Essays in Economics of Public Health Insurance in Developing Countries: Evidence from Thailand and Vietnam

A DISSERTATION
SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL
OF THE UNIVERSITY OF MINNESOTA
BY

Phatta Kirdruang

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

Paul Glewwe and Glenn Pederson, Advisers

December 2011

Acknowledgements

I would like to thank my advisers Paul Glewwe and Glenn Pederson for their exceptional guidance, comments, and support. I particularly would like to express my gratitude to Paul Glewwe for encouraging me to study public health insurance in Vietnam and for his patience in reading and editing previous drafts of this dissertation. I would also like to thank my dissertation committee members John Nyman and Caroline Carlin for their useful comments and suggestions. Further, I would like to give special thanks to Frances Homans for her help with the dynamic programming problem in the first essay. Without her help, I would have struggled for a longer period of time.

Additionally, I would like to acknowledge the National Statistical Office of Thailand for providing the data used in the first and second essays, and the Center for International Food and Agricultural Policy for financial support in obtaining these data. Moreover, I would like to acknowledge the Royal Thai Government for financial support during my PhD study, and I would like to thank the staffs at the Office of Educational Affairs, the Royal Thai Embassy, in Washington, DC for their assistance during my stay in the United States.

Earlier versions of the first essay were presented at the second AMID Summer School in London in 2010 and at the 2011 Midwest Economic Association Annual Meeting in St. Louis, Missouri. A preliminary version of the second essay was also presented at the Population Association of America 2010 Annual Meeting. Comments and suggestions from the participants at these conferences have contributed to the improvements of these two essays, and I would like to thank them for those useful inputs.

Financial support for traveling to these meetings was provided by the Center for Economic Policy Research, the Department of Applied Economics, and the Minnesota Population Center at the University of Minnesota.

I would also like to thank my friends from the Department of Applied Economics at the University of Minnesota. Irma Arteaga, Misty Heggeness, Rodrigo Lovaton, Papak Nabipay, Clint Pecenka, Uttam Sharma, and Shinya Takamatsu have given me help and support throughout my graduate study. In addition, I would like to thank my colleagues from the Minnesota Population Center, particularly Sula Sarkar for her help with ArcGIS program, Lara Cleveland and Matt Sobek for their advice and encouragement, and all other IPUMS-International project graduate research assistants for their friendship and help during my dissertation writing process. I must also thank Sasiwooth Wongmonta and Borwornsom Leerapan for useful comments and discussion, and Sawitree Tantra-Ampai for assistance with some data-cleaning work. Finally, I would like to thank Nantavut Phipatseritham for always being supportive and for standing by me during difficult times. Most important of all, I would like to thank my family for their endless love and support. Without them, I would have not come this far.

To my family

Abstract

The three essays in this dissertation provide some evidence on the impact and the utilization of public health insurance programs in two developing countries: Thailand and Vietnam. The first essay examines the impact of Thailand's Universal Health Coverage Scheme (UCS) on households' precautionary savings. Results show that, in the short run, the UCS has no impact on households' savings or non-medical consumption expenditures, but it generates increases in both savings and non-medical consumption expenditures in the long run. These findings suggest that the UCS implementation does not produce a reduction in precautionary savings, but creates only an income effect, and only in the long run. The second essay investigates why a large group of the UCS beneficiaries do not use health care services provided by the program. This study finds that beneficiaries from richer households are more likely to forgo low-cost health care at UC facilities and pay out-of-pocket for health care at non-UC facilities, suggesting that quality of health care at UC facilities remains a problem. Nonetheless, health care services at UC facilities tend to be a "back-up" option for non-poor households. The last essay re-examines the problem of non-utilization of public health insurance program in the context of the Vietnam's Health Care Fund for the Poor (HCFP) program. Here, distance is an important barrier to obtain access to health care for households in rural areas, but this negative impact is weaker for wealthier households. Moreover, the insured who have higher education and whose illness is more severe tend to bypass their designated health facilities in favor of higher level public facilities or private health facilities. This study also reveals an evidence of "moonlighting" among government

health workers, particularly doctors. In sum, while the first essay shows that a public health insurance program can result in a welfare gain for a particular group of population, the second and third essays suggest that indirect costs of obtaining health care strongly determine health care choices, particularly when health care services are largely subsidized by the governments.

Table of Contents

List of Tables

List of Figures

List of Acronyms and Abbreviations

CHC	Commune health center
CHI	Compulsory Health Insurance
CSMBS	Civil Servant Medical Benefit Scheme
HCFP	Health Care Fund for the Poor
HHINC	Household current income
HWS	Health and Welfare Survey
LICS	Low-income Card Scheme
MOH	Ministry of Health, Vietnam
MOPH	Ministry of Public Health, Thailand
MWS	Medical Welfare Scheme
NDSAV	Savings excluding durable consumption expenditures
NHSO	National Health Security Office, Thailand
NMCON	Non-medical consumption expenditures
NMNDCON	Non-medical non-durable consumption expenditures
NTASST	Net assets and liabilities
SES	Socio-economic Status Survey
SHI	Social Health Insurance
SSS	Social Security Scheme
SSO	Social Security Office
TOTCON	Total consumption expenditures
TOTSAV	Total savings
UCE	Universal Coverage Scheme (Exempt 30-baht copayment)
UCP	Universal Coverage Scheme (With 30-baht copayment)
UCS	Universal Coverage Scheme
VHCS	Voluntary Health Card Scheme
VHI	Voluntary Health Insurance
VHLSS	Vietnam Household Living Standard Survey
VSS	Vietnam Social Security

Chapter 1 Introduction

Expanding health insurance coverage is one of the major tools used by many low-income and middle-income countries to reduce poverty and to improve the population's health, which is one of the Millennium Development Goals (MDGs).[1] However, in most developing countries, the health insurance market is restricted to the formal sector, leaving people in the informal sector more susceptible to uncertain health costs (Wagstaff, 2010), which could cause them to forgo expensive health care treatments. Moreover, private health insurance markets in these countries are subject to market failures, most of which arise from asymmetric information and imperfect competition (Jack, 2002). The market failures in the health insurance market, together with the inequitable distribution of health care resources, justify governments' intervention in providing public health insurance for certain population groups (Santerre & Neun, 2007). As a result, in recent years several developing countries have attempted to scale-up health insurance coverage with the ultimate goal of achieving universal health coverage (Wagstaff, 2010).

Along with the increasing interest in expanding public health insurance coverage, health policymakers and researchers are interested in assessing the impacts of the existing programs, particularly on financial risk protection and on health care utilization. To add to the literature in this area, this dissertation is a collection of three essays that seek to evaluate the impacts of the Universal Health Coverage Scheme (UCS) in Thailand, which

[1] Millennium Development Goals have eight goals in total. One of them is to eliminate extreme poverty, and two of them are health-related goals.

was adopted in 2001 to provide health care access to people who were previously uninsured, and the Health Care Fund for the Poor (HCFP) program in Vietnam, which was initiated in 2003 to provide access to health care to the poor in that country. Although the public health insurance systems in Thailand and Vietnam differ substantially, the Thai UCS and the Vietnamese HCFP program share some similarities in that both are financed largely by the general tax revenues and are designed to assist low income populations. The studies of these two public health insurance programs not only provide guidance for the policymakers in Thailand and Vietnam, but they also serve as lessons to be learned for other developing nations.

The three essays that follow are: (1) "The Impact of Universal Health Coverage on Households' Precautionary Savings in Thailand"; (2) "Why do the Sick not Use Publicly Provided Health Care? The Case of Thailand's Universal Health Coverage Scheme"; and (3) "Access and Utilization of Public Health Insurance Programs: Evidence from Vietnam's Health Care Fund for the Poor." While the first essay is a straightforward economic impact evaluation of the UCS, the second and third essays demonstrate how individuals respond to the economic incentives that result from by subsidized public health insurance programs by investigating the health seeking behaviors of UCS and HCFP beneficiaries.

To start, the first essay addresses the impact of Thailand's UCS on households' financial risk protection, a topic of much interest to health economists, because it concerns the effect of health insurance on poverty reduction, in particular whether formal health insurance can replace households' *self-insurance*, such as precautionary savings.

More specifically, the essay investigates whether the UCS has any impact on households' savings behavior, by taking into account that the implementation of the UCS has resulted in both an income transfer effect and a risk reduction effect on households' savings. Given that some UCS beneficiaries were uninsured before the UCS implementation while others had the same health insurance before and after the UCS implementation, the net impact on savings can be captured by comparing changes in the savings and consumptions of the two groups. However, one drawback of the Thai Health and Welfare Surveys and the Socioeconomic Status Surveys (SES) is a lack of true panel data. As a result, a pseudo-panel dataset is created using the method proposed by Deaton (1985). Using a difference-in-differences estimation method, this study finds that, in the short run the UCS has no impact on households' savings or non-medical consumption expenditures, but it results in increases in both savings and non-medical consumption expenditures in the long run. These findings lead to a conclusion that there is no reduction in precautionary savings as a result of the UCS implementation. Instead, the program produces only an income effect, and only in the long run.

These results are the opposite of the findings in a recent study of the impact of National Health Insurance (NHI) on precautionary savings in Taiwan; that study found a reduction in households' precautionary savings as a result of the NHI that was adopted in 1995 (Chou, Liu, & Hammitt, 2003). This difference reflects not only the different designs of the two programs, but also the distinct savings behaviors in Taiwan and Thailand. However, the findings of this study of the Thai UCS need to be interpreted with caution. The supposition that the health insurance would reduce precautionary savings is made based on the assumption that the households take up the benefits of the program. If many eligible households do not utilize the services provided by the UCS, then the program will have neither an income effect nor a risk reduction effect on households' savings and consumption, even among households who are UCS beneficiaries. In fact, results based on quantile regressions suggest that the impact of the UCS on savings and consumption tends to be higher for households with higher savings when compared to the households with lower savings. Thus, it is possible that the impact of the UCS on households' precautionary savings is not evident because the UCS beneficiaries do not take up the benefits of the program. This leads to the second essay, which seeks to examine the UCS beneficiaries' utilization of the UC cards to obtain health care at UC facilities.

The second essay focuses on the issue of low utilization of the health care services provided by the UCS. This issue is especially important for policymakers as it can indicate how well the health insurance benefits actually reach the targeted population. In the context of the UCS in 2007, while the rate of *enrollment* has been very high (more than 90 percent), the rate of *use* of UC health cards among the sick UCS beneficiaries to obtain health insurance benefits appears to be low (approximately 40 percent), particularly for outpatient care. This low utilization rate raises an interesting question: why do the other 60 percent of the sick UCS beneficiaries choose other alternatives, such as visiting private health providers, self-medicating, or doing nothing, instead of using the low-cost health care services provided at the UC facilities? Findings from this analysis not only reveal the patterns of health care seeking behaviors, but they could also help identify whether the low utilization of subsidized public health care occurs among the poor population, and if so what causes this behavior. An understanding of the low utilization of public health insurance in Thailand can provide a direction to policymakers on how the current health delivery system could be improved.

In this essay, the data from the Thai 2007 Health and Welfare Survey are used to analyze health care choices for out-patient care among UCS beneficiaries. The sample in the analysis is restricted to 51 provinces, in which the information on the numbers of private clinics, private hospitals, and all levels of public health facilities are available. Moreover, the approximate distances from the household location to the nearest health facility of each type are calculated using ArcGIS10; these are used as a measure of *access* to health care.

Based on the mixed logit model results, this study finds that UCS beneficiaries are unlikely to have problems in obtaining "access" to out-patient care. These results also show that individuals' demographic characteristics, health conditions, and factors that determine households' budget constraints, such as household income and household size, have significant impacts on health care choices. In particular, UCS beneficiaries from poorer households, who have more restrictive budget constraints, are more likely to use health care services provided at UC facilities. In contrast, UCS beneficiaries from richer households are more likely to forgo the low-cost health care at UC facilities and pay out-of-pocket for health care at non-UC facilities, suggesting that quality of health care at UC facilities remains a problem. Nonetheless, health care services at UC facilities tend to be a "back-up" option for non-poor households, particularly when the individuals have chronic diseases that require more expensive treatments, such as cardiovascular diseases, and/or have another sick member in the household.

The finding that the poor are more sensitive to the health care cost whereas the rich are more sensitive to the quality of care is not surprising, and it is consistent with a previous study on the impact of UCS on health seeking behavior in the 6 pilot provinces during an early stage of the program (Suraratdecha, Saithanu, & Tangcharoensathien, 2005) and a focus-group study on the impact of the UCS on health security (NaRanong, 2006). Despite limitation due to a lack of health facilities characteristics, this essay contributes to the literature by showing that access to health care is not a major concern for the UCS, and confirming that the UCS is a "pro-poor" policy. The fact the "non-poor" do not use the health care services provided by the UCS could be explained by the fact that there is congestion at UC facilities and, at the same time, there are other alternatives, such as private clinics, that are affordable to this group.

In order to better understand the problem of non-utilization of public health insurance program in developing countries, the last essay re-examines the problem of non-utilization of public health insurance program, but in the context of the Vietnam's HCFP program. Unlike Thailand, Vietnam has not yet achieved universal health coverage, although the government has set a goal in achieving universal coverage by the year 2014. Nevertheless, the HCFP program was established based on a similar philosophy as that of the UCS in Thailand, and it has also experienced a low utilization of health care at the designated public health facilities among the HCFP beneficiaries. Thus, the third essay seeks to determine the factors that impact the decisions of HCFP beneficiaries in rural areas to use the health care services provided by the program, and to investigate the causes of bypassing behaviors among the HCFP beneficiaries.

This last essay takes advantage of the information on community health facilities and detailed characteristics of rural commune health centers available from the 2006 Vietnam Household Living Standards Survey. The mixed logit model results suggest that distance is still an important barrier that obstructs people from seeking health care from professional health providers, but the negative impact of distance is diminished as their incomes rise. In addition to proving the expected impacts of individual and household characteristics, this essay is able to depict the impacts of the health workers' densities at the commune health center on the individuals' health care choices. Interestingly, the results reveal some evidence of moonlighting among government health workers, particularly doctors. Finally, this essay also finds that the bypassing behaviors, especially bypassing to a higher level public facility, are more prevalent among individuals who have higher education and who are more ill.

The rest of this dissertation is structured as follows. Chapter two reviews the socioeconomic and demographic backgrounds as well as the backgrounds of health care systems in both Thailand and Vietnam. Chapters three to five discuss the three essays described above. Chapter 6 concludes, presents policy implication, and provides suggestions for future research.

Chapter 2 Country Background

This chapter provides an overview of the socioeconomic and demographics backgrounds as well as the health care systems, particularly the health care reforms, in Thailand and Vietnam. Given different historical and political contexts, the two countries have experienced different development paths, which resulted in different evolutions in their health systems. While Thailand has already adopted its Universal Health Coverage Scheme in 2001, Vietnam is still working on expanding health insurance coverage, with the goal of achieving universal coverage by the year 2014. Nevertheless, both Thailand and Vietnam share some similarities in their demographic characteristics and health care systems. For instance, the epidemiologic trends in both countries show a decrease in the prevalence of communicable diseases accompanied by an increase in chronic non-communicable diseases. Moreover, the health care systems in both countries are largely operated by the public sector.

There are two sections in this chapter. The first section presents background information on Thailand, including its socioeconomic and demographic characteristics, the health care delivery system, the evolution of health care reforms, and some literature on the evaluation of the UC Scheme. In a similar manner, the second section presents the socioeconomic and demographic characteristics, the health care delivery system, and the evolution of health care reforms in Vietnam.

2.1. Background: Thailand

2.1.1. Socioeconomic and Demographic Background

With a GDP per capita of US$ 2,751.5 (constant 2000 US$), Thailand is classified as an upper-middle-income country in the East Asia and Pacific Region by the World Bank (2011). The total population in 2010 was 68 million, with 66 percent of the population living in rural areas. With a total land area of 510,890 square kilometers (about 197,256 square miles), the population density is approximately 133 people per square kilometer of land area. The adult literacy rate in 2005 was 94 percent, a 6-percent increase from 88 percent in 1980.

The Thai economy has enjoyed rapid economic growth since the 1980s. Its GDP growth rate ranged from 5 percent to 13 percent from the late 1980s to the mid-1990s, until the 1997 Asian financial crisis. Since then, the economy has recovered and started to grow again, with an average annual GDP growth rate of 4.4 percent from 2001 to 2010. Thailand's gross national income (GNI) per capita increased to $8240 (current international $) in purchasing power parity terms in 2010. However, during this time period, inequality increased. In particular, the Gini inequalities index increased from 0.420 in 2002 to 0.536 in 2009, suggesting a more unequal distribution of income among the population in the country.

Demographically, the growth rate of the Thai population has decreased steadily from 3.2 percent in 1970 to 1.0 percent in 2005 and 0.6 percent in 2010, respectively. This demographic trend is moving Thailand toward an ageing society, and the World

Health Organization projects that the proportion of the population who are elderly will reach 15.9 percent in 2020 (World Health Organization, 2005).[2] This demographic pattern is, among other things, a result of Thailand's successful family planning program, which was implemented in the early 1980s, and of the improvement in population health outcomes. In 2009, life expectancy at birth was 69 years, and the infant mortality rate was 12 per 1,000 live births. Moreover, the mortality rate for female adults was 170 per 1,000, while the mortality rate for male adults was 291 per 1,000. Nevertheless, these adult mortality rates are considered relatively high for countries at similar income levels.

In addition to the demographic transition, Thailand has experienced an epidemiologic transition, with an increasing burden of chronic non-communicable disease and a high prevalence of HIV/AIDS in early 1990s (Wibulpolprasert & Thaiprayoon, 2008). Currently, HIV/AIDS, traffic accidents, and non-communicable diseases such as cancers and diabetes are now among the leading cause of death (Wibulpolprasert, 2011).

In terms of health care spending, the proportion of health care expenditure relative to the GDP in Thailand has been quite low for its income level. More specifically, only 3.4 and 4.3 percent of Thailand's GDP were spent on health in 2000 and 2009, respectively. As in many other middle-income countries, the government's share of health expenditure out of total health expenditure has been relatively high and has risen considerably, from 56.2 percent in 2000 to 75.9 percent in 2009. The last number suggests that the Thai government devoted approximately 14 percent of its total

[2] Elderly in this context refers to people who are 60 years or older.

expenditure on health. Moreover, the proportion of out-of-pocket expenditure relative to total private health expenditure has decreased from 76.9 percent in 2000 to 68.1 percent in 2009. These changes in the public and private health expenditures are due primarily to the health care financing reform and the implementation of the Universal Health Coverage Scheme, both of which started in 2001.

2.1.2. Background on Thailand's Health Care System

Health Care Delivery

The Thai health care system is mixed and predominantly driven by the public sector. In delivering health care services to the population, three levels of care are provided at different types of public health facilities: community health centers provide primary care; community and general hospitals provide secondary care); and regional, specialized, and university hospitals provide tertiary care.[3] In 2009, Thailand had 9,768 community health centers, 734 community hospitals (10 to 150 beds), 71 general hospitals (200-500 beds), and 25 regional hospitals (500+ beds), 48 specialized hospitals, and 11 medical school hospitals.[4] The private sector is somewhat smaller; in 2009 it had 344 hospitals with 35,806 beds, and 17,990 private clinics, most of which were located in urban areas (Bureau of Policy and Strategy, Ministry of Public Health). In addition, both public and private sectors had 15,201 modern drug stores and 1,986 traditional drug stores (Wibulpolprasert, 2011).

[3] The types of public health facilities are not necessary the only determinant of the level of health care provided. In some cases, community hospitals provide both primary and secondary levels of care.
[4] Community hospitals are situated at the district levels; there are three sizes of community hospitals: (i) small community hospitals have 10-30 beds, medium community hospitals have 60 beds, and (iii) large community hospitals have 90-150 beds. General hospitals are located in large districts or provinces. Regional hospitals are located in large provinces and have doctors in all specializations.

The above-mentioned health facilities were staffed by 19,089 medical doctors, 14,833 dentists, 7,689 pharmacists, 101,760 professional nurses, and 8,270 technical nurses in 2009 (Bureau of Policy and Strategy, Ministry of Public Health).[5] When considering the distribution of health professionals across different regions of the country, these ratios vary substantially. For instance, while the proportion of doctors out of all doctors in the country in the northeastern region was the third largest (almost the same as that in Bangkok), due to the high population the ratio of doctors to 10,000 people in this region was the lowest in 2009 (see Figure 2-1). This example illustrates the highly unequal distribution of health professionals in Thailand.

Evolution of Health Care Reform in Thailand

Prior to the health care reform in late 2001, a majority of the Thai population was covered by four public health insurance schemes. The first scheme was the Medical Welfare Scheme (MWS).[6] This scheme was first initiated in 1975 as a means-tested program, and it became the Low-income Card Scheme (LICS), in which a card for free care was given to eligible individuals. Later it was expanded to cover the elderly in 1992 and to other needy and privileged groups in 1994, including children under age twelve, community leaders, and health volunteers. These beneficiaries were entitled to receive a comprehensive package of services without user fees at public health facilities. However, despite low costs to obtain health care, there were some concerns regarding funding, population targeting, and the quality of care (Pannarunothai, 2002).

[5] These numbers are likely to be underestimated because the number of doctors in private sector could be underreported.
[6] The term Medical Welfare Scheme (MWS) will be used in place of the Low-income Card Scheme (LICS) throughout this dissertation.

The second scheme was the Civil Servant Medical Benefit Scheme (CSMBS), which started in 1978 as a noncontributory regime to provide health care as a fringe benefit to all government employees, their dependents (including spouse, parents, and up to three children below age 20), and retirees from the public sector. This scheme was funded by general tax revenue through the Comptroller General Department of the Ministry of Finance. However, unlike other schemes, the beneficiaries were free to choose health care services from private or public health facilities, under the condition that only 50 percent of the costs incurred at private health facilities (with maximum of 3,000 baht) could be reimbursed. Compared with all other schemes, the CSMBS had the highest expenditures due to its fee-for-service payment method (Sriratanaban, 2002).

The third scheme was the Social Security Scheme (SSS), which originated in 1990 as the Worker Compensation Fund, which was compulsory for employees in the formal private sector. This scheme used a capitation-payment method and was funded equally by three parties: employees, employers, and the government. Unlike the CSMBS, the SSS does not provide any health benefits to the beneficiaries' dependents, and the beneficiaries are required to choose their designated health facilities from among those that have a contract with the Social Security Office (SSO).

Finally, the fourth scheme was a Voluntary Health Card Scheme (VHCS), which began in 1993 as a maternal and child health fund. This scheme was later extended to be a health insurance scheme for the near-poor and the non-poor in the informal sector who were not eligible for any of the other health insurance schemes, and it was financed by premiums from households, the Ministry of Public Health, and an Asian Development

Bank loan. Similar to the MWS, the VHCS beneficiaries needed to register and receive health care services from certain health facilities as their first contacts. Moreover, since the VHCS was run on a voluntary basis, the scheme also faced some selection bias problems (Srithamrongsawat, 2002). The scheme induced people with health problems to enroll, whereas healthy people dropped out from the program, resulting in increasing costs with lower contributions.

By 1998, about 80 percent of the Thai population was insured by one of the four health insurance schemes discussed above. Nevertheless, despite the existence of these four health insurance schemes, more than 18 million people (or about 30 percent of the total population) still remained uninsured in 2001. This group of people included individuals who were not eligible for the CSMBS, SSS, and MWS, were not insured by private health insurance, and chose not to participate in the VHCS. There had been many attempts to establish a universal coverage system, but none was successful until the 2000 election campaign, in which the Thai-Rak-Thai party proposed a universal health coverage scheme called "the 30 baht treat all". Their landslide victory triggered the new government to move toward achieving a universal health coverage scheme.

In October 2001, the Thai government launched a Universal Coverage Scheme (UCS) by first implementing the program in 6 pilot provinces. The UCS combined the MWS and the VHCS, and it also covered all individuals who were previously uninsured. With this new scheme in place, Thailand now has three public schemes that are financed from public resources: the Civil Servants Medical Benefit Scheme (CSMBS), the Social Security Scheme (SSS), and the Universal Coverage (UCS) program. While the CSMBS and SSS were largely unchanged by the 2001 reform, the UCS covers the individuals who previously were eligible for health benefits from the MWS and VHCS, as well as all individuals who were previously uninsured. However, while some expensive but *necessary* treatments are covered by the UCS, other expensive procedures such as cosmetic surgery, obstetric delivery beyond two pregnancies, organ transplant, and renal dialysis are not covered.[7] Moreover, every eligible individual must register with a public health facility in his or her residential area and use it as a primary point of contact before getting a referral for secondary or tertiary care.

From 2001 to 2006 the UCS required each individual to pay 30 baht[8] per each visit for outpatient or inpatient care and drugs on the specified list. This 30-baht copayment is waived for the elderly (age 60+), children below age 12, handicapped, monks, veterans, community leaders, and individuals whose monthly income is below 3000 baht. Finally, in 2007 this exemption was extended to everyone covered by the UCS.[9] In 2007, 97.7 percent of the Thai citizens were covered by at least one health insurance scheme: 74.6 percent were covered by UCS, 8 percent were covered by

[7] The inclusive list of expensive treatments includes chemotherapy for cancers, radiation therapy for cancers, open heart surgery including prosthetic cardiac valve replacement, percutaneous transluminal coronary angioplasty (PTCA), coronary artery bypass grafting (CABG), stent for treatment of atherosclerotic vessels, prosthetic hip replacement therapy, prosthetic shoulder replacement therapy, neurosurgery e.g. craniotomy, and antifungal treatments for cryptoccocal meningitis.
The exclusive list of expensive treatments includes antiretroviral treatment for HIV, renal replacement therapy including kidney transplants for patients with end-stage renal disease, other organ transplants, cosmetic surgery, and fertility treatment. However, there have been some changes with the coverage; these included coverage of ARV drugs for HIV patients (included since October 2003) and renal replacement therapy (included since January 2008).

[8] Thirty baht is approximately $0.89 (exchange rate 1$ = 33.38 baht, on November 3, 2009).

[9] The UCS is also known as the 30-baht or the Gold Card (GC) Scheme. The name "30-baht" reflects the 30 baht copayment discussed above, and the "Gold Card (GC)" refers to the health cards issued to this group of the population. The regular Gold Cards (GC) are issued to beneficiaries who need to pay the 30 baht copayment, and the Gold Cards with exemption (GCE) are issued to those who are exempted from the copayment. In this paper, the term Universal Coverage Scheme (UCS) will be used instead of the 30-baht Scheme, and it includes both GC and GCE.

CSMBS, 12.3 percent were covered by SSS, and the rest were covered by private health insurance and health insurance provided by employers (National Statistical Office, 2007). Table 2-1 shows the percentage of health insurance coverage of the Thai population from 1991 to 2009.

Table 2-2 summarizes the main characteristics of the health insurance schemes both before and after the implementation of the UCS. The first two columns show the characteristics of the MWS/LICS and VHCS that were eliminated in 2001. The last three columns illustrate the three current health insurance schemes, and some of the main features of these schemes are worth highlighting here. First, while the CSMBS and SSS are associated with an individual's employment status, the UCS is for the rest of the population who are not covered by the other two schemes, including those who were covered by the MWS and VHSC and those who were previously uninsured. In other words, the UCS includes people who are self-employed, unemployed, disabled, children, and the elderly. Second, the CSMBS beneficiaries can choose to receive health care from any public providers without prior registration, whereas the SSS and UCS beneficiaries need to use the services from the health care facilities that they register with, and referrals are limited to the other facilities within the network. Third, both the CSMBS and UCS provide a comprehensive package in terms of conditions included, while the SSS covers only non-work related illness and injuries. Fourth, the payment mechanism for the SSS and UCS is capitation,[10] whereas under the CSMBS the payment is fee-for-service for

[10] Capitation is a payment method in which a fixed amount of payment per person per year is allocated to the health facility at which the person registers. For the UCS, the capitation payment was 1202, 1309, 1396, 1659, 2089, 2100, and 2202 baht in years 2003, 2004, 2005, 2006, 2007, 2008, and 2009

outpatient care and Diagnosis Related Group (DRG) for inpatient care. Finally, in terms of copayment, the CSMBS beneficiaries pay for their health care services when receiving the services, and later receive a reimbursement based on actual care from public hospitals and a partial reimbursement if using private hospitals. For the SSS, there is no copayment, except for maternity and emergency services. For the UCS, only the UCS beneficiaries who were not exempted from the copayment were required to pay 30 baht for each visit. As mentioned before, this 30-baht copayment was later eliminated in late 2007.

Literature on the Impact of the UCS

Since the adoption of the UCS in 2001, the impacts of this scheme have been examined in several different studies. These studies focused primarily on the impact of the UCS on households' financial status and on individuals' health care utilization. The results generally indicate that the impacts of the UCS have been pro-poor (Wibulpolprasert & Thaiprayoon, 2008).

In terms of the impact on households' financial status, Limwattananon et al. (2007) suggest that the UCS has protected their financial situation, as the rate of catastrophic spending and the incidence of impoverishment due to high out-of-pocket health spending have decreased. The co-authors also argue that the UCS reduced inequality in the standard of livings among the population because the government health subsidies through the UCS were targeted toward the poor at all levels of public health

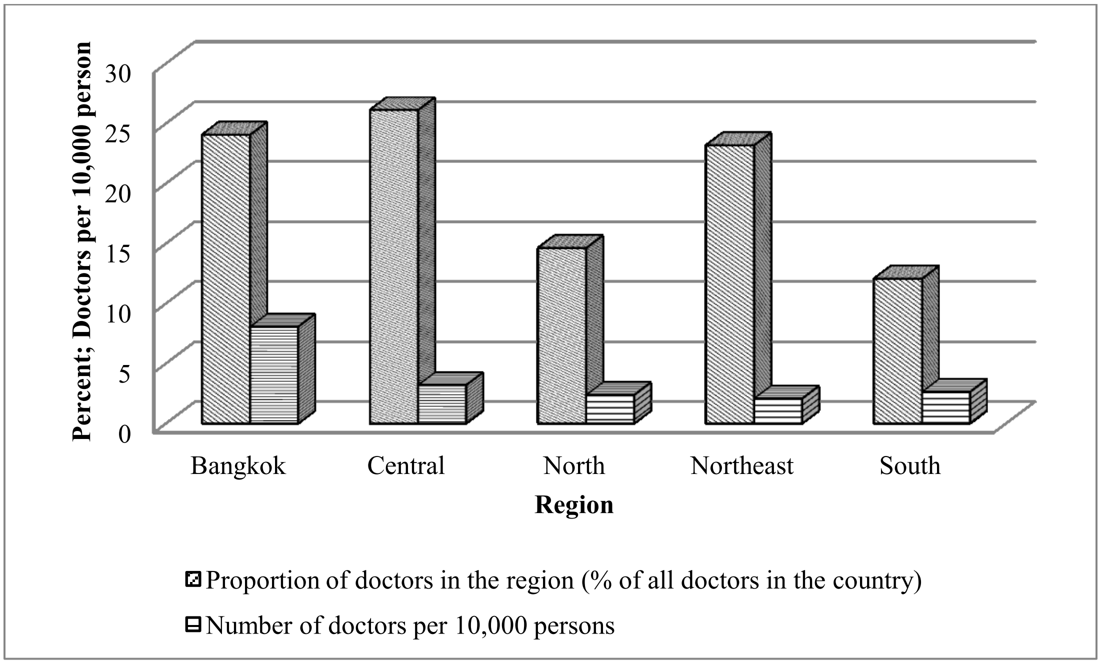
respectively. These numbers are determined by the Ministry of Public Health under the government's approval.

facilities, for both outpatient and inpatient care (Limwattananon, Tangcharoensathien, & Prakongsai, 2007). Furthermore, other studies have found that the UCS has had positive impacts on households' overall financial status. For instance, a study based on a survey of 300 households done by the National Economic and Social Development Board (NESDB) reveals that, after the implementation of the UCS, Thai households on average have lower total expenditures due to lower medical expenditures and thus higher total savings (NESDB, 2003). Similarly, Na Ranong *et al.* (2005) estimate the change in household medical expenditures by using Socio-Economic Status Survey (SES) data collected before and after the implementation of the UCS, and find that the average ratio of household medical expenditures to total income decreased from 2.1-2.2 percent during 1999-2001 to 1.8 percent in 2002. As a result, each household could reduce its total expenditure up to 8,178 - 9,432 baht per month in 2002. In another study, Panpiemrat *et al*. (2007) find a similar result, in that household health expenditures declined by 68 percent compared to the period before the implementation of UC, but this reduction became smaller in later years. Similarly, O'Donnell et al. (2005) argue that the UCS has improved equity in health financing since the better-off paid more in terms of general taxes as a share of their income than did the worse-off.

During the first phase of the program (2001-2002), studies of the UCS's impacts on health care utilization were based on pilot projects and focus groups in selected (mostly low-income) provinces. For example, Suraratdecha *et al.* (2005) used a household survey conducted in 2002 in three low-income provinces (Tak, Sakol Nakorn, and Narathiwat) to study health seeking behavior and the determinants of the take-up of the health care benefits provided by the UCS. They find that the UCS was successful in terms of expanding access to care for people who were previously uninsured. However, it was evident that many respondents who were covered by the UCS still either sought no treatment, self-medicated, or obtained health care from private clinics/hospitals. The coauthors argue that observed differences in health-seeking behavior are largely influenced by socio-economic factors such as education and income. More specifically, people in higher-income groups are more likely to seek health care than people in lower-income groups, and people with higher education are less likely to visit UC facilities (for outpatient) because they do not want to waste time waiting at UC facilities and they often feel that they have the necessary knowledge to treat themselves. In a more recent study, Panpiemrat *et al.* (2007) examine the impact of the UCS over a longer period, from 1996 to 2006. They conclude that the UCS had little impact on inpatient visits, but it did lead to an increase in the number of both patients and visits for outpatient services, particularly in poorer areas. Moreover, their results show that the impacts in terms of increased utilization were most pronounced during the first year the program was implemented, after which the impacts decreased.

Finally, Puenpatom (2006) applies a Quadratic Almost Ideal Demand System (QUAIDS) model to the Socio-Economic Survey (SES) data in the years before and after the introduction of the UCS to analyze the change in the allocation of household expenditures on different groups of consumption goods. She finds that the uncompensated own-price elasticities for most consumption groups in the year 2002 are higher in absolute terms than the elasticities in the year 2000. Similarly, the magnitudes of the cross-price elasticities of most commodities in 2002 are higher than those in 2000. These results suggest that the demand for most consumption groups has become more sensitive to own-price changes and to a decrease in medical care cost as a result of introduction of the UCS (Puenpatom, 2006). Nonetheless, the relationship between the introduction of the UCS and the increased demand of most consumption groups is still left unexplained.

Figure 2-1 Percentage of Doctors and the Ratios of Doctors per 10,000 Persons by Regions in Thailand, 2009



Source: Office of the Permanent Secretary for Public Health, Ministry of Public Health

Table 2-1 Percentage of Coverage under Different Health Insurance Schemes during 1991-2009

Type of health insurance	1991	1996	1998	2001	2003	2004	2005	2007	2009
Universal health coverage (UCS) [a]									
UC-Exempt 30 baht	--	--	--	--	32.7	32.4	28.2	44.4	76.5
UC-Pay 30 baht	--	--	--	--	42.8	41.1	44.5	29.9	--
Social Security Scheme (SSS) [b]	--	5.6	8.5	7.6	9.1	9.7	11.3	12.3	12.5
Civil Service Medical Benefits Scheme (CSMBS) [c]	15.3	10.2	10.8	8.5	8.9	9.9	10.1	8.01	8.0
Medical Welfare Scheme (MWS)	12.7	12.6	45.1	28.9	--	--	--	--	--
Voluntary Health Card Scheme(VHCS)	1.4	15.3	13.9	23.4	--	--	--	--	--
Private health insurance	4	1.8	2	1.3	1.9	0.8	2.7	2.15	3.6
Insurance provided by employer	n/a	n/a	n/a	n/a	0.1	0.0	0.9	0.42	0.3
Other	n/a	n/a	n/a	1.2	0.4	0.1	0.4	0.49	0.6
Total insured	**33.4**	**45.5**	**80.3**	**70.9**	**96.0**	**94.0**	**97.6**	**97.7**	**97.4**
No health insurance	**66.6**	**54.5**	**19.7**	**29.0**	**5.1**	**5.3**	**2.4**	**2.3**	**2.6**

Source: Health and Welfare Surveys in 2003-2009, Thailand's National Statistics Office; Wibulpolprasert and Thaiprayoon (2008)

[a] This statistics does not include the UCS that was first implemented in October 2001 in 6 pilot-provinces.

[b] This category also includes respondents who are covered by Worker Compensation Funds, which is the health insurance scheme that covers work-related illness or injuries.

[c] This category includes health insurance for state enterprise employees.

Table 2-2 Characteristics of Thailand's Public Health Insurance Schemes

Characteristics	**LICS/MWS**	**VHCS**	**CSMBS**	**SSS**	**UC**
Status	*Eliminated in 2001*	*Eliminated in 2001*	*Unchanged in 2001*	*Unchanged in 2001*	*Created in 2001*
Scheme nature	Social welfare	Voluntary insurance with government subsidy	Fringe benefit	Compulsory	Social welfare
Population coverage	The poor and underprivileged	People living above the poverty line with no insurance	Government officials, retired government workers and their dependents (parents, spouse, children)	Formal sector private employees	The rest of Thai population who are not covered by CSMBS and SSS
Benefits:					
Outpatient services	Public hospitals	Public hospitals	Public & Private hospitals	Public & Private hospitals	Public & Private hospitals
Inpatient services	Public hospitals	Public hospitals	Public & Private (emergency only)	Public & Private	Public & Private
Choice of provider	Contracted hospitals or its network with referral line, registration required	Contracted hospitals or its network with referral line, registration required	Free Choice, no registration required	Contracted hospitals or its network with referral line, registration required	Contracted hospitals or its network with referral line, registration required
Cash benefit	No	No	No	Yes	No
Conditions included	Comprehensive package	Comprehensive package	Comprehensive package	Non-work related illness, injuries	Comprehensive package
Maternity benefits	Yes	Yes	Yes	Yes	Yes

Annual physical check-up	No	Yes	Yes	No	Yes
Prevention, health promotion	Limited	Yes	No	Health education, immunization	Yes
Services not covered	Private bed, special nurse	Private bed, special nurse	Special nurses	Private bed, special nurse	Private bed, special nurse, eye glasses
Financing:					
Sources of funds	General tax	Household and government subsidies	General tax	Employers, employee, and government	General tax
Financing body	Ministry of Public Health (MoPH)	Ministry of Public Health (MoPH)	Comptroller General Department, Ministry of Finance	Social Security Office (SSO)	National Health Security Office (NHSO)
Payment mechanism	Global budget	Capitation and performance based	Fee for service for outpatient service, Diagnosis Related Group for inpatient service (July 2007)	Capitation	Capitation
Copayment	None	None	Yes for inpatient services at private hospitals	Only for maternity and emergency services	None (or 30 baht per visit during 2002-07)

Source: Sukunphanit (2006); Hanvoravongchai & Hsiao (2007).

2.2. Background: Vietnam

2.2.1. Socioeconomic and Demographic Background

Vietnam is a lower-middle-income country in the East Asia Pacific region by the World Bank. In 2010, the country's total population was 88.3 million and its GDP per capita was $711 (constant US$) (World Bank, 2011). More than 70 percent of the population lives in rural areas, and the adult literacy rate was 93 percent in 2009. Since the social and economic reforms were started in the mid-1980s, Vietnam has progressed substantially in terms of economic and social development. In particular, Vietnam's economy has grown at an average rate of 7.3 percent during the 1990-2010 period. In 2010, its gross national income per capita in purchasing power parity terms was $2,910 (current international $).

In addition to economic development, other social sectors have been making progress as well. Particularly in the health care sector, the health outcomes of the Vietnamese population have been improved considerably. In 2009, life expectancy at birth was 74 years, and infant mortality rate was 19.5 per 1,000 live births (World Bank, 2011). Moreover, mortality rates for female and male adults were 88 and 133.6 per 1,000, respectively. These rates show that the Vietnamese population's health has improved exceptionally, relative to other countries in the region. In fact, Vietnam's age-specific mortality rates for people below age 55 were better than those of Thailand, a neighboring country with a much higher income (Lieberman & Wagstaff, 2009).

