459	14.0%	3,281
Education Level						
	Mid. School	2,314	50.7%	2,249	49.3%	4,563
	High school	3,266	76.9%	983	23.1%	4,249
	College attend	4,371	82.7%	916	17.3%	5,287
Gender						
	Female	5,386	71.2%	2,174	28.8%	7,560
	Male	4,565	69.8%	1,974	30.2%	6,539
Spouse						
	Spouse	7,176	74.9%	2,408	25.1%	9,584
	no spouse	2,775	61.5%	1,740	38.5%	4,515
Working status						
	Dep. Worker	4,519	82.1%	984	17.9%	5,503
	Indep. Worker	1,575	75.8%	502	24.2%	2,077
	Unpaid worker	384	66.2%	196	33.8%	580
	Unemployed	3,473	58.5%	2,466	41.5%	5,939
Disabled						
	Disabled	415	42.5%	561	57.5%	976
	Normal	9,536	72.7%	3,587	27.3%	13,123
Additional Public Welfare						
	Add. Support	181	31.0%	402	69.0%	583
	Noraml	9,770	72.3%	3,746	27.7%	13,516

Residence					
Metropolitan	6,474	73.5%	2,331	26.5%	8,805
Urban	3,477	65.7%	1,817	34.3%	5,294
Health-related Variables					
Chronic disease					
No Chronic	4,232	81.1%	985	18.9%	5,217
Chronic	5,179	58.3%	3,163	35.6%	8,882
Health supplement taken					
No Taking	1,021	67.0%	504	33.0%	1,525
Taking	8,930	71.0%	3,644	29.0%	12,574
Smoking Status					
Never smoker	6,343	72.1%	2,450	27.9%	8,793
Ever smoker	1,773	64.3%	984	35.7%	2,757
Current smoker	1,835	72.0%	714	28.0%	2,549
Subjective health valuation					
Bad	1,350	50.9%	1,304	49.1%	2,654
Normal	4,050	71.5%	1,618	28.5%	5,668
Good	4,551	78.8%	1,226	21.2%	5,777
Total	9,951	70.6%	4,148	29.4%	14,099

First of all, income level is defined by the quintile based on household income where the individual belongs to, and the total amount of household income is calculated by the sum of its members' earned income, such as wage and salary, and their all kinds of asset income, including financial interest, real estate, and dividend from social insurance. The education variable is categorized by three levels, under middle school graduation, high school graduation, and college attendance.

Working status is defined to categorize four distinctive groups: employee (dependent workers), independent workers, unpaid family business workers, and

unemployed. The reason for the distinction between dependent and independent workers is that the former possibly are expected to utilize less health care service than the latter due to their restricted working schedule by their employers. Gender, spouse, disability, residence are also controlled in the model. Lastly, the metropolitan in the residence variable includes 9 districts: Seoul, Gyeonggi-Do, Pusan, Incheon, Gwangju, Daejeon, Ulsan, Daegu, and Sejong.

The additional public welfare variable refers to whether an individual is entitled to be exempted fully or partially from taking the deductibles of the NHI by government welfare programs. The entitled suffering from poverty or intractable chronic illness does not have to pay out-of-pocket costs for health care treatments.

I fitted both subjective and objective health-related variables to the model. The chronic disease variable refers to whether an individual has been diagnosed with chronic disease by a certified physician up to date. The subjective health valuation variable shows the level of self-assessed health status. Two kinds of lifestyle habit were also controlled in the model: whether an individual to take any health supplements, such as vitamin, and the smoking status. The reason why I separately categorized the ever smoker was to control reverse causality problem: I controlled ever smoker group, in which people who forcibly quit smoking due to health problems and people who voluntarily cut off cigarettes mixed, from never smoker group.

Chapter4. Result

4.1 The determinants of private health insurance purchase

Table3 shows the result of multivariable logistic regression for the decision to hold private health coverages. It suggests odds ratios along with estimated coefficients of each categorical group to the benchmark, which means the relative probability of people in each group to be insured by self-purchased private coverage to the benchmark group. As a result of logistic regression, most demographic, socio-economic, and health risk variables have a statistically significant influence on the probability of individual decision to hold private health insurance, except for the residential area. The possible reason why residential does not affect the decision can be the fact that the developments of on-line insurance system lowered physical barriers for the people in a rural area to be insured.

