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Ex ante and *Ex post* Moral Hazard in Public HealthInsurance in Thailand

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Abstract

Despite the much-acclaimed success of the Universal Coverage program that ensures virtually everyone in Thailand of gaining access to health insurance, there has recently been a fervent public debate over the possibility that the program may reduce prevention efforts of risky behaviors (*ex ante* moral hazard) or increase unnecessary healthcare utilization of the beneficiary (*ex post* moral hazard). This paper is the first empirical study on this issue in Thailand. Individual-level data from the Supplement Household Socioeconomic Survey in 2007 were used to investigate the effect on healthcare utilization of three different public health insurance programs: Universal Coverage (UC), Civil Servant Medical Benefits (CSMB), and Social Security (SS).The contribution of this study is two-fold. From a theoretical perspective, it is a pioneering empirical study that simultaneously estimates the effect of health insurance on both *ex ante* and *ex post* moral hazard. From a policy perspective, it provides the first empirical evidence that sheds light on the nature of moral hazard in public health insurance in Thailand. In particular, the estimation results show that the UC program is the only public health insurance program that does not exhibit any type of moral hazard. The recent proposed copayment of beneficiaries under the UC program as a preventive measure of moral hazard is therefore unnecessary and likely comes at a cost of reducing access to health insurance of the poor.

Keywords: *Ex ante* Moral Hazard, *Ex post* Moral Hazard, Universal Coverage Program, Copayment, Ordered Probit with Selection Model.

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บทคัดย่อ

ระบบประกันสุขภาพถ้วนหน้าของประเทศไทยถือได้ว่าประสบความสำเร็จเป็นอย่างสูงในการช่วยให้คนไทยทุกคนเข้าถึงระบบประกันสุขภาพขั้นพื้นฐาน อย่างไรก็ตาม มีความกังวลจากหลายฝ่ายว่าระบบ ดังกล่าวอาจก่อให้เกิดปัญหาจริยธรรมวิบัติ (Moral hazard) ที่มักเกิดขึ้นกับระบบประกันทั่วไป กล่าวคือ ปัญหาการขาดการดูแลสุขภาพเท่าที่ควรของผู้ที่มีประกันก่อนที่จะเกิดการเจ็บป่วย (ex ante moral hazard) และปัญหาการใช้บริการรักษาสุขภาพพร่ำเพรื่อของผู้มีประกันภายหลังจากที่ได้เจ็บป่วยแล้ว (ex post moral hazard) บทความวิจัยเรื่องนี้มุ่งศึกษาประเด็นข้างต้นโดยใช้ข้อมูลจากแบบสำรวจภาวะเศรษฐกิจและสังคมในปีพ.ศ.2550 โดยวิเคราะห์ผลกระทบจากสถานะการเป็นผู้ประกันตนของคนไทยในระบบสวัสดิการข้าราชการและรัฐวิสาหกิจ ระบบประกันสังคม และระบบประกันสุขภาพถ้วนหน้า ที่มีต่อความน่าจะเป็นในการเจ็บป่วยและจำนวนการใช้บริการรักษาพยาบาลของผู้เอาประกัน บทความเรื่องนี้มีประโยชน์ในเชิงวิชาการที่สำคัญ 2 ประการ คือ จากในเชิงทฤษฎี บทความเรื่องนี้ได้เสนอแนวทางการทดสอบปัญหาจริยธรรมวิบัติ (Moral hazard) ทั้งสองประเภทพร้อมกันเพื่อลดปัญหาอคติจากการเลือก (Selection Bias) ในการประมาณการ และ จากในเชิงนโยบาย บทความเรื่องนี้เป็นการศึกษาในเชิงประจักษ์เรื่องแรกที่ได้วิเคราะห์ปัญหาจริยธรรมวิบัติของระบบประกันสุขภาพทั้งสามระบบของประเทศไทย ผลการศึกษาชี้ให้เห็นว่าระบบประกันสุขภาพถ้วนหน้าเป็นเพียงระบบเดียวที่ไม่ก่อปัญหาจริยธรรมวิบัติทั้งสองประเภท ข้อเสนอจากหลายฝ่ายที่ต้องการเพิ่มการร่วมจ่ายของผู้เอาประกันในระบบประกันสุขภาพถ้วนหน้าเพื่อป้องกันปัญหาจริยธรรมวิบัติจึงอาจเป็นการเพิ่มภาระให้กับผู้มีรายได้น้อยโดยไม่จำเป็น