Moreover, like other emerging economies, Vietnam has experienced an epidemiological shift from a country with high morbidity due to communicable diseases to a country with high morbidity due to non-communicable diseases, such as cancer, cardio-vascular disease, diabetes, and hypertension (Ekman & Bales, 2008). In addition, accidents and injuries have become an increasing cause of death. Nevertheless, certain communicable diseases, such as dengue fever, malaria, and tuberculosis still remain a problem in certain areas of the country, including the Mekong Delta, the Northern Mountains, and the Central Highlands (Oanh, et al., 2009). Finally, new and re-emerging communicable diseases, such as HIV/AIDS, Avian flu, Japanese encephalitis, and SARS, have been more of a concern in recent years (Lieberman & Wagstaff, 2009).

In terms of health spending, out-of-pocket health expenditure, most of which is private, still accounts for a large fraction of total health expenditure. In particular, in 2009, the out-of-pocket health expenditure was 55.3 percent and 90.2 percent of total health expenditure and total private health expenditure, respectively (World Bank, 2011). However, the government has attempted to reduce out-of-pocket health expenditures by expanding health insurance coverage, particularly to vulnerable groups of the population, such as the poor and children under six. As a result, total health expenditure as a percentage of GDP and public health expenditure as a percentage of total government expenditure increased from 5.7 percent and 6.5 percent in 2001 to 7.2 percent and 8.9 percent in 2009 (World Bank, 2011). Although these numbers are considered about average for countries at this income level, the fact that public health expenditures have increased in past years suggests a promising future for the improvement in the health care system and population's health in Vietnam.

2.2.2. Background on Vietnam's Health Care System

Health Care Delivery

The health care system in Vietnam is a mixed system, in which the public sector is dominant. In delivering health care services, the system operates on four tiers. First, commune health centers (CHCs) serve as the first point of contact in the public health care system, and they mainly provide primary health care services. In addition, regional polyclinics, which are operated under district hospitals, provide primary health care services within certain communes in a given district. Second, district hospitals take care of referrals from primary care units (commune health centers or regional polyclinics). Third, provincial and/or specialized hospitals are responsible for the secondary referral. Finally, regional and central hospitals are in charge of delivering tertiary-level care.

In terms of infrastructure, in 2010 there were a total of 1,108 hospitals, providing 189,855 beds, or about 22.1 beds per 10,000 persons in Vietnam (Dung, 2010). Of these hospitals, only 108, with approximately 6,500 beds, are private. Moreover, among all public hospitals, 73.4 percent are district hospitals, while provincial hospitals and central hospitals account for 23.0 percent and 3.6 percent of all public hospitals, respectively. In addition, there are approximately 10,732 commune health centers throughout the country. Regarding the availability of health personnel, there are on average 6.5 doctors, 7.2 nurses, and 1.3 pharmacists per 10,000 persons (Dung, 2010). These numbers are considered about average when compared to other low-income countries. Nevertheless, the qualities of services, as well as access to and utilization of health care, are still questionable in Vietnam, especially the provision of primary health care at commune health centers (Ekman & Bales, 2008).

Evolution of Health Care Reform

Vietnam has undergone a series of health policy changes in the past thirty years. Prior to the reforms that began in the late 1980s, Vietnam had an extensive network of public health care facilities that provided curative health services free of charge. However, the negative economic growth in the late 1980s and the collapse of the cooperatives undermined the government's ability to finance this extensive public health care network. These constraints together with the collapse of the Soviet Union, who subsidized pharmaceutical supplies in Vietnam, led to the financial crisis in the health sector (Gertler & Litvack, 1998). Then, as a result of the economic reform program known as *Doi Moi*, which was launched in 1986, the health care system in Vietnam was de-regulated, and health professionals were allowed to operate private clinics and private pharmacies. Consequently, a large number of health professionals who formally worked in public health facilities began to work part-time in their own private clinics (Ekman & Bales, 2008). Furthermore, in the late 1980s partial service fees and charges for drugs and diagnostics were introduced in all public facilities in order to increase their revenue, which could be used to improve their services. However, these user fees appeared to have adverse impacts on health care utilization, in that they became barriers to access to health care, particularly among poor households. This negative consequence of the user-fee introduction led the government to introduce a health insurance program that was designed to increase health care utilization and reduce out-of-pocket health spending, especially among the poor. Figure 2-2 lists the major changes in health insurance reforms in Vietnam from 1992 to 2010 in a chronological order, and Table 2-3 summarizes the main characteristics of different health insurance schemes. The details of these schemes are discussed in the following paragraphs.

First, the social health insurance (SHI) was introduced in 1992 as a compulsory scheme for two groups of people.[11] The first group, which is required to make contributions to the social health insurance fund, includes all Vietnamese employees (i.e., formal sector workers and civil servants) with a contract of three or more months. The second group, whose contributions are paid by the government, includes: (i) individuals who have served government or provided meritorious service to the country, including elected officials, policy beneficiaries who served in the revolution or wars protecting the nation, and family members of current military or police officers; and (ii) the "vulnerable" including the elderly age 90+, social assistance beneficiaries (e.g. the disabled, elderly without family to care for them, orphans), and foreign students on scholarship from the Vietnamese government. Both the contributory and non-contributory schemes of the SHI are run by the Vietnam Social Security (VSS) agency.

Another major health insurance is the Voluntary Health Insurance (VHI) program, which was implemented in 1994. The VHI is designed to cover individuals who need health insurance but are not covered under the compulsory scheme, such as the self-employed or the non-working individuals who have SHI but wanted to contribute to VHI

[11] The term SHI is often referred to as the Compulsory Health Insurance (CHI) due to its compulsory nature.

to supplement their compulsory coverage. This scheme has different target groups (and different modalities), which can be categorized into three main groups (Lieberman & Wagstaff, 2009). The first target group is full-time students, who are enrolled in groups at their schools or colleges and whose premiums are paid for by their families. The second target group is family members of the compulsorily insured, who can voluntarily enroll. The third target group is other people who are allowed by VSS to enroll through group organizations, including communes. The main problem with this scheme is adverse selection and, as a result, certain requirements were later imposed.[12]

In addition to the SHI and VHI, two other health insurance schemes were created originally as subsidized health care programs, and were later integrated into the SHI. These two schemes are the Health Care Fund for the Poor (HCFP) and the "free health care for children age under 6." The HCFP program was set up under Decision 139 in 2003 to finance health care services for the poor, ethnic minorities in disadvantaged provinces, and residents of remote communes. The predecessor of this program was the "Free Health Care Certificate," which was a program designed to provide the poor with special health care, and each beneficiary received a free health care certificate. In the early stage of the implementation of the HCFP program, provinces were allowed to choose whether to provide health care for the poor by purchasing health insurance or by reimbursing facilities directly for services used by the poor. However, this direct reimbursement option was discontinued in 2005 as a result of Decree 63, and the

[12] As of December 2007, family members of the compulsorily insured were required to enroll all household members together. For others' enrollment in VHI, 20 percent of the grouped were required to register, as individuals could not enroll by themselves. These two requirements were imposed in order to reduce adverse selection problem.

provinces were required to buy health insurance for these target groups with funding from the central budget. The health insurance bought by the provinces for the poor is called "Health insurance for the poor." Accordingly, the two terms "Free Health Card Certificate" and "Health insurance for the poor" both refer to the HCFP program, and are often used interchangeably.[13]

The second subsidized program was free health care for children under age 6. Beginning in 2005, the government enacted "the Law on Protection and Care of Children," which required that all children in Vietnam under 6 years old are eligible for free health care at all government health facilities, with facility services reimbursed directly from the state budget. Later, in 2005, the Law on Protection and Care of Children was passed, and since then the free care for children under age 6 program has been a part of the compulsory SHI. More importantly, the Law on Health Insurance has set a roadmap for achieving the universal coverage by the year 2014. In order to do so, the health insurance is planned to cover all students and pupils by January 1, 2010, farmers and workers in the sectors of agriculture, forestry, fishery, and production of salt by January 1, 2012, and all remaining groups by January 1, 2014 (Ha, 2011). Whether the goal of universal coverage can be achieved within the determined timeline is yet to be seen.

Despite the difference in health financing strategies, the benefit packages of the above health insurance schemes are almost identical. In particular, both SHI and VHI

[13] In the VHLSS 2006, the questionnaire separates the two groups of HCFP beneficiaries by referring to the former group as people who have "Free health care certificate" and the latter group as people who are covered by CHI under the specific term "Health insurance for the poor".

pay for outpatient and inpatient diagnosis and treatment at public facilities and certain private facilities that have signed a contract with the social insurance agency. The packages cover the cost of consultation, diagnosis, treatment, rehabilitation at the health facility; lab tests, diagnostic imaging, and other diagnostic techniques; medicines on the MOH's designated list; blood and transfusions; medical procedures and surgery; use of materials, medical equipment, and treatment bed; and prenatal exams and assistance at delivery (Ekman & Bales, 2008). Moreover, for people covered by health insurance for the poor, policy beneficiaries, and people living or working in mountainous and remote areas, transportation costs from referrals from district hospitals to higher-level hospitals are also covered by their health insurance. However, these health insurance programs do not reimburse fees for certain health problems or treatments that are already covered by other government programs or that are deemed unnecessary. The treatments that are covered by other government programs or are related to moral hazard problems include treatment of leprosy; medicines for treatment of TB, malaria, schizophrenia, epilepsy, and other diseases already covered by government-funded programs; diagnosis and treatment of HIV/AIDS, except when HIV tests are part of protocols for treatment of other diseases or if the individuals was infected with HIV through work; syphilis and gonorrhea; immunizations, nursing care, early diagnosis of pregnancy, health checkups, family planning services, and infertility treatment; plastic surgery, prosthetics, false teeth, eyeglasses, and hearing aids; occupational diseases, labor accidents, and war-related accidents; treatment costs in suicide attempts, self-inflicted harm, drug addiction or health problems associated with illegal activities or behavior; health assessments for legal reasons; and consultations, treatment, rehabilitation, or home deliveries. Nevertheless, the distinction between the treatments covered by other government programs and the treatments relating to moral hazard problem is unclear.

To receive the health benefits, beneficiaries are required to register with a local public health facility (or a private facility that has a contract with VSS), and they are expected to use the designated facility when in need of care. If the patient's condition cannot be treated at the registered facility, the patient can be referred to higher-level health facilities. In addition, patients are responsible for additional costs incurred beyond the basic services covered by the health insurance at public health facilities. This is usually the case when patients have special requests, such as selecting a specific facility, bypassing a primary care facility without a referral, or seeking treatment at a private facility outside the contract.

In terms of contributions to health insurance funds, the amount of contributions varies substantially across different schemes, as shown in Table 2-3. Essentially, the contributions to the compulsory SHI are based on the salary for people who work in formal sectors (3 percent of salary, of which 2 percent is paid by employers and 1 percent is paid by employee). On the contrary, the contributions to the SHI for the elderly and pensioners, children age under 6, and HCFP beneficiaries are fixed and paid by the central budget and by the provincial budget. According to Ekman and Bales (2008), the contributions are fixed at US$3.1 per persons per year for the poor and the elderly, and US$ 4.7 per child for children age under 6. For the HCFP beneficiaries, the province is required to allocate US$ 4.4 per eligible beneficiaries.[14] Furthermore, unlike the compulsory SHI, the contributions to VHI funds differ considerably across different areas (e.g. urban vs. rural) and the type of risk pooling (e.g. school, association, or commune). For instance, the required contributions to VHI in 2007 are estimated to range from VND 60,000 - 120,000 and VND 50,000-100,000 for pupils and students in urban area and rural areas, respectively.

With regard to provider payments, the main method of paying providers is fee-for-service (FFS), while capitation is also used, mainly at district hospitals (Dung, 2010). The facilities can be reimbursed from health insurance by the amount based on the partial schedule of user fees charged to uninsured patients. However, it is often the case that the amount reimbursed from health insurance is less than the amount the facility charges the uninsured (Ekman & Bales, 2008). Moreover, the FFS method creates an incentive for providers to provide more care or even perform unnecessary procedures. As a result, alternative provider payment methods, such as diagnostic related group (DRG), are being explored along with other elements in health insurance reform (Dung, 2010).

[14] These contribution rates were based on the information before the Law on Health Insurance was passed. Recently, the contributions for the CHI beneficiaries increased to 4.5% of salary (with 2/3 paid by employers and 1/3 paid by employees). For the social protection group as well as the poor and children under 6, the contribution rate is 4.5% of minimum salary and paid by the state budget. For the poor, the contribution rate is 4.5% of minimum salary, with at least 50% subsidized by state budget (Dung, 2010).

Figure 2-2 Chronology of Health Reforms in Vietnam, 1992-2008

Year	Events
1992	Introduction of Social Health Insurance for formal sector workers
1994	Voluntary Health Insurance introduced for school children and students
2003	Health Care Fund for the Poor (integrated into SHI in 2005)
2005	Free care for all children under age 6 years old (integrated into SHI in 2007)
2008	Law on Social Health Insurance passed (in effect since July 1, 2009)

Source: Adapted from Ekman & Bales (2008) and Dung (2010)

Table 2-3 Characteristics of Public Health Insurance Schemes in Vietnam, 2007

Characteristics	Social Health Insurance (SHI)	Health Care Funds for the Poor (HCFP)[a]	Programme of free health care for children age < 6[b]	Voluntary Health Insurance (VHI)
Scheme nature	Compulsory	Compulsory	Compulsory	Voluntary
Target group(s)	Formally employed, retirees, disabled, meritorious people	The poor, ethnic minorities in mountainous areas, inhabitants in disadvantaged communities	All children under 6 years of age	Self-employed, informal sector workers, dependents of SHI-members, students and school children
Population coverage [c]	9 percent	18 percent	11 percent	11 percent
Benefits:				
• Services covered	Medical consultation; diagnosis and treatment; X-ray and lab tests, functional examination, imaging diagnosis; blood and transfusion; surgery; antenatal examination and delivery			
• Services not covered	Treatments covered by other government's programs and treatments related to moral hazard problems			
• Estimated monetary benefits per member (VND)[d]	393,477	114,570	n/a	719,620
• Drug coverage	Medicines on the list drawn by MOH			
• Transportation costs (for referrals to higher-level hospitals)	Yes (for policy beneficiaries)	Yes	No	No
• Choice of provider	Public facilities and private facilities that have contracts with health insurance agencies			
Financing:				
• Sources of funds	- Employers (2% of salary) and employees (1% of salary) for formal sector workers -Government budget for pensioners and meritorious	General government revenues (75%) and provincial resources (25%)	General government revenues	Private premium paid by parents for students, and by individuals and households for other groups

	persons			
• Estimated monetary contributions per person (VND)[e]	~ 290,000 (3% of salary) for formal sector workers ~ 50,000 (US 3.1$) for the elderly	~ 68,000 (US$ 4.4)	~72,000 (US$ 4.7)	~50,000 - 120,000 for students and pupils ~120,000 - 320,000 for other group-based
• Revenue management	VSS collects premium and issues health insurance cards to beneficiaries.	Province-level management boards purchase insurance cards from VSS.	No charge	Individuals, organizations, and associations purchase insurance cards from VSS.

Source: Ekman et al. (2008), Ekman and Bales (2008), Giang (2008) and Ha (2010)

Note: [a] HCFP became a part of compulsory SHI in 2005

[b] Free care for children age under 6 was transferred to compulsory SHI in 2008

[c] Numbers estimated by Ekman et al. (2008)

[d] These numbers are the estimated monetary benefits received by each group of beneficiaries, and they are based on the estimation in Ha (2011)

[e] The estimates in VND are obtained from Giang (2008), and the estimates in US dollars are obtained from Ekman and Bales (2008). The currency exchange rate used is 1 US$ = 15,736 VND, based on the rate as of December 31, 2007

.

Chapter 3 The Impact of Universal Health Coverage on Households' Precautionary Savings in Thailand

3.0. Introduction

In 2001, a Universal Healthcare Coverage Scheme (UCS) was introduced in Thailand to provide health care access to previously uninsured people. Since then, this scheme has received a great deal of attention from many groups, including medical care providers, policy analysts, academic researchers, the media, and the general Thai population, mainly because it covers more than 70 percent of the population, [15] and it is financed predominantly from the general tax revenues. As the UCS developed, a number of studies have looked at its impact on the population in terms of access to health care, health care utilization, and household expenditures. The main findings from previous studies reveal that the UCS has increased access to health care and health care utilization, particularly among the poor (Panpiemrat, Sampantaruk, Puttitanun, & Piyanirun, 2007; Suraratdecha, Saithanu, & Tangcharoensathien, 2005).

Although it is evident that the UCS has lowered household health care expenditure and thereby increased households' savings after the program was introduced (NESDB, 2003; Na Ranong, Na Ranong, & Wongmonta, 2005), the *causal* impact of this policy on household consumption and *precautionary* savings behavior in Thailand has not been rigorously investigated. In particular, one would expect that, when compared to

[15] This information is based on the 2007 Health and Welfare Survey data.

the population that had long been covered by previously existing public health insurance schemes, households that become eligible for the UCS will adjust their choices regarding both current and future consumption. After becoming eligible for health care coverage under the UCS, the income risk associated with any future health shock is reduced, and consequently expected future health care expenditure will decrease. Accordingly, households have less need to save for their future medical expenses; that is, households tend to reduce their precautionary saving after obtaining coverage under the UCS. Conversely, it is also possible that households save more because their out-of-pocket payments on health care in the current period are reduced, assuming that their income and other expenditures are the same. Given the ambiguous impacts of the UCS on household consumption and saving behavior, it is important to investigate this linkage because it can be used to draw some policy implications on how the UCS alters household behavior and whether it actually affects households' savings.

To address these issues, this study will analyze the impacts on the savings behavior of previously uninsured households who are now covered by the UCS. More specifically, it will examine the relationship between expanding UCS coverage and the savings behavior of households whose members became eligible for UCS coverage in 2001, relative to the behavior of households whose members' health insurance status remained the same, both before and after the implementation of the program in 2001. Since the UCS can be seen as a protection mechanism against uncertain health risk, changes in the households' savings behavior after the UCS implementation could be due to a change in households' savings for precautionary purposes. Findings on the relationship between health insurance and precautionary motives for savings in this study will provide policy implications on how well formal health insurance works, when compared with informal insurance devices such as precautionary savings. Moreover, they can promote a better understanding of the broader economic impacts of government health care policy, such as changes in consumption behavior and the re-allocation of resources from the general population to the UCS beneficiaries.

The chapter is organized as follows. Section 3.1 describes Thailand's health care system, and Section 3.2 reviews the literature related to public health insurance and precautionary savings. Section 3.3 presents the conceptual framework and a theoretical model to explain precautionary savings with uncertain medical expenditure. Section 3.4 describes the data, and the empirical strategy is explained in Section 3.5. Finally, Section 3.6 presents the results and Section 3.7 concludes.

3.1. Background on Thailand's Health Care System

Prior to 2001, a majority of the Thai population was covered by four public health insurance schemes: the Civil Servant Medical Benefit Scheme (CSMBS), the Social Security Scheme (SSS), the Medical Welfare Scheme (MWS), [16] and the Voluntary Health Card Scheme (VHCS). The first two were for government employees and employees in the formal private sectors, respectively.[17] The other two schemes were government-subsidized health insurance provided to disadvantaged groups (MWS) and to

[16] Medical Welfare Scheme (MWS) later became the Low-income Card Scheme (LICS), but the two terms will be used interchangeably throughout this chapter.

[17] The CSMBS provides benefits to all government employees, their dependents (including spouse, parents, and up to three children below age 20), and retirees from the public sector. The Social Security Scheme (SSS) is a compulsory health insurance for employees, but not their dependents, who work in private enterprises in which there are at least 20 employees.

those who were near poor and not eligible for the other schemes (VHCS).[18] Nevertheless, despite the existence of these four schemes, there still remained a large segment of the population (about 18.5 million, or 30% of the total population) that was still uninsured up until the year 2001 (Sakunphanit, 2006). This uninsured group was comprised of people who were not eligible for the first three schemes and chose not to purchase a health care card to enroll in the VHCS. In October 2001, the Thai government launched a Universal Healthcare Coverage Scheme that expanded access to healthcare for all individuals who were previously uninsured, as well as those who were previously covered by the MWS and VHCS. That is, the UCS includes all people who are self-employed, unemployed, disabled, children, and the elderly. With this new scheme in place, Thailand now has three public schemes that are financed from public resources: the Civil Servants Medical Benefit Scheme (CSMBS), the Social Security Scheme (SSS),[19] and the Universal Coverage Scheme (UCS).[20] In 2007, these three health insurance schemes covered approximately 96.7% of Thai citizens: 9.3% are covered by CSMBS, 12.4% are covered by SSS, and 75% are covered by UCS (National Statistical Office, 2007). The other 3.3% of the population is covered by private health insurance or by health insurance provided by private employers. Figure 3-1 illustrates Thailand's public health insurance schemes before and after the 2001 health care reform.

---

[18] The VHCS required each person to purchase a health card that cost 500 baht per year in order to enroll in the scheme.

[19] The funding of the SSS is contributed by three parties, namely the employees, the employers, and the government.

[20] The UCS is also known as the 30-baht or the Gold Card (GC) Scheme. The name "30-baht" follows the 30 baht copayment, and the "Gold Card (GC)" refers to the health cards issued to this group of the population. The regular Gold Cards (GC) are issued to beneficiaries who need to pay the 30 baht copayment, and the Gold Cards with exemption (GCE) are issued to those who are exempted from the copayment. In this chapter, the term Universal Coverage Scheme (UCS) will be used instead of the 30-baht Scheme, and it includes both GC and GCE.

More details about Thailand's health care system can be found in Hanvoravongchai and Hsiao (2007), Sakunphanit (2006), and Wibulpolprasert and Thaiprayoon (2008).

3.2. Literature Review

In the health insurance literature, precautionary savings can be considered as a form of *self-insurance*, which households can use to insure themselves in the event of ill-health in the future. Accordingly, one can argue that self-insurance is a substitute for, or an informal form of, health insurance. Kotlikoff (1989) develops a theoretical model to illustrate that an uninsured household faces greater uncertainty than an insured household, and hence has a stronger incentive to hold assets against the possibility of accident or illness. By the same argument, one would expect that households will save less if they have health insurance since the risk reduction from health shocks in the future can lead to lower expected future health expenditure and higher expected net future income, assuming that households are risk-averse. However, given that there are many types of health insurance (i.e. private health insurance, public health insurance, etc.), the empirical evidence on the savings impacts of health insurance appears to be inconclusive, as discussed in more detail in the rest of this section.

The first group of studies in this area focuses on private health insurance in developed countries. According to the precautionary saving hypothesis, prudent households will decrease saving and increase consumption when risk is reduced (Kimball, 1990). Yet, Starr-McClure (1996) finds a positive correlation between private health insurance and household asset holding in the U.S. Using a maximum likelihood model to control for selectivity, she also finds that health insurance has a significantly positive effect on asset holding. Similarly, Guariglia and Rossi (2004) study the effects of private medical insurance on saving behavior using the British Household Panel Survey data. They find that health insurance coverage increases the probability of saving. Note, however, that neither of these studies controls for unobserved risk aversion that varies across different groups of people.

Another group of studies examines public health insurance programs, which differ across countries according to different justifications for each program. For example, the U.S. Medicaid program was enacted to assist the low-income population, and hence eligibility for that program is determined based on household incomes and asset holdings. Gruber and Yelowitz (1999) study the impact of the Medicaid program on household assets. They find that Medicaid eligibility has a significant and negative effect on asset holding. Maynard and Qiu (2009) study the effect of Medicaid on household savings across different segments of the wealth distribution within the Medicaid recipients group, and their results are generally consistent with those of Gruber and Yelowitz. However, they find that the disincentive effect of Medicaid on household saving is stronger for the households of middle net worth[21], and that Medicaid expansion does not necessarily discourage the savings of the poorest households. These two studies reveal not only that health insurance can reduce uncertainty due to risk, but also that households may "spend-down" their wealth in order to qualify for a means-tested program.

Unlike the Medicaid program, the UCS in Thailand is not a means- or asset-tested program. In this context, one can ignore the possibility that households will reduce their

[21] Total household net worth is defined as the sum of financial assets, home equity, vehicle equity, and business equity, net of unsecured debt holdings.

wealth in order to become eligible for public health insurance. Accordingly, the impacts on saving can be attributable mainly to the reduction in out-of-pocket medical expenditures as well as the risk reduction brought about by the health insurance program. A well-known example is Taiwan's National Health Insurance (NHI) program, which was implemented in 1995. Chou *et al.* (2003) study the impact of Taiwan's NHI on precautionary saving, and their identification is based on employment-based variation in insurance coverage before the introduction of NHI. By using a difference-in-differences method, they find that the implementation of NHI has a significant and negative effect on household precautionary saving. Similarly, Chou *et al.* (2004) use the same data and a semiparametric smooth coefficient model to analyze the relationship between NHI and savings over the household life cycle. They find that younger households are more sensitive to risk reductions and have a greater response in terms of reduced precautionary savings; these results are consistent with their earlier study.

The UCS that was launched in Thailand in 2001 shares some characteristics with Taiwan's NHI. In particular, both Thailand's UCS and Taiwan's NHI are exogenous to household decisions on savings and, hence, they offer an opportunity to estimate the impact of a public health insurance program on household savings behavior. However, there are two important differences between the two programs. First, Taiwan's NHI is the only public program that covers Taiwan's population, whereas Thailand's UCS is just one of three public health insurance schemes, and it was designed to cover both people who were previously uninsured or were previously covered by other low-income health security schemes. Second, and more importantly, Taiwan's NHI provides a comprehensive health care package, and individuals can choose their medical care providers freely. In Thailand, however, the UCS beneficiaries' choices of health care providers are restricted to the health care facilities that they have registered with. Given this restriction and some limitations on the comprehensiveness of health care services, an analysis of the impacts of the UCS on household saving behavior in Thailand may give a different result from the studies on Taiwan's NHI. Thus, one contribution of this research to literature in this area will be to examine whether the findings for Taiwan still hold for a different type of public health care system.

Finally, consider the literature on Thailand's UCS and household's savings behavior. Na Ranong *et al*. (2005) and Panpiemrat *et al.* (2007) have examined the impact the UCS on household expenditure and saving. While those studies are interesting in their own right, none of them has investigated the impact of the UCS on households' consumption smoothing patterns or their precautionary savings behavior. More specifically, the impact of the UCS has not been analyzed in a dynamic framework with uncertainty. In addition, in these studies the behavior of the previously insured population is not distinguished from that of previously uninsured population. Hence, this study attempts to fill the gap in the literature and to further explore the impacts of the UCS in a way that allows additional policy implications, such as those on economic inequality, to be drawn.

3.3. Conceptual Framework

The framework of analysis in this study will be based on the economic theory of precautionary savings. The introduction of the UCS, which guarantees access to health care services, reduces a household's uncertainty about future health expenditures and also reduces its expected size of future health care expenditure. This risk reduction effect should, under general conditions, lead to a *ceteris paribus* increase in consumption and a decrease in precautionary savings. In addition to the risk reduction effect, there is an income effect as a result of a reduction in medical expenses, because the UCS is funded largely by general tax revenue and households pay only a trivial amount to use the program.[22]. Consequently, UCS increases expected life cycle income net of medical expenses for the households whose members are UCS beneficiaries. Thus, the hypothesis to be examined is that households in which the members were previously uninsured and have become eligible for health benefits under the UCS coverage will have lower precautionary savings in the periods after the implementation of UCS, when compared to households in which household members are covered by other existing health insurance schemes, controlling for all other household characteristics.

Theoretical Model

This multi-period is based upon a stochastic life-cycle model, building on the models of Deaton (1992, chapter 6), Chou *et al.* (2003), and Kong *et al* (2008). This model depicts a household's utility maximization problem in which the household chooses both current and future consumption to maximize expected utility subject to an intertemporal budget constraint, given that income depends on health status, which is stochastic (i.e. uncertain). More specifically, assume that each household lives for a

[22] The sustainability of the UC Scheme has always been a problem. It is evident that many hospitals already have budget deficits, while others do better financially. Nevertheless, the problem of financing the UC Scheme is beyond the scope of this study.

finite number of time periods T, and that in each period t the household chooses a consumption path (C_t, C_{t+1}, ..., C_T) and a medical care consumption path (M_t, M_{t+1}, ..., M_T) to maximize its expected utility subject to the intertemporal budget constraint. The household's expected utility depends on the consumption good (C_t) and health status (H_t). The current health status (H_t) together with current medical care consumption (M_t), and a random health shock (η_{t+1}) determines health status in the next period (H_{t+1}). Assume that the household is risk-averse, and that the utility function exhibits constant absolute risk aversion (CARA). For each period t, denote A_t as the asset that the household owns, Y_t as the labor income household members earn, and M_t as the medical expenditure incurred, assuming the price of consumption good is normalized to one. The household spends all its income and assets in the last period so that $A_T=0$. Furthermore, assume that labor income is positively correlated with the health status. Finally, assume that the interest rate is r and that the discount rate equals to β.

First, assume that the household's utility from the consumption good (C_t) and from health (H_t) are additively separable, where α and γ are the coefficients of absolute risk aversion on consumption and health, respectively. Thus, the household's utility maximization problem at time zero can be written as:

$$\max_{C_\tau, M_\tau} E_\tau \sum_{\tau=t}^{T} \beta^t \left[U(C_t, H_t) = -\frac{1}{\propto} e^{-\propto C_t} - \frac{1}{\gamma} e^{-\gamma H_t} \right] \quad (1)$$

Subject to:

$$A_{t+1} = (1 + r)(A_t + Y_t - M_t - C_t) \quad (2)$$

$$Y_t = \omega H_t \quad (3)$$

$$H_{t+1} = (1-\delta)H_t + \lambda M_t + \eta_{t+1} \qquad (4)$$

$$A_{T+1} = 0 \qquad (5)$$

where ω is the contribution of health to labor income ($0 < \omega < 1$); δ is the depreciation rate of health stock (0< δ <1); λ is the impact of medical expenditure on improvement in health status ($0 \leq \lambda \leq 1$); and assume $\eta_t \sim N(0, \sigma^2)$.

Define $V_t(A_t, H_t)$ as the value function in period *t*. From the above maximization problem, a Bellman equation can be written as:

$$V_t(A_t, H_t) = \max_{C_t, M_t} U(C_t, H_t) + \beta E_t[V_{t+1}(A_{t+1}, H_{t+1})]$$

$$= \max_{C_t, M_t} U(C_t, H_t) + \beta E_t\big[V_{t+1}\big((1+r)(A_t + Y_t - M_t - C_t), (1-\delta)H_t +$$

$\lambda Mt+\eta t+1$ (6)

The first order conditions with respect to C_t and M_t can be written as:

$$U_C(C_t, H_t) = \beta(1+r)E_t\left[\frac{\partial V_{t+1}}{\partial A_{t+1}}\right] \qquad (7),$$

and $$E_t\left[\frac{\partial V_{t+1}}{\partial A_{t+1}}\right] = \frac{\lambda}{1+r}E_t\left[\frac{\partial V_{t+1}}{\partial H_{t+1}}\right] \qquad (8),$$

respectively.

By Envelope Theorem, it can be shown that:

$$\frac{\partial V_t}{\partial A_t} = \beta(1+r)E_t\left[\frac{\partial V_{t+1}}{\partial A_{t+1}}\right] \qquad (9)$$

$$\frac{\partial V_t}{\partial H_t} = U_H(C_t, H_t) + \beta E_t\left[\omega(1+r)\frac{\partial V_{t+1}}{\partial A_{t+1}} + (1-\delta)\frac{\partial V_{t+1}}{\partial H_{t+1}}\right] \qquad (10)$$

Based on equations (7) and (9), the Euler equation for consumption can be written as:

$$U_C(C_t, H_t) = \beta(1 + r)E_t[U_C(C_{t+1}, H_{t+1})] \tag{11}$$

where $U_c(C_t, H_t) = \frac{\partial U(C_t, H_t)}{\partial C_t}$ and $U_c(C_{t+1}, H_{t+1}) = \frac{\partial U(C_{t+1}, H_{t+1})}{\partial C_{t+1}}$ are the marginal utilities of consumption in periods *t* and *t+1*, respectively. This equation suggests that the household maximizes their expected utility by equating the marginal utility of current consumption to the expected marginal utility of future consumption. Moreover, since H_{t+1} is a function of health shock (η_{t+1}), the expression in equation (11) allows the uncertainty from health shocks to have an impact on the current consumption (C_t).

Furthermore, the relationship between the marginal utilities of consumption and health in period *t* can be derived from equations (8) and (10), and it can be written as:

$$U_C(C_t, H_t) = \left(\frac{\lambda}{r+\delta-\omega\lambda}\right) U_H(C_t, H_t)$$

Or $$\frac{U_C(C_t, H_t)}{U_H(C_t, H_t)} = \frac{\lambda}{r+\delta-\omega\lambda} \tag{12}$$

The term on the left hand side of equation (12) is the marginal rate of substitution (MRS) between consumption and health, and it is positive because $U_c > 0$ and $U_h > 0$. This equation suggests that the MRS between consumption and health depends on the relative magnitudes of the contribution of health to labor income (ω), the depreciation rate of health stock (δ), the impact of medical expenditure on improvement in health status (λ), and the interest rate (r)[23].

From the Euler equation (11) and the relationship in equation (12), one can derive the optimal paths for consumption and medical care separately due to the additive separability assumption of the utility function. Appendix 1 shows that the optimal paths for consumption and medical care need to satisfy the following two conditions:

$$C_{t+1} = C_t + \frac{ln(\beta(1+r))}{\alpha} + \frac{\gamma^2}{2\alpha}\sigma^2 + \varepsilon_{t+1} \tag{13}$$

$$M_{t+1} = M_t + \frac{\delta ln(\beta(1+r))}{\gamma\lambda} + \frac{\delta\gamma}{2\lambda}\sigma^2 + \xi_{t+1} \tag{14}$$

where $\sigma^2 = Var(\eta_t)$ for all t; $\varepsilon_{t+1} = C_{t+1} - E_t[C_{t+1}]$; and $\xi_{t+1} = M_{t+1} - E_t[M_{t+1}]$.

By rewriting equations (13) and (14), the changes in consumption and medical expenditure can be expressed as:

$$\Delta C_t = C_{t+1} - C_t = \frac{ln(\beta(1+r))}{\propto} + \frac{\gamma^2}{2\alpha}\sigma^2 + \varepsilon_{t+1} \tag{15}$$

$$\Delta M_t = M_{t+1} - M_t + \frac{\delta ln(\beta(1+r))}{\gamma\lambda} + \frac{\delta\gamma}{2\lambda}\sigma^2 + \xi_{t+1} \tag{16}$$

Equations (15) and (16) suggest that the variance of health shock (σ^2) has a positive effect on both change in consumption and change in medical expenditure because the parameters $\gamma, \alpha, \delta,$ and λ are all positive. Thus, in the event that the variance of health shock increases, the household will need to lower the current consumption in order to maintain the same level of consumption in the next period. Moreover, the optimal paths

[23] $MRS_{CH} > 1$ if $\frac{\lambda}{r+\delta-\omega\lambda} > 1$; that is, when $(1+\omega)\lambda > r + \delta$.

of consumption and medical expenditures can be used to find the optimal level of current consumption level. For illustrative purposes, assume that *T=2* so that $A_3=0$, and that the interest rate (*r*) is zero. By using backward substitution, the optimal consumption level at time *t=1* can be solved as:

$$C_1 = \frac{A_1 - \Omega}{2} + \left(1 - \frac{\delta}{2}\right) Y_1 - \left(1 - \frac{\omega\lambda}{2}\right) M_1 - \left(\frac{\gamma}{\alpha} + \frac{\delta}{\lambda}\right)\frac{\gamma}{4}\sigma^2 + \frac{\omega\eta_2 - \varepsilon_2 - \xi_2}{2} \qquad (17)$$

where $\Omega = \left(\frac{1}{\propto} + \frac{\delta}{\gamma\lambda}\right) ln\beta$.[24]

This optimal current consumption in equation (17) is the level of consumption that the consumer chooses when all of the medical expenditures (M_t) are out-of-pocket. It suggests that the level of consumption will be lower if medical expenditure is higher, since $\frac{\omega\lambda}{2} < 1$. Moreover, this optimal consumption also depends on the person's relative risk aversion ($\frac{\gamma}{\alpha}$) as well as the variance of the health shocks (σ^2). Specifically, for a given level of health shocks, a person whose risk aversion on health is greater than the risk aversion on consumption (i.e., $\gamma > \alpha$) will reduce the current consumption more than the person whose risk aversion on health is smaller than the risk aversion on consumption (i.e., $\gamma < \alpha$). Similarly, if the variance of health shocks rises, the optimal consumption in the current period will be lowered, all else constant.

Next, suppose that there exists a new health care scheme that subsidizes most of out-of-pocket medical expenditures. To illustrate the impact of this medical care subsidization, the budget constraint is now modified to:

$$A_{t+1} = A_t + Y_t - \rho M_t - C_t, \text{ where } 0 < \rho < 1. \qquad (18)$$

[24] The derivation of C_1 is also shown in **Error! Reference source not found.**.

where ρ is a copayment rate that the consumer is required to pay under the new scheme, and M_t is the *real* cost of medical care. This equation can be rewritten as:

$$A_{t+1} = A_t + Y_t - M_t - C_t + (M_t - \rho M_t).$$

This expression shows that the difference between the *real* cost of medical expenditure and the small copayment (that is, $M_t - \rho M_t$) can be seen as an income transfer from the government to the consumer. Moreover, the fact that the new scheme provides preventive care as well as guarantees that the consumer will always receive health care when needed suggests that the magnitude of the negative health shock can be reduced to $\tilde{\eta}_t$, where $\tilde{\eta}_t \sim N(0, \tilde{\sigma}^2)$ and $\tilde{\eta}_t < \eta_t$ for all *t* and $\tilde{\sigma} < \sigma$. Thus, the new optimal consumption in period t=1 in the two-period model can be written as:

$$\tilde{C}_1 = \frac{A_1 - \Omega}{2} + \left(1 - \frac{\delta}{2}\right) Y_1 - \left(\rho - \frac{\omega\lambda}{2}\right) M_t - \left(\frac{\gamma}{\alpha} + \frac{\delta}{\lambda}\right) \frac{\gamma}{4} \tilde{\sigma}^2 + \frac{\omega\tilde{\eta}_2 - \varepsilon_2 - \xi_2}{2}\,. \tag{19}$$

Consequently, the difference in the optimal current consumption levels with and without medical care subsidization can be shown as:

$$\tilde{C}_1 - C_1 = (1 - \rho) M_1 + \left(\frac{\gamma}{\alpha} + \frac{\delta}{\lambda}\right) \frac{\gamma}{4} \left(\sigma^2 - \tilde{\sigma}^2\right) - \frac{\omega}{2} (\eta_2 - \tilde{\eta}_2). \tag{20}$$

From equation (20), the difference in the consumption levels can be decomposed into two components. The first is an *income transfer effect*, where the medical care subsidization reduces the medical care price, and the reduction in total medical expenditure can be seen as a positive income transfer. This income transfer effect can be illustrated by the distance $|C_1' - C_1| = (1 - \rho) M_1$, and it is clearly positive since $0 < \rho < 1$. The other component of the change in consumption levels is a *risk-reduction effect*, where the variance of health shocks is reduced after medical care expenditure is subsidized, and it is illustrated by an upward parallel shift of the budget constraint from L_1' to L_1 or, equivalently, the distance $\left|\tilde{C}_1 - C_1'\right| = \left(\frac{\gamma}{\alpha} + \frac{\delta}{\lambda}\right)\frac{\gamma(\sigma^2 - \tilde{\sigma}^2)}{4} - \frac{\omega}{2}(\eta_2 - \tilde{\eta}_2)$ on the x-axis (see Figure 3-2).[25,26] This risk reduction effect could be either positive or negative, or even zero. Accordingly, the total change in the current consumption level is the sum of the income transfer effect and the risk-reduction effect, and it is positive when both effects are positive. However, if the risk reduction is negative, then the total change in the current consumption is arbitrary. Moreover, if there is no risk reduction, then the total increase in the consumption will be a sole result of the income effect. In this study, the hypothesis is that the UCS implementation also results in a risk-reduction effect, which in turn results in a reduction in precautionary savings. This hypothesis is tested empirically in the following sections.

3.4. Data

The main dataset used in this study is Thailand's Socio-Economic Survey (SES), which was obtained from Thailand's National Statistics Office. The SES is an annual, nationally representative survey that collects data on both household and individual characteristics. More specifically, it collects detailed data on household income, expenditures, debts, assets, and the characteristics of the household's dwelling. The SES also collects data on household members' characteristics, such as age, gender, education,

[25] This expression is equal to the difference between the original consumption level and the new consumption level when medical care is zero.