From the estimates and odds ratios of income quintile variable, I could find that the relative probability to be insured by private health coverage was negatively correlated with the level of household income. The 5th quintile group had three times higher likelihood of being insured than the 1st quintile group, which means that private health insurance has had an intrinsic limitation to play a pivotal social safety-net in providing the low-income class with affordability to health care services.

Table3. Result of logistic regression

Variables	Estimate	Pr > ChiSq	Odds Ratio
Intercept	-2.4615	<.0001	0.0850
Income level (Quintile)			
1(low)			
2	0.5409	<.0001	1.7180
3	0.7752	<.0001	2.1710
4	1.1150	<.0001	3.0500
5(high)	1.2528	<.0001	3.5000
Education Level			
Mid. Graduate			
High Graduate	-0.1807	0.0051	0.8350
College attend	-0.0712	0.3437	0.9310
Age	0.1289	<.0001	1.1380
Age square	-0.0017	<.0001	0.9980
Gender			
Female			
Male	-0.3781	<.0001	0.6850
Spouse			
With Spouse			
No spouse	-0.5289	<.0001	0.5890
Working status			
Dep. Worker			
Indep. Worker	0.2583	0.0004	1.2950
Unpaid worker	-0.3597	0.0019	0.6980
Unemployed	-0.1433	0.0116	0.8670
Disabled			
Disabled			
Normal	0.3904	<.0001	1.4780
Additional Public Health Welfare			
Add. Support			
Normal	0.6540	<.0001	1.9230

Residence				
	Metropolitan			
	Rural area	-0.0384	0.4148	0.9620
Chronic disease				
	No Chronic			
	Chronic	0.3534	<.0001	1.4240
Health supplement taken				
	No Taking			
	Taking	0.2293	0.0018	1.2580
Smoking Status				
	Never smoker			
	Ever smoker	0.2571	0.0004	1.2930
	Current smoker	0.2131	0.0048	1.2380
Subjective health evaluation				
	Bad			
	Normal	0.3135	<.0001	1.3680
	Good	0.4106	<.0001	1.5080

* Seoul, GyeongGi-Do, Pusan, Incheon, Gwangju, Daejeon, Ulsan, Daegu and Sejong

For the square of age, the elderly who usually tend to be at health risk could not be sufficiently covered by private insurances, which can imply private insurance firms have excluded them from their coverage through in-advance screening or incremental premium according to age. This differentiation in the private health insurance market implies that public health insurance should play more roles for the low-income class in response to the rapidly aging in our society. The results provide solid grounds for recent comprehensive reform in the NHI to provide deeper and broader benefits to the low-income class.

The empirical result also shows that the disabled were less likely to be insured by private health coverage than otherwise. The substantially low probability for people with disabilities to be additionally insured implies that the private

insurance market has alienated the socially disadvantaged from stable health care treatments, which requires for government to enhance public programs for them and to legally prohibit discriminating them from private coverage only for their physical challenges.

Another critical factor in the probability of being insured by private coverage is health-related variables. As shown in Table3, people suffering from chronic diseases had a lower propensity to be additionally insured. Given the fact that people with a chronic disease have a high risk of getting medical care, the result implies that there exists adverse-selection (in insurers' shoes) concerning objective health status. In other words, the underwriting process by private insurers has not sufficiently screened out people with high health risks. The result provides the financial authority with grounds for new policies to manage incremental insurance money expenditure by activating 'InsureTech (Insurance + Technology)' or newly developing health-promoting insurance products. According to the Financial Services Commission, Korean top financial authority, health-promoting insurance has become a new breed of insurance product that offers economic benefit, such as discounts on the insurance premium, based on policyholders' efforts to stay healthy - such as walking, quitting smoking, and regular physical checks using of information technology. As of now, the information technology helps private insurers manage ex-post insurance holder's risk even when they cannot fully screen them in advance.

For individual precautionary efforts to manage their health, two conflicting effects have been observed. Current smokers are likely to be insured with higher probability than never smokers, which means that there exists an adverse-selection in the private health insurance system under the hypothesis that smoking deteriorates

individual health increasing health care utilization. On the other hand, people taking health supplements showed a higher probability of being covered by private health insurance, which means that there exists advantageous-selection.