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1.Introduction

Thailand is among a few middle-income countries with a universal healthcare program. By 2011, ten years after the program was established, approximately 99.95 percent of the population in Thailand was covered by one of the three public health insurance schemes: the Civil Servant Medical Benefit scheme (CSMB), the Social Security scheme (SS), or the Universal Coverage scheme (UC) (National Health Security Office, 2013). The three schemes are mutually exclusive and distinctive in the coverage they provide, the contributions required, and their overall benefits. Key features of these schemes are summarized in Table 1.

Despite the much-acclaimed benefit of the UC program that ensures that virtually everyone in Thailand now has access to health insurance, there has recently been growing concern over the financial burden of the program. Over the past decade, public spending on the UC program has been increasing at a rate of 9.84 percent per year on average (National Health Security Office, 2013). By 2028, the required budget to finance the program is estimated to be as high as 2.53 percent of GDP and will become one of the most expensive public programs in the country (Thailand Development Research Institute, 2010). In light of this seemingly unsustainable trajectory of the UC program, a number of policy measures have been proposed to control the cost. One of the most controversial of these recommendations is the copayment of 30 baht (approximately 0.95 U.S. dollar at the exchange rate in 2017) per visit for all beneficiaries under the UC program.

The proposed change has resulted in a heated public debate. Proponents of the copayment argue that the change will make the structure of the program more equitable and more efficient. With the copayment, beneficiaries under the UC scheme must bear some financial burden for the program, just as do those covered by the other two schemes, and hence all three public health insurance programs will become more equitable. The copayment can also improve efficiency in the design of the insurance system. As health services become more costly, patients are more inclined to alter behaviors that induce health risks (*ex ante* moral hazard) and reduce unnecessary visits to doctors (*ex post* moral hazard).Opponents of the copayment argue that the demand for health services is naturally inelastic, so that doctor visits are usually not determined by price but by patients' medical needs. Moreover, moral hazard is unlikely given the fact that the defined benefits in the UC program are rather limited. The adoption of a copayment policy in the UC program as a preventive measure of moral hazard is therefore unnecessary and may come at a cost of reducing access to health insurance of the poor.

Table 1: Key Features of Public Health Insurance Schemes in Thailand

	Civil Servant Medical Benefit (CSMB)	Social Security (SS)	Universal Coverage (UC)
Beneficiary	Civil servants, spouses, parents, and children under 20 years of age	Full time employees outside the public sector	Thai citizen outside the CSMB and SS scheme
Coverage	All expenses in any public hospitals; Limited expenses for emergency cases in private hospitals	Limited expenses in registered public/private hospitals	Limited expenses in registered public/private hospitals
Contribution	None	Monthly contribution to the Social Security Fund equally shared by employee, employer, and the government	None
Financing	Tax financing	Social Security Fund	Tax financing
Copayment	None	None	None
Deductible	None	None	None

Note: A copayment of 30 baht (approximately 0.95 U.S. dollar in 2017 exchange rate) was required when the UC program was initially launched in 2002. The copayment policy was revoked in 2007, but reenacted again in 2012. Since 2012, a copayment of 30 baht is required unless the patient refuses to pay.

Indeed, there is no study to date that investigates the problem of moral hazard in any of the three public health insurance programs in Thailand, and the existence of moral hazard still remains theoretical conjecture rather than being grounded in empirical evidence. Due to the highly controversial nature of the proposed change and complete lack of supporting evidence, starting in September 2012 the copayment policy was eventually implemented in a rather equivocal manner. The copayment of 30 baht per visit is now "required," unless, that is, the patient refuses to pay (Ministry of Public Health, 2012). It comes as no surprise then, that the policy has caused much confusion among the public, and the adoption of the policy remains *de facto* at the discretion of hospital directors or even cashiers.