[26] In this model, the additional income is assumed to be translated to an increase in consumption. However, if the consumption of other goods actually remains the same, this income effect will result in an increase in regular savings that is the residual between the income and consumption.

and occupation. The income and total expenditure data available in the SES data will be used to calculate household savings, which is the dependent variable in this analysis.

In addition, because the SES does not have complete information on health insurance coverage, which is the main explanatory variable in this analysis, the Health and Welfare Survey (HWS) will be used to supplement the SES data. The HWS contains detailed information on individual health insurance coverage and health behaviors, such as health care utilization, choice of medical providers, out-of-pocket health care expenditure, and whether the person takes up the benefits from the health insurance scheme for which he or she is eligible. Unlike the SES, however, the HWS data were collected only every 5 years during 1981-2001, after which they were collected annually starting in 2003. More importantly, the HWS does not have data on income or consumption expenditures. As a result, these limitations of the HWS data will determine the SES data used in this analysis.

More specifically, this paper will analyze the impact of the implementation of the UCS by using the HWS and the SES data collected in the years 2001, 2004, and 2007. The 2001 data will be used to represent household behaviors before the UCS implementation, because the 2001 data are the latest data available before the UCS implementation and the variables in both the HWS and SES collected in 2001 are consistent with the data in the more recent years. Moreover, both the 2001 HWS and SES data were collected during the months prior to October 2001, which was when the UCS was officially implemented throughout the country. For the period after the UCS implementation, the HWS and SES data collected in 2004 and 2007 will be used to determine the impacts of the program. The 2004 data can reveal information on the impact of the program in the short to medium term, while the 2007 data allow one to see whether the long run impacts differ from the initial impacts.

Despite the comprehensiveness of these two datasets, they have some problems that need to be addressed. First, only in 2007 are the HWS households a sub-sample of the SES households; for 2001 and 2004 the households surveyed in the HWS are not the same as the households surveyed in the SES. This problem prevents one from using the health insurance status in the HWS to identify treatment and control groups in the SES data. To deal with this problem, the information available in the HWS is used to predict the type of health insurance that each individual has in the SES data. This information comes from the variables that are available in both the HWS and SES, and are closely related to the types of health insurance. These variables include age, employment status (i.e. government workers, employees in private sector, etc.), occupation, income, and whether household members used the Medical Welfare Scheme (MWS) or purchased a Voluntary Health Card Scheme (VHCS).[27] Nevertheless, since the data that are useful for predicting health insurance types in the 2001 SES are different from the analogous data for the 2004 SES, two different approaches are used to predict health insurance types in the two years, which are explained in the following paragraphs.[28]

The 2001 SES data contain no individual-level variable that indicates the type of each individual's health insurance, but there are two variables at the household level that

---

[27] This last variable exists only in the 2001 SES data at the household level, and can be computed in the 2001 HWS data.

[28] More details and illustrations of these two approaches are shown in **Error! Reference source not found.**.

indicate whether any household member was covered by MWS or VHCS. Consequently, these two variables, together with the fact that certain health insurance types are associated with the employment status of the individuals, are used to establish a set of rules that can be used to predict the type of health insurance that each individual has. For instance, persons who work for the government, and their dependents, are entitled to be covered by the CSMBS. Similarly, persons who work in the formal private sector, but not their family members, are required to be covered by the SSS. The rules for other types of health insurance are determined primarily by age, income, and occupation. Once these rules are determined, they will be applied to predict the type of health insurance for each individual in the HWS data, and then compared the actual health insurance types with the predicted ones. The results show that approximately 68% of the predicted health insurance types match the actual health insurance types in the HWS data. Then, these rules are used to predict the health insurance of each individual in the SES data, and compare the predicted percentages of different health insurance types in the SES to the actual percentages in the HWS data. The results show that the predicted percentages of CSMBS and SSS in the SES are close to the actual percentages in HWS, but that the predicted percentage of the uninsured is overestimated, although only by about three percentage points (see Table A-1 in **Appendix 2**).

Unlike the 2001 SES, the 2004 SES already collects information at the individual level for the major types of health insurance. That is, the survey asks whether each household member has one of the following health insurance schemes: UCS, CSMBS, SSS, or private health insurance; this information can be used directly in the analysis.

However, the survey does not distinguish the UCS beneficiaries who are exempted from paying the 30-baht copayment from those who are required to pay the 30 baht copayment. This distinction is important because it can be used to identify who were previously uninsured and who were not, which in turn determines who are in the treatment and control groups, respectively. In theory, the former group (UCE) is comprised of individuals who previously participated in the Medical Welfare Scheme (MWS) before the UCS implementation, whereas the latter group (UCP) includes individuals who previously had no health insurance (or may have had a Voluntary Health Card). Nevertheless, although there are certain rules (such as income levels) that differentiate the UCE beneficiaries from the UCP beneficiaries, the percentages of both groups in the HWS data do not match with these rules. One possible explanation for this is that there was some confusion in the registration process in the early stages of the UCS. Another possibility is that there could be some measurement error in the income data. Given this limitation, the prediction of the UCE and UCP beneficiaries will be based on a regression method, which will now be explained.

To differentiate between the UCE beneficiaries and UCP beneficiaries, the information from the 2004 HWS data is used to estimate the probability of being covered by the UCE or UCP Scheme among all the UCS beneficiaries in the 2004 SES data. Specifically, the probability of being covered by the UCE or UCP Scheme in the HWS data is computed by using a standard logit regression model, in which the explanatory variables are those that are available in both the HWS and SES data and that have high predictive power on the individual health insurance type for the UCS beneficiaries. Next, the estimated coefficients obtained from the HWS data are used to predict the probability of being covered by UCE as opposed to being covered by UCP, conditional on being covered by one of these two programs, in the SES data. After obtaining the predicted probabilities, a dummy variable indicating whether the person is covered by UCE or UCP is constructed based on the cut point that gives the closest percentages to the actual percentages in the HWS data. This approach is similar to the *direct prediction* method used in McKenzie (2005), where the auxiliary survey is employed to regress non-durable consumption on the asset indicators and other control variables, and the fitted coefficients are used to predict household non-durable consumption in the main survey. In this context, the SES is the main survey, and the HWS is the auxiliary survey.

In addition to the lack of an individual level health insurance variable in the 2001 and 2004 SES data, a second problem is that the type of health insurance is an individual level variable, while savings is measured at the household level. In the context of Thailand's health care system, it is very common for household members to have different types of health insurance, because the eligibility for most health insurance schemes is determined on an individual basis. The only exceptions are the Voluntary Health Card (VHCS) in the pre-2001 period, which covered all household members, and the CSMBS in all years, which covers not only government workers but also their dependents (spouse, parents, and children up to age 20). Consequently, the main explanatory variables in this analysis are not a set of dummy variables that indicate whether the household has certain types of health insurance. Instead, the health insurance variable will be the *proportion* of household members who have a particular type of health insurance. In this context, there are eight types of health insurance, including no insurance. This implies that there are eight health insurance proportions, all of which sum to one. Accordingly, the impact of the UCS implementation will be estimated from how much the change in the proportions of uninsured household members and the change in the proportions of household members insured by the UCS affect household savings. This estimation will be explained in greater detail in the Section 3.5.

Finally, a third problem is that the SES data are repeated cross-sections. Even though the surveys are done on a regular basis, the households interviewed in these surveys are not the same across different years. This prevents one from using panel data methods, particularly using household fixed effects to capture the unobserved time-invariant characteristics. To deal with this problem, one possible solution is to create pseudo-panel data by using age cohorts to link different cross-sectional datasets (Deaton, 1985; McKenzie, 2001). To do this, cohorts based on characteristics of the household heads are created, and each cohort contains people in households whose heads were born within the same five year period. Since the focus of this study is on savings, which may be significantly different among the older households, the sample is restricted to households in which the ages of heads are between 25 and 60 years old in 2001. Hence, in total there are seven age groups (i.e., 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, and 55-60). In addition to the age groups of household heads, cohorts are also defined based on the employment status of the head and the sub-regions (groups of provinces) in which the household is located in order to increase the number of cohorts, assuming that the household heads are unlikely to change their jobs or move. Employment status is classified into five categories according to the SES questionnaires: employer, own-account worker or unpaid family worker, government or state enterprise employee, private employee or member of a co-operative, and economically inactive (no occupation). Moreover, from the seventy-six provinces, nearby provinces that have similar characteristics are grouped according to the Ministry of the Interior classification scheme, which yields nineteen groups of provinces in total. Based on these three variables, the total number of cohorts should be 665. However, there are some empty cells, most of which are among younger cohorts and cohorts whose household heads are economically inactive. Despite these missing cells, the numbers of cohorts across the three years are still comparable; the total numbers for 2001, 2004, and 2007 are 638, 664, and 657, respectively.

Descriptive Statistics

The restriction to households in which the heads are between 25 and 60 years old and the elimination of outliers and missing values reduce the household sample sizes to 9,024, 24,908, and 15,204 households in the 2001, 2004, and 2007 SES surveys, respectively. Table 3-1 shows some descriptive statistics for the households in this selected sample. The main variables of interest are the types of health insurance, which are reported in terms of the proportion of household members with each type of health insurance. There are a number of trends that are worth mentioning here. First, on average, approximately 33% of household members were uninsured in 2001, but this group declined to 5% and 4% in 2004 and 2007, respectively. Thus, most of the uninsured in 2001 became UCP beneficiaries after the UCS was implemented; only the uninsured persons whose income was lower than 3,000 baht per month became UCE beneficiaries. Second, the proportions of household members who are covered by CSMBS and SSS are approximately 10% and 9%, respectively, and, as one would expect, they remain relatively stable over time. Third, while the largest insurance category in 2001 was uninsured (33.2%), the largest category in 2004 was household members who were covered by UCP (47.7%), and in 2007 the largest category was those covered by UCE (42.9%). This reflects the fact that, in the early stage of the UCS implementation, the UCP scheme was intended to cover everyone who was previously uninsured, and it may have also covered some individuals who were previously covered by VHCS. Moreover, since policy makers were planning to eliminate the 30-baht copayment, the proportion of household members covered by UCE became larger than the proportion of household members covered by UCP by 2007.

In addition to the proportion of household members with each type of health insurance, other household characteristics are included as control variables. These characteristics include household size; age, employment status, and education level of the household head; and location of the household (i.e. region and municipal area). The average values of these statistics from Table 3-1 reveal that these household characteristics do not change over time. For instance, the average age of household head is in the range 43-45 years old. Moreover, the household size is approximately 3.5-3.6 persons, and approximately 66%-67% of the households live in non-municipal areas. Nevertheless, some characteristics of household heads in the 2007 data seem to deviate from those in the 2001 and 2004 data. For example, about 17% of households head are employers in 2001 and 2004, whereas only 7% are employers in 2007. Similarly, in 2001 and 2004, only 0.5%-0.6% of household heads attained upper-vocational education, whereas 3% of them attained upper-vocational education in 2007.[29] Table 3-1 also reports different measures of household savings and consumption expenditures, all of which are in real terms and are measured on a monthly basis. The three measures of savings are adopted from Paxson (1992). These measures of savings are: (i) TOTSAV defined as the difference between income and expenditure on *all* goods and services; (ii) NDSAV defined as the difference between income and expenditure on all goods and services *except* consumer durables (vehicles, household equipment, furniture, clothing, footwear, and educational expenses), and (iii) NTASST defined as purchases minus sales of real and financial assets. In this study, TOTSAV is used as the measure of savings used in the main analysis. Although TOTSAV may underestimate the true value of savings because it does not take into account the consumption of durable goods (Paxson, 1992), it is widely used as a measure of household savings for studying the precautionary savings hypothesis (see Chou et al (2003) for example). Moreover, both TOTSAV and NDSAV increase by approximately 2,000 baht during 2001-2007. In particular, TOTSAV increases from 3,602.3 baht in 2001 to 5,314.3 baht in 2007, whereas NDSAV increases from 6,389.5 baht in 2001 to 8,978.5 baht in 2007. Finally, NTASST is not a comparable measure of savings between 2001 and 2007 because the 2007 SES collects data on assets and liabilities as a categorical variable. Parallel to measures of savings, there are three different measures of household consumption. These measures include:

[29] The variations in these percentages are likely a result of changes in definitions and concepts asked in the surveys from different years. In particular, the codes for education levels in the 2001 and 2004 SES are similar, but they are different from the codes for education levels in the 2007 SES.

(i) TOTCON defined as the total household monthly consumption expenditure; (ii) NMCON defined as non-medical consumption expenditures; and (iii) NMNDCON defined non-medical non-durable consumption expenditures. Since TOTCON is the complement of TOTSAV and the consumption expenditures on non-medical goods and services is the focus of this analysis, NMCON is used as the measure of consumption expenditures in the main analysis. From Table 3-1, NMCON increases from 8,845.9 baht in 2001 to 11,294.6 baht in 2007, which is similar to the trend of increasing savings during 2001-2007.

Table 3-2 reports some descriptive statistics of cohorts. These numbers reveal that the characteristics of cohorts are almost the same as the characteristics of households. The difference between the percentages in household characteristics and the percentages in cohort characteristics can be explained by different numbers of households within different cohorts. Nevertheless, when looking at relative terms, the statistics of both cohorts and households show the same pattern of characteristics. For instance, the average proportion of uninsured cohorts is approximately 36% in 2001 and decreases to 5% and 4% in 2004 and 2007, respectively. In addition, the average proportion of cohorts members covered by UCP decreases from 43% in 2004 to 27% in 2007. Other cohort characteristics, such as household head's education and location of households, also demonstrate trends similar to those that appeared in the household characteristics. For example, approximately 63%-65% of households live in rural area, and households in which the heads have lower-primary education are the majority group in this sample. Although these numbers may not be exactly the same as the numbers in Table 3-1, the fact that the descriptive statistics of both households and cohorts have similar trends suggests that these cohorts are representative of the households used to construct these cohorts.

3.5. Empirical Specifications

This section presents the empirical model that is used to test the impact of the implementation of the UCS on households' precautionary savings. However, before specifying the estimation equation, it is important to first understand how the proportions of different health insurance types evolved during the UCS implementation. As explained in the background section, the implementation of the UCS has resulted in the elimination of the MWS and the VHCS, and the creation of the two sub-schemes: UC-exempt copayment (UCE) and UC-with copayment (UCP). For the first part of the scheme, the UCE replaced the MWS, which was designated to cover children, elderly, and low-income people. Since both the UCE and MWS are almost the same in terms of costs and benefits for the patients, one can consider the MWS beneficiaries and the UCE beneficiaries to be the same group of people. For the second part of the UCS, the UCP provides health care access to people who were previously uninsured and who were covered by the VHCS. Because the focus of this study lies on the risk reduction effect, only the UCP beneficiaries who were previously uninsured will be regarded as the treatment group, and all VHCS beneficiaries who became UCP beneficiaries will be treated as a control group. Finally, the implementation of the UCS has no impact on individuals who are insured by the CSMBS, the SSS, and private health insurance; these three groups will also be treated as control groups.

Given this institutional context, consider a hypothetical panel dataset at the household level, where individuals in the same household can have different types of health insurance, and their health insurance types can change over time. Denote $Y_{h,t}$ as household h's savings at time t, and $G^{j}_{h,t}$ as the *proportion* of household members who have health insurance type j at time t, where $j \in$ *{ CSMBS, SSS, Private HI, MWS, VHCS, uninsured, UCP, UCE}*, and $t \in \{0,1\}$. From the changes in different types of health insurance described above, only *CSMBS, SSS, Private HI* exist in both time periods, while *uninsured*, *MWS* and *VHCS* exist only when *T=0,* and *UCP* and *UCE* exist only when *T=1*. Further, suppose that X is a vector of household characteristics, and T is the time dummy variable where *T=0* for the year 2001 and *T=1* for the years 2004 and 2007.

In order to examine the impact of different health insurance types on savings, one can write a regression equation in a form that allows for a difference-in-differences estimation. The difference in this context is that $G^{j}_{h,t}$ can have a value between 0 and 1, instead of only a binary dummy variable. In addition, the time dummy variable is interacted with these proportion-treatment variables for those treatments (health insurance types) that exist in both periods. For a normalization, the SSS beneficiaries are used as the omitted category. Accordingly, the regression equation if one had household level data can be written as:

$$Y_{h,t} = \beta_0 + \beta' X_{h,t} + \gamma T + \delta_1 G_{h,t}^{csmbs} + \delta_2 G_{h,t}^{priv} + \delta_3 G_{h,t}^{mws} + \delta_4 G_{h,t}^{vhcs} + \delta_5 G_{h,t}^{unins} + \rho_1 T.G_{h,t}^{csmbs} + \rho_2 T.G_{h,t}^{priv} + \rho_3 T.G_{h,t}^{uce} + \rho_4 T.G_{h,t}^{ucp} + a_h + \varepsilon_{h.t} \quad (21)$$

where a_h is a time invariant household fixed effect, and $\varepsilon_{h.t}$ is the error term.

Note that $G_{h,t}^{ucp}$ and $G_{h,t}^{uce}$ are omitted in this equation because they exist only in period *T=1* and, hence, are perfectly correlated with $T.G_{h,t}^{ucp}$ and $T.G_{h,t}^{uce}$, respectively. Similarly, the interaction terms $T.G_{h,t}^{mws}$, $T.G_{h,t}^{vhcs}$, and $T.G_{h,t}^{unins}$ are also omitted because they exist only in period *T=0* and, accordingly, are equal to zero.[30]

To simplify further, one can use the fact that all MWS beneficiaries in period *T=0* became UCE beneficiaries in period *T=1*, and that all the uninsured people together with the VHCS beneficiaries in period *T=0* became UCP beneficiaries in period *T=1*, and rewrite equation (21) as:

$$Y_{h,t} = \beta_0 + \beta' X_{h,t} + \gamma T + \delta_1 G_{h,t}^{csmbs} + \delta_2 G_{h,t}^{priv} + \delta_3 G_{h,t}^{mws/uce} + \delta_4 G_{h,t}^{vhcs/ucp1} + \delta_5 G_{h,t}^{unins/ucp2} + \rho_1 T.G_{h,t}^{csmbs} + \rho_2 T.G_{h,t}^{priv} + \rho_3 T.G_{h,t}^{mws/uce} + \rho_4 T.G_{h,t}^{vhc/ucp1} + \rho_5 T.G_{h,t}^{unins/ucp2} + a_h + \varepsilon_{h.t} \qquad (22)$$

where $G_{h,t}^{mws/uce}$ is the proportion of household members who were MWS beneficiaries in period *T=0* and became UCE beneficiaries in period *T=1*; $G_{h,t}^{vhcs/ucp1}$ is the proportion of household members who were VHCS beneficiaries in period *T=0* and became UCP beneficiaries in period *T=1*; and $G_{h,t}^{unins/ucp2}$ is the proportion of household members

[30] Theoretically, everyone who is still uninsured in the period after the UCS implementation is entitled to be covered by the UCS automatically. However, it is possible that some people may report that they are still uninsured (as found in the 2004 and 2007 HWS data) after the UCS implementation. These people could be people who are not covered by the UCS due to legal constraints (e.g. illegal immigrants), or they could be people who currently have no need to seek medical care and hence have not obtained the UC card voluntarily. Based on their characteristics in the 2004 and 2007 HWS data, these people who remained uninsured appear to be from the latter group. Given this ambiguity, including the remaining uninsured people in the analysis could lend to misleading estimates of the treatment effect. Thus, the people who remained uninsured after the UCS implementation will be excluded from this analysis.

who were uninsured in period *T=0* and became UCP beneficiaries in period *T=1*. This specification can be written under the assumption that one can distinguish the UCP beneficiaries who were previously uninsured from those who were previously insured by the VHCS.[31]

Based on equation (22), the main parameters of interest in this study are δ_5 and ρ_5, which are the coefficients of the treatment group (i.e. *Uninsured/UCP2*). While δ_5 is the coefficient on uninsured people in period *T=0*, ρ_5 is the coefficient of the UCP beneficiaries in period *T=1* who were uninsured in period *T=0*. Moreover, since the SSS group is assumed to be the omitted group in this regression, β_0 is essentially the coefficient of the SSS beneficiaries in both periods, and $\beta_0 + \gamma$ can be interpreted as the coefficient of the SSS beneficiaries in period *T=1*. The comparison between the changes in savings of the two groups (treatment and SSS) will be illustrated algebraically below. For other interaction terms, namely $T.G_{h,t}^{csmbs}$, $T.G_{h,t}^{priv}$, $T.G_{h,t}^{mws/uce}$, and $T.G_{h,t}^{vhcs/ucp1}$, the coefficients ρ_1, ρ_2, ρ_3, and ρ_4 measure the *changes* in the impact of the UCS implementation on saving behaviors of people who were CSMBS beneficiaries, insured by private health insurance, MWS/UCE beneficiaries, and VHCS/UCP beneficiaries, respectively, in the second period.

Recall that true panel data are not available, so that estimation must be done using a pseudo-panel data set. The estimation model for the pseudo-panel is slightly different from the model discussed above. First, suppose that there are H_c households (*h = 1, 2,*

[31] In conducting the empirical analysis, the information on health insurance from the 2001 HWS is used to predict whether the UCP beneficiaries in 2004 and 2007 were previously uninsured or were covered by VHCS in 2001. The method used is the linear prediction method that was used to distinguish between UCE and UCP beneficiaries in the 2004 SES data, as explained in the data section.

..., H_c) in the cohort *c*, and there are *C* cohorts in total. Each cohort will be tracked over time and treated as a collection of similar households. In this context, the dependent variable ($\bar{Y}_{c,t}$) will be the average household savings of cohort *c* at time *t*, which is computed by taking the average of savings from all households who belong to cohort *c*. Similarly, $\bar{X}_{c,t}$ will be the average of the household characteristics among all households in cohort *c*. Next, $\bar{G}^{j}_{c,t}$ is the average of the proportion of household members who have health insurance type *j* among all households in cohort *c*. Finally, we have a cohort fixed effect ($\bar{a}_c$) in place of a household fixed effect.

Again, the SSS beneficiaries are the omitted category. By taking the average of each variable in equation (22), the regression equation for pseudo-panel data can be written as:

$$\bar{Y}_{c,t} = \beta_0 + \beta' \bar{X}_{c,t} + \gamma T + \delta_1 \bar{G}^{csmbs}_{c,t} + \delta_2 \bar{G}^{priv}_{c,t} + \delta_3 \bar{G}^{mws/uce}_{c,t} + \delta_4 \bar{G}^{vhcs/ucp1}_{c,t} + \delta_5 \bar{G}^{unins/ucp2}_{c,t} + \rho_1 T.\bar{G}^{csmbs}_{c,t} + \rho_2 T.\bar{G}^{priv}_{c,t} + \rho_3 T.\bar{G}^{mws/uce}_{c,t} + \rho_4 T.\bar{G}^{vhc/ucp1}_{c,t} + \rho_5 T.\bar{G}^{unins/ucp2}_{c,t} + \bar{a}_c + \bar{\varepsilon}_{c.t} \quad (23)$$

To illustrate the impact of the UCS on household savings, consider the change in the level of cohorts as follows. In the period before the UCS implementation (*T=0*), the saving of any cohort can be written as:

$$\bar{Y}_{c,0} = \beta_0 + \beta' \bar{X}_{c,0} + \delta_1 \bar{G}^{csmbs}_{c,0} + \delta_2 \bar{G}^{priv}_{c,0} + \delta_3 \bar{G}^{mws/uce}_{c,0} + \delta_4 \bar{G}^{vhc/ucp1}_{c,0} + \delta_5 \bar{G}^{unins/ucp2}_{c,0} + \bar{a}_c + \bar{\varepsilon}_{c.0} \quad (24),$$

where $\bar{G}_{c,0}^{mws/uce} = \bar{G}_{c,0}^{mws}$, $\bar{G}_{c,0}^{vhcs/ucp1} = \bar{G}_{c,0}^{vhc}$, and $\bar{G}_{c,0}^{unins/ucp2} = \bar{G}_{c,0}^{unins}$, because only MWS and VHCS existed in period *T=0*.

Similarly, in the period after the UCS implementation (*T=1*), the savings equation in period *T=1* can be written as:

$$\bar{Y}_{c,1} = \beta_0 + \beta'\bar{X}_{c,1} + \gamma + (\delta_1 + \rho_1)\bar{G}_{c,1}^{csmbs} + (\delta_2 + \rho_2)\bar{G}_{c,1}^{priv} + (\delta_3 + \rho_3)\bar{G}_{c,1}^{mws/uce} + (\delta_4 + \rho_4)\bar{G}_{c,1}^{vhcs/ucp1} + (\delta_5 + \rho_5)\bar{G}_{c,1}^{unins/ucp2} + \bar{a}_c + \bar{\varepsilon}_{c.1} \quad (25),$$

where $\bar{G}_{c,1}^{mws/uce} = \bar{G}_{c,1}^{uce}$, $\bar{G}_{c,1}^{vhcs/ucp1} = \bar{G}_{c,1}^{ucp1}$, and $\bar{G}_{c,1}^{unins/ucp2} = \bar{G}_{c,1}^{ucp}$, because both MWS and VHCS were eliminated, and UCE and UCP were created in period *T=1*.

From equations (24) and (25), the change in the savings for any cohort *c* between the two periods can be derived as:

$$\bar{Y}_{c,1} - \bar{Y}_{c,0} = \gamma + \delta_1\Delta\bar{G}_c^{csmbs} + \delta_2\Delta\bar{G}_c^{priv} + \delta_3\Delta\bar{G}_c^{mws/uce} + \delta_4\Delta\bar{G}_c^{vhcs/ucp1} + \delta_5\Delta\bar{G}_c^{unins/ucp2} + \rho_1\bar{G}_{c,1}^{csmbs} + \rho_2\bar{G}_{c,1}^{priv} + \rho_3\bar{G}_{c,1}^{uce} + \rho_4\bar{G}_{c,1}^{ucp1} + \rho_5\bar{G}_{c,1}^{ucp2} + \Delta\bar{\varepsilon}_c \quad (26),$$

where $\Delta\bar{G}_c^{csmbs} = \bar{G}_{c,1}^{csmbs} - \bar{G}_{c,0}^{csmbs}$; $\Delta\bar{G}_c^{priv} = \bar{G}_{c,1}^{priv} - \bar{G}_{c,0}^{priv}$; $\Delta\bar{G}_c^{mws/uce} = \bar{G}_{c,1}^{uce} - \bar{G}_{c,0}^{mws}$; $\Delta\bar{G}_c^{vhc/ucp1} = \bar{G}_{c,1}^{upc1} - \bar{G}_{c,0}^{vhc}$; $\Delta\bar{G}_c^{unins/ucp2} = \bar{G}_{c,1}^{ucp2} - \bar{G}_{c,0}^{unins}$; and $\Delta\bar{\varepsilon}_c = \bar{\varepsilon}_{c,1} - \bar{\varepsilon}_{c,0}$.

Equation (26) illustrates the change in savings for any cohort *c*, which depends on the different types of health insurance, and the changes in different types of health insurance, of its members. Based on this equation, the impact of UCS can be computed by comparing the changes in average savings between the treatment group and the control group. As mentioned before, the treatment group is composed of individuals who were uninsured until 2001 and became insured by the UCP Scheme, and the control group is composed of individuals whose status did not change. To illustrate, one can compare the change in savings for the UCP beneficiaries, who were previously uninsured, and the change in savings for the SSS beneficiaries. Under the assumption that the changes in the proportions of different health insurance types between the two periods within each cohort are negligible, the net impact of the UCS implementation on the savings of previously uninsured population, compared with the savings of SSS beneficiaries can be written as:

$$\Delta Y^{Net} = \left(E\left[\bar{Y}_{c,1}^{ucp2}\right] - E\left[\bar{Y}_{c,0}^{unins}\right]\right) - \left(E\left[\bar{Y}_{c,1}^{sss}\right] - E\left[\bar{Y}_{c,0}^{sss}\right]\right). \qquad (27)$$

To estimate the net impact of the UCS, or the *treatment effect*, in equation (27), consider again equation (22). The expected value of the savings of the uninsured in *T=0* and the expected value of the savings of the UCP beneficiaries in *T=1* who were previously uninsured can be expressed as:

$$E\left[\bar{Y}_{c,0}^{unins/ucp2}\right] = E\left[\bar{Y}_{c,0}^{unins}\right] = \beta_0 + \beta' \bar{X}_{c,0} + \delta_5 + \bar{a}_c, \text{ and}$$

$$E\left[\bar{Y}_{c,1}^{unins/ucp2}\right] = E\left[\bar{Y}_{c,1}^{ucp2}\right] = \beta_0 + \beta' \bar{X}_{c,1} + \gamma + \delta_5 + \rho_5 + \bar{a}_c, \text{ respectively.}$$

Thus, the expected value of the change in the savings for the treatment group is:

$$E\left[\bar{Y}_{c,1}^{ucp2}\right] - E\left[\bar{Y}_{c,0}^{unins}\right] = \gamma + \rho_5 \qquad (28),$$

given that the other characteristics of the cohort ($\bar{X}_c$) remain unchanged.

Similarly, the expected values of the savings of the SSS beneficiaries in both periods *T=0* and *T=1* can be expressed as:

$E\left[\bar{Y}_{c,0}^{sss}\right] = \beta_0 + \beta' \, \bar{X}_{c,0} + \bar{a}_c$, and

$E\left[\bar{Y}_{c,1}^{sss}\right] \ = \beta_0 + \beta' \bar{X}_{c,1} + \gamma + \bar{a}_c$, respectively.

Thus, the expected value of the change in the savings for this control group is:

$$E\left[\bar{Y}_{c,1}^{sss}\right] - E\left[\bar{Y}_{c,0}^{sss}\right] = \gamma. \qquad (29).$$

Consequently, the net difference between the savings of the previously uninsured who become UCP beneficiaries and the savings of the SSS beneficiaries can be computed from the following difference-in-difference estimate:

$$\begin{aligned} \tau_{DID}^{0} &= \left(E\left[\bar{Y}_{c,1}^{ucp2}\right] - E\left[\bar{Y}_{c,0}^{unins}\right]\right) - \left(E\left[\bar{Y}_{c,1}^{sss}\right] - E\left[\bar{Y}_{c,0}^{sss}\right]\right) \\ &= (\gamma + \rho_5) - \gamma \\ &= \rho_5. \end{aligned} \qquad (30)$$

In place of SSS beneficiaries, one can also use CSMBS beneficiaries, people covered by private health insurance, MWS/UCE beneficiaries, or VHCS/UCP1 beneficiaries, as the control group in computing the difference-in-difference estimates. By the same method, the expected value of the change in the savings of the CSMBS beneficiaries after the UCS implementation can be written as:

$$E\left[\bar{Y}_{c,1}^{csms}\right] - \mathrm{E}\left[\bar{Y}_{c,0}^{csmbs}\right]$$

$$= \left(\beta_0 + \beta'\bar{X}_{c,1} + \gamma + \delta_1 + \rho_1 + \bar{a}_c\right) - \left(\beta_0 + \beta'\bar{X}_{c,0} + \delta_1 + \bar{a}_c\right)$$

$$= \gamma + \rho_1. \tag{31}$$

Thus, the corresponding difference in the savings of the previously uninsured who become UCP beneficiaries and the savings of the CSMBS beneficiaries can be estimated from:

$$\tau_{DID}^{1} = \left(E\left[\bar{Y}_{c,1}^{ucp}\right] - E\left[\bar{Y}_{c,0}^{unins}\right]\right) - \left(E\left[\bar{Y}_{c,1}^{csmbs}\right] - E\left[\bar{Y}_{c,0}^{csmbs}\right]\right)$$

$$= (\gamma + \rho_5) - (\gamma + \rho_1)$$

$$= \rho_1 - \rho_5. \tag{32}$$

Similarly, the estimates of the difference in savings can also be derived as:

$$\tau_{DID}^{2} = \left(E\left[\bar{Y}_{c,1}^{ucp}\right] - E\left[\bar{Y}_{c,0}^{unins}\right]\right) - \left(E\left[\bar{Y}_{c,1}^{priv}\right] - E\left[\bar{Y}_{c,0}^{priv}\right]\right) = \rho_2 - \rho_5, \tag{33}$$

$$\tau_{DID}^{3} = \left(E\left[\bar{Y}_{c,1}^{ucp}\right] - E\left[\bar{Y}_{c,0}^{unins}\right]\right) - \left(E\left[\bar{Y}_{c,1}^{uce}\right] - E\left[\bar{Y}_{c,0}^{mws}\right]\right) = \rho_3 - \rho_5, \tag{34}$$

or

$$\tau_{DID}^{4} = \left(E\left[\bar{Y}_{c,1}^{ucp}\right] - E\left[\bar{Y}_{c,0}^{unins}\right]\right) - \left(E\left[\bar{Y}_{c,1}^{ucp1}\right] - E\left[\bar{Y}_{c,0}^{vhcs}\right]\right) = \rho_4 - \rho_5, \tag{35}$$

when the control group includes people with private health insurance, the MWS/UCE beneficiaries, or the VHCS/UCP1 beneficiaries, respectively.

Given the variation among different control groups, there are both advantages and disadvantage of using each of these groups. On the one hand, the SSS and CSMBS beneficiaries can be a better comparison group because they are not affected at all by the implementation of the UCS. Thus, the results are less likely to be confounded by measurement errors. However, the result based on this comparison is valid only when the fixed effects are controlled for. On the other hand, the MWS/UCE beneficiaries and VHCS/UCP1 beneficiaries can produce better results in the absence of fixed effects, because the characteristics of the MWS/UCE beneficiaries and VHCS/UCP1 beneficiaries are more similar to the characteristics of the Uninsured/UCP2 beneficiaries. Nevertheless, without the true panel data, the inability to perfectly match between the MWS and UCE beneficiaries or between the VHCS and UCP beneficiaries are likely to result in a large measurement error, which could lead to bias in the estimation.

3.6. Empirical Results

This section presents estimates of the impact of the UCS on household's savings for precautionary purposes, based on the difference-in-difference regression described in the previous section. Since precautionary savings itself is not observable, the main variable of interest will be the total savings of the household. The treatment effect of the UCS is captured by the net difference between the change in savings of the treatment group (i.e. previously uninsured people who become UCP beneficiaries) and the change in savings of each control group. Given the five different control groups, namely SSS beneficiaries, CSMBS beneficiaries, privately insured people, MWS/UCE beneficiaries, and VHCS/UCP1 beneficiaries, there are five different values for the treatment effect of the UCS. In addition, a weighted average treatment effect of all the control groups is calculated by using the proportions of health insurance types in the after-UCS period. Note that, although a small group of people who remained uninsured after the UCS implementation exists in the HWS data, this group will be excluded entirely from the analysis.[32]

To estimate the impacts of the UCS on households' precautionary savings, two dependent variables used in this analysis are the log value of household savings (TOTSAV) and the log value of non-medical consumption expenditures (NMCON); both of them are in real terms. Since the change in total savings could be a result of either a change in income or a change in consumption or both, the log value of non-medical consumption expenditure is used to determine whether the change in precautionary savings explains the change in the total savings. According to the precautionary savings hypothesis, households' non-medical consumption is expected to increase if their precautionary savings decrease in the period after the UCS implementation. However, it is possible that both savings and non-medical consumption increase at the same time due to an increase in income. Consequently, to factor out the confounding effects of income and price changes, the ratio of savings to income (TOTSAV/HHINC) and the ratio of non-medical consumption to income (NMCON/HHINC) are also used to examine the allocation of income between savings and consumption. If precautionary savings is reduced, then both the consumption in absolute terms and the consumption to income ratio should increase.

The same set of explanatory variables is used for all of the dependent variables, and the estimation is based on the regression equation (23) as shown in the empirical specification section. The main explanatory variables are the fractions of household

[32] The reason why this remaining uninsured group is excluded from the analysis is explained earlier in footnote 30.

members with different types of health insurance within the household, a dummy for the period after the UCS implementation (*T*), and the interaction of *T* with the fractions of household members with the types of health insurance. Several household level control variables are added to the regression, including ages and education of the household head, household size, socio-economic class[33], and location of the household. The omitted category for the insurance variables is SSS beneficiaries, and the omitted categories for the control variables are: the head of household's age between 55 and 60 years old[34], head has no education, the household's socioeconomic status is laborers; and the household is located in the urban area of Bangkok.

3.6.1 Pooled OLS Estimates

Given that the SES data are repeated cross-sectional data, it is natural to first estimate the difference-in-difference regression by using standard pooled OLS estimation. By using the 2001 data as *before*-UCS data and the 2004 and 2007 as *after*-UCS data, there are two sets of difference-in-difference estimates. The first set is based on the 2001 and 2004 data, which represents the short-run impact of the UCS. Another set of the estimates is based on the 2001 and 2007 data, which represents the medium (or long run) impact of the UCS.

---

[33] In the Socio-Economic Survey (SES), there is a variable on socio-economic class of the household, which is computed based on the household's land ownership, the work status and occupations of household members, the economic sectors/industries in which they work. This SES variable include seven major categories: (i) farm operator (own land), (ii) farm operator (rent land), (iii) entrepreneurs, trade and industry, (iv) professional, technical and managerial, (v) labourers, (vi) other employees, and (vii) economically inactive.

[34] In the pooled OLS estimation, the age of household head is treated as a continuous variable, and hence there is no omitted category for this variable.

3.6.1.1 Estimates from 2001-2004 Data (Short-Run Impact)

First, Table 3-3 presents the pooled OLS estimates of UCS impacts on household savings and non-medical consumption expenditure in the absolute terms between 2001 and 2004. The estimates of the UCS impacts on both savings and consumption suggest a similar trend. In particular, the coefficients of all health insurance variables, except private health insurance, are negative and statistically significant. This suggests that, when compared to SSS beneficiaries, people with other types of health insurance save and consume less. When considering the time dummy variable and the interaction of the time dummy with health insurance variables, the coefficients of the interaction with CSMBS, VHCS/UCP1, and Uninsured/UCP2 are positive and statistically significant. This suggests that the implementation of the UCS results in an increases in savings and consumption of the CSMBS beneficiaries, as well as an increase in savings and consumption of the previously uninsured and the VHCS beneficiaries, both of whom become UCP beneficiaries.

In addition to health insurance variables, the characteristics of household head have similar effects on both savings and consumption. More specifically, the age and education level of the household head have positive effects on household savings and consumption expenditure. That is, as the household head is older and has higher education degree, household savings and consumption expenditure become higher. This is not surprising because the household heads who are older and have higher education are more likely to earn more, and hence have more to consume and save. In terms of other characteristics of the households, households that have more members and are in the socio-economic status other than labourers are able to save more. In addition, households located in the rural area and outside Bangkok save more when compared to those located in urban area or in Bangkok.

Similar to Table 3-3, Table 3-4 presents the pooled OLS estimates of the UCS impacts on household savings to income ratio and non-medical consumption expenditure to income ratio. When the savings to income ratio is used as the dependent variables, the coefficients of all health insurance variables, except private health insurance, are negative and statistically significant. This suggests that the savings to income ratio of people with other types of health insurance, except those with private health insurance, are less than the savings to income ratio of SSS beneficiaries. Moreover, the coefficient of the time dummy is negative and statistically significant, whereas the coefficients of the interaction terms between the time dummy and VHCS/UCP1 and Uninsured/UCP2 are positive and statistically significant at 10% and 1% levels, respectively. These results suggest that the UCS implementation results in a negative change in the ratio of savings to income for SSS beneficiaries, but a positive change in the ratio of savings to income for both VHCS beneficiaries and the previously uninsured, both of whom become UCP beneficiaries. More interestingly, when using the ratio of non-medical consumption to income as the dependent variables, the signs of the coefficients of almost all variables are opposite to those in the model where the savings to income ratio is the dependent variable. This is intuitive since savings is defined as the difference between household income and consumption expenditure. Accordingly, an increase in the proportion of income allocated to savings implies a decrease in the proportion of income allocated to consumption.

Based on the estimated coefficients in Table 3-3, the changes in savings and non-medical consumption during 2001-2004 of people with different types of health insurances are reported in Table 3-5. The first two columns are the estimated changes in household savings and non-medical consumption in absolute terms, and the last two columns are the estimated changes on the ratio of savings to income and on the ratio of non-medical consumption to income. These changes not only capture the impact of the UCS on savings and consumption, but they also reflect the general time trend effect of other changes that occurred during 2001-2004. For the treatment group (Uninsured/UCP2), after the UCS both savings and non-medical consumption in absolute terms and the savings to income ratio increased, but the consumption to income ratio. For the control groups, the absolute savings of the CSMBS and VHCS/UCP1 beneficiaries increased after the UCS, while those values of the SSS beneficiaries, privately insured people, MWS/UCE beneficiaries, and the control group on average decreased. In terms of changes consumption, non-medical consumption of almost all control groups, except the SSS beneficiaries, increased after the UCS. These mixed evidence of changes in savings and consumption of the control groups suggest little or no impact of the UCS on these groups.