4.2 Comparison of outpatient care utilization between the insured and uninsured individuals

4.2-(1) Analysis on ever use of outpatient care

Table4 shows the result of SUR with endogeneity for the ever use of outpatient. The system regression, simultaneously estimating equation (2) and (3) by maximum likelihood estimation method as explained in section 3.2, has been iterated until when only statistically significant variables with at least 90% confidence level remain in the equation model.

Table4. Result of seemingly unrelated bivariate logit regression

Variables	Ever use of Outpatient		Private Health Ins.	
	Est.	P-value	Est.	P-value
Intercept	-0.3093	0.0628	-0.9224	<.0001
Private Insurance				
Non-Insured				
Insured	1.3450	<.0001		
Income level (Quintile)				
1(low)				
2	-0.2387	0.0004	0.3377	<.0001
3	-0.3020	<.0001	0.4803	<.0001
4	-0.2825	0.0001	0.6667	<.0001
5(high)	-0.2299	0.0019	0.7545	<.0001

Education Level					
Under High school					
	High Graduate			-0.1003	0.0057
	College attend			-0.0435	0.2941
Age		-0.0169	0.0071	0.0682	<.0001
Age square		0.0004	<.0001	-0.0009	<.0001
Gender					
	Female				
	Male	-0.2992	<.0001	-0.2071	<.0001
Spouse					
	No spouse				
	Spouse			0.3673	<.0001
Working status					
	Dep. Worker	-			
	Indep. worker	-0.0720	0.1098	0.1426	0.0004
	Unpaid worker	0.1417	0.1658	-0.1956	0.0034
	Unemployed	0.0900	0.0165	-0.0843	0.0083
Additional Public Welfare					
	Normal				
	Special exception			-0.3399	<.0001
Residence					
	Metropolitan				
	Rural area	0.0567	0.0657		
Chronic disease					
	No Chronic				
	Chronic	0.8292	<.0001	0.2086	<.0001
Supplement food taken					
	Taking				
	No Taking	-0.1317	0.0243	-0.1184	0.0043
Smoking Status					
	Current smoker				
	Ever smoker	0.2448	<.0001	0.1248	0.0026
	Never smoker	0.2404	<.0001	0.1111	0.0101

Subjective health evaluation			
	Bad		
	Normal	0.2208	<.0001
	Good	0.2467	<.0001
P		-0.5426	<.0001
Likelihood-ratio test of rho	H0 : rho=0 / rejected		

First of all, from the likelihood ratio test on rho, the correlation coefficient between error terms of two equations suggested at the end of the table4, I found that the advantageous selection by uncontrolled factor is stronger than the adverse selection effect by uncontrolled factors in the relationship between being covered by private health insurance and ever use of outpatient service. According to Chiappori et al. (1997) and Fabbri (2004), the statistically significant non-zero correlation between error terms implies the presence of self-selection bias caused by some unobservable factors, and the negative correlation implies that the advantageous selection effect surpasses the adverse selection effect. In a nutshell, the people with lower propensity to ever use outpatient services were more likely to be insured by private coverage. One of the possible explanations on the net advantageous selection is that insurance companies have strong screening criteria in their underwriting procedures. Under the dominance of advantageous selection by uncontrollable factors, the people with additional private health coverage demonstrated a higher probability to ever utilize outpatient care than the people with only NHI coverage.

Another notable result of the simultaneous estimation is the influence of income and age on the probability of being insured by private health coverage and of ever using outpatient. Under the 3rd quintile of income class, as the household

income level increased, the propensity to ever use outpatient service increased, while their probability of being insured decreased. Furthermore, the elderly with a low likelihood of being protected by private insurance, on the contrary, showed a higher propensity ever to use outpatient. In a nutshell, these results imply that the private health insurance market has failed to give better accessibility to health care services to the low-income class and the elderly, so the public welfare programs for them should be implemented further.