The aim of this paper is to investigate the presence of both types of moral hazard in public health insurance in Thailand using the data on the incidence of sickness and healthcare utilization from the 2007 Socioeconomic Survey (SES). The contribution of this study is two-fold. From a policy perspective, it is the first study that sheds light on the nature of moral hazard in

public health insurance system in Thailand and provides evidence-based guidelines for future policy recommendations. From a theoretical perspective, it is also a pioneering empirical study that simultaneously estimates the effect of health insurance on both *ex ante* and *ex post* moral hazard. In general, the *ex ante* and *ex post* moral hazard are not independent since the *ex ante* moral hazard may trigger an increase in the probability of sickness and consequently an increase in hospital visits. Studies that independently estimate the two types of moral hazard may thus be subject to sample selection bias, which renders unreliable estimates in the *ex post* moral hazard model.

2.Moral Hazard in Health Insurance

Empirical studies on the presence of moral hazard in public insurance in Thailand are scarce, although there is anecdotal evidence on *ex post* moral hazard based on opinions of health professionals that the number of patient visits has been sharply increasing after the implementation of the UC program and that many of the visits are not deemed a medical necessity. From a theoretical point of view, the existence of *ex ante* moral hazard is dubious. One view perceives efforts at sickness prevention as a personal trait that is entirely independent of insurance. Another view perceives it as being an economic outcome of the decision-making process, which may well vary with the financial constraints of the individual. Despite this ongoing debate, many empirical studies on *ex ante* moral hazard are documented in the literature and various measures of sickness prevention efforts are found to correlate with insurance status and defined benefits and contributions of the insurance plan, which include deductibles (Lillard et al., 1986), copayments (Roddy et al., 1986), insurance status, and coverage (Dave & Kaestner, 2009; Yilma et al., 2012).

The existence of *ex post* moral hazard in health insurance is subject to less criticism in the literature. It is widely accepted that health services are indeed responsive to price, although price elasticity of demand for healthcare, a measure that is closely related to moral hazard, is conjectured to be low due to the common perception that healthcare is a necessity. Nevertheless, empirical evidence on the existence of *ex post* moral hazard is relatively abundant and the demand for healthcare is found to be responsive to changes in the characteristics of the insurance contracts which include deductibles (Newhouse et al., 1974), dollar co-payment (Beck, 1974; Cherkin et. al., 1989; Harris et al., 1990; Hughes & McGuire, 1995), and change in co-insurance rate (Scitovsky & Snyder, 1972; Manning et al., 1987; Keeler & Rolph, 1988).

3.Data and Estimation Strategy

This study uses data from the supplement Socioeconomic Survey of Thailand in 2007.The use of data from the 2007 survey merits a few explanations. First, the 2007 survey is richer in comparison to surveys conducted in other years as it includes a number of health variables such as self-rated health condition and diseases known to the respondents, which were not included in former or latter surveys. The year 2007 also marked the fifth anniversary of the UC program and the transition period of the public health system in Thailand. And as of 2007 a large fraction of the respondents in the survey still reported having no health insurance. This variation in the insurance status of the respondents in the 2007 survey allows for the identification of the moral hazard using respondents without any health insurance as the reference group. Using this identification tactic is not possible with data from the most recent survey which indicates that almost everyone belongs to one of the three public insurance schemes. Note especially that although the term moral hazard is generally defined as the change in behavior after being insured, empirical studies on the existence of moral hazard problem based on cross sectional data using the difference in behavior between those with and without insurance are numerous (See, for example, Coulson et al. (1995) and Shin and Lim (2010)).

The survey covers 16,118 respondents and contains their various household and personal information such as insurance status, perceived health status, and healthcare utilization, as well as basic socioeconomic and demographic variables. Descriptive statistics of the variables used in this study are summarized in Table 2. Of 16,118 individuals in the survey, 4,137 individuals reported being sick in the 12 months prior to the interview and reported the frequency of doctor visits categorized in levels from no visit, 1-2, 3-4, and more than four visits. The health insurance scheme that an individual belonged to is classified into five groups, namely, CSMB, SS, UC, employer provided health insurance, and private health insurance.