Nevertheless, the estimates of the UCS effects for all health insurance groups in Table 3-5 could be a result of other factors that affect each particular health insurance group differently. To eliminate these potential confounding factors, difference-in-difference estimates, or the net effects of the UCS, are computed by comparing the UCS effect on the savings and consumption of the treatment group to the UCS effects on the savings and consumption of the control groups. Table 3-6 illustrates four columns of difference-in-difference estimates, and within each column there are six values of estimates that correspond to the net treatment effects when the control groups are the SSS beneficiaries, CSMBS beneficiaries, privately insured people, MWS/UCE beneficiaries, and the weighted average control group, respectively.

From the first column of Table 3-6, the results are consistent in that all of the difference-in-difference estimates are positive and statistically significant at 1% level, suggesting that household savings of people who were previously uninsured and become UCP beneficiaries increases when compared to any control group. Moreover, the difference-in-difference estimates of the UCS impact on non-medical consumption are positive and statistically significant at 1% level when the comparison groups are the SSS beneficiaries, MWS/UCE beneficiaries, VHCS/UCP1, and the average control group. The fact that both non-medical expenditures and savings increase at the same time suggests that the UCS results in an income transfer, through a reduction in medical consumption and possibly an increase in income due to improved health. Furthermore, the difference-in-difference estimates from the last two columns in Table 3-6 suggest that the UCS has a positive effect on the savings to income ratio but a negative effect on the non-medical consumption to income ratio. The fact that the UCS has a positive impact on the absolute non-medical consumption but a negative impact on the non-medical consumption to income ratio suggests that the increase in the net income (total income net of medical expenditure) is allocated to savings more than it is allocated to consumption. That is, households increase their regular savings as a result of the UCS implementation. However, since there is no evidence of a decrease in savings, the UCS does not lead to a risk reduction among the treatment group. Therefore, based on the repeated cross-section data in 2001 and 2004, households' precautionary savings are not reduced in the short-run.

3.6.1.2. Medium-Term (or Long-Term) Impact

Table 3-7 presents the pooled OLS estimates of the UCS impacts on household savings and non-medical consumption in absolute terms based on the 2001-2007 data. Almost all of the coefficient estimates of health insurance variables in these models have the same sign and similar magnitudes as the estimates based on the 2001-2004 data. That is, the coefficients of all health insurance variables, except private health insurance, are negative and statistically significant. Moreover, the coefficients of the interaction terms between the time dummy and CSMBS, VHCS/UCP1, and Uninsured/UCP2 are positive and statistically significant. The only different estimate is the coefficient on the interaction terms between the time dummy and MWS/UCE, which is negative and not significant in 2001-2004 but is positive and statistically significant in 2001-2007. This result is plausible because, due to the attempt to eliminate the co-payment in 2007, the UCE sub-scheme covers more people with higher income in 2007. Accordingly, the effect of being UCE/MWS beneficiaries on savings and consumption in 2007 is more positive when compared with its effect in 2004. Similar to Table 3-7, Table 3-8 presents the pooled OLS estimates of the UCS impacts on household savings and non-medical consumption as ratios to income based on the 2001-2007 data. Most of the coefficient estimates of health insurance variables and their interaction terms with the time dummy are close to the estimates obtained from the 2001-2004 data. One small difference is that, among the interaction terms between health insurance variables and the time dummy, only the interaction term of the treatment group has a significant result, and it is positive for the savings to income ratio and negative for the consumption to income ratio.

Next, the OLS estimates from Table 3-7 and Table 3-8 are used to calculate the changes in savings and non-medical consumption of people in each health insurance group in the period of the UCS, and to compute the net effects of the UCS. Results from Table 3-9 show that, when compared to 2001, total savings of households in all health insurance groups, except the SSS beneficiaries and privately insured household increased in 2007. Similarly, non-medical consumption of households in all health insurance groups also increased. The increases in both savings and consumption for all health insurance groups are likely a result of an economic growth during 2001-2007. Nevertheless, when considering the changes the savings and consumption as ratios of income, the savings to income ratios increased while the consumption to income ratios decreased only among the treatment group (Uninsured/UCP2 beneficiaries) and the MWS/UCE beneficiaries.

Table 3-10 then shows the difference-in-difference estimates of the UCS impact, using six different control groups. Unlike the results based on the 2001-2004 data, the estimates of the UCS impact based on 2001-2007 are mixed. In particular, the UCS has a statistically significant and positive treatment effect on household savings only when the SSS beneficiaries and the privately insured households are used as the control groups. Note that when the MWS/UCE and VHCS/UCP1 beneficiaries are used as the control groups, the UCS has a positive net effect on savings, but it is not statistically significant. Furthermore, the difference-in-difference estimates of the UCS impact on non-medical consumption is positive and statistically significant at 5% when SSS beneficiaries are the control group, while they are negative and statistically significant at 5% level when CSMBS and MWS/UCE beneficiaries are used as the control groups. Finally, the difference-in-difference estimates from the last two columns of Table 3-10 suggest that the UCS has a positive effect on the savings to income ratio but a negative effect on the non-medical consumption to income ratio; the effects are statistically significant when using all health insurance groups, except the privately insured households and MWS/UCE beneficiaries, as the control groups. Note that, when the CSMBS beneficiaries are the control group, the net effects of the UCS on both absolute value and the ratio to income of non-medical consumption are positive. This does not suggest that the UCS reduces the amount of non-medical consumption of the treatment group. In fact, the net effect is negative because the increase in the consumption of the treatment group is lower than the increase in the consumption of the control group (i.e. CSMBS beneficiaries). Thus, the pooled OLS estimates from the 2001-2007 data are consistent with the findings based on the 2001-2004 that the UCS results in a rise in both savings and non-medical consumption, but the increased income is allocated to savings more than to consumption. This implies that, in the long run, the income transfer due to the UCS implementation still results in additional savings, which households do not use for non-medical consumption. The evidence of increased consumption and savings at the same time casts doubt on the precautionary savings hypothesis.

Overall, the pooled OLS estimates suggest no evidence of a reduction in precautionary savings after the UCS implementation; households tend to save more and consume more in the short run and even save more and consume less (when CSMBS and VHCS beneficiaries are control groups) in the long run. Nevertheless, the pooled OLS estimates of the UCS impact on households' precautionary savings are very likely to be biased because there could be some unobserved heterogeneity that is not controlled for in this estimation. Thus, a pseudo-panel approach will be used to address this possible heterogeneity bias problem.

3.6.2. Pseudo-Panel Estimations

Similar to the pooled OLS estimation, there are two sets of difference-in-difference estimates based on the pseudo-panel data: the short-run impact based on the 2001 and 2004 data; and the medium (or long run) impact based on the 2001 and 2007 data. Moreover, for each regression model, both fixed-effects and random-effects models are specified, and a Hausman test (chi-square test) is used to determine whether the fixed-effects estimates or the random-effects estimates should be used in interpreting the results. Note that, since the cohorts are generated from age groups of household heads and the groups of provinces in which households are located, the household age groups and the regions are automatically dropped in both fixed-effects specifications.

3.6.2.1. Short-Term Impact

Table 3-11 reports the pseudo-panel estimates when savings and non-medical consumption in absolute terms are used as the dependent variables. The first two columns present the results from the fixed-effects model and the random-effects model, respectively, when the log value of savings is the dependent variable. The other two columns show the results from the fixed-effects model and the random-effects model when the log value of non-medical consumption is used as the dependent variable. For both sets of regression results, the coefficients of all health insurance variables, except private health insurance, are negative and statistically significant. This suggests that people with other types of health insurance, except private health insurance, both save more and consume more than the SSS beneficiaries. Moreover, the coefficient on the time dummy variable is negative and not statistically significant in all models, suggesting the savings and consumption of the SSS beneficiaries do not change significantly after the UCS implementation. However, the results on the coefficients of the interaction terms between the time dummy and health insurance variables are different between the two sets of models. In particular, when savings is the dependent variable, the coefficients of the health insurance interaction terms are mostly positive but not statistically significant. On the contrary, when non-medical consumption is the dependent variable, the coefficients of the interaction terms for CSMBS, MWS/UCE, private health insurance (only in random-effects model), and Uninsured/UCP2 (only in fixed-effects model) are positive and statistically significant. This suggests that the CSMBS beneficiaries, MWS/UCE beneficiaries, privately insured households, and the treatment group consume more non-medical goods in the periods after the UCS implementation.

In addition to the health insurance variables, the age and education of the household head have positive impacts on both savings and non-medical consumption in the random-effects specifications. Specifically, the negative coefficients of younger age groups suggest that households with older heads save and consume non-medical goods more, because the omitted age group in the random-effects specifications is age 55-60. Moreover, given that the omitted category of household head's education is no education or kindergarten, the positive coefficients on all other education groups suggest that households with higher education levels save and consume more. These results are consistent with the results based on the pooled OLS estimates from 2001-2004 data. Nevertheless, in the fixed-effects specification, the education of household head does not have statistically significant impact on savings, which is different from the results based on the pooled OLS estimates and the random-effects specification.

Parallel to Table 3-11, Table 3-12 presents the pseudo-panel estimates when the savings to income ratio and the non-medical consumption to income ratio are used as the dependent variables. For the fixed-effects specifications in both models, the coefficients of all health insurance variables and the interaction terms of time dummy and health insurance are not statistically significant. This suggests that the savings and consumption ratios to income of people with other types of health insurance are not statistically different from those of SSS beneficiaries both before and after the UCS implementation. For the random-effects specifications, only the health insurance variables MWS/UCE, VHCS/UCP1, and Uninsured/UCP2 have statistically significant and negative impacts on savings, and statistically significant and positive impacts on consumption. Furthermore, most of other household characteristics do not have statistically significant impacts on both the savings to income ratio and the consumption to income ratio. Nevertheless, it is important to note that the statistical insignificance of these coefficients can also be a result of large standard errors, which lead to imprecise estimates. Thus, the fact that the results are not statistically significant does not always imply that the UCS has no impact on household savings and consumption.

For the four sets of regression results in Table 3-11 and Table 3-12, the Hausman tests reject the null hypothesis that the random-effects estimates are equal to the fixed-effects estimates. Thus, the changes in savings and consumption in the period after the UCS in Table 3-13 and the difference-in-difference estimates in Table 3-14 will be based on the results from the fixed-effects specifications. In Table 3-13, the first two columns correspond to the estimates of the UCS impacts obtained from Table 3-11, and the last two columns correspond to the estimates obtained from Table 3-12. Based on the estimates in the first two columns, it suggests that, after the UCS, the savings of the treatment group and the other three control groups including SSS, CSMBS, VHCS beneficiaries decreased, whereas the savings of people with private health insurance and MWS/UCE beneficiaries increased. When considering the absolute value of non-medical consumption, the consumption of people in all health insurance groups, except SSS beneficiaries, increased after the UCS implementation.

The next two columns in Table 3-13 show the changes in the ratio of savings to income and the ratio of consumption to income. Similar to the results from the pooled OLS estimates, the savings to income ratio of the treatment group increased, while its consumption to income ratio decreased. In contrast, for all other insurance groups, except CSMBS beneficiaries, their savings to income ratios decreased while the consumption to income ratios increased. These results suggest that, in addition to the effect of the general time trend, the UCS has contributed to the changes in savings and consumption of the treatment group, and it is has no effect on the other groups.

Despite the similarity in the changes in savings and consumption, the difference-in-difference estimates based on pseudo-panel data are much different from those based on the pooled OLS estimates. Recall that the difference-in-difference estimates based on the pooled OLS regression suggest that savings, both in absolute and ratio terms, increase as a result of the UCS implementation. On the contrary, the difference-in-difference estimates based on the 2001-2004 pseudo panel suggest that the UCS does not have any statistically significant impact on household savings both in absolute and ratio terms. Similarly, when considering the impact on non-medical consumption, the UCS almost has no significant impact on non-medical consumption, both in absolute and ratio terms. The only exception is when SSS beneficiaries are used as the control group; the UCS has a positive effect on the absolute value of non-medical consumption, but the impact is only statistically significant at 10% level. Overall, the results from 2001-2004 pseudo-panel data suggest that the UCS does not have significant impact on both savings and non-medical consumption. Although the net effects on savings are negative for some comparison groups, the results are not statistically significant. Thus, based on the pseudo panel data, there is no evidence of either an income effect or a risk reduction effect as a short-term impact of the UCS implementation.

3.6.2.2. Medium-Term (or Long-Term) impact

Table 3-15 and Table 3-16 are analogous to Table 3-11 and Table 3-12. More specifically, Table 3-15 displays regression results from both fixed-effects and random-effects specifications when savings and non-medical consumption in absolute terms are used as dependent variables. Likewise, Table 3-16 shows the same set of regression results when savings to income and non-medical consumption are the dependent variables. The results in Table 3-15 are similar to those in Table 3-11 in that the coefficients of all health insurance variables, except private health insurance, are negative and statistically significant. Moreover, the coefficients on the interaction terms between the time dummy and all health insurance variables are not statistically significant when predicting the impact of the UCS on households' savings. However, when using non-medical consumption as the dependent variable, the coefficients of the interaction terms between the time dummy and all health insurance variables are positive and statistically significant. This suggests that households with all other types of health insurance except the SSS beneficiaries increase their non-medical consumption in the period after the UCS implementation. For other household characteristics, the coefficients on age groups and education levels of household in the random-effects specifications are similar to the estimates based on the 2001-2004 pseudo-panel data. That is, the younger age groups have more negative coefficients, and the higher levels of education have more positive coefficients. These results are reasonable in that younger cohorts are more likely to earn less and to be able to save less, while cohorts with higher education levels tend to earn more and to be able to save. In addition, the coefficients of education groups and the socio-economic status of households are not statistically significant in the fixed-effects specifications when predicting household savings.

Further, when the savings to income ratio and the non-medical consumption to income ratio are dependent variables, the results are again similar to the estimates based on the 2001-2004 pseudo-panel data. Specifically, the coefficients of the health insurance variables MWS/UCE, VHCS/UCP1, and Uninsured/UCP2 are statistically significant and negative when predicting savings, and they are statistically significant and positive when predicting non-medical consumption. However, unlike the 2001-2004 pseudo-panel estimates, the coefficients for these health insurance variables in the fixed-effects specification are also statistically significant and have the same signs and similar magnitude as the corresponding coefficients in the random-effects specification. For all other household characteristics, their coefficients, except those for region dummies, do not have strong predictive power on both savings and consumption.

Unlike the 2001-2004 pseudo-panel estimation results, the Hausman tests suggest that the random-effects estimates are consistent for all models, except the one in which the absolute value of non-medical consumption is the dependent variable. Thus, the estimates discussed below will be based on the random-effects specifications.[35] Based on the coefficients on the health insurance variables in Table 3-15 and Table 3-16, Table 3-17 shows the changes in savings and consumption after the UCS for different health insurance groups. The estimates in the first two columns suggest that the savings of the treatment group and all the control groups except the SSS and VHCS beneficiaries, increased in 2007. Similarly, the non-medical consumption of all health insurance groups, except the SSS beneficiaries, also increased in 2007. This latter result is similar

[35] Nevertheless, the fixed-effects estimates are not much different from the random-effects estimates since both of them are computed based on differencing methods.

to the impact found in the 2001-2004 pseudo-panel data. When considering the changes in terms of ratios to income, the savings to income ratios increased for the treatment group, privately insured households, and MWS/UCE beneficiaries, but decreased for all other control groups. Again, these mixed evidences suggest that, in addition to the UCS, some other economic changes might occur and affect household savings and consumption during 2001-2007.

Based on the estimated impacts in Table 3-17, the difference-in-difference estimates are computed and presented in Table 3-18. In particular, the difference-in-difference estimates of the UCS impacts on savings are positive when comparing with all control groups, but they are statistically significant at the 5% level only when the CSMBS and VHCS/UCP1 beneficiaries are used as the comparison groups. Furthermore, the difference-in-difference estimate of the UCS impact on non-medical consumption is positive and statistically significant at 1% level, when using the SSS beneficiaries as the control group. Although the UCS appears to have a negative effect on the consumption when compared with privately insured households, the difference-in-difference estimate is only statistically significant at 10% level. Finally, the net effects of the UCS on both the savings to income ratio and the non-medical consumption to income ratio are not statistically significant.

Using the 2001-2007 pseudo-panel data and a random-effects specification, there is some evidence that the UCS leads to an increase in savings and non-medical consumption in absolute terms. These results are consistent with the findings from the 2001-2007 pooled OLS estimates. That is, the UCS results in only an income effect, which can be seen from increases in both savings and consumption. Thus, the precautionary savings hypothesis is also not supported by the 2001-2007 pseudo-panel data.

3.6.3. Robustness Analyses

The results presented so far are subject to a number of issues, including the validity of savings and consumption measurement, the exclusion of the remaining uninsured people in 2004 and 2007, and a possible variation in the UCS impacts due to the heterogeneity of UCS beneficiaries. In order to verify that the results presented in the previous section are robust, three additional analyses are conducted.

3.6.3.1 Using alternative measures of savings and consumption expenditures

One limitation to using TOTSAV to measure savings is that it may underestimate the true savings because is calculated from the difference between total income and total consumption expenditures, including expenditures on non-durable goods (Paxson, 1992). Thus, to test the robustness of TOTSAV, two alternative measures of savings are used in place of TOTSAV. These two measures are NDSAV (the difference between income and expenditure on all goods and services *except* consumer durables) and NTASST (net values of real and financial assets and liabilities). Because NTASST is not available as a continuous variable in the 2007 SES data, only the short-term impact of UCS on NTASST will be estimated. In addition, by the same argument that NMCON includes expenditures on durable goods, it is likely to overestimate the true value of non-medical consumption expenditures. Accordingly, an alternative measure of consumption expenditures will be non-durable non-medical consumption expenditures (NMNDCON).

Given the three alternative measures of savings and consumption expenditures, Table 3-19 presents the difference-in-difference estimates of the UCS impacts when using these measures, both in absolute and ratio to income terms, as the dependent variables. Based on the 2001-2004 pseudo-panel data, the UCS does not have any statistically significant impact on the absolute values of NDSAV, NTASST, nor NMNDCON. Moreover, when considering the UCS impacts on NDSAV and NMNDCON as the ratios to income, the difference-in-difference estimates are also not statistically significant. These results are consistent with the estimates of the UCS impact on TOTSAV and NMCON in the main analysis. Nevertheless, when using NTASST to income ratio as the dependent variable, the impacts of the UCS is positive and statistically significant, given that the SSS and CSMBS beneficiaries are the control groups. This result could be explained by the fact that, unlike TOTSAV and NDSAV that are measured based on income and consumption, NTASST is measured based on the net values of assets and liabilities, which can better capture accumulated household wealth. Moreover, this wealth is likely to differ greatly between the CSMBS beneficiaries and the treatment group, since the former works in the formal sector and is entitled to receive pensions when retired.

Analogous to Table 3-19, Table 3-20 presents the results when using alternative measures of savings and consumption based on the 2001-2007 pseudo-panel data. These new results are similar to the results in the main analysis. In particular, when the SSS beneficiaries are used as the control group, the UCS has a positive and statistically significant impact on both NDSAV and NMNDCON. Similarly, when the CSMBS beneficiaries are the control group, the UCS has a positive and statistically significant impact on NMNDCON. Moreover, when estimating the impact of the UCS on NDSAV and NMNDCON as ratios to income, the results are also not statistically significant.

Overall, the results in this sub-section suggest that the impact of the UCS on savings and consumption as measured by TOTSAV and NMCON, respectively, are robust to whether or not the non-durable consumption expenditures are taken into account. That is, the UCS does not affect savings and consumption in the short run, but there is some evidence that it leads to increases in savings and consumption in the long run. Thus, TOTSAV and NMCON will be used in the next two robustness analyses.

3.6.3.2. Including the Remaining Uninsured Group in 2004 and 2007

A second robustness analysis deals with the fact that the remaining uninsured in the period after the UCS implementation are excluded entirely from the analysis. To test whether excluding this remaining uninsured affects the results, the remaining uninsured will be used as another health insurance group in the period after the UCS implementation. More specifically, the empirical specification can be modified as:

$$\begin{aligned}\bar{Y}_{c,t} &= \beta_0 + \beta' \bar{X}_{c,t} + \gamma T + \delta_1 \bar{G}_{c,t}^{csmbs} + \delta_2 \bar{G}_{c,t}^{priv} + \delta_3 \bar{G}_{c,t}^{mws/uce} + \delta_4 \bar{G}_{c,t}^{vhcs/ucp1} \\ &\quad + \delta_5 \bar{G}_{c,t}^{unins/ucp2} + \rho_1 T.\,\bar{G}_{c,t}^{csmbs} + \rho_2 T.\,\bar{G}_{c,t}^{priv} + \rho_3 T.\,\bar{G}_{c,t}^{mws/uce} \\ &\quad + \rho_4 T.\,\bar{G}_{c,t}^{vhc/ucp1} + \rho_5 T.\,\bar{G}_{c,t}^{unins/ucp2} + \rho_6 T.\,\bar{G}_{c,t}^{remain\_unins} + \bar{a}_c + \bar{\varepsilon}_{c.t}\end{aligned}$$

Similar to previous results, the difference-in-difference estimates in Table 3-21 reveal no statistically significant short-run impacts of the UCS on both savings and consumption. For the long-run impact, the difference-in-difference estimates in Table 3-22 suggest that the UCS has a positive and statistically significant impact on savings when CSMBS beneficiaries are used as the control group, and it also has a positive and statistically significant impact on consumption when SSS beneficiaries are used as the control group. These results are consistent with the results based on the 2001-2007 pseudo-panel data when excluding the remaining uninsured group. Thus, by including the remaining uninsured people in the analysis, the results of the UCS impacts on savings and consumption remain unchanged. That is, the UCS does not result in a reduction in precautionary savings.

3.6.3.3. Quantile Regression Analysis

In addition to the two issues mentioned above, another possible bias is the heterogeneity bias among the treatment group, and hence the impact of the UCS may differ across different income groups. Since savings is highly correlated with income, a quantile regression on savings is employed in order to examine whether the impacts of UCS on savings and consumption are different across different quantiles of income.[36] Table 3-23 presents a comparison between the pooled OLS estimates and the quantile regression estimates based on the 2001-2004 data. The difference-in-estimates based on the quantile regression show that the impacts of UCS on savings are positive and statistically significant across different quantiles, but the magnitude of the impact is greater for lower quantile (q=0.25) and becomes smaller for upper quantiles (q=0.5 and

[36] At this stage, the quantile regression is based on repeated cross-section data because there is no stata command to run a quantile regression on panel data. For future work, a quantile regression using panel data can be done using program R.

q=0.75), particularly when the SSS beneficiaries are the comparison group. Nonetheless, when other control groups are used or when consumption is the dependent variables, the relative magnitudes of the UCS impacts across different quantiles are mixed. For instance, when the CSMBS beneficiaries are the control group, the UCS impact on savings is smaller for the median quantile when compared to the lower and upper quantiles, whereas the UCS impact is larger for upper quantiles when the VHCS beneficiaries are the control groups.

Furthermore, the quantile regression estimates based on the 2001-2007 data in Table 3-24 illustrate similar results as the estimates in Table 3-23. More specifically, when the SSS beneficiaries are the control group, the magnitude of the UCS impact on savings and consumption is larger for lower quantiles when compared to upper quantiles. Likewise, when the privately insured is the control group, the UCS impact on savings for the median quantile is almost twice larger than the impact for the upper quantile.

Although the relative magnitudes of the UCS impacts on savings at different quantiles are not consistent across different control groups, there is some evidence that the impact is larger for lower quantiles when compared to the impact for upper quantiles. This suggests that the heterogeneity among the treatment group should be taken into account when assessing the impact of the UCS.

3.7. Conclusion and Discussion

This chapter examines the impact of the UCS implementation on households' precautionary savings. Results from the theoretical model suggest that, after the UCS implementation, households' current consumption would increase as a result of an income effect and a risk-reduction effect. Based on the precautionary savings hypothesis, a reduction in risk is expected to result in a decrease in precautionary savings and an increase in consumption. This hypothesis is tested by using repeated cross-section data and pseudo-panel data in 2001, 2004, and 2007. The net difference between the savings in 2001 and the savings in 2004 reflects the impact of the UCS in the short run, whereas the net difference between the savings in 2001 and the savings in 2007 reveal the impacts of the UCS in the long run.

Overall, the empirical results suggest no evidence of a reduction in savings. More specifically, based on the repeated cross-section data analysis, the UCS has a positive and statistically significant impact on both savings and consumption, both in the short run and the long run. When the pseudo-panel data are employed, the UCS has impact on neither savings nor consumption in the short run. However, in the long run there is some evidence that the UCS has a positive and statistically significant impact on savings, particularly when the CSMBS and VHCS beneficiaries are used as the comparison groups. Thus, these results suggest that the implementation of the UCS only produces an income effect due to the reduction in out-of-pocket medical expenditures. This income effect is particularly more pronounced when using the pseudo-panel data and when examining in the long run.

The results found in the context of Thai UCS are contrast to Chou *et al.* (2003)'s finding that the NHI reduces precautionary savings in Taiwan. This could be explained by the fact that the implementation of the UCS in Thailand is significantly different from the NHI in Taiwan. First, the insured under the NHI are free to choose their health care providers, whereas the UCS beneficiaries need to seek care from their registered public health facilities or from other public health facilities within the UCS network (in the case of referral). Moreover, the NHI became the only health insurance in Taiwan after the health care reform, while the UCS is one of the three public health insurance schemes in Thailand. These two distinct characteristics could be the sources of different findings on the impacts of public health insurance on households' precautionary savings in the two countries.

All of the results discussed above can be interpreted in at least two different ways. First, the UCS actually has no risk reduction effect because households save very little or none for precautionary purposes. According to the precautionary savings hypothesis, the prediction of a reduction in savings due to a reduction in risk relies on the assumption that households use savings as self-insurance, and that this self-insurance is a substitute for formal health insurance. However, if households never use savings as a self-insurance against the event of sickness in the first place, then providing access to formal health insurance may not have any impact of the savings behavior of households. This suggests that a formal health insurance may not work well in Thailand in terms of providing a mechanism to reduce risks associated with uncertainty in health. Nevertheless, the income transfer, which is a byproduct of this subsidized health insurance, seems to have more impact on the regular savings of the households. This income effect implies that the UCS policy has re-distributed the country's economic resources from the general population to the UCS beneficiaries, most of whom are the disadvantageous groups of the population.

An alternative interpretation of the results is that the UCS implementation may actually have impacts on households' precautionary savings behavior, but the impacts are not captured well in this study due to the following complications. First, the UCS implementation on households' savings behavior depends on how much the households take up the benefits from the UCS. If the households do not use the health care services provided by the UCS, then the predicted income effect or the risk reduction effect will not occur. As a result, the UCS will have no impact on savings or consumptions even if these households are entitled as UCS beneficiaries. This explanation is consistent with the finding from the quantile regressions that the UCS impacts on savings are larger for lower quantiles than they are for upper quantiles.

Finally, the finding that the UCS impacts on savings are not statistically significant also suggests that the estimates are imprecise due to large standard errors, and do not necessarily imply that the UCS has no impacts on savings. The large standard errors are caused by some limitations in the data. The most important limitation is the lack of true panel data; the inability to identify the individuals' health insurance types before and after the implementation of the UCS hinders the advantage of using the difference-in-difference estimates and the fixed-effects specifications to control for unobserved characteristics. Another limitation is the lack of health insurance variables in the 2001 and 2004 SES data. Using the information from the HWS to predict health insurance types in the SES data inevitably lead to larger measurement errors. Nonetheless, despite these limitations, the analysis in this study provides some new insights on how the UCS has altered the savings and consumption behavior of the UCS beneficiaries relative to that of the other groups of population, and how it affects the redistribution of economic resource from the general population to a particular group of population.

Figure 3-1 The Reform of Public Health Insurance Schemes before and after 2001

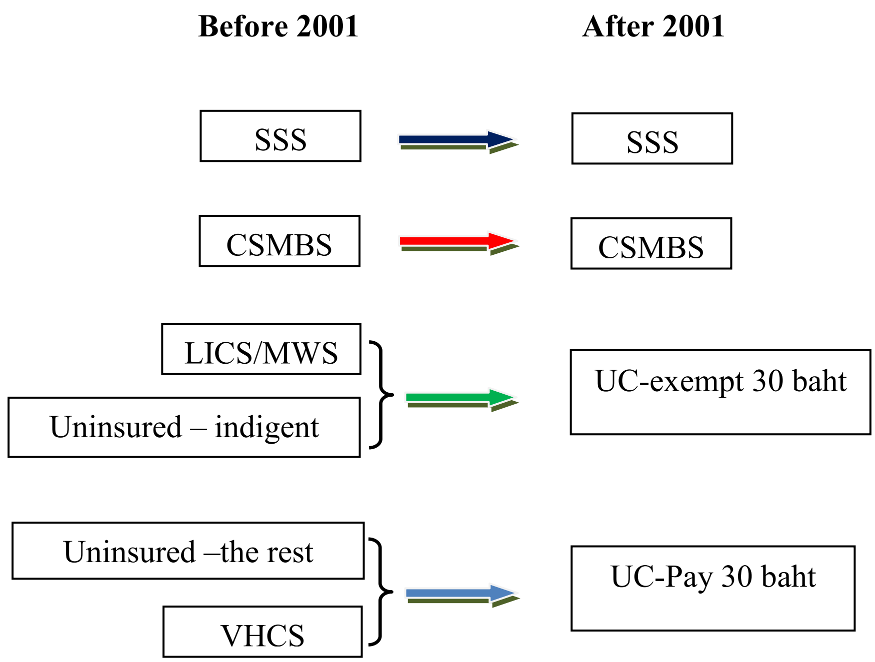
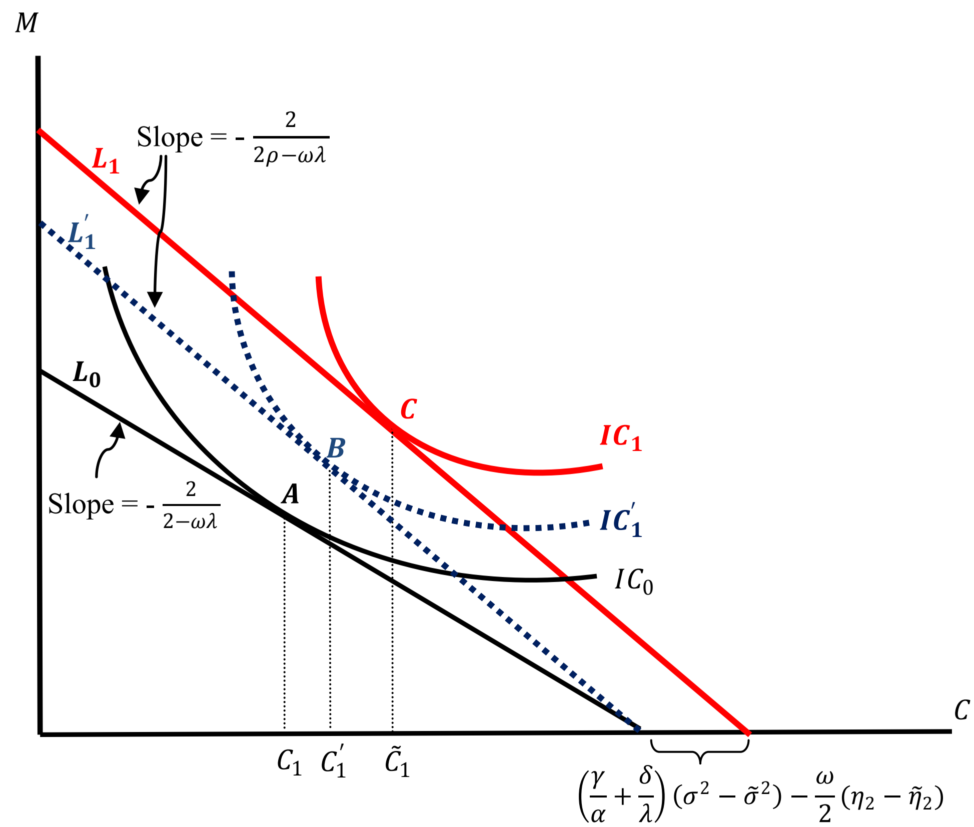


Figure 3-2 Optimal Current Consumption with Medical Care Subsidization



Note:

Equation for L_0 can be written as:

$$M_1 = \frac{(A_1-\Omega)+(2-\delta)Y_1}{2-\omega\lambda} - \frac{2}{2-\omega\lambda}C_1 - \frac{\gamma\sigma^2}{2(2-\omega\lambda)}\left(\frac{\gamma}{\alpha}+\frac{\delta}{\lambda}\right) + \frac{\omega\eta_2-\varepsilon_2-\xi_2}{2-\omega\lambda}.$$

Equation for L_1 can be written as:

$$\widetilde{M}_1 = \frac{(A_1-\Omega)+(2-\delta)Y_1}{2\rho-\omega\lambda} - \frac{2}{2\rho-\omega\lambda}\tilde{C}_1 - \frac{\gamma\tilde{\sigma}^2}{2(2\rho-\omega\lambda)}\left(\frac{\gamma}{\alpha}+\frac{\delta}{\lambda}\right) + \frac{\omega\tilde{\eta}_2-\varepsilon_2-\xi_2}{2\rho-\omega\lambda}.$$

Table 3-1 Household Characteristics

Variables	2001		2004		2007	
	Mean	s.d.	Mean	s.d.	Mean	s.d.
Health insurance of household members (proportion):						
Uninsured	0.332	-	0.049	-	0.040	-
CSMBS	0.100	-	0.102	-	0.100	-
SSS	0.095	-	0.095	-	0.114	-
Private health insurance	0.011	-	0.025	-	0.029	-
VHCS	0.247	-	n.a	n.a	n.a	n.a
MWS/LICS	0.215	-	n.a	n.a	n.a	n.a
UC-with copayment	n.a	n.a	0.477	-	0.287	-
UC-exempt copayment	n.a	n.a	0.252	-	0.429	-
Age of household head	43.217	9.293	44.114	9.201	44.752	9.184
Employment status:						
Employer	0.170	-	0.173	-	0.068	-
Own-account worker/unpaid family worker	0.385	-	0.350	-	0.467	-
Government or State Enterprise employee	0.105	-	0.115	-	0.114	-
Private employee/member of co-operation	0.286	-	0.306	-	0.281	-
Economically inactive or no occupation	0.054	-	0.056	-	0.070	-
Education level:						
Never attend school or kindergarten	0.037	-	0.036	-	0.036	-
Elementary-Lower	0.536	-	0.483	-	0.432	-
Elementary-Upper	0.161	-	0.176	-	0.209	-
Secondary-Lower	0.089	-	0.094	-	0.101	-
Secondary-Upper	0.047	-	0.058	-	0.067	-
Vocational-Upper	0.006	-	0.005	-	0.031	-
Vocational-Lower	0.053	-	0.060	-	0.030	-
University	0.063	-	0.076	-	0.081	-
Higher than Bachelor	0.007	-	0.012	-	0.012	-
Household size	3.606	1.576	3.492	1.566	3.397	1.526
Region:						
Bangkok	0.132	-	0.126	-	0.118	-
Central	0.224	-	0.230	-	0.249	-
North	0.190	-	0.192	-	0.185	-
Northeast	0.323	-	0.323	-	0.313	-
South	0.130	-	0.129	-	0.136	-
Area:						
Municipal area (urban)	0.335	-	0.332	-	0.330	-
Non-municipal area (rural)	0.665	-	0.668	-	0.670	-

Table 3-1 Household Characteristics (continued)

Variables	2001		2004		2007	
	Mean	s.d.	Mean	s.d.	Mean	s.d.
Household savings (in real terms):						
TOTSAV (Current income - Total consumption expenditures)	3602.319	10194.02	4053.84	14757.51	5314.33	21017.42
NDSAV (Savings excluding durable goods expenditures)	6389.513	11337.56	7644.54	15581.94	8978.49	22814.84
NTASST (Net total assets and liabilities)	776.264	16690.59	1337.033	49654.90	n.a.	n.a.
Household consumption expenditures (in real terms):						
TOTCON (Total consumption)	9122.56	8771.11	10770.28	11141.25	11502.65	10607.93
NMCON (Non-medical consumption expenditures)	8845.89	8559.77	10564.09	10946.58	11294.63	10364.12
NMNDCON (Non-medical non-durable goods consumption expenditures)	6059.11	5072.21	6973.38	5420.78	7628.72	5566.51
Number of observations	9,024		24,908		15,204	

Source: Socio-Economic Surveys and Health and Welfare Surveys (2001, 2004, 2007), NSO-Thailand

Table 3-2 Cohort Characteristics

Variables	2001		2004		2007	
	Mean	s.d.	Mean	s.d.	Mean	s.d.
Health insurance of household members (proportion):						
Uninsured	0.363	-	0.054	-	0.038	-
CSMBS	0.195	-	0.183	-	0.187	-
SSS	0.063	-	0.077	-	0.090	-
Private health insurance	0.014	-	0.034	-	0.045	-
VHCS	0.204	-	n.a	n.a	n.a	n.a
MWS/LICS	0.161	-	n.a	n.a	n.a	n.a
UC-with copayment	n.a	n.a	0.425	-	0.266	-
UC-exempt copayment	n.a	n.a	0.228	-	0.375	-
Age of household head						
25-29	0.137	-	0.136	-	0.145	-
30-34	0.143	-	0.141	-	0.145	-
35-39	0.138	-	0.147	-	0.137	-
40-44	0.144	-	0.144	-	0.145	-
45-49	0.141	-	0.141	-	0.140	-
50-54	0.149	-	0.144	-	0.137	-
55-59	0.148	-	0.148	-	0.151	-
Employment status:						
Employer	0.251	-	0.238	-	0.193	-
Own-account /unpaid family worker	0.243	-	0.214	-	0.235	-
Government/State Enterprise employee	0.135	-	0.150	-	0.154	-
Private employee/member of co-operation	0.221	-	0.215	-	0.221	-
Economically inactive or no occupation	0.150	-	0.183	-	0.197	-
Education level:						
Never attend school or kindergarten	0.030	-	0.038	-	0.036	-
Elementary-Lower	0.445	-	0.419	-	0.404	-
Elementary-Upper	0.179	-	0.164	-	0.179	-
Secondary-Lower	0.110	-	0.114	-	0.121	-
Secondary-Upper	0.064	-	0.068	-	0.070	-
Vocational-Upper	0.011	-	0.008	-	0.036	-
Vocational-Lower	0.067	-	0.071	-	0.037	-
University	0.084	-	0.102	-	0.101	-
Higher than Bachelor	0.010	-	0.016	-	0.016	-
Household size	3.516	0.694	3.460	0.519	3.367	0.545

Table 3-2 Cohort Characteristics (Continued)

Variables	2001		2004		2007	
	Mean	s.d.	Mean	s.d.	Mean	s.d.
Region:						
Bangkok	0.102	-	0.112	-	0.104	-
Central	0.269	-	0.250	-	0.282	-
North	0.199	-	0.189	-	0.157	-
Northeast	0.308	-	0.316	-	0.303	-
South	0.122	-	0.133	-	0.154	-
Area:						
Municipal area (urban)	0.347	-	0.354	-	0.366	-
Non-municipal area (rural)	0.653	-	0.646	-	0.634	-
Household savings (in real terms):						
TOTSAV (Current income - Total consumption expenditures)	4422.07	5534.69	5298.76	6385.32	7678.00	12108.74
NDSAV (Savings excluding durable goods expenditures)	7607.92	6562.72	9643.10	8050.16	12278.62	13667.31
NTASST (Net total assets and liabilities)	922.08	7364.29	2518.14	14831.21	n.a.	n.a.
Household consumption expenditures (in real terms):						
TOTCON (Total consumption)	10255.20	5329.29	12431.92	6313.77	13580.02	7155.42
NMCON (Non-medical consumption expenditures)	9939.24	5187.54	12156.53	6133.04	13224.32	6945.66
NMNDCON (Non-medical non-durable goods consumption expenditures)	6753.60	3259.81	7812.19	3404.19	8621.74	3701.13
Number of observations	638		663		656	