For the working status, the unemployed showed a higher propensity to utilize outpatient than current workers, regardless of current workers' income. In terms of the residential area, people living in rural areas show a high propensity ever to use outpatient treatments. Moreover, women are likely ever to use outpatient as well as to be insured by private coverage than men. For the health-related variables, the tendencies of being covered by private insurance and of ever using outpatient treatments have shown in the same way. Distinctively people with more than one chronic disease are more likely to use outpatient treatments and concurrently are four times more likely to be covered by self-purchased private insurance, which implies managing insurance holders' chronic disease would be a critical issue for private insurance companies.

4.2-(2) Analysis on the outpatient visits and health insurance

Further study on moral hazard with respect to outpatient was to examine whether the insured individuals are likely to increase their total outpatient visits than otherwise. I implemented Poisson regression to model the number of total outpatient visits among ever users of outpatient treatments, i.e., conditional on ever use.

Because the outpatient visit is a count variable, the estimates of the OLS method could be biased, inefficient, and inconsistent (Long 1997). Accordingly, I applied Poisson regression based on the maximum likelihood method rather than the OLS method.

Table5 shows the result of Poisson regression to model the total outpatient visit during the last one year. The sample size was 12,196, the number of ever users of outpatient. The sample mean was 21, with a standard deviation of 27. The table5 also suggests the incident rate ratio (IRR), which implies the expected frequency changes by IRR times compared to the benchmark group. As found in the table, most variables such as demographic, socio-economic, and health-related factors were statistically significant except for the variable of whether an individual to live with a spouse or not.

Table5 Result of Poisson regression on total outpatient visit

Description on outpatient visits : sample size = 12,196 Sample mean : 20.99 / Sample s.d. : 27.11					
Variables	Estimate	Wald Chi-Square	P-value	IRR	
Intercept	1.0103	1469.17	<.0001		
Private Insurance					
Insured					
Non-Insured	-0.0255	25.51	<.0001	0.975	
Income level (Quintile)					
1(low)					
2	0.0447	40.56	<.0001	1.046	
3	0.0682	95.1	<.0001	1.071	
4	0.0997	202.63	<.0001	1.105	
5(high)	0.0763	102.9	<.0001	1.079	

Education Level					
Under Highschool					
	High Graduate	0.0623	90.29	<.0001	1.064
	College attend	0.1847	661.53	<.0001	1.203
Age		0.039	1599.1	<.0001	1.040
Age square		-0.0002	622.87	<.0001	1.000
Gender					
	Male				
	Female	0.1355	396.09	<.0001	1.145
Spouse					
	No spouse				
	Spouse	-0.0088	3.08	0.0792	0.991
Working status					
	Dep. worker				
	Indep. worker	-0.1187	164.6	<.0001	0.888
	Unpaid worker	-0.1226	351.89	<.0001	0.885
	Unemployed	-0.1611	862.47	<.0001	0.851
Additional Public Welfare					
	Normal				
	Special exception	0.1835	584.26	<.0001	1.201
Disabled					
	Normal				
	Disabled	0.0943	227.03	<.0001	1.099
Residence					
	Metropolitan				
	Rural area	-0.0676	265.03	<.0001	0.935
Chronic disease					
	No Chronic				
	Chronic	0.6264	7416.95	<.0001	1.871
Supplement food intake					
	Taking				
	No Taking	0.0968	306.15	<.0001	1.102

Smoking Status					
Current smoker					
Ever smoker	0.1871	643.44	<.0001	1.206	
Never smoker	0.1254	235.3	<.0001	1.134	
Subjective health evaluation					
Bad					
Normal	-0.282	3440.88	<.0001	0.754	
Good	-0.4412	5855.66	<.0001	0.643	

From the Poisson regression on total outpatient visits, I found the presence of insurance holders' moral hazard on outpatient visits. The entire outpatient visits of the non-insured over the last one year are 0.975[= $\exp(-0.0255)$, incident rate ratio] times the total visits of the insured. Given the sample mean, 20.99, the insured visit hospital for outpatient treatments nearly 0.5 days (count) more per year than the non-insured.

For the income level, the total outpatient visit increases as the income-level increases up to the 4th quintile. As the age increase, the total outpatient visits are shown to decrease, although it is slow. The total outpatient visits of the disabled are 1.1 times normal people; the total outpatient visit of metropolitan residents is 1.07 times that of rural residents.