Table 2: Explanation of Variables

Variables	Definition
Dependent variables	
sick	Dummy variable = 1 if the respondent reports ever had health problem during the past 12 months.
visit (if *sick* = 1)	Number of times respondents who report sick go to see doctors, a categorical variable = 0 (no visit), 1 (1-2 times), 2 (3-5 times), 3 (6-10 times), 4 (more than 10 times).
Independent variables	
Insurance	
CSMB	Dummy variable = 1 if the respondent is a beneficiary of the Civil Servant Medical Benefit (CSMB) program.
SS	Dummy variable = 1 if the respondent is a beneficiary of the Social Security (SS) program.
UC	Dummy variable = 1 if the respondent is a beneficiary of the Universal Coverage (UC) program.
Employer	Dummy variable = 1 if the respondent receives any extra health insurance benefit provided by employers.
Private	Dummy variable = 1 if the respondent has private health insurance.
None	Dummy variable = 1 if the respondent has no health insurance.
Health condition	
Very good	Dummy variable = 1 if the respondent describes his/her health condition as very good compared to other people at the same age.
Good	Dummy variable = 1 if the respondent describes his/her health condition as good compared to other people at the same age.
Fair	Dummy variable = 1 if the respondent describes his/her health condition as fair compared to other people at the same age.
Poor	Dummy variable = 1 if the respondent describes his/her health condition as poor compared to other people at the same age.
Region	
Bangkok	Dummy variable = 1 if the respondent currently resides in Bangkok and municipal area.
Central	Dummy variable = 1 if the respondent currently resides in the central region.
North	Dummy variable = 1 if the respondent currently resides in the northern region.
Northeast	Dummy variable = 1 if the respondent currently resides in the northeastern region.
South	Dummy variable = 1 if the respondent currently resides in the southern region.
Demographic	
Male	Dummy variable = 1 if the respondent is male.
Age	Age of the respondent at the date of interview. Information about minors are provided by parents or legal guardians.
Socio-economic	
Employment	Dummy variable = 1 if the respondent is currently employed.
Income	Total monthly income of the respondent (Baht).
Bachelor	Dummy variable = 1 if the respondent's highest educational attainment is a bachelor degree or higher.
Survey weight	Survey weight proportional to the population in the area

Table 3: Descriptive Statistics

	n	min	max	mean	s.d.
Dependent variables					
Sick	16,118	0	1	0.257	0.437
Visit (if *sick* = 1)	4,137	0	4	1.983	1.307
Explanatory variables					
Insurance					
CSMB	16,118	0	1	0.118	0.322
SS	16,118	0	1	0.128	0.334
UC	16,118	0	1	0.719	0.449
Employer	16,118	0	1	0.004	0.066
Private	16,118	0	1	0.036	0.186
None	16,118	0	1	0.037	0.188
Health condition	16,118				
Very good	16,118	0	1	0.108	0.311
Good	16,118	0	1	0.576	0.494
Fair	16,118	0	1	0.267	0.442
Poor	16,118	0	1	0.049	0.215
Region					
Bangkok	16,118	0	1	0.206	0.404
Central	16,118	0	1	0.246	0.431
North	16,118	0	1	0.177	0.381
Northeast	16,118	0	1	0.261	0.439
South	16,118	0	1	0.111	0.314
Demographic					
Male	16,118	0	1	0.567	0.496
Age	16,118	2	99	41.867	18.593
Socio-economic					
Employment	16,118	0	1	0.751	0.432
Income	16,118	0	2,900,000	11781.400	52,749.590
Bachelor	16,118	0	1	0.121	0.326

4.Results

The survey contains details on household consumption of various goods and services but unfortunately provides only limited information about individual consumption of unhealthy products. There are, however, separate questions on the incidence of sickness of the respondents and the frequency of doctor visits of the sick respondents. As such, the *ex ante* moral hazard model is estimated using the effect of an insurance scheme on the probability of sickness with *sick* as the dependent variable. This approach is also common in the literature (Zweifel & Manning, 2000). Given the fact that the survey reports a coded ordinal variable for the number of doctor visits instead of the actual number of doctor visits, the *ex post* moral hazard is model educing an ordered probit model with visit as the dependent variable. Five specifications of the two models are estimated, each differing in the number of controlled variables–health condition, demographic, and socioeconomic variables.