Source: Socio-Economic Surveys and Health and Welfare Surveys (2001, 2004, 2007), NSO-Thailand

Table 3-3 Pooled OLS Estimates of UCS Impacts on Household Savings and Consumption Expenditure (Absolute Values), 2001-2004

Variables	Y=ln(TOTSAV)		Y=ln(NMCON)	
	coef	**se**	**coef**	**Se**
Health insurance:				
CSMBS (δ_1)	-0.408***	0.068	-0.197***	0.026
Private health insurance (δ_2)	0.297**	0.148	0.035	0.055
MWS/UCE (δ_3)	-1.556***	0.076	-0.613***	0.027
VHCS/UCP1 (δ_4)	-1.587***	0.073	-0.543***	0.026
Uninsured/UCP2 (δ_5)	-1.145***	0.069	-0.414***	0.026
T (γ)	-0.271***	0.063	-0.028	0.024
T x CSMBS (ρ_1)	0.299***	0.075	0.196***	0.028
T x Private health insurance (ρ_2)	-0.131	0.177	0.247***	0.065
T x MWS/UCE (ρ_3)	-0.069	0.085	0.034	0.030
T x VHCS/UCP1 (ρ_4)	0.296***	0.082	0.152***	0.029
T x Uninsured/UCP2 (ρ_5)	0.515***	0.075	0.225***	0.028
Age of household head	0.023***	0.001	0.005***	0.000
Education of household head:				
Elementary-Lower	0.360***	0.047	0.232***	0.015
Elementary-Upper	0.585***	0.051	0.333***	0.016
Secondary-Lower	0.754***	0.052	0.470***	0.017
Secondary-Upper	0.825***	0.057	0.563***	0.018
Vocational-Upper	1.038***	0.086	0.655***	0.030
Vocational-Lower	1.036***	0.056	0.653***	0.018
University	1.338***	0.056	0.781***	0.018
Higher than Bachelor	1.693***	0.080	1.061***	0.028
Household size	0.165***	0.005	0.169***	0.002
Household's socioeconomic status:				
Farm operator (own land)	0.609***	0.041	0.146***	0.013
Farm operator (rent land)	0.695***	0.055	0.156***	0.017
Entrepreneurs, trade and industry	0.864***	0.037	0.425***	0.012
Professional, technical and managerial	0.753***	0.044	0.406***	0.014
Other employees	0.292***	0.037	0.207***	0.012
Economically inactive household	0.407***	0.044	0.259***	0.014
Region:				
Central	-0.232***	0.033	-0.196***	0.012
Northern	-0.268***	0.035	-0.391***	0.012
Northeastern	-0.308***	0.034	-0.439***	0.012
Southern	-0.294***	0.036	-0.213***	0.013
Non-municipal area (rural)	0.043**	0.019	-0.050***	0.006
Intercept	6.524***	0.094	8.176***	0.033
Number of observations	24,074		33,898	

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 3-4 Pooled OLS Estimates of UCS Impacts on Household Savings and Consumption Expenditures (Ratios to Income), 2001-2004

	Y=TOTSAV/HHINC		Y=NMCON/HHINC	
	coef	**se**	**coef**	**Se**
Health insurance:				
CSMBS (δ_1)	-0.240*	0.125	0.234*	0.125
Private health insurance (δ_2)	-0.133	0.263	0.134	0.263
MWS/UCE (δ_3)	-0.573***	0.130	0.555***	0.130
VHCS/UCP1 (δ_4)	-0.590***	0.126	0.572***	0.126
Uninsured/UCP2 (δ_5)	-0.621***	0.124	0.607***	0.124
T (γ)	-0.243**	0.115	0.244**	0.115
T x CSMBS (ρ_1)	0.157	0.137	-0.159	0.137
T x Private health insurance (ρ_2)	0.042	0.315	-0.051	0.314
T x MWS/UCE (ρ_3)	0.187	0.144	-0.177	0.144
T x VHCS/UCP1 (ρ_4)	0.267*	0.140	-0.251*	0.140
T x Uninsured/UCP2 (ρ_5)	0.398***	0.133	-0.386***	0.133
Age of household head	0.005***	0.002	-0.006***	0.002
Education of household head:				
Elementary-Lower	-0.004	0.071	0.006	0.071
Elementary-Upper	-0.091	0.077	0.094	0.077
Secondary-Lower	0.002	0.080	0.000	0.080
Secondary-Upper	-0.017	0.088	0.020	0.088
Vocational-Upper	-0.013	0.145	0.019	0.144
Vocational-Lower	0.008	0.087	-0.006	0.087
University	0.071	0.089	-0.066	0.089
Higher than Bachelor	0.097	0.137	-0.091	0.137
Household size	0.004	0.009	-0.004	0.009
Household's socioeconomic status:				
Farm operator (own land)	-0.012	0.061	0.012	0.061
Farm operator (rent land)	-0.066	0.080	0.069	0.080
Entrepreneurs, trade and industry	0.131**	0.056	-0.129**	0.056
Professional, technical and managerial	0.122*	0.070	-0.116*	0.070
Other employees	0.083	0.056	-0.078	0.056
Economically inactive household	-0.167**	0.066	0.163**	0.066
Region:				
Central	0.138**	0.057	-0.139**	0.057
Northern	0.181***	0.060	-0.180***	0.060
Northeastern	0.165***	0.059	-0.164***	0.059
Southern	0.129**	0.061	-0.128**	0.061
Non-municipal area (rural)	0.036	0.031	-0.035	0.031
Intercept	0.087	0.157	0.899***	0.157
Number of observations	33,900		33,899	

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 3-5 Changes in Savings and Consumption after the UCS (Repeated Cross-Section Data), 2001-2004

Health insurance group	Y in absolute values		Y in ratios	
	Y=ln(TOTSAV)	Y=ln(NMCON)	Y=TOTSAV/HHINC	Y=NMCON/HHINC
Treatment ($\gamma + \rho_5$)	0.243	0.197	0.156	-0.141
Control:				
SSS (γ)	-0.271	-0.028	-0.244	0.246
CSMBS ($\gamma + \rho_1$)	0.027	0.169	-0.087	0.087
Private HI ($\gamma + \rho_2$)	-0.403	0.219	-0.211	0.203
MWS ($\gamma + \rho_3$)	-0.341	0.006	-0.056	0.068
VHCS ($\gamma + \rho_4$)	0.024	0.125	0.024	-0.007
Weighted average	-0.160	0.072	-0.079	0.086

Note: The regression equation is:

$$Y_{h,t} = \beta_0 + \beta' \boldsymbol{X}_{h,t} + \gamma T + \delta_1 G_{h,t}^{csmbs} + \delta_2 G_{h,t}^{priv} + \delta_3 G_{h,t}^{mws/uce} + \delta_4 G_{h,t}^{vhcs/ucp1} + \delta_5 G_{h,t}^{unins/ucp2} + \rho_1 T.G_{h,t}^{csmbs} + \rho_2 T.G_{h,t}^{priv} + \rho_3 T.G_{h,t}^{mws/uce} + \rho_4 T.G_{h,t}^{vhc/ucp1} + \rho_5 T.G_{h,t}^{unins/ucp2} + a_h + \varepsilon_{h.t}$$

Table 3-6 Difference-in-Difference Estimates (Repeated Cross-Section Data), 2001-2004

Comparison group	Y in absolute values		Y in ratios	
	Y=ln(TOTSAV)	Y=ln(NMCON)	Y=TOTSAV/HHINC	Y=NMCON/HHINC
SSS (ρ_5)	0.515***	0.225***	0.400***	-0.387***
CSMBS ($\rho_5 - \rho_1$)	0.216***	0.028	0.242***	-0.228***
Private HI ($\rho_5 - \rho_2$)	0.646***	-0.022	0.366	-0.344
MWS ($\rho_5 - \rho_3$)	0.584***	0.191***	0.212**	-0.209**
VHCS ($\rho_5 - \rho_4$)	0.219***	0.073***	0.131	-0.135
Weighted average	0.403***	0.125***	0.234***	-0.228***

Note: *** p<0.01, ** p<0.05, * p<0.1; the regression equation is the same as the above.

Table 3-7 Pooled OLS Estimates of UCS Impacts on Household Savings and Consumption (Absolute Values), 2001-2007

	Y=ln(TOTSAV)		Y=ln(NMCON)	
	coef	se	Coef	Se
Health insurance:				
CSMBS (δ_1)	-0.359***	0.070	-0.227***	0.026
Private health insurance (δ_2)	0.305**	0.152	0.008	0.054
MWS/UCE (δ_3)	-1.507***	0.079	-0.614***	0.027
VHCS/UCP1 (δ_4)	-1.547***	0.076	-0.547***	0.026
Uninsured/UCP2 (δ_5)	-1.149***	0.072	-0.424***	0.026
T (γ)	-0.316***	0.066	0.001	0.024
T x CSMBS (ρ_1)	0.426***	0.080	0.269***	0.029
T x Private health insurance (ρ_2)	-0.280	0.180	0.169***	0.064
T x MWS/UCE (ρ_3)	0.445***	0.084	0.256***	0.029
T x VHCS/UCP1 (ρ_4)	0.535***	0.087	0.276***	0.030
T x Uninsured/UCP2 (ρ_5)	0.443***	0.083	0.224***	0.029
Age of household head	0.026***	0.001	0.007***	0.000
Education of household head:				
Elementary-Lower	0.286***	0.056	0.248***	0.017
Elementary-Upper	0.579***	0.060	0.364***	0.018
Secondary-Lower	0.657***	0.062	0.507***	0.019
Secondary-Upper	0.740***	0.066	0.577***	0.021
Vocational-Upper	0.828***	0.077	0.649***	0.025
Vocational-Lower	0.937***	0.069	0.686***	0.022
University	1.245***	0.066	0.806***	0.021
Higher than Bachelor	1.588***	0.093	1.072***	0.032
Household size	0.143***	0.006	0.165***	0.002
Household's socioeconomic status:				
Farm operator (own land)	0.551***	0.055	0.125***	0.016
Farm operator (rent land)	0.449***	0.066	0.081***	0.019
Entrepreneurs, trade and industry	0.838***	0.050	0.399***	0.015
Professional, technical and managerial	0.664***	0.056	0.393***	0.018
Other employees	0.220***	0.049	0.164***	0.015
Economically inactive household	0.327***	0.057	0.186***	0.017
Region:				
Central	-0.277***	0.038	-0.141***	0.013
Northern	-0.366***	0.041	-0.360***	0.014
Northeastern	-0.388***	0.041	-0.383***	0.014
Southern	-0.263***	0.042	-0.209***	0.014
Non-municipal area (rural)	-0.027	0.022	-0.089***	0.007
Intercept	6.685***	0.107	8.105***	0.036
Number of observations	17,578		24,192	

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 3-8 Pooled OLS Estimates of UCS Impacts on Household Consumption (Ratios to income), 2001-2007

	Y=TOTSAV/HHINC		Y=NMCON/HHINC	
	coef	se	Coef	se
Health insurance:				
CSMBS (δ_1)	-0.265*	0.151	0.259*	0.151
Private health insurance (δ_2)	-0.187	0.317	0.185	0.316
MWS/UCE (δ_3)	-0.584***	0.159	0.565***	0.159
VHCS/UCP1 (δ_4)	-0.604***	0.155	0.584***	0.155
Uninsured/UCP2 (δ_5)	-0.642***	0.151	0.627***	0.150
T (γ)	-0.227	0.144	0.231	0.143
T x CSMBS (ρ_1)	0.190	0.173	-0.190	0.172
T x Private health insurance (ρ_2)	0.013	0.375	-0.023	0.374
T x MWS/UCE (ρ_3)	0.232	0.170	-0.219	0.169
T x VHCS/UCP1 (ρ_4)	0.158	0.176	-0.149	0.175
T x Uninsured/UCP2 (ρ_5)	0.424**	0.173	-0.415**	0.173
Age of household head	0.005**	0.002	-0.005**	0.002
Education of household head:				
Elementary-Lower	0.010	0.100	-0.007	0.099
Elementary-Upper	-0.081	0.107	0.084	0.107
Secondary-Lower	0.036	0.113	-0.033	0.112
Secondary-Upper	0.002	0.122	0.002	0.121
Vocational-Upper	0.017	0.146	-0.013	0.146
Vocational-Lower	0.033	0.129	-0.032	0.129
University	0.108	0.124	-0.105	0.124
Higher than Bachelor	0.108	0.187	-0.104	0.186
Household size	0.014	0.012	-0.014	0.012
Household's socioeconomic status:				
Farm operator (own land)	-0.059	0.095	0.063	0.094
Farm operator (rent land)	-0.046	0.114	0.049	0.114
Entrepreneurs, trade and industry	0.170*	0.089	-0.165*	0.089
Professional, technical and managerial	0.120	0.106	-0.113	0.105
Other employees	0.100	0.088	-0.094	0.088
Economically inactive household	-0.211**	0.101	0.208**	0.101
Region:				
Central	0.213***	0.079	-0.215***	0.079
Northern	0.261***	0.084	-0.261***	0.084
Northeastern	0.235***	0.083	-0.234***	0.083
Southern	0.257***	0.085	-0.255***	0.085
Non-municipal area (rural)	0.040	0.042	-0.040	0.042
Intercept	-0.002	0.210	0.985***	0.210
Number of observations	24,193		24,192	

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 3-9 Changes in Savings and Consumption after the UCS (Repeated Cross-Section Data), 2001-2007

Health insurance group	Y in absolute values		Y in ratios	
	Y=ln(TOTSAV)	Y=ln(NMCON)	Y=TOTSAV/HHINC	Y=NMCON/HHINC
Treatment ($\gamma + \rho_5$)	0.126	0.225	0.197	-0.184
Control:				
SSS (γ)	-0.316	0.001	-0.227	0.231
CSMBS ($\gamma + \rho_1$)	0.110	0.270	-0.036	0.041
Private HI ($\gamma + \rho_2$)	-0.597	0.170	-0.214	0.208
MWS ($\gamma + \rho_3$)	0.128	0.257	0.005	0.012
VHCS ($\gamma + \rho_4$)	0.219	0.277	-0.068	0.082
Weighted average	0.064	0.226	-0.058	0.069

Note: The regression equation is:

$$Y_{h,t} = \beta_0 + \beta' \boldsymbol{X}_{h,t} + \gamma T + \delta_1 G_{h,t}^{csmbs} + \delta_2 G_{h,t}^{priv} + \delta_3 G_{h,t}^{mws/uce} + \delta_4 G_{h,t}^{vhcs/ucp1} + \delta_5 G_{h,t}^{unins/ucp2} + \rho_1 T.G_{h,t}^{csmbs} + \rho_2 T.G_{h,t}^{priv} + \rho_3 T.G_{h,t}^{mws/uce} + \rho_4 T.G_{h,t}^{vhc/ucp1} + \rho_5 T.G_{h,t}^{unins/ucp2} + a_h + \varepsilon_{h.t}$$

Table 3-10 Difference-in-Difference Estimates (Repeated Cross-Section Data), 2001-2007

Comparison group	Y in absolute values		Y in ratios	
	Y=ln(TOTSAV)	Y=ln(NMCON)	Y=TOTSAV/HHINC	Y=NMCON/HHINC
SSS (ρ_5)	0.443***	0.224***	0.424**	-0.415**
CSMBS ($\rho_5 - \rho_1$)	0.016	-0.045**	0.234*	-0.225*
Private HI ($\rho_5 - \rho_2$)	0.723***	0.055	0.411	-0.392
MWS ($\rho_5 - \rho_3$)	-0.002	-0.032	0.192	-0.196
VHCS ($\rho_5 - \rho_4$)	-0.092	-0.052**	0.265**	-0.266**
Weighted average	0.062	-0.001	0.255**	-0.253**

Note: *** p<0.01, ** p<0.05, * p<0.1; the regression equation is the same as the above.

Table 3-11 Pseudo-Panel Estimates of UCS Impacts on Household Savings and Consumption (Absolute Values), 2001-2004

Variables	Y=ln(TOTSAV)				Y=ln(NMCON)			
	FE model		RE model		FE model		RE model	
	coef	se	coef	se	coef	se	coef	se
Health insurance:								
CSMBS (δ_1)	-1.405*	0.75	-1.842***	0.38	-0.422**	0.20	-0.516***	0.10
Private health insurance (δ_2)	0.810	1.40	1.081	1.05	0.341	0.38	0.280	0.29
MWS/UCE (δ_3)	-2.645***	0.77	-3.210***	0.47	-0.776***	0.20	-0.855***	0.13
VHCS/UCP1 (δ_4)	-2.761***	0.75	-3.046***	0.46	-0.534***	0.20	-0.670***	0.12
Uninsured/UCP2 (δ_5)	-2.565***	0.70	-2.551***	0.43	-0.504***	0.19	-0.530***	0.12
T (γ)	-0.214	0.42	-0.348	0.38	-0.043	0.12	-0.035	0.11
T x CSMBS (ρ_1)	0.111	0.45	0.144	0.41	0.265**	0.13	0.232*	0.12
T x Private health insurance (ρ_2)	0.864	2.10	1.747	1.58	0.414	0.59	1.066**	0.44
T x MWS/UCE (ρ_3)	0.315	0.62	0.849*	0.51	0.309*	0.17	0.371***	0.14
T x VHCS/UCP1 (ρ_4)	-0.011	0.55	0.117	0.49	0.222	0.15	0.177	0.14
T x Uninsured/UCP2 (ρ_5)	0.211	0.53	0.276	0.47	0.247*	0.15	0.189	0.13
Age of household head:								
25-29	(dropped)		-1.464***	0.17	(dropped)		-0.370***	0.04
30-34	(dropped)		-1.214***	0.15	(dropped)		-0.259***	0.04
35-39	(dropped)		-1.019***	0.12	(dropped)		-0.167***	0.03
40-44	(dropped)		-0.688***	0.11	(dropped)		-0.050*	0.03
45-49	(dropped)		-0.277***	0.10	(dropped)		0.002	0.03
50-54	(dropped)		-0.068	0.10	(dropped)		0.028	0.03
Education of household head:								
Elementary-Lower	-0.152	0.68	0.261	0.43	-0.058	0.17	0.082	0.12
Elementary-Upper	-0.221	0.72	0.838*	0.45	-0.044	0.18	0.306***	0.12
Secondary-Lower	0.880	0.74	1.068**	0.48	0.316*	0.19	0.511***	0.13
Secondary-Upper	0.309	0.75	1.129**	0.51	0.530***	0.20	0.708***	0.13
Vocational-Lower	-1.757	1.21	0.057	0.81	0.245	0.27	0.891***	0.19
Vocational-Upper	0.973	0.76	1.595***	0.50	0.365*	0.19	0.718***	0.13
University	1.459*	0.77	2.095***	0.52	0.643***	0.20	0.944***	0.14
Higher than Bachelor	1.605	1.13	2.767***	0.81	1.192***	0.32	1.477***	0.22

Household size	0.117	0.08	0.149***	0.05	0.185***	0.02	0.166***	0.01
Household's socioeconomic status:								
Farm operator (own land)	2.101***	0.68	1.575***	0.36	-0.118	0.16	0.184**	0.09
Farm operator (rent land)	2.375***	0.88	2.597***	0.50	-0.004	0.20	0.404***	0.12
Entrepreneurs, trade and industry	2.588***	0.62	1.953***	0.33	0.308**	0.15	0.580***	0.08
Professional, technical and managerial	1.730**	0.67	1.528***	0.43	0.276	0.17	0.445***	0.11
Other employees	1.446**	0.57	1.107***	0.37	0.114	0.14	0.291***	0.09
Economically inactive household	2.236***	0.63	1.463***	0.32	0.302**	0.15	0.345***	0.08
Region:								
Central	(dropped)		-0.283*	0.15	(dropped)		-0.227***	0.04
Northern	(dropped)		-0.190	0.17	(dropped)		-0.416***	0.04
Northeastern	(dropped)		-0.221	0.16	(dropped)		-0.412***	0.04
Southern	(dropped)		-0.290*	0.16	(dropped)		-0.262***	0.04
Non-municipal area (rural)	0.281	0.27	0.226	0.18	-0.111*	0.07	0.002	0.05
Intercept	7.636***	1.08	8.485***	0.63	8.683***	0.27	8.786***	0.17
Number of observations		1,181				1,301		
sigma_e	0.729		0.729		0.217		0.217	
sigma_u	0.856		0.436		0.257		0.096	
Rho	0.580		0.263		0.583		0.164	
Hausman test (chi2 test):								
chi2		38.42				56.03		
Prob > chi2		0.0714				0.0009		

Note: *** p<0.01, ** p<0.05, * p<0.1

Source: Socio-Economic Surveys and Health and Welfare Surveys (2001-2004), NSO-Thailand

Table 3-12 Pseudo-Panel Estimates of UCS Impacts on Household Savings and Consumption (Ratios to Income), 2001-2004

	Y=TOTSAV/HHINC				Y=NMCON/HHINC			
	FE model		RE model		FE model		RE model	
Variables	**coef**	**se**	**coef**	**se**	**coef**	**se**	**coef**	**se**
Health insurance:								
CSMBS (δ_1)	1.095	1.17	-0.696	0.56	-1.121	1.17	0.690	0.56
Private health insurance (δ_2)	1.867	2.23	-0.454	1.57	-1.856	2.23	0.482	1.57
MWS/UCE (δ_3)	-0.118	1.18	-1.456**	0.68	0.073	1.18	1.421**	0.68
VHCS/UCP1 (δ_4)	0.155	1.14	-1.136*	0.66	-0.191	1.14	1.117*	0.66
Uninsured/UCP2 (δ_5)	-0.549	1.09	-1.487**	0.63	0.519	1.09	1.478**	0.63
T (γ)	-0.159	0.69	-0.109	0.63	0.171	0.69	0.114	0.63
T x CSMBS (ρ_1)	0.453	0.75	0.029	0.69	-0.462	0.75	-0.029	0.69
T x Private health insurance (ρ_2)	-0.690	3.45	0.937	2.40	0.629	3.45	-0.932	2.40
T x MWS/UCE (ρ_3)	-0.535	0.97	-0.044	0.81	0.569	0.97	0.069	0.81
T x VHCS/UCP1 (ρ_4)	0.099	0.89	-0.177	0.79	-0.109	0.89	0.189	0.79
T x Uninsured/UCP2 (ρ_5)	0.676	0.86	0.467	0.76	-0.686	0.86	-0.468	0.76
Age of household head								
25-29	(dropped)		-0.020	0.23	(dropped)		0.028	0.23
30-34	(dropped)		0.018	0.20	(dropped)		-0.008	0.20
35-39	(dropped)		-0.026	0.16	(dropped)		0.036	0.16
40-44	(dropped)		-0.307**	0.14	(dropped)		0.315**	0.14
45-49	(dropped)		-0.054	0.14	(dropped)		0.060	0.14
50-54	(dropped)		-0.008	0.13	(dropped)		0.012	0.13
Education of household head:								
Elementary-Lower	-0.796	1.01	-0.227	0.62	0.793	1.01	0.204	0.62
Elementary-Upper	-0.748	1.03	-0.393	0.63	0.733	1.03	0.358	0.63
Secondary-Lower	0.082	1.12	-0.017	0.67	-0.078	1.12	0.003	0.67
Secondary-Upper	-0.584	1.14	-0.633	0.72	0.581	1.14	0.615	0.72
Vocational-Lower	-0.518	1.57	-0.755	1.04	0.471	1.57	0.712	1.04
Vocational-Upper	-0.096	1.13	-0.563	0.71	0.087	1.13	0.540	0.71
University	-1.122	1.19	-0.992	0.74	1.082	1.19	0.935	0.74
Higher than Bachelor	1.181	1.87	0.505	1.20	-1.231	1.87	-0.548	1.20

Household size	-0.066	0.12	-0.007	0.07	0.064	0.12	0.005	0.07
Household's socioeconomic status:								
Farm operator (own land)	0.102	0.94	-0.068	0.47	-0.103	0.94	0.069	0.47
Farm operator (rent land)	-0.399	1.16	-0.257	0.66	0.387	1.16	0.251	0.66
Entrepreneurs, trade and industry	-0.183	0.88	0.375	0.44	0.176	0.88	-0.375	0.44
Professional, technical and managerial	2.169**	0.98	0.490	0.59	-2.144**	0.98	-0.467	0.59
Other employees	0.032	0.83	-0.091	0.50	-0.023	0.83	0.092	0.50
Economically inactive household	-0.730	0.88	-0.134	0.43	0.725	0.88	0.122	0.43
Region:								
Central	(dropped)		0.722***	0.20	(dropped)		-0.721***	0.20
Northern	(dropped)		0.827***	0.22	(dropped)		-0.825***	0.22
Northeastern	(dropped)		0.832***	0.22	(dropped)		-0.827***	0.22
Southern	(dropped)		0.768***	0.21	(dropped)		-0.767***	0.21
Non-municipal area (rural)	-0.229	0.39	-0.017	0.24	0.217	0.39	0.010	0.24
Intercept	0.709	1.59	0.785	0.91	0.308	1.59	0.224	0.91
Number of observations	1,301				1,301			
sigma_e	1.270		1.270		1.270		1.270	
sigma_u	1.252		0.000		1.253		0.000	
Rho	0.493		0.000		0.493		0.000	
Hausman test (chi2 test)								
chi2	36.76				37.05			
Prob > chi2	0.0996				0.0941			

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 3-13 Changes in Savings and Consumption after the UCS based on Pseudo-Panel Data and FE Model, 2001-2004

Health insurance group	Y in absolute values		Y in ratios	
	Y=ln(TOTSAV)	Y=ln(NMCON)	Y= TOTSAV/HHINC	Y=NMCON/HHINC
Treatment ($\gamma + \rho_5$)	-0.004	0.204	0.517	-0.515
Control:				
SSS (γ)	-0.214	-0.043	-0.159	0.171
CSMBS ($\gamma + \rho_1$)	-0.104	0.222	0.293	-0.291
Private HI ($\gamma + \rho_2$)	0.649	0.371	-0.850	0.799
MWS ($\gamma + \rho_3$)	0.101	0.266	-0.694	0.739
VHCS ($\gamma + \rho_4$)	-0.226	0.179	-0.061	0.061
Weighted average	-0.055	0.194	-0.226	0.244

Note: The regression equation is:

$$\bar{Y}_{c,t} = \beta_0 + \beta' \bar{\boldsymbol{X}}_{c,t} + \gamma T + \delta_1 \bar{G}^{csmbs}_{c,t} + \delta_2 \bar{G}^{priv}_{c,t} + \delta_3 \bar{G}^{mws/uce}_{c,t} + \delta_4 \bar{G}^{vhcs/ucp1}_{c,t} + \delta_5 \bar{G}^{unins/ucp2}_{c,t} + \rho_1 T.\bar{G}^{csmbs}_{c,t} + \rho_2 T.\bar{G}^{priv}_{c,t} + \rho_3 T.\bar{G}^{mws/uce}_{c,t} + \rho_4 T.\bar{G}^{vhc/ucp1}_{c,t} + \rho_5 T.\bar{G}^{unins/ucp2}_{c,t} + \bar{a}_c + \bar{\varepsilon}_{c.t}$$

Table 3-14 Difference-in-Difference Estimates based on Pseudo-Panel Data and FE Model, 2001-2004

Comparison group	Y in absolute values		Y in ratios	
	Y=ln(TOTSAV)	Y=ln(NMCON)	Y= TOTSAV/HHINC	Y=NMCON/HHINC
SSS (ρ_5)	0.211	0.247*	0.676	-0.686
CSMBS ($\rho_5 - \rho_1$)	0.100	-0.018	0.223	-0.224
Private HI ($\rho_5 - \rho_2$)	-0.653	-0.167	1.367	-1.315
MWS ($\rho_5 - \rho_3$)	-0.104	-0.062	1.211	-1.255
VHCS ($\rho_5 - \rho_4$)	0.222	0.025	0.577	-0.576
Weighted average	0.052	0.010	0.742	-0.759

Note: *** p<0.01, ** p<0.05, * p<0.1; the regression equation is the same as the above.

Table 3-15 Pseudo-Panel Estimates of UCS impacts on Household Savings and Consumption (Absolute Values), 2001-2007

Variables	Y=ln(TOTSAV)				Y=ln(NMCON)			
	FE model		RE model		FE model		RE model	
	coef	se	coef	se	coef	se	coef	se
Health insurance:								
CSMBS (δ_1)	-1.812**	0.72	-2.223***	0.37	-0.619***	0.19	-0.701***	0.11
Private health insurance (δ_2)	-0.845	1.54	-0.017	1.09	-0.201	0.42	-0.078	0.30
MWS/UCE (δ_3)	-3.432***	0.76	-3.556***	0.47	-0.774***	0.20	-1.059***	0.13
VHCS/UCP1 (δ_4)	-2.883***	0.71	-3.405***	0.45	-0.560***	0.19	-0.884***	0.13
Uninsured/UCP2 (δ_5)	-2.808***	0.66	-2.917***	0.43	-0.595***	0.18	-0.727***	0.12
T (γ)	-0.232	0.47	-0.158	0.41	-0.239*	0.13	-0.164	0.12
T x CSMBS (ρ_1)	0.344	0.50	0.223	0.45	0.535***	0.14	0.477***	0.13
T x Private health insurance (ρ_2)	2.574	2.01	0.194	1.38	1.180**	0.52	1.284***	0.39
T x MWS/UCE (ρ_3)	0.829	0.60	0.614	0.50	0.604***	0.16	0.524***	0.14
T x VHCS/UCP1 (ρ_4)	-0.220	0.64	-0.199	0.52	0.534***	0.18	0.453***	0.15
T x Uninsured/UCP2 (ρ_5)	0.634	0.62	0.781	0.52	0.616***	0.17	0.544***	0.15
Age of household head								
25-29	(dropped)		-1.476***	0.15	(dropped)		-0.380***	0.04
30-34	(dropped)		-1.174***	0.14	(dropped)		-0.235***	0.04
35-39	(dropped)		-0.938***	0.12	(dropped)		-0.147***	0.03
40-44	(dropped)		-0.639***	0.11	(dropped)		-0.067**	0.03
45-49	(dropped)		-0.269***	0.10	(dropped)		0.007	0.03
50-54	(dropped)		-0.035	0.10	(dropped)		0.050*	0.03
Education of household head:								
Elementary-Lower	0.213	0.79	1.062**	0.42	0.178	0.19	0.121	0.12
Elementary-Upper	-0.119	0.85	1.510***	0.44	0.315	0.21	0.301**	0.12
Secondary-Lower	0.458	0.85	1.974***	0.46	0.738***	0.21	0.578***	0.13
Secondary-Upper	0.770	0.86	1.985***	0.49	0.750***	0.21	0.777***	0.13
Vocational-Upper	0.859	0.99	2.412***	0.61	0.903***	0.25	0.829***	0.16
Vocational-Lower	0.658	0.88	2.059***	0.51	0.894***	0.22	0.804***	0.14
University	1.570*	0.87	3.077***	0.50	1.165***	0.22	1.071***	0.14
Higher than Bachelor	4.550***	1.34	4.635***	0.81	1.697***	0.35	1.523***	0.23

Household size	0.068	0.07	0.124***	0.05	0.169***	0.02	0.184***	0.01
Household’s socioeconomic status:				0.34				
Farm operator (own land)	1.021	0.68	0.987***	0.47	0.299*	0.15	0.239***	0.09
Farm operator (rent land)	1.061	0.92	1.905***	0.32	-0.097	0.19	0.329***	0.12
Entrepreneurs, trade and industry	1.776***	0.63	1.663***	0.39	0.726***	0.14	0.597***	0.08
Professional, technical and managerial	1.037	0.65	0.660*	0.34	0.654***	0.15	0.399***	0.10
Other employees	0.523	0.56	0.368	0.31	0.555***	0.13	0.216**	0.09
Economically inactive household	0.695	0.59	0.687**	0.14	0.715***	0.13	0.375***	0.08
Region:				0.16				
Central	(dropped)		-0.095	0.15	(dropped)		-0.142***	0.04
Northern	(dropped)		0.099	0.15	(dropped)		-0.319***	0.04
Northeastern	(dropped)		-0.010	0.16	(dropped)		-0.309***	0.04
Southern	(dropped)		0.001		(dropped)		-0.203***	0.04
Non-municipal area (rural)	-0.033	0.23	0.074		-0.054	0.06	-0.048	0.04
Intercept	8.927***	1.15	8.509***	0.63	8.095***	0.29	8.810***	0.17
Number of observations	1,189				1,294			
sigma_e	0.814		0.814		0.240		0.240	
sigma_u	0.818		0.299		0.285		0.062	
Rho	0.503		0.119		0.584		0.062	
Hausman test (chi2 test)								
chi2	29.00				100.25			
Prob > chi2	0.3609				0.0000			

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 3-16 Pseudo-Panel Estimates of UCS Impacts on Household Savings and Consumption (Ratios to Income), 2001-2007

Variables	Y=TOTSAV/HHINC				Y=NMCON/HHINC			
	FE model		RE model		FE model		RE model	
	coef	se	coef	se	coef	se	coef	se
Health insurance:								
CSMBS (δ_1)	-1.382	1.047	-0.724	0.535	1.375	1.046	0.718	0.534
Private health insurance (δ_2)	-0.462	2.259	-0.612	1.545	0.466	2.257	0.640	1.544
MWS/UCE (δ_3)	-2.202**	1.076	-1.419**	0.664	2.156**	1.075	1.382**	0.663
VHCS/UCP1 (δ_4)	-1.719*	1.039	-1.131*	0.641	1.683	1.039	1.105*	0.641
Uninsured/UCP2 (δ_5)	-1.993**	0.960	-1.500**	0.613	1.963**	0.960	1.484**	0.613
T (γ)	-0.056	0.712	-0.097	0.614	0.068	0.712	0.098	0.614
T x CSMBS (ρ_1)	-0.061	0.772	0.026	0.670	0.051	0.772	-0.022	0.670
T x Private health insurance (ρ_2)	1.091	2.822	0.687	1.962	-1.093	2.820	-0.715	1.962
T x MWS/UCE (ρ_3)	0.073	0.882	0.116	0.731	-0.060	0.882	-0.084	0.731
T x VHCS/UCP1 (ρ_4)	-0.131	0.947	-0.090	0.765	0.133	0.947	0.109	0.765
T x Uninsured/UCP2 (ρ_5)	0.580	0.931	0.440	0.761	-0.590	0.931	-0.434	0.761
Age of household head								
25-29	(dropped)		-0.087	0.206	(dropped)		0.092	0.206
30-34	(dropped)		-0.074	0.189	(dropped)		0.077	0.189
35-39	(dropped)		-0.095	0.160	(dropped)		0.102	0.160
40-44	(dropped)		-0.328**	0.146	(dropped)		0.334**	0.146
45-49	(dropped)		-0.060	0.141	(dropped)		0.065	0.140
50-54	(dropped)		-0.031	0.137	(dropped)		0.034	0.137
Education of household head:								
Elementary-Lower	-0.220	1.043	-0.206	0.588	0.208	1.042	0.184	0.587
Elementary-Upper	-0.169	1.108	-0.301	0.604	0.155	1.108	0.277	0.604
Secondary-Lower	-0.249	1.144	0.047	0.632	0.226	1.143	-0.075	0.632
Secondary-Upper	-0.146	1.160	-0.599	0.673	0.154	1.159	0.582	0.673
Vocational-Upper	-0.365	1.344	-0.303	0.827	0.329	1.343	0.276	0.827
Vocational-Lower	-0.756	1.201	-0.427	0.702	0.745	1.200	0.412	0.701
University	-1.023	1.179	-0.708	0.690	1.004	1.179	0.670	0.689
Higher than Bachelor	-0.895	1.884	0.038	1.147	0.933	1.883	-0.028	1.146

Household size	-0.010	0.099	-0.015	0.062	0.012	0.099	0.014	0.062
Household's socioeconomic status:								
Farm operator (own land)	-0.207	0.830	-0.161	0.447	0.217	0.829	0.170	0.447
Farm operator (rent land)	-0.143	1.049	-0.235	0.584	0.134	1.048	0.225	0.584
Entrepreneurs, trade and industry	-0.328	0.768	0.323	0.409	0.349	0.767	-0.316	0.408
Professional, technical and managerial	0.595	0.822	0.252	0.510	-0.604	0.822	-0.250	0.509
Other employees	-0.372	0.694	-0.164	0.446	0.375	0.693	0.173	0.445
Economically inactive household	-0.594	0.727	-0.250	0.392	0.589	0.726	0.247	0.392
Region:								
Central	(dropped)		0.736***	0.195	(dropped)		-0.734***	0.195
Northern	(dropped)		0.824***	0.215	(dropped)		-0.823***	0.215
Northeastern	(dropped)		0.811***	0.209	(dropped)		-0.808***	0.209
Southern	(dropped)		0.774***	0.207	(dropped)		-0.774***	0.207
Non-municipal area (rural)	-0.142	0.329	-0.007	0.213	0.130	0.329	-0.004	0.213
Intercept	2.367	1.548	0.869	0.867	-1.361	1.547	0.138	0.866
Number of observations	1,294				1,294			
sigma_e	1.298		1.298		1.297		1.297	
sigma_u	0.927		0.000		0.926		0.000	
Rho	0.338		0.000		0.338		0.000	
Hausman test (chi2 test)								
chi2	14.84				14.97			
Prob > chi2	0.9717				0.9726			

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 3-17 Changes in Savings and Consumption after the UCS based on Pseudo-Panel Data and RE Model, 2001-2007

Health insurance group	Changes in absolute values		Changes in ratios	
	Y=ln(TOTSAV)	Y=ln(NMCON)	Y=TOTSAV/HHINC	Y=NMCON/HHINC
Treatment ($\gamma+\rho_5$)	0.624	0.380	0.343	-0.336
Control:				
SSS (γ)	-0.158	-0.164	-0.097	0.098
CSMBS ($\gamma+\rho_1$)	0.066	0.313	-0.071	0.076
Private HI ($\gamma+\rho_2$)	0.037	1.120	0.589	-0.618
MWS ($\gamma+\rho_3$)	0.457	0.360	0.019	0.013
VHCS ($\gamma+\rho_4$)	-0.357	0.289	-0.188	0.206
Weighted average	0.096	0.270	-0.053	0.070

Note: The regression equation is:

$$\bar{Y}_{c,t} = \beta_0 + \beta'\bar{\boldsymbol{X}}_{c,t} + \gamma T + \delta_1 \bar{G}_{c,t}^{csmbs} + \delta_2 \bar{G}_{c,t}^{priv} + \delta_3 \bar{G}_{c,t}^{mws/uce} + \delta_4 \bar{G}_{c,t}^{vhcs/ucp1} + \delta_5 \bar{G}_{c,t}^{unins/ucp2} + \rho_1 T.\bar{G}_{c,t}^{csmbs} + \rho_2 T.\bar{G}_{c,t}^{priv} + \rho_3 T.\bar{G}_{c,t}^{mws/uce} + \rho_4 T.\bar{G}_{c,t}^{vhc/ucp1} + \rho_5 T.\bar{G}_{c,t}^{unins/ucp2} + \bar{a}_c + \bar{\varepsilon}_{c.t}$$

Table 3-18 Difference-in-Difference Estimates based on Pseudo-Panel Data and RE Model, 2001-2007

Comparison group	Changes in absolute values		Changes in ratios	
	Y=ln(TOTSAV)	Y=ln(NMCON)	Y=TOTSAV/HHINC	Y=NMCON/HHINC
SSS (ρ_5)	0.781	0.544***	0.440	-0.434
CSMBS ($\rho_5-\rho_1$)	0.558**	0.068	0.414	-0.412
Private HI ($\rho_5-\rho_2$)	0.587	-0.740*	-0.247	0.282
MWS ($\rho_5-\rho_3$)	0.167	0.020	0.323	-0.350
VHCS ($\rho_5-\rho_4$)	0.980**	0.091	0.530	-0.543
Weighted average	0.528*	0.111	0.396	-0.406

Note: *** p<0.01, ** p<0.05, * p<0.1; the regression equation is the same as the above.