In terms of health-related variables, the total outpatient visit of those having a chronic disease is 1.9 times otherwise. The better the self-evaluated health status, the less frequently people visit a hospital. The ever smoker group utilizes outpatient most often, which may be accounted for by the reverse causality that some significant proportion of them has involuntarily quitted smoking due to their bad health. In addition, never smokers visit hospitals more than the current smoker group

for outpatient treatments. The possible explanation for the result may be that they tend to utilize outpatient services in a precautionary manner to stay healthy.

4.3 Comparison of inpatient care utilization between the insured and uninsured individuals

Table6 and Table7 show the results of bivariate logistic regression and Poisson regression on the relationship with private health coverage and the use of hospitalization. From those results, for the use of inpatient services, I could not find statistically significant proof of the presence of a moral hazard.

In the multivariate logistic regression, insured individuals are less likely ever to be hospitalized (as shown in table6). On the contrary, I found the presence of adverse selection by ‘controllable variables’, such as chronic disease. Also, the likelihood ratio test (LR test) shows a statistically significant positive correlation between the propensity of being covered and the probability ever to use inpatient services, which means the presence of adverse selection by uncontrolled factors. Given these two conflicting results, it is difficult to see individuals with private coverage tend to use inpatient treatments more than those without private coverage.

Furthermore, the Poisson regression was applied to the sample of people who have ever used inpatient treatments in order to measure the intensity of moral hazard. As shown in table7 below, I could not find any empirical proof on the hypothesis concerning whether the insured tends to prolong the period of being hospitalized.

This result can be interpreted by some possible explanations. First, the use

of inpatient care is strongly affected by the health care suppliers (Wong et al., 2010). One of the prerequisites to occur moral hazard in hospitalization is that individuals can decide whether or not to and how long to be hospitalized. However, when the use of inpatient care and bed-days substantially depends on the doctors' medical decision, the individual decision to use inpatient care may not be affected by private health coverage. According to Wong et al. (2010), they found statistical evidence of the moral hazard in the use of private outpatient and inpatient care, but they did not in the use of public hospital care. Second, the FSC's regulation on the private insurers that limits the fixed insurance money for the bed-days to 30,000 won per day, implemented since 2010, could be effective. The regulation might increase the out-of-pocket cost for hospitalization, thereby lowering the incentive to ever use more inpatient treatments. The examination of these aspect needs to be further studied.

Table6. Result of SUR on ever use of inpatient care

Variables	Ever use of Inpatient		Private Health Ins.	
	Est.	P-value	Est.	P-value
Intercept	-1.2029	<.0001	-1.4787	<.0001
Private Insurance				
Non-Insured				
Insured	-0.8632	<.0001		
Income level (Quintile)				
1(low)				
2	0.0800	0.1033	0.3303	<.0001
3	0.1078	0.0448	0.4755	<.0001
4	0.1395	0.0138	0.6629	<.0001
5(high)	0.1524	0.0083	0.7475	<.0001

Education Level				
Under High school				
	High Graduate		-0.0888	0.0128
	College attend		-0.0199	0.6273
Age	0.0093	0.2356	0.0821	<.0001
Age square	-0.0001	0.2045	-0.0011	<.0001
Gender				
	Male			
	Female	0.0994	0.0006	-0.1647
				<.0001
Spouse				
	No spouse			
	Spouse	0.2094	<.0001	0.2931
				<.0001
Working status				
	Dep. Worker	-	-	
	Indep. worker	0.0414	0.3238	
	Unpaid worker	0.0676	0.3126	
	Unemployed	0.1395	<.0001	
Disabled				
	Normal			
	Disabled		-0.2450	<.0001
Additional Public Welfare				
	Normal			
	Special exception		-0.4350	<.0001
Residence				
	Metropolitan			
	Rural area	0.1298	<.0001	
Chronic disease				
	No Chronic			
	Chronic	0.3091	<.0001	0.1853
				<.0001

Health supplement taken				
	Taking			
	No Taking	-0.0720	0.0766	-0.1291 0.0018
Smoking Status				
	Current smoker			
	Ever smoker			0.1278 0.0016
	Never smoker			0.1216 0.0039
Subjective health evaluation				
	Bad			
	Normal			0.2545 <.0001
	Good			0.3391 <.0001
	P	0.5504	<.0001	
Likelihood-ratio test of rho		H0 : rho=0 / rejected		

For the income quintile, the propensity to ever use inpatient services also increased with the increase of household income level (as shown in table6). On the other hand, the bed-days increase with household income level only under the 3rd quintile, while the 4th and 5th quintile group has been hospitalized longer than 1st and 2nd quintile, which can be along with the explanation that the people with higher income would pay higher opportunity costs for their bed-days.