An important variable that is controlled for in the model is the health condition of the respondents. In general, it can also be expected that the causal linkage between health insurance and health condition is reverse. More specifically, individuals who are prone to illness are more inclined to buy health insurance (adverse selection problem). Although this problem is unlikely for the UC program since the launching of the program in 2002 is fairly exogenous, it is widely speculated that a job-related welfare program such as the CSMB may well attract more individuals with poor health, which would thus bias the estimation results as the effect of insurance on the probability of sickness will be confounded with the effect of health condition. This problem is mitigated by including self-reported health condition as a control in the model in order to keep the effect of health condition constant as the effect of insurance on the probability of sickness is estimated

Since visit is known only for respondents with sick = 1 but otherwise missing for those with sick = 0, estimates using information from only the respondents who report visits can be another source of bias in the ex post moral hazard model, unless the sick and visit models are independent. In the last model, the sick and visit equations are estimated simultaneously rather than sequentially, using the ordered probit model with sample selection proposed by De Luca and Perotti (2011). In particular, the model can be represented by a system of bivariate threshold crossing model such that

$$Y_j^* = \boldsymbol{\beta}_j' \boldsymbol{X}_j + \epsilon_j, j = 1,2$$
$$Y_1 = I(Y_1^* \geq 0)$$

$$Y_2 = \sum_{h=0}^{H} hI(\alpha_h < Y_2^* \leq \alpha_{h+1}),$$

where Y_1^* and Y_2^* are the continuous latent dependent variables of the selection and outcome of interest, respectively, X and $\beta$are the matrix of the explanatory variables and their corresponding parameters, ϵ is the error term assumed to be i.i.d. normal, Y_1 is the observed outcome of the selection process, $I(\cdot)$is the indicator function that is 1 if the argument is true and 0 otherwise, Y_2 is the ordinal outcome that is observed only when Y_1 = 1, H is the number of classes of Y_2, and α_h are the threshold parameters to be estimated. Under regular assumptions on the properties of the error terms, the parameters $\boldsymbol{\theta} = (\boldsymbol{\beta}, \boldsymbol{\alpha})$ can be estimated by the method of maximum likelihood in a straightforward manner. Note that the model is similar to the celebrated Heckman sample selection model in spirit, with the exception that the variable in the response equation is now an ordinal rather than a continuous variable. Detailed explanation of the model with extension for semi parametric estimation is further discussed in De Luca and Perotti (2011).

The estimation results are discussed in three parts. The first and the second part respectively examine the presence of *ex ante* and *ex post* moral hazard among the three insurance schemes by testing if the probability of being sick and the number of doctor visits of those with an insurance is statistically higher than those without one. The last part examines the robustness of the results by simultaneously estimated the selection and the outcome models using the method of ordered probit with selection by De Luca and Perotti (2011) as explained. Table 4 summarizes results from the probit model with *sick* as the dependent variable. All specifications include health insurance status and use individuals without any health insurance as the reference group. The first specification reports results from the model with health insurance status as the only explanatory variable. These results are indeed biased, but are shown for illustrative purpose. Individuals under the CSMB and UC scheme tend to be sick more frequently than those without any insurance, while those under the SS scheme tend to be sick less frequently. Such a pattern is consistent with figures from annual reports by the government (National Health Security Office, 2011) but cannot be interpreted as the causal effect of health insurance status on the probability of sickness since a number of variables that affect both the insurance status and the probability of sickness are not properly controlled for.

Table 4: Estimated Average Marginal Effect from Probit Model.