Table 3-19 Difference-in-Difference Estimates based on Pseudo-Panel Data and FE Model: Alternative Measures of Savings and Consumption, 2001-2004

Comparison group	Y in absolute terms			Y in ratios		
	Y=ln(NDSAV)	Y=ln(NTASST)	Y=ln(NMNDCON)	Y=NDSAV/HHINC	Y=NTASST/HHINC	Y=NMNDCON/HHINC
SSS (ρ_5)	0.432	-0.047	0.108	0.613	1.215**	-0.623
CSMBS ($\rho_5 - \rho_1$)	0.145	0.505	-0.003	0.164	0.786***	-0.164
Private HI ($\rho_5 - \rho_2$)	0.626	0.400	-0.675	0.947	3.337	-0.894
MWS ($\rho_5 - \rho_3$)	-0.261	-0.371	-0.147	1.059	0.886	-1.103
VHCS ($\rho_5 - \rho_4$)	0.074	0.958	0.012	0.521	0.952*	-0.520
Weighted average	0.030	0.186	-0.048	0.643	0.959***	-0.660

Note: *** p<0.01, ** p<0.05, * p<0.1

The regression equation is:

$$\bar{Y}_{c,t} = \beta_0 + \beta'\bar{\boldsymbol{X}}_{c,t} + \gamma T + \delta_1 \bar{G}_{c,t}^{csmbs} + \delta_2 \bar{G}_{c,t}^{priv} + \delta_3 \bar{G}_{c,t}^{mws/uce} + \delta_4 \bar{G}_{c,t}^{vhcs/ucp1} + \delta_5 \bar{G}_{c,t}^{unins/ucp2} + \rho_1 T.\bar{G}_{c,t}^{csmbs} + \rho_2 T.\bar{G}_{c,t}^{priv} + \rho_3 T.\bar{G}_{c,t}^{mws/uce} + \rho_4 T.\bar{G}_{c,t}^{vhc/ucp1} + \rho_5 T.\bar{G}_{c,t}^{unins/ucp2} + \bar{a}_c + \bar{\varepsilon}_{c.t}$$

Table 3-20 Difference-in-Difference Estimates based on Pseudo-Panel Data and RE Model: Alternative Measures of Savings and Consumption, 2001-2007

Comparison group	Y in absolute values		Y in ratios	
	Y=ln(NDSAV)	Y=ln(NMNDCON)	Y=NDSAV/HHINC	Y=NMNDCON/HHINC
SSS (ρ_5)	1.125***	0.341***	0.476	-0.470
CSMBS ($\rho_5 - \rho_1$)	0.436***	0.066	0.360	-0.359
Private HI ($\rho_5 - \rho_2$)	0.159	-0.738**	-0.300	0.335
MWS ($\rho_5 - \rho_3$)	0.154	-0.010	0.278	-0.304
VHCS ($\rho_5 - \rho_4$)	0.422*	-0.001	0.560	-0.572
Weighted average	0.424***	0.052	0.374	-0.384

Note: *** p<0.01, ** p<0.05, * p<0.1; the regression equation is the same as the above.

Table 3-21 Difference-in-Difference Estimates based on Pseudo-Panel Data and FE Model: Remaining Uninsured Included, 2001-2004

Comparison group	Y in absolute values		Y in ratios	
	Y=ln(TOTSAV)	Y=ln(NMCON)	Y=TOTSAV/HHINC	Y=NMCON/HHINC
SSS (ρ_5)	0.187	0.242	0.680	-0.684
CSMBS ($\rho_5 - \rho_1$)	-0.397	-0.032	0.153	-0.156
Private HI ($\rho_5 - \rho_2$)	-0.729	-0.084	1.701	-1.633
MWS ($\rho_5 - \rho_3$)	-0.112	-0.028	1.250	-1.285
VHCS ($\rho_5 - \rho_4$)	-0.770	-0.042	0.422	-0.431
Weighted average	-0.284	0.006	0.713	-0.729

Note: *** p<0.01, ** p<0.05, * p<0.1

The regression equation is:

$$\bar{Y}_{c,t} = \beta_0 + \beta'\bar{\boldsymbol{X}}_{c,t} + \gamma T + \delta_1 \bar{G}_{c,t}^{csmbs} + \delta_2 \bar{G}_{c,t}^{priv} + \delta_3 \bar{G}_{c,t}^{mws/uce} + \delta_4 \bar{G}_{c,t}^{vhcs/ucp1} + \delta_5 \bar{G}_{c,t}^{unins/ucp2} + \rho_1 T.\bar{G}_{c,t}^{csmbs} + \rho_2 T.\bar{G}_{c,t}^{priv} + \rho_3 T.\bar{G}_{c,t}^{mws/uce} + \rho_4 T.\bar{G}_{c,t}^{vhc/ucp1} + \rho_5 T.\bar{G}_{c,t}^{unins/ucp2} + \rho_6 T.\bar{G}_{c,t}^{remain\_unins} + \bar{a}_c + \bar{\varepsilon}_{c.t}$$

Table 3-22 Difference-in-Difference Estimates based on Pseudo-Panel Data and RE Model: Remaining Uninsured Included, 2001-2007

Comparison group	Y in absolute values		Y in ratios	
	Y=ln(TOTSAV)	Y=ln(NMCON)	Y=TOTSAV/HHINC	Y=NMCON/HHINC
SSS (ρ_5)	0.674	0.503***	0.396	-0.391
CSMBS ($\rho_5 - \rho_1$)	0.652**	0.064	0.383	-0.382
Private HI ($\rho_5 - \rho_2$)	0.476	-0.909**	-0.279	0.309
MWS ($\rho_5 - \rho_3$)	0.313	-0.003	0.289	-0.316
VHCS ($\rho_5 - \rho_4$)	1.042**	0.112	0.499	-0.511
Weighted average	0.602**	0.096	0.362	-0.373

Note: *** p<0.01, ** p<0.05, * p<0.1; the regression equation is the same as the above.

Table 3-23 Difference-in-Difference Estimates based on Repeated Cross-Section Data and Quantile Regression, 2001-2004

Health insurance group	Y = ln(TOTSAV)				Y=ln(NMCON)			
	OLS	QR_25	QR_50	QR75	OLS	QR_25	QR_50	QR75
SSS (ρ_5)	0.515***	0.493***	0.462***	0.383***	0.225***	0.169***	0.186***	0.273***
CSMBS ($\rho_5 - \rho_1$)	0.216***	0.178**	0.170***	0.178***	0.028	0.031	0.034*	0.063***
Private HI ($\rho_5 - \rho_2$)	0.646***	0.715***	0.769***	0.460***	-0.022	-0.034	0.003	-0.026
MWS ($\rho_5 - \rho_3$)	0.584***	0.512***	0.597***	0.551***	0.191***	0.187***	0.163***	0.201***
VHCS ($\rho_5 - \rho_4$)	0.219***	0.133*	0.190***	0.273***	0.073***	0.038*	0.043**	0.085***
Weighted average	0.403***	0.348***	0.381***	0.366***	0.125***	0.109***	0.104***	0.145***

Note: *** p<0.01, ** p<0.05, * p<0.1

The regression equation is:

$$Y_{h,t} = \beta_0 + \beta' \boldsymbol{X}_{h,t} + \gamma T + \delta_1 G_{h,t}^{csmbs} + \delta_2 G_{h,t}^{priv} + \delta_3 G_{h,t}^{mws/uce} + \delta_4 G_{h,t}^{vhcs/ucp1} + \delta_5 G_{h,t}^{unins/ucp2} + \rho_1 T.G_{h,t}^{csmbs} + \rho_2 T.G_{h,t}^{priv} + \rho_3 T.G_{h,t}^{mws/uce} + \rho_4 T.G_{h,t}^{vhc/ucp1} + \rho_5 T.G_{h,t}^{unins/ucp2} + a_h + \varepsilon_{h.t}$$

Table 3-24 Difference-in-Difference Estimates based on Repeated Cross-Section Data and Quantile Regression, 2001-2007

Health insurance group	Y = ln(TOTSAV)				Y=ln(NMCON)			
	OLS	QR_25	QR_50	QR75	OLS	QR_25	QR_50	QR75
SSS (ρ_5)	0.443***	0.466***	0.354***	0.371***	0.224***	0.165***	0.165***	0.319***
CSMBS ($\rho_5 - \rho_1$)	0.016	0.043	-0.110*	-0.042	-0.045**	-0.054**	-0.051*	-0.041
Private HI ($\rho_5 - \rho_2$)	0.723***	0.751***	0.755***	0.396**	0.055	0.027	0.068	0.064
MWS ($\rho_5 - \rho_3$)	-0.002	0.074	-0.068	0.021	-0.032	-0.021	-0.047*	-0.027
VHCS ($\rho_5 - \rho_4$)	-0.092	-0.076	-0.053	-0.040	-0.052**	-0.023	-0.051	-0.034
Weighted average	0.062	0.104	0.003	-0.046	-0.001	-0.003	-0.017	0.018

Note: *** p<0.01, ** p<0.05, * p<0.1; the regression equation is the same as the above.

Chapter 4 Why Do the Sick Not Use Publicly Provided Health Care?: The Case of Thailand's Universal Health Coverage Scheme

4.0 Introduction

A primary objective of public health insurance programs is to improve the health of the general population. Consequently, many governments in both developed and developing countries have implemented public health insurance programs in order to improve access to health care, particularly among the workers in the informal sector and other low-income groups. However, it is often the case that the insured are reluctant to utilize public health care services even though these services are provided at little or no cost. Instead, they choose other alternatives such as going to private providers, purchasing medicine without a prescription, using traditional medicine, or doing nothing. Low utilization rates of public health care services among the insured could be due to the characteristics of the program itself, such as low quality of health care, or it could reflect the characteristics of individuals, such as perceptions about the quality of care. In order to ensure that health insurance benefits actually reach the targeted population, it is important to understand why public health services are sometimes not used by the insured. In order to do so, an analysis of individual health care choice is required to assess which groups of the insured are less likely to use the public health services, and why these individuals are more inclined to choose alternatives other than using services provided by the public health insurance program.

This chapter investigates the extent and nature of non-use of the health care services provided by the Universal Healthcare Coverage Scheme (hereafter called the UCS) in Thailand. This public health insurance scheme was introduced in 2001 to make health care accessible to previously uninsured people in Thailand, in order to protect them against health risks and, more generally, to improve their health status. Currently, the UCS covers more than 70 percent of the Thai population, and eligible individuals are automatically entitled to receive UC health cards, which can be used to obtain health care services at those individuals' registered primary care unit.[37] While the rate of *enrollment* in the UCS has been very high (more than 90 percent), the rate of *use* of UC health cards to obtain health insurance benefits appears to be low, particularly for outpatient care. More specifically, the 2007 Health and Welfare Survey data reveal that, when they are sick, only about 40 percent of all UCS beneficiaries use their UC cards to obtain free outpatient care at their registered UC facilities, while about 27 percent choose to self-medicate (i.e., buy their own medicine without a prescription), about 23 percent pay for the services of private health care providers, and the rest either do nothing or use herbal/traditional medicine. More interestingly, among people who have more than one outpatient visit for the same illness and choose to visit UC facilities for the first visit, 50 percent choose other options for the second visit.

To understand this puzzling low utilization for the UCS, this chapter examines which characteristics of the beneficiaries and the program affect the utilization of the

[37] UC facilities are the health care facilities that serve as the primary care unit for UCS beneficiaries. The majority of these facilities are public health care facilities, including community health centers, community hospitals, provincial hospitals, and regional hospitals. However, a very small number of UC facilities are private clinics and private hospitals that have contracts with the National Health Security Office (NHSO).

program, accounting for the fact that the beneficiaries have other alternatives, including receiving treatment from public non-UC and private health providers, self-medicating, using traditional medicine, or doing nothing. First, the chapter develops a theoretical model to explain the mechanism by which each factor affects a UCS beneficiary's decision to use the health care services provided by that scheme or the services received from alternative providers, including the choice of doing nothing. The implications of the model are tested empirically using the 2007 Thai Health and Welfare Survey.

The chapter is organized as follows. Section 4.1 describes Thailand's health care system, and Section 4.2 reviews the literature on low utilization of health care services in Thailand and in other countries. Section 4.3 presents a theoretical model to explain individual health care choices, and an empirical specification based on this model is developed in Section 4.4. Section 4.5 describes the data, and Section 4.6 presents the results. Finally, Section 4.7 concludes and discusses policy implications.

4.1. Background on Thailand's Health Care System

Prior to 2001, a majority of the Thai population was covered by four public health insurance schemes: the Civil Servant Medical Benefit Scheme (CSMBS), the Social Security Scheme (SSS), the Medical Welfare Scheme (MWS), [38] and the Voluntary Health Card Scheme (VHCS). The first two were for employees in the public and formal private sectors, respectively.[39] The other two schemes were government-subsidized

---

[38] Medical Welfare Scheme (MWS) later became the Low-income Card Scheme (LICS).

[39] The CSMBS was a benefit provided to all government employees, their dependents (including spouse, parents, and up to three children below age 20), and retirees from the public sector. On the other hand, the Social Security Scheme (SSS) was a compulsory health insurance for employees in the formal private sector.

health insurance provided to disadvantaged groups (MWS) and to those who were near poor and not eligible for the other schemes (VHCS).[40] Nevertheless, despite the existence of these four schemes, there still remained a large segment of the population (about 18.5 million, or 30 percent of the total population) that was still uninsured up until the year 2001 (Sakunphanit, 2006). This last group consisted of people who were not eligible for the first three schemes and chose not to purchase a health care card to enroll in the VHCS.

In October 2001, the Thai government launched the Universal Healthcare Coverage Scheme, which provided access to healthcare for all individuals who were previously uninsured. With this new scheme in place, Thailand now has three public schemes that are financed from public resources: the Civil Servants Medical Benefit Scheme (CSMBS), the Social Security Scheme (SSS), and the Universal Coverage Scheme (UCS).[41] In 2007, these three health insurance schemes cover approximately 96.7 percent of Thai citizens: 9.3 percent were covered by the CSMBS, 12.4 percent were covered by the SSS, and 75 percent were covered by the UCS (National Statistical Office, 2007). The rest of the population was covered by private health insurance or by health insurance provided by private employers. More details about Thailand's health care system can be found in Hanvoravongchai and Hsiao (2007) and Sakunphanit (2006).

[40] The VHCS required each person to purchase a health card that cost 500 baht per year in order to enroll in the scheme.

[41] The UCS is also known as the 30-baht or the Gold Card (GC) Scheme. The name "30-baht" follows the 30 baht copayment, and the "Gold Card (GC)" refers to the health cards issued to this group of the population. The regular Gold Cards (GC) are issued to beneficiaries who need to pay the 30 baht copayment, and the Gold Cards with exemption (GCE) are issued to those who are exempted from the copayment. In this chapter, the term Universal Coverage Scheme (UCS) will be used instead of the 30-baht Scheme, and it includes both GC and GCE.

Since the UCS is the focus of this chapter, it is worth summarizing the main characteristics of the scheme. First, the UCS is designated for all members of the population who are not covered by the other two schemes. Thus, it includes those who were previously covered by the MWS and VHCS, as well as those who were previously uninsured. In other words, the UCS includes people who are self-employed, unemployed, disabled, children, or elderly.

Second, the UCS delivers health care to its beneficiaries by using the *primary care-based* system, in which primary care provider units (PCUs) are assigned to be gatekeepers in providing health care for people in their catchment areas. In this context, the "Contracting units for primary care" (CUPs) are primary health facilities that offer curative, preventive, and rehabilitative services to the UCS beneficiaries.[42] Thus, the UCS beneficiaries must register with one or two health facilities within the CUP in the area where they live, and to obtain health care they must use the services from their registered health care facilities (i.e. UC facilities). In the cases where the patients need higher level of care, they will be referred to higher-level health facilities that are under the management of the National Health Security Office (NHSO).[43]

Third, the UCS provides a comprehensive package in terms of conditions included. However, not all services are covered by the UCS; some expensive procedures

[42] More details on the minimum CUP requirements (e.g. minimum numbers of health workers per 10,000 persons) can be found in Wibulpolprasert and Thaiprayoon (2008).
[43] The NHSO is the organization that administers the UCS budget and its health care delivery.

such as cosmetic surgery, obstetric delivery beyond two pregnancies, organ transplant, and renal dialysis are not covered.[44]

Fourth, the payment mechanism for the UCS is a capitation payment, that is a payment method in which a fixed amount of payment per person per year is allocated by the government to the health facility at which the person has registered.[45] Finally, from 2001 to 2006 the UCS required each individual to pay 30 baht[46] per visit for outpatient or inpatient care, which includes the cost of those drugs that are on the specified list. During this period, the 30-baht copayment was not required for the elderly (age 60+), children below age 12, the handicapped, Buddhist monks, veterans, community leaders, and individuals whose monthly income was below 3000 baht. In 2007 this exemption was extended to everyone covered by the UCS, and so the 30-baht copayment ceased to exist.[47]

4.2. Literature Review

Previous studies of low utilization of public health insurance programs have attempted to answer two main questions: (i) Why do eligible individuals not enroll in the program (the low take-up problem)? and (ii) Why do some individuals give up the benefits to which they are entitled and instead choose alternatives to the program (the

---

[44] Note that there have been some changes with the coverage over time, including coverage of ARV drugs for HIV patients. More details on the inclusive list and the exclusive list of treatments covered by the UCS can be found in Chapter 2.
[45] For the UCS, the capitation payment was 1202, 1309, 1396, 1659, 2089, 2100, and 2202 baht in years 2003, 2004, 2005, 2006, 2007, 2008, and 2009 respectively. These numbers are determined by the Ministry of Public Health under the government's approval.
[46] Thirty baht is approximately $0.89 (exchange rate 1$ = 33.38 baht, on November 3, 2009).
[47] The 30-baht copayment was eliminated in November 2007. However, the data used in this chapter were collected during January-June 2007. Hence, some respondents still needed to pay the copayment at the time they were interviewed.

non-use problem)? Low take-up rates are a common problem in implementing public assistance programs, particularly in developed countries. Studies in this area have shown that low participation is usually due not to direct financial costs, but rather to factors such as the time required to participate, the difficulty of application procedures, and lack of information about eligibility and the enrollment in the program (Aizer, 2007; Currie, 2004; Currie & Gruber, 1996; Remler, Rachlin, & Glied, 2001). In addition, some unobserved characteristics, such as the "stigma" that is attached to the program, can contribute to low rates of participation in the public programs (Moffit, 1983). Since the UCS has a simple registration system, the enrollment rate in the program has been very high, suggesting that the take-up problem is of less concern for the UCS.

An analysis of the non-use problem of public health insurance requires an understanding of why individuals choose alternatives other than those services publicly provided. In general, individuals often have alternatives to seeking care from professional health care providers. Particularly in developing countries, individuals may choose alternatives such as care from traditional healers, self-medication, or doing nothing. Previous studies have looked on the determinants of individuals' decisions to seek care at a health facility, as opposed to self-medicate or to do nothing. For instance, Hjortsberg (2003) used the 1998 Living Conditions Monitoring Survey (LCMS) in Zambia to examine which factors affect sick individuals' propensity to seek care at a health facility or to use self-medication (or do nothing). She found that, in addition to the type of illness, the decision to seek care is also greatly influenced by financial means, distance to health facilities, ownership of transportation, and the individual's perception of the health care quality. Moreover, Brown and Theoharides (2009) analyzed health care seeking in rural China, and found that age, food consumption share of household expenditure, and the presence of another sick member in the household have negative impacts on the decision to seek care. Finally, Trivedi (2004) and Chang and Trivedi (2003) examined self-medication behavior in Vietnam, and find that self-medication is an inferior good for high-income households but a normal good for low-income households. In the latter study, they also showed that health insurance has a negative impact on using self-prescribed drugs

Once the individuals decide to seek health care, they also have to choose the health care providers from whom they will receive the services. Many previous studies have analyzed the influences on individual decisions about health care providers, focusing mainly on the choice between public and private facilities. An example is Borah (2006), who found that price and distance to the facility appear to be the main factors affecting individuals' choices of outpatient health care providers in rural India. He also found that the sensitivities to price and to distance varied according to health conditions and household income levels, respectively. Nevertheless, an equally important factor in determining health care provider choice is the quality of care. Although quality *per se* is hard to measure and can be subjective, a number of studies focus on the impact of "perceived" quality of care on the individual's health care choice. For instance, Hanson *et al.* (2005) argue that the perceived quality, as determined by the thoroughness of examination, staff attitudes, and drug availability, plays an important role in determining the demand for hospital care in Zambia.

In addition to using certain health care attributes to indicate perceived quality, other studies also use the evidence of the “bypassing” phenomenon to infer the quality of health care and its impact on the choice of health care provider. One of the earliest studies in this area is Akin and Hutchinson (1999), who defined “bypassing” as the phenomenon where individuals travel past a free or subsidized local public health facility to obtain health services from a private health facility for which they need to pay. They found that bypassing behavior is generally not associated with income, but it is more common among those who are severely ill. Moreover, they argue that the benefits from the lower cost of public service and closer proximity of that facility cannot outweigh the disadvantage of its poor quality. In a more recent study, Gauthier and Wane (2008) study bypassing behavior in Chad, and suggest that there are two different types of bypassing behavior. On one hand, the rich bypass low-quality facilities in search of a higher quality of care. On the other hand, the poor bypass high-quality facilities that are unaffordable to them.

Another set of studies looks more specifically at the relationship between health insurance and health seeking behavior. For example, Jowett *et al.* (2004) evaluate the effect of Voluntary Health Insurance on patterns of treatment seeking behavior in Vietnam, and find that insured patients are more likely to seek outpatient care at public providers and that this effect is stronger for lower income households. Similarly, Sosa-Rubi *et al.* (2009) examined the impact of the Seguro Popular (SP) program in Mexico, focusing on its effects on pregnant women’s choices of obstetrical services providers. They found that the SP program reduced pregnant women’s attendance at both private facilities and non-SP state-run facilities, but the reduction was greater among those who attended non-SP state-run facilities than those who attended at private facilities. In addition, Sepehri *et al.* (2009) examined the factors that determine the insured's decision to use their health insurance card when seeking outpatient and inpatient care in Vietnam. They found that the probability of using insurance benefits varies inversely with income and level of education.

Finally, consider the very small literature on Thailand's UCS. This chapter builds upon a previous study by Suraratdecha *et al.* (2005), who examined how the UCS affects households' health seeking behavior and their probability of taking up program benefits. The authors use a probit model to estimate the probability that UCS beneficiaries decide, for their first treatment choice, to seek care at UC facilities, conditional on the probability that they are ill, using survey data from three low-income provinces in 2002. Their results show that the UCS beneficiaries' likelihood of seeking care at UC facilities is lower among those who must pay the 30-baht copayments, who live in an urban area, and who have a higher level of education. Note, however, that this study applies to the early stages of the UCS, and it is based on a survey of 1834 households in only three low-income provinces out of 76 provinces in all of Thailand. Hence, the results may not apply to the current UCS, and may not hold for the entire population of Thailand. This chapter will address these issues by building a theoretical model to understand the health care seeking behavior of the UCS beneficiaries, and by using a nested logit model to examine their health care choices, based on the most recent data available.

4.3. Theoretical model

The economic model in this section is adapted from the general model of health seeking behavior in Gertler and van der Gaag (1990) and the model of health care provider choice in Borah (2006). In this model, the individual health care choices include not only choosing different health care providers, but also the choices to self-medicate, to use alternative medicine (herbal or traditional medicine), or to do nothing. Moreover, in the event that the individual chooses to seek health care from a professional health provider, her decision is to decide between seeking free health care services from UC facilities or paying out-of-pocket to receive and potentially faster and better-quality services from non-UC facilities. For simplicity, suppose that the choices of self-medicating, using alternative medicine, and doing nothing are grouped together into one category called "no professional care". Accordingly, the individual, when sick, has three main treatment choices: (i) not seeking professional care, (ii) visiting UC facilities, and (iii) visiting non-UC facilities.

To start, consider an individual i whose utility depends on consumption (C) and health (H). If sick, she has the three health care alternatives mentioned above. Denote j as the health care choice, where $j=1$ if she does not seek professional care, $j=2$ if she uses the free health care services that are paid for by the UCS, and $j=3$ if she goes to a non-UC health care provider (either private or public) and pays for its services.[48] If individual i chooses treatment choice j, her utility function from that choice be written as:

[48] Visiting non-UC public facilities could occur if public hospitals provide health care outside of the regular office hours for some small extra charges, or the patients choose to visit well-known public hospitals or

$$U_{ij} = U_{ij}(H_{ij}, C_{ij}) \tag{1}$$

where H_{ij} is her health status after receiving health care services if choosing health care choice j and C_{ij} is the consumption of all other goods associated with choosing health care choice j.

Assume that the health outcome (H_{ij}) depends on the medical care obtained from choosing health care choice j (m_{ij}), which in turn depends on the characteristics of the health care choice that are constant across individuals ($\boldsymbol{\theta}_j$) and the attributes of the health care choice that vary across individuals ($\boldsymbol{Z}_{ij}$). Moreover, the health outcome also varies with the individual initial health conditions (H_{oi}), and the characteristics of the consumer ($\boldsymbol{X}_i$). This health production function can be written as:

$$H_{ij} = H_{ij}\big(m_{ij}, H_{oi}, \boldsymbol{X}_i\big) = H_{ij}\big(m_{ij}(\boldsymbol{\theta}_j, \boldsymbol{Z}_{ij}), H_{oi}, \boldsymbol{X}_i\big)\ . \tag{2}$$

Examples of characteristics of the health care choice that are constant across individuals ($\boldsymbol{\theta}_j$) are the number of health workers and the availability of medical devices at the health facility; and examples of the attributes of the health care choice that vary across individuals ($\boldsymbol{Z}_{ij}$) are the distance from the individual's house to the health care facility.

Furthermore, assume that this consumer spends all her income on either consumption goods or health. Hence, her budget constraint can be written as:

$$C_{ij} + P_{ij}^{M} = Y_i, \tag{3}$$

and $P_{ij}^{M} = P_{ij}^{OOP} + \big(T_{ij} + w_i * \tau_{ij}\big)\ ,$ (4)

university hospitals for better quality of care. Since there are a small number of observations in this category, it is combined with the category of non-UC private facilities.

where P_{ij}^{M} is the total costs of obtaining medical care (m_{ij}) from choice j, C_{ij} is the amount of money that individual *i* spends on all consumption goods other than health if she chooses health care choice j,[49] and Y_i is individual i's income. The total cost of obtaining medical care (P_{ij}^{M}) is equal to the sum of the out-of-pocket payment of medical care (P_{ij}^{OOP}) and the indirect cost of obtaining medical care that is measured by the transportation cost (T_{ij}) and individual i's forgone wages ($w_i * \tau_{ij}$), where $w_i$is the hourly wage rate and τ_{ij} is the time spent on travelling to, and/or the waiting time to receive care from, the health care provider j. Note that the total medical care cost (P_{ij}^{M}) in this context is not the cost per unit of medical care; rather it is the total amount of money spent on medical care. Alternatively, this total medical care cost can be viewed as the cost of forgone consumption when the individual chooses this particular choice j.

When choosing from among different medical care choices, the total cost varies due to variation in both the out-of-pocket expenditure and the indirect cost of getting the medical care. To illustrate, if individual *i* chooses to self-medicate (*j=1*) or to a visit non-UC facility (*j=2*), the out-of-pocket medical care costs will be some positive amounts P_{i1}^{m} and P_{i2}^{m}, respectively, where $P_{i1}^{m} < P_{i2}^{m}$ because the health care services provided by a health professional are more expensive than the health care provided by the individual herself. However, if she chooses to visit a UC facility (*j=3*), her out-of-pocket medical care cost is zero; that is, $P_{i3}^{m} = 0$.[50]

---

[49] The price of all other consumption goods is normalized to one.
[50] Assume for simplicity that individual *i* is a UCS beneficiary who is exempted from paying the 30-baht copayment.

In addition to the out-of-pocket medical payment, the indirect cost of obtaining medical care is contingent upon the transportation cost and the time spent traveling to the health facility and/or waiting to receive health care services. For self-medicating or doing nothing, the indirect cost is very small or close to zero, assuming that the nearest pharmacy is located near individual i's house. If individual *i* chooses to visit a UC facility, the transportation cost is likely to be small, but the wait-time is generally longer than at a non-UC facility, because the provision of free health care tends to induce higher demand for health care. If, instead, individual *i* chooses to visit a non-UC facility, the transportation cost and traveling time could be smaller or greater than that of visiting a UC facility, depending on whether the non-UC facility is a nearby private clinic or a more distant higher-level public facility. On one hand, if the non-UC facility chosen is a nearby private clinic, then the transportation cost and traveling time will be smaller. On the other hand, if the non-UC facility is a higher-level public facility located in a different district or province, then the transportation cost will be larger. Similarly, the wait-time at the non-UC facility could be greater or smaller than the wait-time at the UC facility, depending on the demand for medical care and the supply capacity at that particular facility. Thus, whether the indirect cost of visiting a UC facility is greater or smaller than the indirect cost of visiting a non-UC facility depends on the specific circumstances.

To describe which health care choice to select, individual *i*'s utility maximization problem can be written as:

$$\max_{j\in\{1,2,3\}} U\left[C_{ij}, H_{ij}\left(m_{ij}\left(\boldsymbol{\theta}_j, \boldsymbol{Z}_{ij}\right), H_{oi}, \boldsymbol{X}_i\right)\right] \qquad (5)$$

Subject to:

$$C_{ij} + P_{ij}^{OOP} + \left(T_{ij} + w_i * \tau_{ij}\right) = Y_i \qquad (6)$$

Rewriting the budget constraint in equation (6) and substituting C_{ij} as a function of income and medical care expenditure in the utility function, the utility maximization problem in (5) can be rewritten as:

$$\max_{j\in\{1,2,3\}} U\left[H_{ij}\left(m_{ij}\left(\boldsymbol{\theta}_j, \boldsymbol{Z}_{ij}\right), H_{oi}, \boldsymbol{X}_i\right), Y_i - P_{ij}^{OOP} - T_{ij} - w_i * \tau_{ij},\right] \qquad (7)$$

From this utility maximization problem, individual *i* makes a decision based on trading off between the utility gained from improved health status and the total cost of medical care, which can also be thought of as the forgone consumption of all other goods. To maximize her utility, individual *i* selects the medical care choice *j* that gives her the highest utility. That is, she will choose the choice *j* if the following condition is satisfied: $U_{ij}^{*} > U_{ik}^{*}, \forall k \neq j \in \{1,2,3\}$, where U_{ij}^{*} is the utility obtained from medical choice *j*.

The probability that individual *i* chooses health care choice *j* depends on the following set of observable factors: the individual's income; the costs of using that health care choice (both direct and indirect); the characteristics of health care choice *j* that do not vary across individuals (e.g. the size of the health care facility, the health care provider's training and experience; the number of physicians); the characteristics of individuals that do not vary across health care choice (e.g. age, gender, education, health conditions); and the characteristics of the health care choice that vary across individuals, such as the travel distance from the individual's home to each health facility. However, the extent to which each factor affects the individual's health care choice must be investigated empirically.

4.4. Empirical Specification

To investigate the utility maximization problem in (7) empirically, a nested logit model is used in this analysis in order to take into account the two types of health facilities (UC facility and non-UC facility) that are nested within the choice of seeking professional care and the two alternatives (doing nothing and self-medicating) that are nested within the choice of seeking no professional care. Most importantly, a nested logit model allows one to relax the independence of irrelevant alternatives (IIA) assumption, which is a strong assumption that is embodied in a standard multinomial logit model. In the first level of the model, individual *i* decides whether to seek care from a professional health provider. The second level of the model then consists of two sets of choices. On one hand, if individual *i* chooses not to seek care from a professional health provider, she has two alternatives: (i) doing nothing and (ii) self-medicating. If, on the other hand, individual *i* chooses to seek care from a professional health provider, she has two other alternatives: (i) visiting a UC facility and (ii) visiting a non-UC facility. This two-level nested logit model can be depicted in a tree structure as shown in Figure 4-1.

To illustrate, define *j* as the top-level alternative (nest) where *j=1* if the individual chooses to seek no care, and *j=2* if she chooses to seek care from a professional health care provider. Also, define k_1 as the bottom-level alternative (branch) when the individual does not seek professional care, where $k_1 = a$ if the individual chooses to do nothing, and $k_1 = b$ if she chooses to self-medicate. Likewise, define k_2 as the bottom-level alternative (branch) when the individual chooses to seek professional care, where $k_2 = c$ if the individual chooses to visit a UC facility, and $k_2 = d$ if she chooses to visit a non-UC facility. The utility for choosing alternative jk (i.e. the nest j in the first level and the alternative k in the second level) can be written as:

$$U_{jk} = V_{jk} + \varepsilon_{jk} = \boldsymbol{z}_j'\alpha + \boldsymbol{x}_{jk}'\beta_j + \varepsilon_{jk}, \quad (16)$$
[51]

where $j \in J = \{1, 2\}$, $k_1 \in K_1 = \{a, b\}$, and $k_2 \in K_2 = \{c, d\}$; $\boldsymbol{z}_j$ is the set of variables that change over nests only; $\boldsymbol{x}_{jk}$ is the set of variables that changes over nests and branches; and ε_{jk} is the error term.[52]

Let the binary indicator variable y_{jk} equal one if alternative jk is chosen, and zero otherwise. The associated probability that alternative jk is chosen can be written as:

$$p_{jk} = \Pr(y_{jk} = 1) = Pr(U_{jk} > U_{lm}, \forall l \neq j, m \neq k) \quad (17)$$

The nested logit model assumes that the error terms ε_{jk} have the generalized extreme value (GEV) joint cumulative distribution function. Following Amemiya (1985), the probability of choosing alternative k, given the choice of nest j can be illustrated as:

$$p_{k|j} = \frac{\exp(\boldsymbol{x}_{jk}'\beta_j/\rho_j)}{\sum_{m=1}^{K_j} \exp(\boldsymbol{x}_{jm}'\beta_j/\rho_j)}, \quad (18)$$

where ρ_j is a measure of the degree of independence in unobserved utility among the alternatives in nest j, and $0 \leq \rho_j \leq 1$ for the model to be consistent with utility-maximizing behavior. A higher value of ρ_j implies greater independence and less

---

[51] The subscript i used to identify the individual is omitted in the equations in this section.

[52] This specification is a general form of a nested logit model. In the empirical analysis in this chapter, the variables that change over nests only do not exist. Thus, all the explanatory variables are the variables that change over nests and branches (i.e. $\boldsymbol{x}_{jk}$).

correlation among the alternatives within the same nest. Note that, if $\rho_j = 1$ for all j, the nested logit model reduces to the standard multinomial logit model.

The probability of choosing nest j can be shown to be equal to:

$$p_j = \frac{\exp\,(\mathbf{z}_j'\alpha + \rho_j I_j)}{\sum_{l=1}^{J} \exp\,(\mathbf{z}_l'\alpha + \rho_l I_l)}, \tag{19}$$

where $I_j = ln\left(\sum_{m=1}^{K_j} \exp\,(\boldsymbol{x}_{jm}'\beta_j/\rho_j)\right)$ is called the inclusive value.

Based on the expressions in equations (18) and (19), the probability that nest j is chosen in the first level and alternative k is chosen in the second level can be derived as:

$$p_{jk} = p_j \times p_{k|j} = \frac{\exp\,(\mathbf{z}_j'\alpha + \rho_j I_j)}{\sum_{l=1}^{J} \exp\,(\mathbf{z}_l'\alpha + \rho_l I_l)} \times \frac{\exp\,(\boldsymbol{x}_{jk}'\beta_j/\rho_j)}{\sum_{m=1}^{K_j} \exp\,(\boldsymbol{x}_{jm}'\beta_j/\rho_j)}.\text{[53]} \tag{20}$$

To estimate equation (20), the dependent variable is the set of all alternatives, including the choices of doing nothing, self-medicating, visiting a UC facility, and visiting a non-UC facility. The explanatory variables include the variables that vary across alternatives (alternative-specific variables) and the variables that vary across individuals but are constant across alternatives (case-specific variables). Given the data available, the only alternative-specific variables are the distance from household to the nearest health facility of each type, and the densities of doctors who work in UC facilities and who work in non-UC facilities in the province.[54] The case-specific variables include individual and household characteristics, such as age, gender, education, household income, and location of household, the type of disease that the individual has, the number

[53] The derivations can be found in Train (2003) and Cameron and Trivedi (2005).
[54] This variable is assumed to be zero for the choices of doing nothing and self-medicating.

of days not being able to work, and whether another household member is sick. Moreover, the density of private clinics in the province is also included as another explanatory variable.

This chapter examines the factors that affect the individual's decision to seek care from a UC facility or to choose other alternatives. Reasons for not using the health care services provided by the UCS could reflect "access" problems, "quality of health care" problems, or other factors, such as the inconvenience associated with visiting a public health facility, or the individual's needs for specific types of care. If the individual has difficulty obtaining access to a health care facility, then the distances to the various health facilities should have a negative coefficient. However, if poor quality or inconvenience is the main problem, then one would expect the coefficients on the income among people who choose to visit non-UC facilities to have positive signs because they are more likely to be able to afford more expensive health care services. In other words, if the health care services provided at UC facilities are viewed as inferior goods, then the individuals with higher income are less likely to consume them.

Note that bypassing behavior, defined as a phenomenon in which a sick person travels past a nearby public health facility to a farther health facility,[55] is *not* examined in this chapter because there are only a few cases of individuals who bypass their registered UC facilities to visit higher level (and mostly farther away) public facilities and pay out-of-pocket for the services. In most cases, individuals who skip UC facilities and do not self-medicate choose to visit non-UC facilities, most of which are private facilities

[55] This is the definition of bypassing behavior in Akin and Hutchinson (1999).

located near their households. Thus, in some sense, the choice of visiting nearby private clinics instead of visiting UC facilities can also be considered as another type of bypassing, and such bypassing is addressed in this analysis.

4.5. Data and descriptive statistics

4.5.1 Data

The main dataset used in this analysis is the 2007 Thai Health and Welfare Survey (HWS), which was obtained from Thailand's National Statistics Office. The HWS data are collected from nationally representative repeated cross-sectional samples. The HWS was implemented every 5 years during 1981-2001 and have been collected annually since 2003. In 2007, 21,539 households and 69,679 individuals were interviewed in the HWS. The HWS includes information on individuals' health status (e.g. being sick or not, which disease the person has), their health care utilization, choice of medical provider, out-of-pocket health care expenditures, health insurance type, and whether each person makes use of the benefits from the health insurance scheme for which he or she is eligible. Moreover, the 2007 HWS data contain some broad socioeconomic and demographic variables, such as geographic area, age, gender, education, marital status, occupation, and earnings.

In addition to the HWS data, another dataset used in the analysis is a list of all public health care facilities operated by Thailand's Ministry of Public Health,[56] a list of all private hospitals, and the total number of private clinics available in each province.

[56] A few public hospitals are administered by other agencies. For instance, university hospitals (or teaching hospitals) are managed by the universities themselves, and hence are administered by the Ministry of Education.

All of these data are compiled by the Bureau of Policy and Strategy, which is part of the Ministry of Public Health. The public health facilities include community health centers, community hospitals, provincial hospitals, and regional hospitals, and all of them have detailed information on their locations (e.g. addresses). Similarly, the list of all private hospitals provides the exact address of each hospital. For private clinics, although the aggregate numbers of private clinics are available in all provinces, the geographical information of private clinics in 2007 is available for only 51 of Thailand's 76 provinces. Consequently, the sample in this analysis is restricted to the households living in these 51 provinces.[57]

The geographical information of all health facilities (except private clinics in some provinces) can be used to impute the densities of different health facilities at the sub-district (*Tambon*) level, which is the smallest administrative unit in Thailand. More importantly, by linking the household location to the location of the nearest health facility of each type, one can calculate the distances between households and the nearest health facility of each type. To do so, the distance between the centroid of the sub-district in which the household is located and the centroid of the district in which the nearest health facility is located was computed using ArcGIS 10. The information on distance can be

[57] The 51 provinces include 21 provinces in Central region (Samut Prakan, Nonthaburi, Pathum Thani, Phra Nakhon Si Aytthaya, Ang Thong, Lop Buri, Sing Buri, Saraburi, Chon Buri, Rayong, Chanthaburi, Chachoengsao, Prachin Buri, Sa Kaeo, Ratchaburi, Kanchanaburi, Suphan Buri, Samut Sakhon, Samut Songkhram, Phetchaburi, and Prachuap Khiri Khan), 12 provinces in Northeastern region (Buri Ram, Surin, Si Sa Ket, Ubon Ratchathani, Yasothon, Chaiyaphum, Amnat Charoen, Loei, Nong Khai, Maha Sarakham, Roi Et, and Mukdahan), 7 provinces in North region (Lamphun, Uttaradit, Phayao, Chiang Rai, Uthai Thani, Tak, and Phitsanulok), and 10 provinces in South region (Krabi, Phangnga, Phuket, Surat Thani, Chumpon, Songkhla, Satun, Phattalung, Pattani, and Narathiwat).

used as a measure of access to health care for different types of health care provider choices.