Moreover, Table6 and table7 show the female is more likely to be hospitalized than male, but their bed-days is shorter than male. The people with a spouse showed a higher propensity ever to use inpatient than otherwise, and people in a rural area have a higher probability of being hospitalized than metropolitan residents.

For the health-related factors, as shown in table6 and table7, people with chronic diseases are more likely ever to use inpatient and to stay longer in the

hospital than otherwise. Besides, current smokers' bed-days to be hospitalized was higher than never smokers' probability to be hospitalized longer.

Table7. Result of Poisson regression on total bed-days

Description on bed-days : sample size = 1,869				
Sample mean : 9.72 / Sample s.d. : 14.94				
Variables	Estimate	Wald Chi-Square	P-value	IRR
Intercept	1.6716	260.97	<.0001	
Private Insurance				
Insured				
Non-Insured	0.1681	77.00	<.0001	1.1831
Income level (Quintile)				
1(low)				
2	0.0531	5.78	0.0162	1.0545
3	0.1549	40.79	<.0001	1.1675
4	0.0799	8.94	0.0028	1.0832
5(high)	0.0252	0.78	0.3777	1.0255
Education Level				
Under Highschool				
High Graduate	-0.3101	216.36	<.0001	0.7334
College attend	-0.3261	140.94	<.0001	0.7217
Age	0.0327	84.62	<.0001	1.0332
Age square	-0.0003	89.24	<.0001	0.9997
Gender				
Male				
Female	-0.0532	4.18	0.0409	0.9482
Spouse				
No spouse				
Spouse	-0.1655	85.79	<.0001	0.8475

Working status					
	Dep. worker				
	Indep. worker	-0.1380	23.81	<.0001	0.8711
	Unpaid worker	-0.0886	4.81	0.0283	0.9152
	Unemployed	0.1849	73.44	<.0001	1.2031
Disabled					
	Normal				
	Disabled	0.0883	16.13	<.0001	1.0923
Residence					
	Metropolitan				
	Rural area	0.1312	72.29	<.0001	1.1402
Chronic disease					
	No Chronic				
	Chronic	0.0648	5.66	0.0174	1.0669
Supplement food taken					
	Taking				
	No Taking	-0.0406	3.55	0.0595	0.9602
Smoking Status					
	Current smoker				
	Ever smoker	-0.0549	4.68	0.0306	0.9466
	Never smoker	-0.0887	9.23	0.0024	0.9151
Subjective health evaluation					
	Bad				
	Normal	-0.3000	283.02	<.0001	0.7408
	Good	-0.2349	110.54	<.0001	0.7906

Chapter5. Conclusion

5.1. Acknowledgment

This study has a couple of limitations. First, this analysis cannot assure the moral hazard causes the difference in health care utilization between the insured and uninsured. The survey-based data cannot distinguish the moral hazard from supplier-induced demand, which might overestimate the effect of a moral hazard if it exists (Wong et al., 2010). The data used in the analysis does not include the information on what made each outpatient and inpatient visit; thus, it could mislead the effect sizes between health care needs and utilization.

Second, the estimation of the effect of health insurance by propensity score method might be biased, as the probability of being insured by private coverage depends on observed and unobserved co-variables. According to Wong et al. (2010), unobservable confounding differences could bring an imbalance between the insured and uninsured. Even though I controlled significant health need variables, such as age, doctor-diagnosed chronic disease, smoking status, self-assessed health status, and intake of health supplements, potentially causing self-selection for purchasing insurance coverage as many as possible to minimize the effects by residual confounding, I cannot completely rule out the possibility that many uncontrollable variables, such as family history of certain ailments and genetic factors, that brings the adverse selection.