Model	(1)	(2)	(3)	(4)	(5)
CSMB	0.410***	0.426***	0.328***	0.306***	0.378***
	(0.053)	*(0.057)*	*(0.059)*	*(0.059)*	*(0.061)*
SS	-0.423***	-0.270***	-0.163***	-0.148**	-0.021
	(0.056)	*(0.060)*	*(0.061)*	*(0.062)*	*(0.064)*
UC	0.108**	0.098*	0.074	0.051	0.044
	(0.048)	*(0.052)*	*(0.053)*	*(0.053)*	*(0.055)*
Employer	0.010	0.198	0.177	0.197	0.245
	(0.175)	*(0.184)*	*(0.183)*	*(0.184)*	*(0.185)*
Private	-0.037	-0.030	0.009	0.032	0.101
	(0.059)	*(0.064)*	*(0.065)*	*(0.065)*	*(0.067)*
Male	-	-	0.182***	0.199***	0.191***
	-	-	*(0.024)*	*(0.025)*	*(0.026)*
Age	-	-	0.017***	0.017***	0.016***
	-	-	*(0.001)*	*(0.001)*	*(0.001)*
Employment	-	-	-	-	-0.137***
	-	-	-	-	*(0.036)*
Log(income)	-	-	-	-	-0.012***
	-	-	-	-	*(0.004)*
Bachelor	-	-	-	-	-0.251***
	-	-	-	-	*(0.046)*
Health condition	-	2714.830***	2123.190***	2108.750***	1832.600***
	-	*(0.001)*	*(0.001)*	*(0.001)*	*(0.001)*
Region	-	-	-	100.92***	79.140***
	-	-	-	*(0.001)*	*(0.001)*
LR statistics	343.800***	3554.470***	4269.030***	4370.470***	4110.890***
Pseudo R squared	0.019	0.194	0.233	0.238	0.239
Observations	16,118	16,118	16,118	16,118	15,439

*Note. The dependent variable is sick. Coefficients of Health condition and Region are F-statistics. Standard errors are in parenthesis. p-values are in bracket. ***,**,* represent significance level at 1,5, and 10 percent. The reference group is female individual who resides in Bangkok with excellent health condition, no insurance, and education less than bachelor degree.*

The second specification further includes the reported health condition of the respondent. As workers in the CSMB program may be relatively unhealthy individuals who choose to work in the public sector to exploit the benefits provided by the program, the observed higher probability of sickness of beneficiaries in the CSMB may hence be due to the adverse selection rather than the moral hazard problem. This conjecture is, however, not consistent with the estimation result given in specification 2. Had the adverse selection problem been present in the CSMB, the inclusion of health condition as control should have decreased the estimated effect of CSMB on the probability of sickness provided that health condition is negatively related with both CSMB and the probability of sickness. On the contrary, the estimated marginal effect of insurance on the probability of sickness increases from 0.410 to 0.426 after the health condition of the respondents is controlled for, which implies that beneficiaries of the CSMB are relatively healthy. This finding merits further investigation as it is unclear whether better health condition of workers in CSMB is due to more generous coverage by the CSMB program or the lack of adverse selection and is left for future study. It is also interesting to note that since beneficiaries under UC were mostly individuals without any health insurance before the UC program was enacted and were thus relatively unhealthy, the estimated effect of UC on the probability of sickness is reduced in magnitude and becomes no longer significant at the conventional 95 percent level after health condition of the respondents is controlled for.

The third specification further controls for demographic variables, which include gender and age of the respondents. Male respondents had a significantly higher probability of sickness than do female respondents in the same insurance scheme. Interestingly, UC no longer produces a significant effect on the probability of sickness once age is controlled for. This could be due to the fact that many beneficiaries of the UC were the elderly and individuals with relatively poor health who naturally have a higher probability of sickness. The seemingly high reported incidence of sickness of beneficiaries under the UC is thus attributed to age and health condition rather than moral hazard per se.

The fourth and the fifth specification of the probit model further control for regional variation as well as socioeconomic variables including employment status, income, and education, all of which produce significantly negative effects on the probability of sickness. In the full model, CSMB remains the only public health insurance program where *ex ante* moral hazard is present.