Finally, the last dataset used in this analysis is the numbers of doctors and nurses working in public hospitals (community hospitals, provincial hospitals, and regional hospitals) and the number of doctors working in the private sector, all of which are collected by the Bureau of Policy and Strategy in the Ministry of Public Health. By dividing the number of doctors in both the public and private sectors in a province by the population of that province, one can obtain the ratios of public and private doctors per person. These ratios can be used as proxies of the wait-time at public facilities and private facilities, respectively. Nevertheless, the numbers of doctors has one limitation, which is that they are aggregated at the provincial level. Hence, the variation in the densities of doctors per population in a smaller geographical level, such as district or sub-district, cannot be captured by these numbers.

4.5.2 Descriptive Statistics

4.5.2.1 Individual and Household Characteristics

The statistics in Table 4-1 describe some characteristics of the survey respondents, including individual characteristics, such as age, sex, and marital status; health-related information, such as type of health insurance, whether a person has been sick in the past 4 weeks, and whether he or she required in-patient care in the past 12 months; and household characteristics, such as the location (region and urban vs. rural) of the household, household size, and monthly household income. The first column of this table reports the characteristics of all persons drawn from the 51-province sample, whereas the second column presents the characteristics of UCS beneficiaries. In general, the characteristics of both groups are very similar. For instance, the average age of people in both groups is approximately 34-35 years old; 47 percent of them are male; about 20 percent have been sick in the past four weeks and 6 percent required in-patient care in the past twelve months. Nevertheless, some characteristics are somewhat different across these two groups. In particular, the general population has, on average, one more year of schooling than the UCS beneficiaries. Moreover, the proportion of general population living in urban areas is slightly higher (6 percent) than the proportion of UCS beneficiaries living in urban areas. Likewise, the average monthly household income of the general population is approximately 4,500 baht (or 27 percent) higher than that of the UCS beneficiaries. These statistics reflect that, on average, the UCS beneficiaries tend to have lower socio-economic status when compared to the general population.

As described in Section 4.1, each UCS beneficiary is required to register with a UC facility designated as his or her primary care unit. In some cases, a UCS beneficiary can have a second registered health facility, particularly when the first registered health facility is a community health center. Table 4-2 presents the percentage of the types of both the first and the second UC facilities with which the UCS beneficiaries are registered. The most common type of the first registered health facility is community health centers (55.4 percent), followed by community hospitals (28.4 percent) and provincial hospitals (14.7 percent). Moreover, most UCs beneficiaries whose first registered health facilities are community health centers have community hospitals as their second registered health facilities (67.3 percent), while the rest are registered with provincial hospitals.

Since this analysis focuses on the UCS beneficiaries' health care choices for outpatient care, the sample is restricted to UCS beneficiaries who reported that they had been sick in the past four weeks before the interview but did not require inpatient care.[58] Table 4-3 presents the disease groups and health care choices of these sick UCS beneficiaries. For disease groups, the four most common are respiratory, musculoskeletal, digestive, and cardiovascular. All other diseases, including urinary, infectious, skin, allergic, ear, throat, nose, eye, genital, endocrine, nerve and mental, and ill-defined or unknown diseases, are grouped together and called "other diseases". Based on the statistics in Table 4-3, the most common disease group for both UCS beneficiaries who were required to make the 30-baht copayment and those who were exempt the copayment was respiratory diseases (38 and 41 percent, respectively), followed by other diseases and musculoskeletal diseases. Interestingly, the proportion of the UCS beneficiaries who had cardiovascular diseases were almost twice as high among the UCS beneficiaries who were exempt from the copayment, when compared to those who were required to pay the copayment. This is likely because the UCS beneficiaries in the former group are generally older than those in the latter group.

---

[58] The questionnaire specifies two different time frames for people who need outpatient and inpatient care. For outpatient care, the questionnaire asks if the person has been sick but did not require inpatient care in the past *4 weeks*. For inpatient care, it asks if the person has been sick and required inpatient care in the past *12 months*. However, it is possible that the same person who needed only outpatient care in the past 4 weeks might have had another episode of sickness that required an inpatient care sometime in the past 12 months. Based on the 2007 HWS data, 11 percent of the individuals who reported having been sick in the past 4 weeks also reported having another sickness that required an inpatient stay in the past 12 months.

In addition, Table 4-3 also reports treatment choices of the sick UCS beneficiaries. These treatment choices are computed based on two questions: (i) whether the person used their UC card to obtain health care; and (ii) what was the first health care services for which they sought to treat the reported illness. In this context, "traditional treatment" refers to the cases where the respondents used traditional/herbal medicine or went to traditional healers, and "self-medicate" refers to the cases where the respondents purchased "modern" medicine without a prescription. For those who sought professional care, visiting UC facilities refers to the cases where the persons visited public health facilities and used the UC card to obtain health care, whereas visiting non-UC public facilities refers to persons who visited public health facilities but did not use UC card (and so paid out-of-pocket) to obtain health care. Lastly, private facilities include private clinics and hospitals.

From Table 4-3, more than 40 percent of UCS beneficiaries who reported an illness in the past 4 weeks chose to visit UC facilities. However, differentiating the UCS beneficiaries who were required to make the 30-baht copayment from those who were exempt the copayment reveals that the treatment choices of the two groups clearly differ. In particular, almost 47 percent of the UCS beneficiaries who were exempt from the copayment chose to visit UC facilities, whereas only 33 percent of the UCS beneficiaries who were required to make the copayment chose to do so. Moreover, while self-medication was used by about 36 percent of the UCS who were required to make the copayment, only 22 percent of those who were exempt from the copayment chose this option.

In addition to the treatment choice, the Health and Welfare Survey also asked the UCS beneficiaries who were sick in the past 4 weeks and did not use their UC cards to obtain health care for the reasons why they chose to do so. From Table 4-4, the top three self-reported reasons for not using health care services at the registered UC facilities are the same for both the UCS beneficiaries who were exempt the copayment and the UCS beneficiaries who were required to pay the copayment. These top three reasons in the respective order are: (1) minor sickness; (2) long waiting time; and (3) not sure in the quality of the medicine. Other reasons are related to quality of health care services, such as doctors' knowledge and health workers' friendliness, as well as the inconvenience and costs in traveling to the health facility. These statistics reveal that, in addition to individuals' self-assessed health conditions, the quality of services and the non-monetary costs of visiting UC facilities (e.g. waiting and traveling time) have impacts on individuals' decisions not to visit their registered UC facilities.

Table 4-5 shows some descriptive statistics of the UCS beneficiaries who were sick in the past 4 weeks, separately for the different treatment choices. The average age is the highest among the UCS beneficiaries who chose to do nothing or to use traditional treatment, followed by those who visited UC facilities, whereas the average age of those who chose to visit private non-UC facilities is the lowest. Moreover, sex does not vary much across different choices of health care, but being married and having more years of schooling are positively associated with self-medicating and visiting non-UC public facilities. In terms of household characteristics, the average monthly household income and the proportion of households living in urban areas are the highest among persons who chose to visit non-UC public facilities, followed by those who chose to visit private facilities and to self-medicate. In addition, the proportion of other household members being sick is the highest among persons who choose to do nothing, while it is the lowest among persons who choose to visit non-UC facilities. Overall, these patterns suggest that people who are younger, are married, have more education, have higher income, and live in urban areas are more likely to visit non-UC facilities or to self-medicate than to visit UC facilities or to do nothing.

In addition, Table 4-5 reports the individual's disease groups and the number of days not being able to work due to sickness, again according to their treatment choices. First, individuals who chose not to visit UC facilities tend to have more common or minor illnesses, such as respiratory diseases, which could be treated by oneself or are less likely to require a follow-up visit. In contrast, individuals who visit UC facilities tend to have more serious illnesses, such as cardiovascular disease, that could incur higher costs or require a follow-up. Moreover, the number of days not being able to work due to sickness is the highest among individuals who chose to visit both UC and non-UC public facilities. The average number of days not being able to work for these two groups is approximately 2 days, whereas it is about 1 day or less for the other groups. This suggests that individuals whose sickness is more severe are more likely to seek care from public health facilities, where they would incur less expenditure. Furthermore, the proportion of sick individuals who had another episode of sickness that required inpatient care within the last 12 months is also the highest among the UCS beneficiaries who chose to visit UC facilities. All of the statistics on the disease groups, the number of days not being able to work, and whether the person had an inpatient care in the past 12 months imply that individuals who have more severe health problems and require higher level (and potentially more expensive) treatments are less willing to pay for health care and are more likely to visit UC facilities.

Furthermore, the out-of-pocket expenditure, which is the expense that individuals have to pay when receiving health care services, appears to be the smallest among persons who chose to visit UC facilities, followed by those whose chose to do nothing/use traditional treatment and those who chose to self-medicate, respectively. In the case of those who visited UC facilities, some of them would have been charged the 30-baht copayment, and many of them are likely to incur additional expenses for services not covered by the UCS. One somewhat surprising finding is that the out-of-pocket expenditure for those who visit public non-UC facilities is higher than that for those who visit private non-UC facilities. This could be due to the fact that public non-UC facilities provide some extra services (such as visits outside normal office hours), and these services are not necessarily cheaper than those obtained from private health facilities. More importantly, the out-of-pocket expenditure not only reflects the type of health care services, but also the type of sickness and the treatment required.

4.5.2.2 Health Care Facilities and Health Care Workers

The availability of public health facilities and private health facilities is displayed by the maps in Figure 4-2 and Figure 4-3. In Figure 4-2, the densities of community health centers, measured by the number of community health centers per 10,000 persons, are illustrated by different levels of shading, where the darkest shade represents the province with the highest number of commune health centers per 10,000 persons. Moreover, to show the locations of all levels of public hospitals in each province, the symbols "triangle", "H", and "hospital building" are used to represent community hospitals, provincial hospitals, and regional hospitals, respectively. On average, there are approximately one to two community health centers per 10,000 persons in each province.[59] When compared across regions, the Northeast region appears to be the area in which the density of community health centers is the lowest. In contrast, the locations of community hospitals are more or less equally distributed throughout the country, with some exceptions in the provinces near the Burmese border. Moreover, almost every province has one provincial hospital, and the provinces that do not have a provincial hospital generally have a regional hospital, which in effect serves as a provincial hospital for that province. In fact, for all 76 provinces in Thailand, there are 69 provincial hospitals and 25 regional hospitals in total.

Figure 4-3 illustrate the density of private clinics measured by the number of private clinics per 10,000 persons, and the locations of private hospitals (if any) in each province. The locations of private clinics are more concentrated in big provinces across different regions, with approximately more than 4 clinics per 10,000 persons. In contrast, many provinces in the Northeast region and some provinces near borders in the North and South regions appear to have fewer private clinics per person. Moreover, provinces with a higher density of private clinics tend to have more than one private hospital.

[59] Community health centers that are administered by the Ministry of Public Health do not exist in Bangkok. Instead, the primary care units under the UCS in Bangkok include the "health service centers" administered Bangkok Metropolitan Administration, private clinics, and public and private hospitals that have contracts with the NHSO. Nevertheless, Bangkok is not included in this analysis since it is not in one of the 51 provinces that have geography information for private clinics.

Nevertheless, most private hospitals are located in the Central region, particularly in the area near or within Bangkok.

The locations of all health facility types as shown in Figure 4-2 and Figure 4-3 can be used to calculate the distances between household locations available in the HWS data and the nearest health facility of each type. Figure 4-4 shows the map that is used to measure the distance between each household to the nearest provincial hospital in the 51-province sample. To illustrate, the symbols "blue pentagons" represent the sub-districts in which the households are located, and the "red buildings" represent provincial hospitals available in these 51 provinces. The distances between each blue pentagon and all provincial hospitals are computed using ArcGIS 10. Then, for each household, the shortest distance among all distances between the households and all provincial hospitals is selected as the distance to the nearest provincial hospital. For instance, from Figure 4-4, the distance d_1 is the shortest distance between household A and the three nearby hospitals H1, H2, and H3. As a result, the hospital H1 is the nearest provincial hospital for household A. In addition to the distance to the nearest provincial hospital, the distances to all other health facilities are calculated using the same procedure.[60]

Table 4-6 summarizes the average distances between households in the HWS and the nearest health facility of each type. As expected, the average distance to the nearest community health center is the shortest (about 2.7 kilometers), followed by the average distances to the nearest private clinic (about 3.7 kilometers) and the nearest community

---

[60] For the household located within the same sub-district in which a health facility is located, the distance from the household to that particular type of health facility is assumed to be zero. Note that the average area in each sub-district in Thailand is approximately 58 square kilometers.

hospital (about 8 kilometers). The average distance to the nearest provincial hospital is larger than the average distance to the nearest private hospital, reflecting the fact that there are fewer provincial hospitals than private hospitals. Lastly, the average distances to the nearest regional hospitals and university hospitals are the second largest and the largest, given that there are only 25 regional hospitals and only 12 university hospitals in the entire country.

Finally, Table 4-7 presents the densities of health workers at different health care facilities. Since the numbers of doctors, nurses, and doctors are available only at the province level, these numbers are divided by the population in each province. The number of health care personnel per person can be used as a proxy of waiting time to receive health care at each type of health facility. Community health centers only have community health workers and nurses, and no doctors.[61] On average, there are approximately 1.8 community health workers per 10,000 persons, but there are only 0.5 nurses per 10,000 at community health centers. For community and provincial hospitals, there are approximately 5 nurses and 0.6-0.7 doctors for every 10,000 persons. For regional hospitals, there are almost 2 nurses and 0.4 doctors per 10,000 persons. Nevertheless, the densities of nurses and doctors at the province level may not reflect the true picture of nurses and doctors available, because not all provinces have regional hospitals. The last statistic in this group is the density of doctors who work in the private sector. Due to data limitations, the number of doctors in the private sector does not

[61] Community health centers serve as primary care units for UCS beneficiaries in the areas where there are no community hospitals. Although no doctor is stationed at the community health centers, in principle, doctors from community hospitals or provincial hospitals need come to the community health centers on a regular basis to provide health care services that nurses or community health center workers cannot perform.

distinguish between the doctors working in private clinics and the doctors working in private hospitals. Based on the available data, there are on average 0.45 doctors per 10,000 persons; in other words, there is almost 1 doctor for every 20,000 persons. Nonetheless, this number of private doctors in the private sector does not include the publicly employed doctors who also work part-time in private hospitals.[62] When such part-time doctors are included, the average number of doctors working in the private sector increases to 1.55 doctors per 10,000 persons.

4.6. Results

This section consists of two sub-sections. The first sub-section presents the results from the nested logit model, which was discussed in Section 4.4. This model assumes that the IIA assumption does not hold. The second sub-section presents a more restrictive form of the multinomial logit model, in which the IIA assumption is imposed. Nonetheless, the dependent variables and the explanatory variables are the same in both models.

4.6.1. Nested Logit Model

This sub-section discusses the results from the two-level nested logit model, in which the top-level model determines the probabilities that the individual chooses to seek care or not to seek care, and the bottom-level model determines the probability that individual chooses the health care choice from among the four alternatives: (i) do

[62] The number of part-time doctors is subject to at least two caveats. First, this number is an aggregate number of all doctors working in both public and private sectors; it does not provide information on where (i.e. what level of public hospital) the doctor is formally working. Second, the number of part-time doctors could be double-counted, as in some provinces the number of part-time doctors is greater than the number of total doctors in the province.

nothing, (ii) self-medicate, (iii) visit a UC facility, and (iv) visit a non-UC facility.[63] The explanatory variables are comprised of individual characteristics, such as age, gender, marital status, years of schooling, the group of diseases, the number of days that the individual cannot work due to sickness, and whether the individual is required to pay the 30-baht copayment, as well as household characteristics, such as household income (in log terms), household size, whether another household member is sick and the location of the household (i.e. whether the household is located in an urban area and the region in which the household is located). Moreover, the density of private clinics in each province is also included as another group of case-specific explanatory variables. Finally, alternative-specific explanatory variables include distance between the household location and health facility of each type, and the densities of doctors who work at UC facilities and who work at non-UC facilities.[64]

It is important to note that the nested logit model with two nests (i.e. "no care" vs. "seek care"), which was described in Section 4.4, has a specification problem. In particular, the dissimilarity parameter for the "no care" nest is 7.1028, suggesting that the model is not consistent with utility maximization for all possible values of the

[63] Since the number of observations in the group of people who use herbal medicine or visit traditional healer is small, this group has been combined with the group of people who self-medicate. Similarly, the number of observations in the group of people who visit public non-UC facilities is also small, so that group is combined with the group of people who visit private non-UC facilities; this group is called "visit non-UC facilities".

[64] The numbers of doctors working at UC facilities are calculated from the numbers of doctors at the UC facilities that are the first registered UC facilities of each UC beneficiaries, and the number of doctors working at non-UC facilities are calculated from the number of doctors working in the private sectors and at the UC facilities that are not the registered UC facilities. Moreover, since these numbers are available only at the provincial level, the densities of both types of doctors are calculated by dividing the total number of each type of doctors by the total population in that province.

explanatory variable (Train, 2003).[65] Thus, to address this problem, the two alternatives within the "no care" nest are separated into two different nests "no care" and "self-medicate." The modified tree structure is depicted in Figure 4-5, and the results of the corresponding nested logit model are presented in Table 4-8. In this model, the base categories are individuals who are female, not married, exempted from the 30-baht copayment, have other diseases, live in the household in which there is no other sick member, and the household is located in a rural area in the Central region (excluding Bangkok). Moreover, the base outcome category is "do-nothing."

First, consider the impact of distance and the density of doctors, which are the alternative-specific variables in this model. The coefficient on distance has the expected negative sign but the estimate is not statistically significant. This finding has at least two interpretations. On one hand, distance may not have a significant impact on a UCS beneficiary's health care choice decision, which could be a result of the fact that UC facilities are widely available throughout the country. As a result, UCS beneficiaries are unlikely to have to travel a long distance to obtain health care services under the UCS. On the other hand, since the distances used in this analysis are obtained from calculating the approximate distances between the sub-district center in which the household is located and the district center in which each health facility is located, there could be a large measurement error that results in imprecise and possibly biased downward estimates.

[65] For the model to be consistent with utility-maximizing behavior, the value of dissimilarity parameter, which measures the degree of independence in unobserved utility among the alternatives within the same nest, must be between zero and one for all alternatives (Train, 2003).

The density of doctors in the province, which is another alternative-specific variable, has a negative but not statistically significant coefficient for all health care choices. This result is surprising in that one would expect the likelihood of seeking health care at either a UC facility or a non-UC facility to increase as the number of doctors per population rises. Although the estimate on the impact of the doctor density is not statistically significant, the fact that this coefficient has a negative sign deserves some explanations. First, the lack of information on the number of pharmacies and/or pharmacists in the province leads to an assumption that this variable is equal to zero for the self-medicating choice, which could reduce the variability across the four health care choices. Second, the numbers of doctors at both UC facilities and non-UC facilities are collected at the provincial level, so they may not reflect the true characteristics of the hospitals at which each UCS beneficiary actually visits or is registered. Third, the numbers of doctors at public hospitals could be confounded by the number of doctors who also work part-time in private hospitals or private clinics.[66] Given this aggregate nature of the data and the difficulty in separating between the doctors who work at UC facilities and those who work at non-UC facility, this doctor density variable could produce a biased estimate.

In terms of demographic characteristics, the coefficients on age and age-square for self-medicating are significantly positive and negative, respectively. Based on the magnitudes of both age coefficients, the age reflection point is 26. This indicates that

[66] Although there are data on the number of health workers who formally work in the public sector and also work in the private sector, these numbers are subject to many problems, including double-counting. In fact, the numbers of part-time doctors are found to be greater than the numbers of total doctors in five provinces. Due to these suspicious data, the numbers of part-time health workers are excluded from this analysis.

individuals who are 26 years old or younger are more likely to self-medicate, but those who are older than 26 years old are less likely to self-medicate than to do nothing as they get older. Moreover, the coefficient of male is significantly negative for visiting a UC facility and for visiting a non-UC facility, suggesting that females are more likely to seek health care from a professional health provider. This result could be explained by the fact that females may have more complicated health problems or that they are more assertive than males in seeking health care. Besides, married people are more likely to self-medicate or to seek professional care than to do nothing. This could be due to the fact that married people have more responsibility for the household compared to non-married people, and hence they need to maintain their good health conditions in order to be able to work and to support the household. Surprisingly, the coefficient on years of schooling has no statistically significant impact on the treatment choice, because one would expect that more educated people would be more likely to seek some kind of care.

As for the individual's health conditions, both disease groups and numbers of days unable to work have statistically significant impacts on health care choice decisions. More specifically, among the variables on disease groups, "respiratory" and "digestive" have statistically significant positive coefficients for self-medicating and seeking professional care (from either a UC facility or a non-UC facility). Similarly, "cardiovascular" disease has statistically significant positive coefficient for visiting a UC facility and for visiting a non-UC facility. However, "musculoskeletal" has a statistically significant negative coefficient for visiting a UC facility. These results suggest that, when compared to persons with "other diseases," persons who have respiratory and digestive diseases are more likely to self-medicate or to seek care from a professional health provider than to do nothing. This could be due to the fact that respiratory and digestive diseases are common symptoms that require outpatient care. Moreover, people cardiovascular diseases tend to require more complicated treatments and, accordingly, they would be more likely to visit a professional health care provider. In contrast, musculoskeletal symptoms, such as back pain or muscle ache, are symptoms commonly treated by traditional medicine, such as Thai massage. As a result, persons with musculoskeletal diseases are less likely to seek care from professional health providers, particularly from UC facilities.

Moreover, the coefficient on the number of days unable to work due to sickness is statistically significant negative for self-medicating. This finding is counterintuitive since one would expect that people whose illness is more severe (as can be determined from the numbers of days being sick and not being able to work) are more likely to seek some kind of care than to do nothing. However, the opposite sign of this variable could be due to an endogeneity bias, since the number of days being sick might depend on the individual's health care choice.[67]

Among household characteristics, household income has a statistically significant and positive coefficient for visiting a non-UC facility. This result is sensible in that higher income implies more economic resources to spend on health care services. Note that, although household income does not have statistically significant impact on visiting a UC facility, the coefficient on the interaction of household income and whether another

[67] By dropping this variable, the coefficients of other variables almost do not change.

household member is sick is negative and statistically significant (at 10% level) for visiting a UC facility. This suggests that, in the household in which there is another sick member, the likelihood of visiting a UC facility decreases as household income increases. Lastly, in addition to income, the coefficients on "urban" is also statistically significant positive for self-medicating and for visiting a non-UC facility, suggesting that urban people are more likely to self-medicate or seek care from a non-UC facility than do nothing. This result is as expected since there are more health care alternatives including (modern) pharmacies and private health facilities available in urban areas.

All of the results discussed thus far need to be treated cautiously. Although the dissimilarity parameters in this modified nested logit model with three nests satisfies the unit interval requirement for consistency with utility maximization, the likelihood ratio test for Independent Irrelevant Alternatives (IIA) assumption fails reject the null hypothesis that all of dissimilarity parameters are equal to one. Specifically, chi-square statistics is 0.82 with p-value equals 0.365. In other words, IIA assumption is not violated, and a standard multinomial logit model is more appropriate than a nested logit model. Consequently, the following paragraphs will discuss the results from a more restricted form of the nested logit model by imposing the IIA assumption.

4.6.2. Imposing the IIA Assumption

Table 4-9 presents the results from an alternative-specific conditional logit model (or mixed logit model),[68] which is a modification of the nested logit model presented in

[68] The "mixed logit" model in this analysis is not to be confused with the random-parameter logit model. It is simply a combination of a multinomial logit model and a conditional logit model, and is estimated by using "asclogit" command in Stata 12.

Table 4-8. In this model, distance remains the only alternative-specific variables, whereas all other explanatory variables are included as case-specific variables. Again, the case-specific variables include individual characteristics, household characteristics, and the number of health workers per population available in the province. Also, the choice of doing nothing is the base outcome category.

Overall, most results based on the mixed logit model are similar to the results based on the nested logit model with three nests in Table 4-8, except two important differences. First, the coefficient on distance in this model is negative and statistically significant at 10% level, and the magnitude of the coefficient is almost twice larger than the magnitude of the distance coefficient in the nested logit model. This result suggests that distance does play a role in determining individual health care choices; individuals are more likely to seek care from a closer health facility. The second difference is that the coefficient on the density of doctors is now positive, although it is still not statistically significant. This suggests that the availability of doctors per population at each type of health facility could influence individuals' decisions on health care choices.

For individual characteristics, almost all coefficients have the same signs and statistical significance levels as the coefficients obtained from the nested logit model in Table 4-8. For instance, the coefficients on age and age-square are statistically significant positive and negative, respectively, for self-medicating; the coefficient on married is statistically significant positive for all health care choices; "cardiovascular" disease group has a negative and statistically significant coefficient for visiting a UC facility; number of days unable to work has a statistically significant negative coefficient on self-medicating; and so on.

In terms of household characteristics, household size, household income, whether another household member is sick, and the location of the household have statistically significant impacts on health care choices. In particular, household size has a significantly negative impact on visiting a non-UC facility, possibly because households with more members are more likely to have a tight budget constraint. Accordingly, they are less likely to choose the option that costs more, which is to visit a non-UC facility in this context. Moreover, household income has a positive and statistically significant impact on the likelihood of visiting a non-UC facility. This reflects that people with higher incomes tend to have higher opportunity costs from waiting to receive free health care services at UC facilities. As a result, they choose to visit non-UC facilities, which are affordable to them and cost less in terms of forgone wages. Furthermore, the coefficient on whether another household member is sick is not statistically significant for any treatment choices. However, the interaction term between household income and whether another household member is sick has a statistically significant coefficient for visiting a UC facility. This result is consistent with the result from the nested logit model with three nests, and they imply that the likelihood of visiting a non-UC facility for a richer individual would diminish if there is another sick member in the household. Finally, individuals in the households that are located in urban areas are more likely to self-medicate and to visit a non-UC facility, most likely because there are more pharmacies and private health facilities available in urban areas.

4.6.3. Sensitivity Analyses

Two additional models are analyzed in this sub-section. The first model investigates potential province effects that could confound the impacts of the health workers densities in the previous analysis by including a set of province dummies and excluding the density of private clinics in the province from the mixed logit model. The second model re-examines the same mixed logit model shown in Table 4-9, but restricts the sample to only the households in rural areas. The results for these two models are shown in Table A-4 and in Table A-5 the **Appendix 3**.

Based on the results in Table A-4, distance has a statistically significant (at 5% level) negative coefficient, and its magnitude is even larger than the magnitude of the coefficient in the mixed logit model. This result confirms the previous finding that individuals prefer to seek health care from health care providers that are closer to them. Nonetheless, the coefficient on the density of doctors appears to be negative but not statistically significant.

All individual characteristics, such as age, gender, disease groups, have the same impacts on health care choices as found in the mixed logit model in Table 4-9, but the results on the household characteristics are slightly different from the previous results. Specifically, the coefficient on household size is not statistically for any health care choice. Moreover, whether household member is sick has a positive and statistically significant (10% level) coefficient for visiting a UC facility in this model, whereas the coefficient of this variable is not statistically significant in the previous model. Finally, the coefficient on the interaction term between household income and whether another household member is sick for visiting a UC facility is larger and has a higher level of significance (5% level). Thus, by controlling for unobserved province level effects, the impacts on variables related to household budget constraints seem to be more pronounced. The differentiated patterns of health seeking behavior is more apparent in that households with more than one sick members are more likely to seek care from UC facilities, whereas richer households are more likely to seek care from non-UC facilities, regardless of whether there is another sick member.

Finally, when restricting the sample in the analysis to households in rural areas, the results in Table A-5 are not much different than the results based on the general population. Although the coefficient on distance is not statistically significant, its magnitude is very similar to that of the coefficient on distance in Table 4-9. Similarly, the coefficient on the density of doctor is positive but not statistically significant. Moreover, most individual characteristics have the same impacts as found previously. For household characteristics, household income has a significantly positive impact on visiting a non-UC facility. In addition, household size has a significantly positive impact on visiting a UC facility, whereas the interaction terms of household income and whether another household member is sick has a significantly negative impact on visiting a UC facility. This suggests that health conditions of other household members have an indirect effect, particular through a more restricted budget constraint, on the individual's health care choice. Nonetheless, a more interesting result based on the rural sample is that the density of private clinics has a negative coefficient for self-medicating and for visiting a non-UC facility, whereas it has a positive coefficient in the previous models.

Even though the estimated coefficient on the density of private clinics is not statistically significant, this result could reflect that fact that most pharmacies and private clinics are more concentrated in urban areas or in the center of the province. As a consequence, individuals living in rural areas are unlikely to benefit from having more pharmacies or private clinics in the urban areas.

4.7. Conclusion and Discussion

This chapter examines why the insured, when they are sick, do not use their health insurance benefits to obtain the health care services available through the Universal Coverage Scheme (UCS) in Thailand. In doing so, it investigates the factors that affect individual choice between using the UC card to obtain the free (or almost free) health care and choosing other alternatives, including seeking care from non-UC facilities, purchasing their own medicine, or doing nothing.

Using data from the 2007 Health and Welfare Survey together with the health facilities data available from the Ministry of Public Health, the empirical results show that the UCS beneficiaries prefer to seek health care from the health facility that is closer to their house. Moreover, an individual's decision on health care choices is largely influenced by the individual's demographic characteristics, such as age and gender; his or her health conditions (as determined by the type of disease and the numbers of days not being able to work due to sickness); and household characteristics, including household income, household size, whether another household member is also sick, and the household location. Specifically, individuals with more severe health problems, such as those with cardiovascular diseases or those who have been sick and could not work for many days, are more likely to seek care from professional health providers. More importantly, factors that determine each household's budget constraint also play an important role in determining whether the individual would seek care from a UC facility or from somewhere else. Based on the results from the mixed logit model, individuals from households with more members are more likely to seek care from UC facilities, whereas individuals from richer households are more likely to seek care from non-UC facilities. These results, together with the effect of other household members' health conditions, imply that the health care choices of UCS beneficiaries are mainly determined by their economic resources, and that visiting UC facilities appears to be the basic option while visiting non-UC facilities is an alternative for those who have fewer budget constraints. Finally, in addition to individual and household characteristics, other external factors, such as the location of the household where there may be more health care alternatives (e.g. pharmacies and private clinics/hospitals) available nearby, also influence the individual's health care choice.

The results in this chapter are consistent with the results in a previous study by Suraratdecha *et al.* (2005) in that different health seeking behaviors exist among UCS beneficiaries. In particular, socioeconomic factors, such as household income, play an important role in determining whether to seek care from a UC facility or not. In addition to Suraratdecha *et al.*'s (2005) study, the analysis in this chapter finds that the individual's health conditions and other household characteristics, such as the health of other household members and the number of household members, also affect the individuals' health care choices.

Given the above results, should the policy makers be concerned about the implementation of the UCS in Thailand and the fact that a large number of UCS beneficiaries do not use health care services at UC facilities? The answer is yes and no. On one hand, the UCS has been successful in terms of providing access to "basic" health care to the Thai population, regardless of their ability to pay for health care or where they live. This policy has proven to reach its goal in providing a financial health protection against health risks to the population, particularly the poor people. Moreover, the existence of the UCS can help prevent people from falling into poverty traps due to health problems, as can be seen from the evidence that people with cardiovascular diseases are more likely to visit UC facilities.

On the other hand, the UCS has not succeeded in terms of maintaining the quality of care and meeting people's expectations. This is partly due to the fact that the UCS covers both the poor and the non-poor population, and the findings in this analysis reflect a clear distinction in health seeking behaviors of these two groups. In particular, while the poor are more sensitive to the cost of health care, the rich (or non-poor) are more sensitive to the quality of care. The evidence that the UCS beneficiaries who have higher incomes choose health care services provided by non-UC facilities instead of the free (or almost free) health care services provided by UC facilities suggests that the health care services at UC facilities are of inferior quality and could still be improved. For the non-poor population, they have more health care alternatives as they have more financial means to do so. However, this health care alternative may not be affordable for the poor population, and there is no reason why they should receive poorer quality of care.

The problems with poor quality of services and long waiting time at UC facilities need to be dealt with from both the supply and the demand sides. On the supply side, more economic resources should be put in the scheme in order to adequately finance health expenditures at public hospitals. However, since the UCS is financed by the general tax revenue, the allocation of more budgets to the UCS cannot always be guaranteed and are highly unsustainable. As a result, other financing methods, such as creating health savings accounts, should be explored in order to improve the sustainability of the program. Moreover, future policies should address the needs to produce more professional health workers, to create more incentives for them to stay in the public sector, and to allocate enough compensation for those who work in rural areas. On the demand side, the UCS beneficiaries should be well-informed about the program, so that they will have neither a false expectation nor a misperception on the health care quality. Finally, basic health care knowledge should be reinforced among the population, particularly in rural areas, so that they are mindful about their health conditions and act to prevent any avoidable sickness.

The analysis in this chapter is subject to a number of caveats, most of which are related to data limitations. The first and most important limitation is the lack of detailed data on the numbers of health workers at each health facility, which hinders the study from analyzing the true characteristics of UC facilities and non-UC facilities. In addition, given the availability of information on private clinics in only 51 provinces, the results from this analysis may not be a true representation of the whole country. Secondly, caveat is that this analysis focuses only on outpatient care. By excluding inpatient care, the results may not reveal certain aspects of the individuals' health seeking behaviors. Thirdly, the use of approximate distances calculated using ArcGIS program may introduce large measurement errors and result in imprecise estimates. Fourthly, since the only available data on health conditions are the type of disease, the analysis does not address the different levels of health care services (i.e. primary, secondary, or tertiary level) needed, which can in turn determine the choice of health care providers. Finally, the lack information on past uses of health care hinders the ability to observe the perceived quality of health care, which could be another important factor in determining health care choices. These caveats still need to be accounted for when interpreting the results and should be addressed in future work.

Figure 4-1 Tree Structure for Two-Level Nested Logit Model

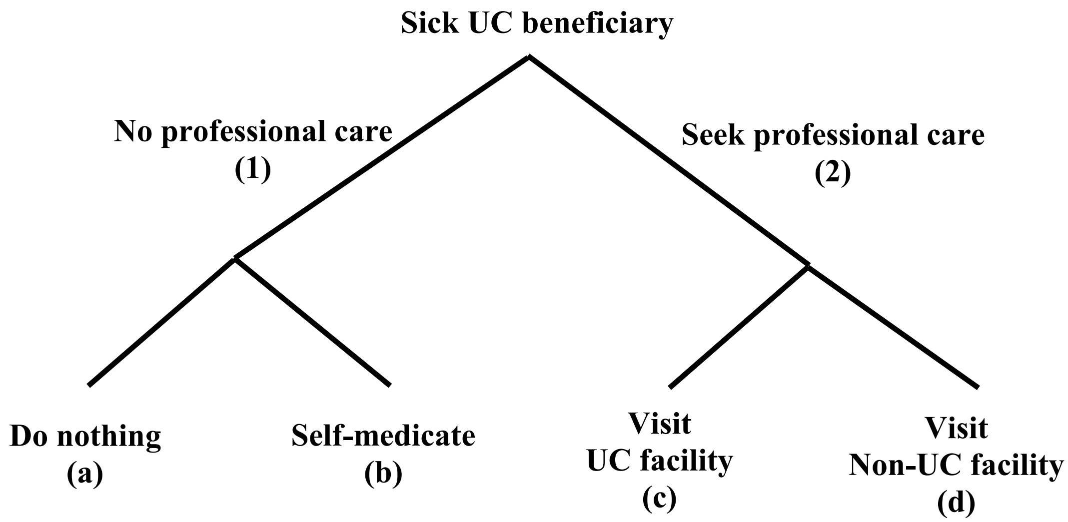


Table 4-1 Summary Statistics from Health and Welfare Survey in 2007

Characteristics	All persons	UCS beneficiaries
Individual characteristics:		
Age	35.423	34.282
Male	0.469	0.469
Married	0.504	0.465
Years of schooling	8.929	7.801
Type of health insurance:		
No insurance	0.029	
UCS - exempt 30 baht	0.424	0.590
UCS - pay 30 baht	0.295	0.410
CSMBS	0.149	
SSS	0.090	
Private health insurance	0.007	
Other health insurance	0.006	
Have been sick in the past 4 weeks	0.195	0.201
Required in-patient care in the past 12 months	0.064	0.063
Whether other household member was sick	0.500	0.519
Household characteristics		
Region:		
Central	0.358	0.324
North	0.197	0.210
Northeast	0.281	0.299
South	0.165	0.167
Live in municipality (urban area)	0.581	0.524
Household size	4.088 (1.78)	4.207 (1.77)
Monthly household income (baht)	21,190.44 (28628.24)	16,680.620 (22815.65)
No. of individuals	42,322	30,439

Source: Health and Welfare Survey, 2007.
Note: Standard errors are in parentheses.

Table 4-2 Percentage of Registered UC Facilities

Type of the first registered UC facility	Percent of all UC beneficiaries	Type of the second registered UC facilities (% of UC beneficiaries with the same type of first UC Facility)			
		None	Community hospital	Provincial hospital	University/other hospitals
Community health center	55.39	0.00	67.26	32.43	0.32
Community hospital	28.44	93.36	0.00	6.62	0.03
Provincial hospital	14.67	99.39	0.21	0.00	0.40
University hospital	0.21	100.00	0.00	0.00	0.00
Other public hospital	0.09	100.00	0.00	0.00	0.00
Private clinic	0.01	0.00	0.00	0.00	100.00
Private hospital	1.19	95.75	0.00	4.25	0.00
No. of individuals	25,676	10,929	9,574	5,108	0

Source: Health and Welfare Survey, 2007.

Table 4-3 Percentage of Sick UCS Beneficiaries across Different Treatment Choices and Disease Groups in 2007[69,70]

Variable	Type of UC beneficiaries		All UC beneficiaries
	Exempt 30 baht	Pay 30 baht	
Treatment choice			
Do nothing/Use traditional treatment	6.54	5.72	6.26
Self-medicate	21.77	36.06	26.63
Visit UC facility	46.94	32.58	42.06
Visit private facility	23.74	23.58	23.68
Visit public non-UC facility	1.01	2.05	1.37
Disease Groups			
Respiratory	0.41	0.38	0.40
Digestive	0.08	0.09	0.09
Cardiovascular	0.10	0.06	0.09
Musculoskeletal	0.13	0.12	0.12
Other diseases	0.28	0.35	0.31
No. of individuals	3,960	2,044	6,004

Source: Health and Welfare Survey, 2007.

[69] These choices are computed based on two questions from Health and Welfare Survey 2007: (1) whether the individual used their health insurance card in treating the last sickness that occurred during four weeks before the interview, and (2) what treatment choice the individual used to treat the last sickness.
[70] Other disease groups include urinary, infectious, skin, allergic, ear, throat, nose, eye, genital, endocrine, nerve and mental, and ill-defined or unknown diseases.

Table 4-4 Percentage of Self-Reported Reasons for Not Using UC Cards to Obtain Health Care at the Registered Facilities

Reasons	Type of UC beneficiaries		All UC beneficiaries
	Exempt 30 baht	Pay 30 baht	
Minor sickness	44.42	51.98	47.37
Accident and emergency illness	1.37	1.65	1.48
Inconvenient travel to health facility	4.43	2.22	3.57
Health facility is far away	1.26	0.99	1.16
Regular office hours are not convenient	4.16	5.02	4.5
Does not have money for transportation	0.26	0.08	0.19
Long waiting time	21.29	19.69	20.66
Not sure in the quality of care	2.27	3.13	2.6
Not sure in the quality of medicine	10.06	7.17	8.93
Has been discriminated	0.11	0	0.06
Health workers are not friendly	0.16	0.33	0.22
Doctors do not have time for patients to ask questions	0.11	0.08	0.1
Doctors are not good at diagnosis/Treatment does not work	5.11	2.55	4.11
Does not live in the same area as the registered facility	2.05	3.13	2.47
Health insurance benefits do not cover	0.32	0.33	0.32
Others	2.63	1.65	2.25
No. of individuals	1,898	1214	3112

Source: Health and Welfare Survey, 2007.