5.2 Conclusion: policy implications

From the empirical analysis of socioeconomic determinants on the probability of having private health insurance, the underserved members of society, such as the elderly, low-income class, the unemployed, and the disabled, are shown to be less likely to be additionally insured by private health coverage. The result implies that the private health insurance market has played a limited role as a social safety net in providing them with better access to health care services. Besides, individuals with chronic diseases were more likely to purchase additional health coverages.

People with additional private health insurance are shown to be more likely to use outpatient care. With various healthcare needs factors being controlled, individuals with additional private insurance are shown to have a higher propensity ever to use outpatient services. Also, insurance holders' total outpatient visits were higher than otherwise. Nevertheless, the results cannot assure the moral hazard causes the more utilization of individuals with both the NHI and additional private health coverage. The self-selection in the health insurance system, as mentioned in the acknowledgment, possibly occurs by various unobservable factors.

Meanwhile, for the use of inpatient care, I could not find any statistical evidence that those with additional private health coverage tend to use more inpatient care. Individuals with additional private insurance did not have a higher probability of ever being hospitalized than otherwise. Also, the total bed days of those with private coverage were not larger than otherwise.

These results provide various policy implications. First, governments should develop various public programs to provide socially vulnerable groups with better access to health care services under the current environment where the private health insurance market is limited to be a social safety-net for them. For example, governments can expand the NHI's coverage and adjust the cost-sharing scheme more favorable for the underserved group, such as low-income class, preemptively. Along with the increased public welfare, the FSC should facilitate private insurers to develop well-designed health coverage targeted to the elderly and those with ailments. Instead of rejecting insurance subscriptions from the socially vulnerable, private insurers should provide health coverages specified for them with a reasonable coverage scope and accurate pricing on their risk. This private coverage would be useful for those who are old and sick but afford the insurance premium, and as a result, it can supplement NHI's financial capacity.

Second, to get long-term fiscal soundness of the NHI, governments and public agencies continue to examine and adjust the structural inharmony between public and private health insurance. Through the collaboration and information-sharing among health and financial authorities, the NHI and HIRAS, private insurers, and experts, governments should focus on figuring out the specific type of outpatient care services that private insurance holders substantially use more. Based on the findings, governments should impose effective regulations that increase the out-of-pocket payments on private insurances in order to mitigate the NHI's excessive expenditure.

Notably, HIRAS and private insurance companies should actively share information and resources for a closer analysis of medical services that are newly covered by the NHI. That is because in-advance analysis of the treatments that are

supposed to be included in the NHI coverage helps governments build foundations in setting the priority of entitlements and well-balanced cost-sharing systems that can prevent excessive use of medical services. The analysis can be done only under the close collaboration between HIRAS and private insurers: the HIRAS has exceptional expertise in assessing insurance claims and analyzing health care data; private insurers has accumulated information on the use of medical treatments uncovered by the NHI. Putting the resources together can lead to an effective and efficient implementation of new public health policies.

Finally, the financial authority should develop incentive mechanisms in the regulatory framework over private insurances that motivate insurance holders to make an effort to stay healthy. For example, financial authorities should set new rules on health-promoting insurances that offer economic benefits, such as discounts on the insurance premium, based on policyholders' efforts to stay health – such as quitting smoking, regular physical checks, and physical exercises. The new breed of health insurance products has been recently powered by technological progress over the world. According to Vlaev et al. (2019), a substantial portion of large employers and health insurers are already actively adopting various financial incentives for healthy behaviors. The United States administration issued a rule for using financial rewards or disincentives for workers worth up to 50% of the insurance premium (Vlaev et al., 2019). This new insurance pricing scheme is expected to reduce the wasteful spending of the NHI as well as enhance public health by mitigating the side effect of adverse selection in the private health insurance market.

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국문초록

민간의료보험 가입의 사회·경제적 결정요인과 민간의료보험이 의료서비스 이용에 미치는 영향

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글로벌행정전공

본 논문은 2015년 한국의료패널 데이터를 활용하여, 개인의 민간의료보험 가입에 영향을 미치는 사회경제적 요인을 분석하고, 민간의료보험 가입자와 미가입자 간의 외래 및 입원 서비스 이용을 비교·분석하였다.