Estimates from the *ex post* moral hazard model with visit as the dependent variable are summarized in Table 5. CSMB and UC tend to have a statistically significant positive effect on the number of doctor visits even when reported health condition and gender and age of the respondents are controlled for. A strikingly finding is noted in the fourth specification, when the inclusion of the regional dummies (with Bangkok and vicinity as the benchmark group) finally absorbs the previously significant effect of UC on the frequency of doctor visits. A plausible explanation is that many of the beneficiaries under the UC program tend to reside in rural areas, where health personnel and equipment are probably of lower quality, which may increase the number of subsequent visits. Many interesting findings are also observed from the last specification when socioeconomic variables such as employment status, income, and education are further controlled for. Income is not a statistically significant determinant of the number of doctor visits, a result that confirms the success of the UC program in that people in Thailand can now gain access to healthcare regardless of their income.

The estimated effect of education on the number of doctor visits is strongly negative, probably because individuals with higher education are more likely to get over-the-counter medicine. Interestingly, as beneficiaries under the SS scheme are mostly workers in the formal sector with relatively higher educational attainment, the previously unobvious positive effect of SS on the number of doctor visits finally becomes more pronounced and statistically significant in the full model once education is controlled for.

The full model with demographic and socioeconomic variables as well as regional dummies as controls is finally estimated using the ordered probit model with selection whereby the *ex ante* moral hazard and the *ex post* moral hazard problem are simultaneously estimated by the selection and the response equation, respectively. Identification of the parameter estimates of this model requires that some variables in the selection equation are excluded from the response equation, a concept that is analogous to the exclusion restriction in the Heckman selection model. In this study, employment status and income are excluded from the response equation based on results suggested in Table 4 and 5. Results from the last model are summarized in Table 6.

Table 5:Estimated Average Marginal Effect from Ordered Probit Model.

Model	(1)	(2)	(3)	(4)	(5)
CSMB	0.294***	0.306***	0.300***	0.285***	0.305***
	(0.082)	*(0.082)*	*(0.083)*	*(0.083)*	*(0.087)*
SS	0.012	0.067	0.115	0.144	0.188*
	(0.094)	*(0.095)*	*(0.095)*	*(0.095)*	*(0.099)*
UC	0.168**	0.163**	0.159**	0.116	0.098
	(0.076)	*(0.076)*	*(0.077)*	*(0.077)*	*(0.081)*
Employer	0.203	0.232	0.255	0.302	0.346
	(0.296)	*(0.297)*	*(0.297)*	*(0.297)*	*(0.298)*
Private	-0.043	-0.027	-0.011	0.026	0.032
	(0.091)	*(0.092)*	*(0.092)*	*(0.092)*	*(0.093)*
Male	-	-	0.221***	0.224***	0.231***
	-	-	*(0.034)*	*(0.034)*	*(0.036)*
Age	-	-	0.003***	0.003***	0.003***
	-	-	*(0.001)*	*(0.001)*	*(0.001)*
Employment	-	-	-	-	-0.027
	-	-	-	-	*(0.047)*
Log(income)	-	-	-	-	-0.007
	-	-	-	-	*(0.005)*
Bachelor	-	-	-	-	-0.166**
	-	-	-	-	*(0.074)*
Health condition	-	89.010***	80.770***	84.990***	84.700***
	-	*(0.001)*	*(0.001)*	*(0.001)*	*(0.001)*
Region	-	-	-	33.550***	32.060***
	-	-	-	*(0.001)*	*(0.001)*
LR statistic	20.770***	110.030***	162.820***	196.390***	217.560***
	(0.001)	*(0.001)*	*(0.001)*	*(0.001)*	*(0.001)*
Pseudo R squared	0.002	0.009	0.013	0.015	0.018
Observations	4,137	4,137	4,137	4,137	3,794

*Note. The dependent variable is visit. Coefficients of Health condition and Region are F-statistics. Standard errors are in parenthesis. p-values are in bracket. ***,**,* represent significance level at 1,5, and 10 percent. The reference group is female individual who resides in Bangkok with excellent health condition, no insurance, and education less than bachelor degree.*

Table 6: Estimated Average Marginal Effect from the Full Specification using Ordered Probit Model with Selection.