민간의료보험 가입의 사회경제적 결정요인 분석을 통해서는 국내 민간의료보험 시장이 국민들의 의료서비스 접근성을 높이는 사회안전망 기능을 충분히 수행하고 있는지에 대해 계량적으로 검증하고자 하였다. 또한, 국민건강보험과 민간의료보험을 동시에 가입한 사람과 국민건강보험에만 가입한 사람 간의 의료서비스 이용을 비교함으로써, 민간의료보험이 국민건강보험의 자기부담금 영역을 보장하는 중첩적 보장 구조하에서 도덕적 해이에 의한 의료서비스 이용 증가가 실제로 나타나는지 여부에 대해 실증적 증거를 확인하고자 하였다.

민간의료보험 가입의 사회경제적 결정요인 분석에는 로지스틱 회귀분석을 활용하였고, 민간의료보험 가입자와 미가입자간 의료서비스 이용을 비교하기 위해 외래·입원서비스 이용여부와 외래 방문일수 및 입원일수 각각에 대하여 이항로지스틱 회귀모형과 포아송 회귀모형을 활용하였다.

분석결과, 저소득층, 고령층, 장애인 등 사회취약계층의 경우, 민간의료보험 가입 확률이 유의미하게 낮게 나타났으며, 이는 국내 민간의료보험 시스템이 사회취약계층에 대한 사회안전망 기능을 수행하는데 한계점을 드러내고 있음을 시사한다. 아울러, 만성질환 보유자가 그렇지 않은 사람에 비해 더 높은 민간의료보험 가입 성향을 보이는 등 민간의료보험 시장에서 역선택 가능성이 상존하는 것을 확인하였다.

한편, 외래서비스 이용 확률 및 외래서비스 이용 빈도의 경우에는, 민간의료보험 가입자가 미가입자에 비해 유의미하게 높게 나타났다. 다만, 건강 위험이 높은 사람이 보험에 더 적극적으로 가입하는 역선택은 관찰할 수 없는 유전적 요인 등 관찰(통제)할 수 없는 다양한 요인에 의해 발생할 수 있으므로, 이러한 요인이 완전히 통제되지 않은 상황에서 민간의료보험 가입자가 외래서비스 이용 확률 및 이용빈도가 높게 나타난 것이 도덕적 해이에 의한 결과인지 역선택의 결과인지를 단정할 수는 없다. 한편, 입원 서비스 이용의 경우에는, 민간의료보험 가입자가 그렇지 않은 사람에 비해 의료이용 확률 및 이용빈도가 높다는 증거를 발견할 수 없었다.

이러한 분석결과로부터 다음과 같은 정책적 시사점을 도출할 수 있다. 첫째로, 민간의료보험의 사각지대에 놓일 수 있는 저소득층 등 사회취약계층의 의료서비스 접근성을 높이기 위해서는 건강보험 보장 확대 등 다양한 복지 정책의 혜택이 이들 계층에 돌아갈 수 있도록 하는 정책대안을 모색할 필요가 있다. 아울러, 민간의료보험 시장에 대해서도 고령층, 유병력자 등에 특화된 보험상품 개발을 활성화하기 위한 민간보험 정책 대안을 적극적으로 모색할 필요가 있다.

두번째로, 보건·금융당국, 국민건강보험, 건강보험심사평가원, 민간 보험회사, 전문가간의 긴밀한 협업을 통해서, 불필요한 이용이 나타나는 외래서비스 유형을 지속 발굴하고, 이에 대한 적절한 자기부담금 설정방안을 강구할 필요가 있다. 특히, 건강보험의 보장범위 확대에 따라 비급여 의료서비스의 급여화가 확대될 것으로 예상되는 바, 건강보험심사평가원의 보험심사 전문성과 민간 보험회사의 비급여서비스 이용 정보를 결합하여 바람직한 건강보험의 자기부담금 설정 방안, 급여화 우선순위 등을 선제적으로 검토해 나갈 필요가 있다.

마지막으로, 역선택에 따른 민간보험산업의 재무건전성 악화 및 건강보험 지출 확대를 완화하기 위해, 보험가입자의 건강관리 노력에 따라 다양한 경제적 인센티브를 제공하는 혁신적인 보험상품을 지속 확대해 나갈 필요가 있다.

주요어: 건강보험, 도덕적 해이, 자기선택, 외래 서비스, 입원 서비스

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