Model	*Sick*	*Visit*
CSMB	0.301***	0.191**
	(0.059)	*(0.082)*
SS	-0.063	0.184*
	(0.062)	*(0.096)*
UC	0.047	0.083
	(0.053)	*(0.076)*
Employer	0.221	0.247
	(0.185)	*(0.300)*
Private	0.028	0.012
	(0.065)	*(0.092)*
Age	0.016***	-0.001
	(0.001)	*(0.001)*
Ln(income)	-0.012***	-0.007
	(0.003)	*(0.004)*
Employment	-0.150***	-
	(0.034)	-
Survey weight*1000	-0.023***	-
	(0.005)	-
Health condition	1971.14	-
	(0.001)	-
Region	111.61	72.09
	(0.001)	*(0.001)*
Wald χ^2 statistic	33.99***	
	(0.001)	
LR test of independent equations	77.97***	
	(0.001)	
Observations	16122	

*Note. The dependent variables in the selection model and the response model are sick and visit, respectively. Coefficients of Health condition and Region are χ^2 statistics. Standard errors are in parenthesis. p-values are in bracket. ***,**,* represent significance level at 1,5, and 10 percent. The LR test computes test statistic for the null hypothesis that the sick and visit equations are independent. The reference group is female individual who resides in Bangkok with excellent health condition, no insurance, and education less than bachelor degree.*

Most of the results concerning the effect of insurance status are strikingly similar to those in Table 4 and 5. In particular, both *ex ante* and *ex post* moral hazard are evident in the CSMB scheme. Another interesting result from the visit equation that seemingly points out to the success of the universal coverage is that income does not have a statistically significant impact on the number of doctor visit, a finding that confirms an equal access to health services regardless of income. Interestingly, estimated effect of income from the sick equation that is highly significant implies that individuals in the higher income group have a lower probability of being sick, a result that partly suggests that there is room for improvement of preventive healthcare in Thailand. Finally, result of the Log-likelihood Ratio (LR) test confirms that the *ex ante* and the *ex post* models are not independent and that they should be jointly estimated so that estimation results from Table 6 are preferred. All models, however, point to the same conclusion, namely, that in contrast to popular belief, neither the *ex ante* nor the *ex post* moral hazard is present in the UC scheme.

5. Concluding Remarks

The existence of moral hazard in health insurance is a controversial issue from the theoretical perspective. Indeed, it is difficult to assess the efficiency of any public health insurance system and whether or to what extent preventive measures of moral hazard in health insurance such as copayment or deductibles are needed without sufficient empirical evidence of moral hazard. This study examines the problem of *ex ante* and *ex post* moral hazard in public health insurance programs using the probability of sickness and healthcare utilization of individuals from the Socioeconomic Survey of 2007. Key findings of the paper suggest that after reported health status, demographic, and socioeconomic variables of the individuals are controlled for, the probability of sickness and health care utilization of beneficiaries of the UC program are not statistically different from those of individuals without any health insurance, thus indicating the absence of both *ex ante* and *ex post* moral hazard in the program. On the contrary, there is strong statistical evidence indicating that *ex ante* moral hazard exists in the CSMB scheme, while *ex post* moral hazard exists in the SS scheme. Another important finding is that income is no longer a statistically significant determinant of healthcare utilization, which confirms the success of the UC program since healthcare services have become fully accessible by everyone in the country regardless of income. The recent proposed copayment of beneficiaries under the UC program as a preventive measure of moral hazard is therefore unnecessary and likely comes at a cost of reducing access to health insurance of the poor.

Although the findings seem conclusive and are invariant to the choice of estimation models used in the study, there are a few caveats that should be mentioned. For identification purposes, the data used in the study is from 2007,when there existed a large proportion of individuals without any health insurance who could be used as a benchmark group in the study. The absence of moral hazard in the UC program can thus be explained by the rather limited coverage and relatively lower quality of the services provided by the program in 2007. As of the present, the benefit package of the UC has been much improved and comparable in quality to those of the other two schemes and thus the current structure of the UC program can become more prone to the moral hazard problem. In addition, the five-year period between 2002 and 2007, the year that the UC program was enacted and the year that the data was collected, may be too short for the effect of moral hazard on the probability of sickness to be fully realized even if there was an increase in some risk-inducing behaviors. This issue merits further exploration when surveys that contain information about sickness prevention efforts of individuals are available.

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