Table 4-5 Descriptive Statistics for UCS Beneficiaries Who Have Been Sick in the Past 4 Weeks

Variable	Treatment Choice: Do nothing/Use traditional treatment	Self-medicate	Visit UC facility	Visit private facility	Visit non-UC public facility	All
Individual characteristics:						
Age	42.766	41.068	42.405	35.507	39.622	40.438
Male	0.444	0.413	0.389	0.362	0.390	0.391
Married	0.444	0.565	0.469	0.425	0.561	0.485
Years of schooling	6.630	7.427	6.459	6.983	7.671	6.898
Household characteristics:						
Monthly household income	14783.7	15165	13075.5	18724.7	22711.5	15248
Lived in urban area	0.439	0.558	0.467	0.540	0.659	0.508
Whether another HH member is sick	0.596	0.483	0.433	0.418	0.366	0.457
Health and health care characteristics:						
Disease groups:						
Respiratory	0.160	0.509	0.327	0.473	0.207	0.399
Digestive	0.043	0.083	0.091	0.091	0.110	0.085
Cardiovascular	0.032	0.011	0.146	0.075	0.110	0.085
Musculoskeletal	0.285	0.140	0.093	0.118	0.085	0.124
Other	0.481	0.257	0.342	0.242	0.488	0.307
No. of days unable to work	1.255	0.340	1.970	1.184	2.280	1.311
Required in-patient care in the past 12 months	0.069	0.051	0.164	0.096	0.110	0.111
Out-of-pocket expenditure (baht)	26.176	78.557	15.474	401.275	543.500	129.008
No. of individuals	376	1599	2525	1422	82	6004

Source: Health and Welfare Survey, 2007.

[a] The number of UC facilities is obtained from the National Health Security Office (NHSO).

[b] The number of private hospitals is obtained from the Ministry of Public Health.

Figure 4-2 Density of Community Health Centers and Locations of Public Hospitals

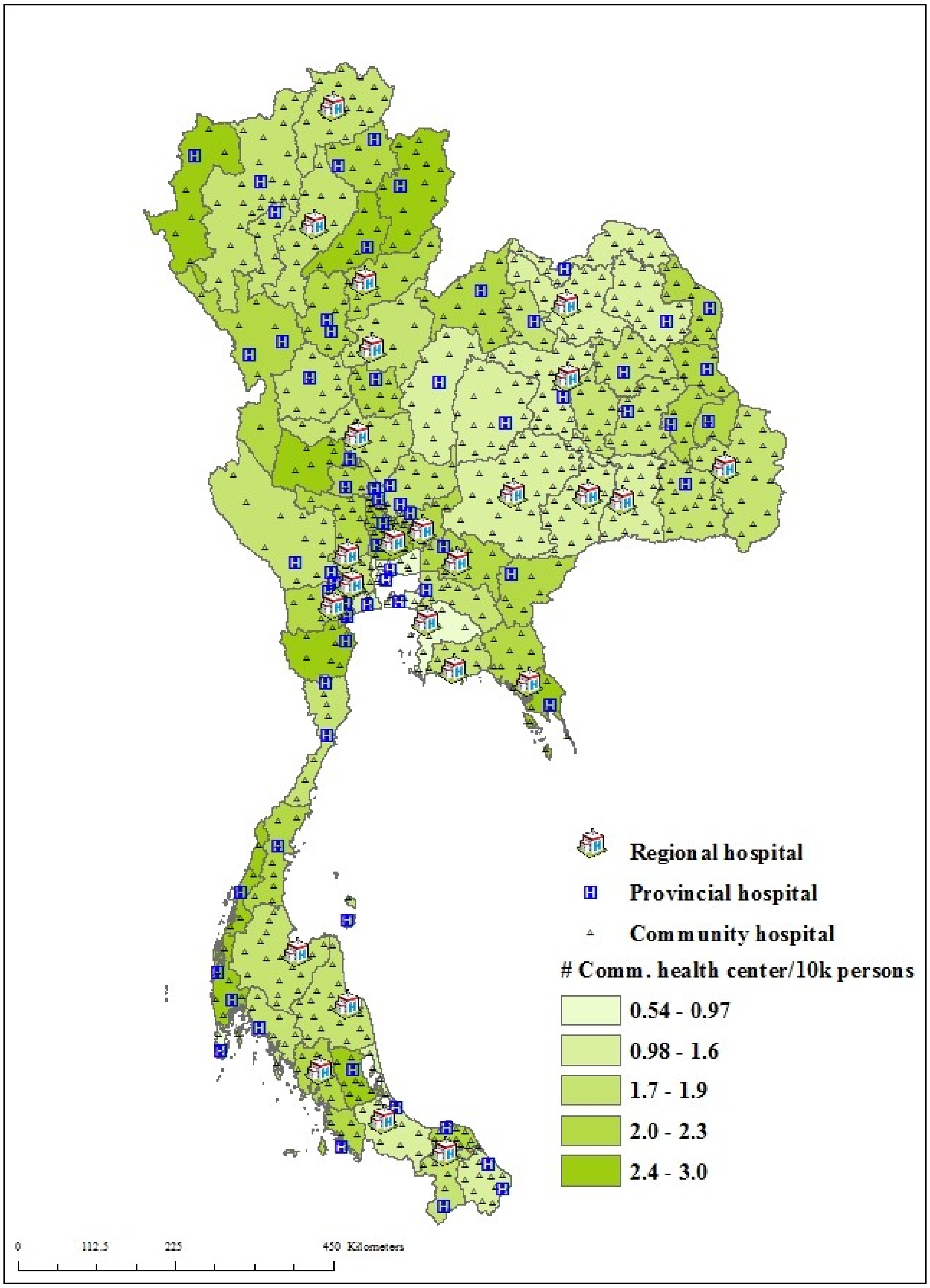


Figure 4-3 Density of Private Clinics and Locations of Private Hospitals

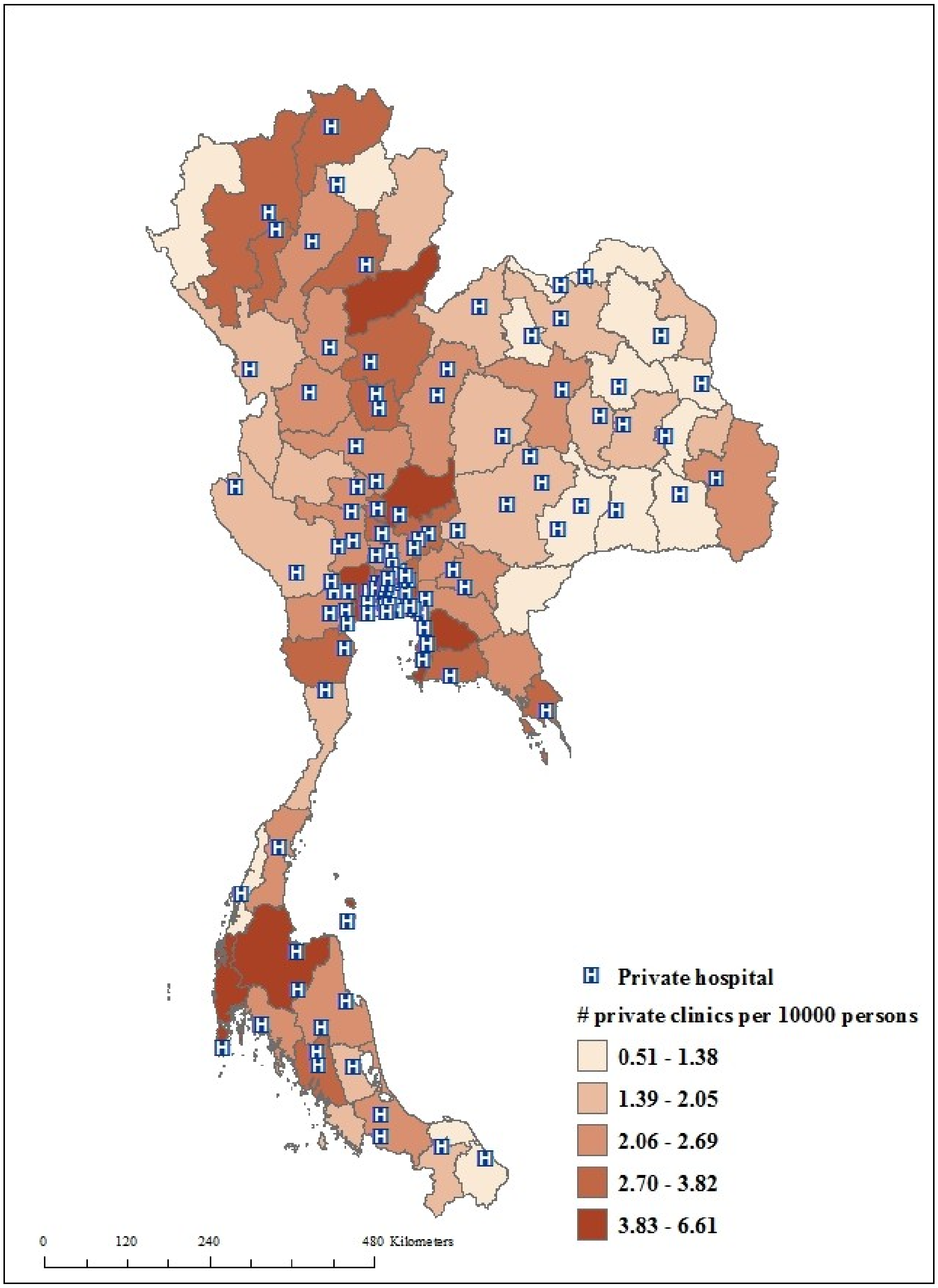


Figure 4-4 Map Used in Calculating Distances between Household Locations and Hospitals

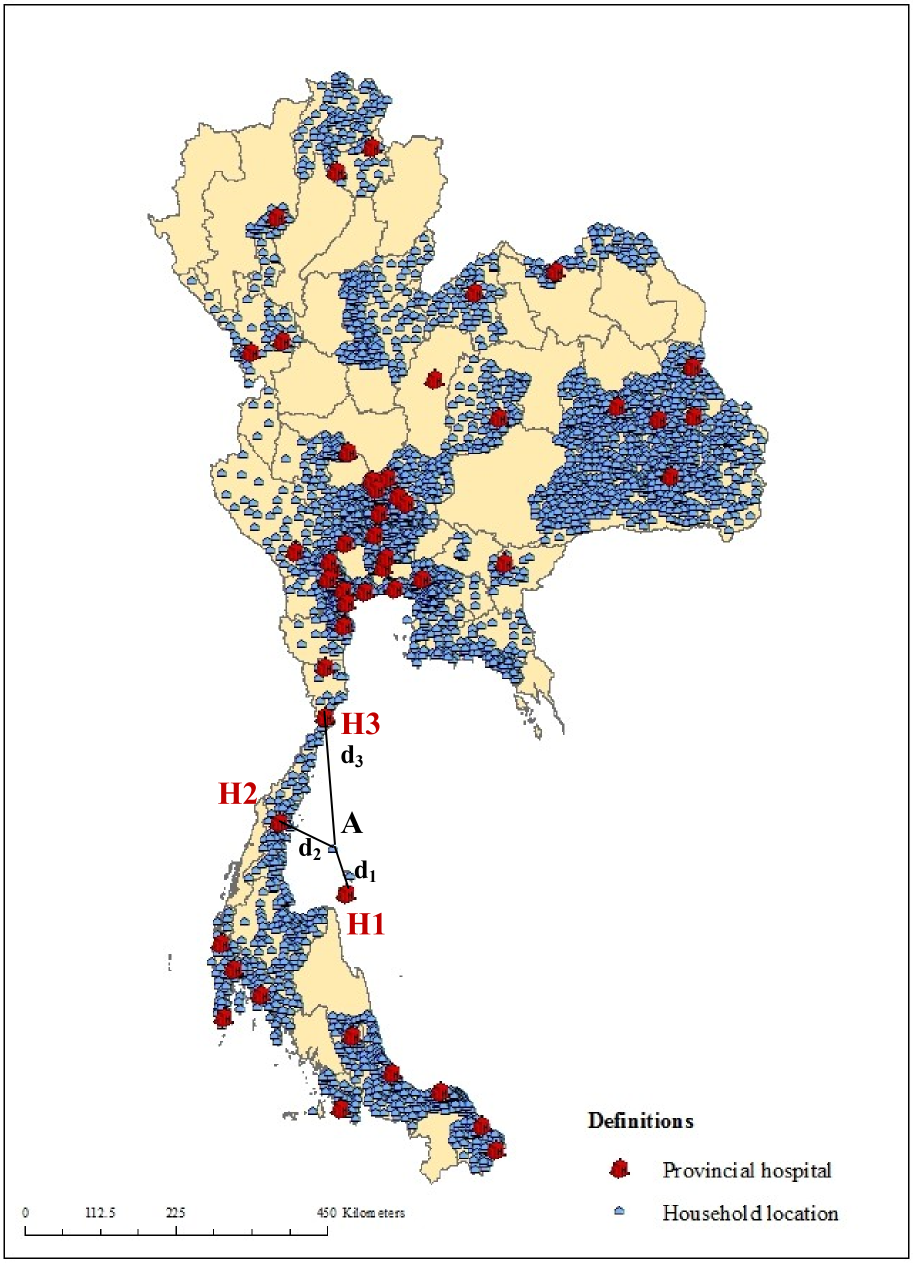


Table 4-6 Average Distances (Kilometers) from Household to Different Health Facilities

Health Facility	Obs	Mean	Std. Dev.	Min	Max
Public facilities:					
Community health center	5928	2.7	5.1	0	47.2
Community hospital	6129	8.1	8.9	0	38.7
Provincial hospital	6111	43.5	39.2	0	166.3
Regional hospital	6111	66.1	44.7	0	245.4
University hospital	6111	123.9	77.2	0	386.3
Private facilities:					
Private clinic	5982	3.7	6.1	0	49.4
Private hospital	6111	29.8	23.3	0	119.1

Source: Bureau of Strategy and Policy, Ministry of Public Health, Thailand

Table 4-7 Average Densities of Health Workers at Different Health Facilities

	Mean	Std. Dev.
Number of community health workers10,000 persons	1.800	0.709
Average number of nurses per 10,000 persons		
Community health center	0.465	0.417
Community hospital	5.455	1.612
Provincial hospital	5.052	4.495
Regional hospital	1.763	3.044
Average number of doctors per 10,000 persons		
Community health center	-	-
Community hospital	0.616	0.187
Provincial hospital	0.654	0.530
Regional hospital	0.356	0.650
Private sector	0.447	0.669
Private sector (including part-time public doctors)	1.553	2.216

Source: Bureau of Strategy and Policy, Ministry of Public Health, Thailand

Figure 4-5 Tree Structure for Modified Nested Logit Model

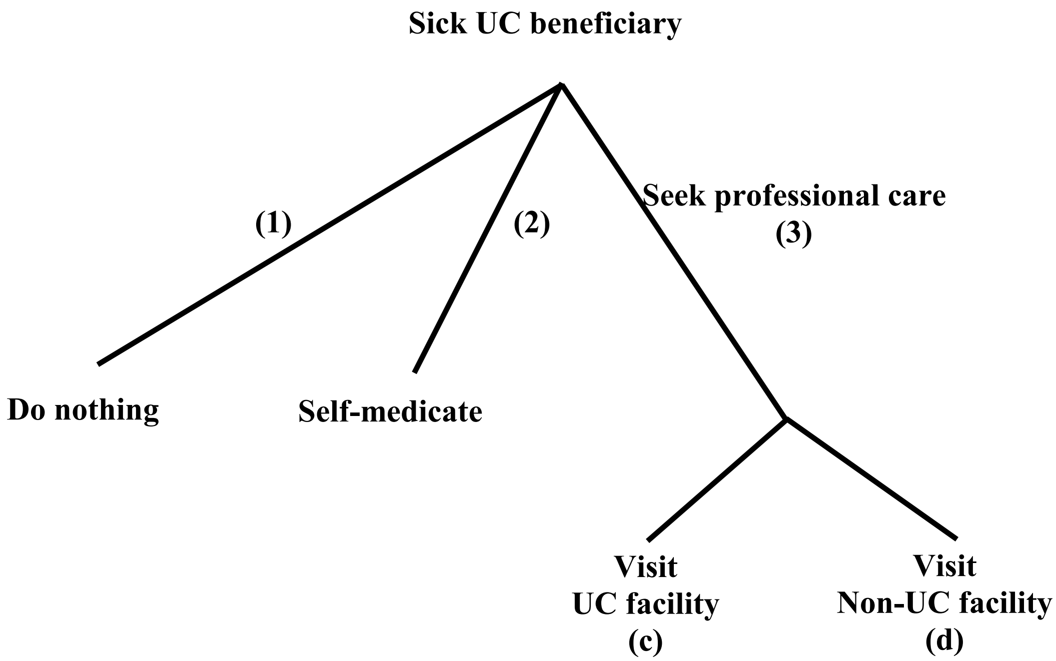


Table 4-8 Nested Logit Model Results

("Do Nothing" is the Base Group.)

	Self-medicate		Seek Professional Care			
			Visit UC Facility		Visit Non-UC Facility	
	coef	se	coef	se	coef	se
Alternative specific variables:						
Distance (1,000 km.)	-4.566	5.813	-4.566	5.813	-4.566	5.813
Number of doctors per 10,000 persons	-0.008	0.024	-0.008	0.024	-0.008	0.024
Case specific variables:						
Individual characteristics:						
Age	0.051***	0.014	-0.007	0.014	-0.016	0.016
Age2	-0.001***	0.000	0.000	0.000	0.000	0.000
Male	-0.122	0.134	-0.266**	0.129	-0.324**	0.136
Married	0.509***	0.165	0.467***	0.159	0.540***	0.171
Years of schooling	0.005	0.019	-0.014	0.018	-0.016	0.019
Required 30-baht copayment	0.260*	0.156	-0.033	0.161	0.089	0.184
Disease groups:						
Respiratory	2.189***	0.187	1.327***	0.221	1.603***	0.290
Digestive	1.266***	0.296	1.028***	0.289	1.187***	0.313
Cardiovascular	-0.443	0.439	1.833***	0.356	1.715***	0.378
Musculoskeletol	-0.154	0.171	-0.758***	0.227	-0.419	0.341
No. of days not being able to work	-0.210***	0.031	0.019	0.013	0.011	0.015
Household characteristics:						
Household size	-0.036	0.045	0.007	0.049	-0.049	0.062
Whether other HH member was sick (hhmemsick)	1.313	1.650	1.772	1.549	1.429	1.596
Log(hh_income)	0.208	0.145	0.270	0.188	0.540**	0.266
Log(hh_income)x hhmemsick	-0.207	0.178	-0.279*	0.167	-0.250	0.171
Urban	0.545***	0.140	0.207	0.135	0.282*	0.150
Region (Central is omitted):						
North	-0.280*	0.164	0.194	0.158	0.116	0.169
Northeast	-0.182	0.183	0.503***	0.176	0.400**	0.197
South	-0.185	0.208	0.224	0.194	0.222	0.196
Private clinics per 10,000 persons	0.341	0.389	0.190	0.393	0.393	0.408
Intercept	-1.966	1.306	-0.616	1.465	-3.134	2.820
Dissimilarity parameters:						
/nocare_tau [a]	1.000					
/selfmed_tau [a]	1.000					
/seek_tau	0.435	0.584				
LR test for IIA	chi2(2) = 0.82 (Prob > chi2 = 0.3657)					
Statistics:						
Number of observations	20,200					
Number of cases	5,050					
Log-likelihood	-5601.7466					
Wald Chi-square	692.26 (Prob > chi2 = 0.0000)					

Note: *** p<0.01, ** p<0.05, * p<0.1

[a] These dissimilarity parameters are forced to equal 1 by using "constraints" option in STATA.

Table 4-9 Mixed Logit Model Results

(Do Nothing is the Base Group.)

	Self-medicate		Visit UC Facility		Visit Non-UC Facility	
	coef	se	coef	se	coef	se
Alternative specific variables:						
Distance (1,000 km.)	-7.968*	4.677	-7.968*	4.677	-7.968*	4.677
Number of doctors per 10,000 persons	0.004	0.047	0.004	0.047	0.004	0.047
Case specific variables:						
Individual characteristics:						
Age	0.050***	0.014	-0.002	0.013	-0.024*	0.014
Age2	-0.001***	0.000	0.000	0.000	0.000	0.000
Male	-0.125	0.134	-0.241*	0.128	-0.367***	0.135
Married	0.513***	0.165	0.432***	0.158	0.608***	0.169
Years of schooling	0.005	0.019	-0.013	0.019	-0.018	0.020
Required 30-baht copayment	0.265*	0.156	-0.094	0.152	0.193	0.159
Disease groups:						
Respiratory	2.196***	0.186	1.206***	0.180	1.815***	0.188
Digestive	1.270***	0.296	0.965***	0.284	1.307***	0.296
Cardiovascular	-0.452	0.439	1.863***	0.356	1.602***	0.371
Musculoskeletol	-0.140	0.170	-0.919***	0.165	-0.124	0.177
No. of days not being able to work	-0.212***	0.031	0.020	0.013	0.005	0.014
Household characteristics:						
Household size	-0.039	0.045	0.031	0.042	-0.090**	0.045
Whether other HH member was sick (hhmemsick)	1.353	1.664	1.931	1.585	1.111	1.680
Log(hh_income)	0.228	0.144	0.146	0.138	0.757***	0.143
Log(hh_income)x hhmemsick	-0.211	0.180	-0.293*	0.172	-0.223	0.181
Urban	0.548***	0.140	0.176	0.134	0.353**	0.141
Region (Central is omitted):						
North	-0.283*	0.164	0.224	0.158	0.060	0.168
Northeast	-0.187	0.183	0.549***	0.174	0.315*	0.187
South	-0.183	0.208	0.224	0.199	0.234	0.207
Private clinics per 10,000 persons	0.353	0.389	0.080	0.388	0.535	0.390
Intercept	-2.127	1.306	0.141	1.243	-5.569***	1.299
Statistics:						
Number of observations	20,200					
Number of cases	5,050					
Log-likelihood	-5,602.156					
Wald Chi-square	1015.36 (Prob > chi2 = 0.0000)					

Note: *** p<0.01, ** p<0.05, * p<0.1

Chapter 5 Access and Utilization of Public Health Insurance Program: Evidence from Vietnam's Health Care Fund for the Poor

5.0. Introduction

Expanding health insurance coverage to the disadvantaged and uninsured population is one of the strategies used by governments in many developing countries to reduce poverty, particularly the poverty caused by illness and accidents. By doing so, those people who are more vulnerable to catastrophic health expenditures are protected against unexpected financial burdens and, at the same time, have access to health care. The latter benefit can, in turn, lead to better health outcomes and potentially increase their productivity. Nevertheless, while most public health insurance programs provide health care services at little or no cost, one common problem in many countries is that a significant portion of the insured do not utilize the subsidized health care that is provided at *registered* public health facilities.[71] Instead, they choose to bypass these facilities and seek health care from alternative sources, such as private providers or higher-level public health facilities,[72] in which case they need to pay for the health care services obtained. In other cases, the insured opt to purchase medicine without a prescription, use traditional medicine, or even do nothing. The fact that the insured do not use the low-cost or free health care services available at designated public facilities may indicate problems

[71] *Registered* public health facilities are local public health facilities designated as the health insurance beneficiaries' primary care units (i.e. the first point of contacts to receive health care services covered by their health insurance). Most registered public health facilities are commune health centers (about 60 percent), and the rest are regional polyclinics.
[72] Higher-level public health facilities in this context refer to public hospitals at the district, provincial, or regional levels. These hospitals have doctors in all specializations and usually provide secondary and/or tertiary levels of health care services.

associated with obtaining access to health care services, or it could suggest problems with the quality of care at those facilities. The low utilization of publicly-subsidized health care services is of interest to policy makers, particularly when the poor, who are the target group, do not seek care from public facilities.

To address this problem, this chapter examines the health-care seeking behavior of people who are insured by the Health Care Fund for the Poor (HCFP) program in Vietnam. The HCFP program was introduced in 2003 as a public program using government revenues to finance health care for the poor, including ethnic minorities, households living in remote areas, and all households living in the communes officially designated as highly disadvantaged. As of 2006, it covered approximately 20 percent of the population in Vietnam (Wagstaff, 2010). However, from the 2006 Vietnam Household Living Standard Survey (VHLSS) data, only about 30 percent of the eligible population who report being sick or injured in the past 4 weeks actually use the health care card provided by the HCFP program to obtain outpatient care, while the rest choose other alternatives, including visiting private health facilities, bypassing to higher-level public facilities without referrals, purchasing medicine without prescription, using traditional medicine, or doing nothing.

This pattern of health care utilization among potential HCFP beneficiaries can be explained in at least two ways. First, since this program covers people in mountainous provinces, the HCFP beneficiaries may not use the health care services provided by the program due to long travel distances or low quality of transportation infrastructure. Second, the HCFP beneficiaries may choose not to use the free health care services because of their concern that the care is of low quality. To assess these potential explanations, this chapter seeks to answer two questions. First, what are the determinants of the HCFP beneficiaries' decisions to seek care and, if sought, of the type of health facilities visited? Second, is there any bypassing behavior among the HCFP beneficiaries and, if any, what cause them to bypass registered public facilities? The findings from this analysis not only reveal the patterns of health seeking behaviors, but they could also help identify the causes of the low utilization of subsidized public health care among the poor population. Knowledge of the true causes of this behavior can provide the government a direction on how to intervene in order to improve the delivery of publicly provided health care.

This chapter proceeds as follows. Section 5.1 provides a description of the health insurance system in Vietnam. Section 5.2 reviews the literature related to health insurance and health care utilization in developing countries. Sections 5.3 and 5.4 present the theoretical model and the corresponding empirical specification, respectively. Section 5.5 describes the data and presents some descriptive statistics, Section 5.6 reports the results, and Section 5.7 presents several conclusions and their policy implications.

5.1. Background on Health Insurance System in Vietnam

As in many developing countries, public health insurance is much more common than private health insurance in Vietnam. Up until 2008,[73] public health insurance in Vietnam was composed of three main schemes: the compulsory health insurance (CHI)

[73] The brief description of Vietnam's health insurance system given in this section pertains to the year 2006. Since the data used in this analysis are from the 2006 survey, this description provides an overview of the health insurance system up to 2006, including the change in 2005. In 2008, the Vietnamese government passed the "Law on Health Insurance"; analysis of this change is beyond the scope of this paper, since no detailed health data have been collected from Vietnam households since 2006. More details on public health insurance programs in Vietnam can be found in Chapter 2.

scheme, the voluntary health insurance (VHI), and the health care fund for the poor (HCFP). The CHI consists of two separate programs, namely the social health insurance (SHI) scheme and free health care for children under age 6. Established in 1992, the SHI scheme covers people who work in the public sector and the private formal sector, and it is financed by the contributions from both employers and the employees. In addition, the SHI also covers government pensioners, the disabled, and "meritorious people",[74] but the contributions are different in that they are paid by the government. Starting in 2005, the CHI scheme was extended to provide free services at public health facilities (or private facilities under contract with the government agency) to children under the age of 6.

Second, the voluntary health insurance (VHI) scheme was introduced in 1994 to provide health care services to people who are not covered by the CHI, such as the dependents of those who are covered by CHI, farmers, the self-employed, and students. However, enrollment in the VHI scheme is restricted by certain group-based requirements. For instance, students can enroll in the VHI scheme only if at least 10 percent of students in their school participate.

Finally, the HCFP scheme was introduced in 2003 through a special government decision known as "Decision 139 on Health Care Funds for the Poor" to cover the poor and residents of communities facing difficult socio-economic circumstances. The predecessor of this program was known as the "Free Health Care Certificate" program, which was designed to provide the poor with a special health card, and was effectively replaced by the HCFP program due to inadequate funding and difficulties in

[74] Meritorious people refer to individuals who have served the government or provided meritorious service to the country, including elected officials, "policy beneficiaries" who served in the revolution or wars protecting the nation, and family members of current military or police officers.

implementation (Ekman, Nguyen, Duc, & Axelson, 2008).[75] The 2006 VHLSS data indicate that the HCFP program covered approximately 20 percent of the population, including the poor, ethnic minorities, people in mountainous areas, and people in particularly difficult circumstances. Moreover, the HCFP program is funded largely by the central government (about 75 percent), and the rest of the cost is funded by the provincial governments.

In 2005, the HCFP became a part of the CHI, and the beneficiaries received the same benefits as those covered by the SHI. In particular, the benefits include outpatient and inpatient diagnosis and treatment at public facilities and certain private facilities that have signed a contract with the social insurance agency. If patients select a specific facility or bypass a primary care facility without a referral, the additional costs need to be paid by the patients. The SHI and HCFP program cover the cost of consultation, diagnosis, treatment, rehabilitation at the health facility; lab tests, diagnostic imaging, and other diagnostic techniques; medicines on the Ministry of Health (MOH)'s designated list; blood and transfusion; medical procedures and surgery; use of materials, medical equipment, and treatment beds; and prenatal exams and assistance at delivery (Ekman & Bales, 2008). Some exceptions include illnesses and treatments are not covered by the health insurance programs; most of which are covered by other government's programs or have to do with moral hazard problems.[76] Finally, for people covered by health

[75] In the VHLSS 2006, the questionnaire distinguishes between people who had a "Free Health Care Certificate" (predecessor of the HCFP) and people who had "Health Insurance for the Poor" (or HCFP in this context). Nevertheless, since the "Free Health Card Certificate" program was eventually replaced by the HCFP program in 2003, the two terms "Free Health Card Certificate" and "Health Insurance for the Poor" will be referred to as "HCFP" in this chapter.

[76] The exceptions are treatment of leprosy; medicines for treatment of TB, malaria, schizophrenia, epilepsy, and other diseases already covered by government-funded programs; diagnosis and treatment of

insurance for the poor and people living or working in mountainous and remote areas, the transportation costs from referrals from district hospitals to higher-level hospitals are also covered by their health insurance.

5.2. Literature Review

The expansion of health insurance coverage has been a global trend since the Alma-Ata declaration, which emphasized the importance of primary health care (WHO, 1978). Many studies have attempted to evaluate the impacts of health insurance expansions on health care utilization, health outcomes, and out-of-pocket medical expenditures, particularly in the developing countries context. One prominent problem that has received a great deal of attention from researchers is low rates of health care utilization. Despite its low monetary costs, the utilization of public health care services is lower than expected due to two major factors: barriers to access and perceptions of low quality care. The literature pertaining to each of these two issues is reviewed in the following paragraphs.

Given that public health insurance programs mostly reduce the monetary or direct cost of health care, the remaining barriers to access appear to be non-monetary ones. One of the earliest studies is that of Acton (1975), who suggested that time is an important non-monetary factor that prevents people from using health care services, especially

---

HIV/AIDS, except when HIV tests are part of protocols for treatment of other diseases or if the individuals was infected with HIV through work; syphilis and gonorrhea; immunizations, nursing care, early diagnosis of pregnancy, health checkups, family planning services, and infertility treatment; occupational diseases, labor accidents, and war-related accidents; treatment costs in suicide attempts, self-inflicted harm, drug addiction or health problems associated with illegal activities or behavior; and health assessments for legal reasons. The treatments considered as causing moral hazard problems include plastic surgery, prosthetics, false teeth, eyeglasses, and hearing aids; and home consultations, treatment, rehabilitation, or home deliveries.

when the costs of health care are substantially reduced by insurance or public expenditure programs. Mwabu (1989) added to Acton's study by showing that seasonality also affects the demand for medical services; the disutility of time cost of medical treatment is much higher in the rainy season when compared to the cost in the dry season, because the opportunity cost of harvesting is higher in the rainy season. Unlike Acton (1975) and Mwabu (1989), Dor *et al*. (1987) and Gertler and van der Gaag (1990) explicitly use distance as a measure of willingness to pay for medical care in the context where the health care costs are very low. More recent studies have identified other factors that influence individual demand for, and utilization of, health care services. For example, Hjortsberg (2003) finds that both the decision to seek care and the amount of spending on health care services are driven by factors such as income, type of illness, distance, and ownership of a vehicle.

In addition to barriers to access, the quality of care also significantly influences individual decisions on health care utilization. One difficulty in studying the effect of the quality of care is that it is hard to measure. Although there is no standard measure of quality, some studies propose proxies of quality that can be used in practice. For instance, Hanson *et al.* (2005) evaluate the role of perceived quality in determining the demand for hospital care in Zambia, and find that the thoroughness of examinations, staff attitudes, and drug availability, in that order, are the most important perceived quality attributes. Nevertheless, in other studies, "perceived" quality is determined by using the implications from household health seeking behaviors such as bypassing.[77] For instance,

[77] Bypassing is the phenomenon where individuals travel past a free or subsidized local public health facility to obtain health services from a private health facility or a higher level public facility for which they need to pay.

Akin and Hutchinson (1999) find that the phenomenon of bypassing is generally not associated with income, but it is more common among those who are severely ill. Thus, the benefits from the lower cost of public services and closer proximity of that facility cannot outweigh the disadvantage of its poor quality. Similarly, Klemick *et al.* (2009) examine the relationship between health seeking behavior and health care quality in rural Tanzania, and find that households often choose to bypass the nearest low-quality health facilities in search of higher-quality care. Furthermore, Gauthier and Wane (2008) study bypassing behavior in Chad by proposing a new measure of bypassing using the patient's own knowledge of available health providers. They find two distinct types of bypassing activities: (i) poor patients bypass high-quality facilities because they are unaffordable; and (ii) rich patients bypass low-quality facilities in search of a higher quality of care.

Focusing on health care utilization in Vietnam, existing studies can be divided into two broad groups. The first group studies health seeking behavior and health care choices based on household and individual characteristics. For instance, Trivedi (2004) examines the factors that determine individual health care choices among different alternatives, including self-prescribing pharmaceutical drugs (or "self-medication"), visiting government hospitals, using commune health centers, or visiting private health facilities. His results suggest that commune health centers and self-medication are normal goods for low-income households, but they are inferior goods for people with higher income levels. Similarly, Chang and Trivedi (2003) focus specifically on people who use self-prescribed drugs; their results add to Trivedi's (2004) finding by showing that health insurance has a negative impact on using self-prescribed drugs. More recently, Sepehri *et al.* (2008) use a multilevel model to examine the impacts of individual and household characteristics on indivuals' likelihood of seeking treatment, while controlling for unobserved household-level effects. They argue that unobserved household characteristics, such as the homogeneity among household members, have a significant impact on the health-seeking behavior among household members.

The second group of studies on health care utilization in Vietnam concentrates on the impact of public health insurance programs in Vietnam. Wagstaff (2010) studies the HCFP exclusively; he finds that the HCFP program has no impact on the utilization of health care, but it significantly reduces out-of-pocket medical expenditures. In a broader context, Nguyen (2008) develops an economic model to explain the phenomenon where the insured do not use their health insurance cards to obtain health care. His results reveal that the utilization rates vary by the health insurance programs and the health care providers. Moreover, as their incomes increase, the individuals are less likely to use a health insurance card to pay for outpatient treatment, presumably due to a concern on quality of care. Similar to Nguyen's study, Sepehri *et al.* (2009) examine the factors that determine the insured's decision to use his or her health insurance card when seeking outpatient and inpatient care in Vietnam, and compare the results across different health insurance programs. They find that the probability of using insurance benefits varies inversely with income and level of education, since people with higher income and more education are more willing to give up the "poor" quality of treatment provided as insurance benefits.

These previous studies on health insurance and health care utilization in Vietnam, while informative, have several limitations. First, none of them has explicitly determined the impacts of access barriers, such as distance to health care facilities, particularly in the context of the HCFP program, which covered a large proportion of the population, and is scheduled to be expanded to help reach the universal health coverage by 2014. Second, and more importantly, characteristics of health care facilities have not been taken into account when studying individuals' decisions to seek health care services. This study attempts to fill these gaps in the literature by exploiting an usually rich dataset that combines individual and household characteristics with the characteristics of health care facilities, all of which are obtained from the 2006 Vietnam Household Living Standards Survey (VHLSS).

5.3. Theoretical model

The theoretical model used in this study is an extension of the general model of health seeking behavior in Gertler and van der Gaag (1990), and is developed to explain the health seeking behavior of an individual whose health care is subsidized by a public health insurance program. The model is based on a consumer utility maximization framework, in which an individual's utility depends on health (H) and the consumption of all other goods (C). When ill, this individual decides whether to seek medical care, and which health facility to visit to obtain health care. For simplicity, suppose that an ill individual who is insured by a public health insurance program has three health care choices: (i) do nothing or using self-prescribed medicine (S), (ii) visit the registered health facility and receive free health care services (F), and (iii) visit another health facility and pay out-of-pocket for the health care (P). Given that an individual i chooses to receive health care from provider j, where $j \in \{S, F, P\}$, his expected utility can be written as:

$$U_{ij} = U_{ij}(H_{ij}, C_{ij}) \tag{1}$$

where H_{ij} is the expected health status after receiving health care services from provider *j* and C_{ij} is the consumption of all other goods associated with choosing provider *j*.

Assume that individual *i*'s expected health status after receiving health care from provider *j* (H_{ij}) is a function of the individual's initial health condition (H_{i0}), his other characteristics such as age, education, income, etc. ($\boldsymbol{X}_i$), and the quality of the health care that individual *i* received from provider *j* (Q_{ij}). Accordingly, the health production function can be written as:

$$H_{ij} = H_{ij}\left(Q_{ij}, H_{i0}, \boldsymbol{X}_i\right) \tag{2}$$

where $j \in \{S, F, P\}$.

Since doing nothing or using self-prescribed medicine uses the least medical knowledge among the three health care choices, the quality of care is assumed to be the lowest. Moreover, for an ill individual to be willing to pay for the health care given that he can receive health care services at his designated facility at no cost, the quality of care received at the other health facility must be at least as good as the quality of care received at the registered facility ($Q_{iP} \geq Q_{iF}$). Assuming that an individual's health status increases with better quality of care, one can write the relationship of health status for the three health care choices as follows:

$$H_{iP} \geq H_{iF} > H_{iS}.$$

Suppose that individual *i* spends his total income Y_i on either health care or consumption of all other goods. The cost of health care depends on which health care choice the individual chooses. For each health care alternative, the total cost of health care is comprised of both monetary costs and non-monetary costs. The monetary costs include the costs of health care services and medications, while the non-monetary costs are the opportunity costs, such as the forgone wages incurred from waiting or traveling. By normalizing the price of the consumption of all other goods to 1, the budget constraint of individual *i* when choosing health care choice *j* can be expressed as:

$$C_{ij} + P_{ij}^{T} = Y_i, \tag{3}$$

where C_{ij} is the total cost of the consumption of all other goods, and P_{ij}^{T} is the total price of health care when choosing provider *j*. Since the total price includes both monetary and non-monetary costs, P_{ij}^{T} can be rewritten as:

$$P_{ij}^{T} = P_{ij}^{m} + w_i * \tau_{ij}, \tag{4}$$

where P_{ij}^{m} is the monetary cost of obtaining health care at provider *j*, w_i is the wage rate of individual *i*, and $\tau_{ij}$is the forgone time that individual *i* spends in traveling or waiting if he or she chooses provider *j*. If individual *i* chooses to visit his or her registered health facility, the monetary cost incurred to him or her is zero; that is, $P_{iF}^{m} = 0$. However, if he chooses to self-medicate or to visit the other health facility and pay out-of-pocket for that care, the monetary costs will be some positive amounts P_{iS}^{m} and P_{iP}^{m}, respectively, where $P_{iP}^{m} > P_{iS}^{m}$ because the health care services provided by a health professional are more expensive than health care provided by the individual himself.

While individual *i* pays nothing for health care services obtained at the registered health facility, he may have to pay other costs to receive those free health services.

Because the provision of free health care tends to induce higher demand for health care, the time spent in waiting to receive health care services is usually longer at the registered health facility than at the other health facility (i.e. $\tau_{iF} > \tau_{iP}$). As a result, the non-monetary cost of visiting the registered health facility is greater than that of visiting the other health facility, where an individual needs to pay for the services. In contrast to visiting professional health providers, the non-monetary cost of self-medicating or doing nothing is close to zero, given that the individual does not have to wait for health care services or can purchase medicine from a nearby pharmacy.

Based on the above information, the total costs of health care when doing nothing or self-medicating, visiting the registered health facility, and visiting the other health facility can be written as:

$$P_{is}^{T} = P_{is}^{m} + w_i * \tau_{is}, \tag{5}$$

$$P_{iF}^{T} = w_i * \tau_{iF} , \tag{6}$$

and $$P_{iP}^{T} = P_{iP}^{m} + w_i * \tau_{iP}, \tag{7}$$

respectively. Since$P_{iP}^{m} > P_{iS}^{m}$ and assume that $\tau_{is} < \tau_{iP}$[78] it is obvious that $P_{iP}^{T} > P_{iS}^{T}$. However, $P_{iP}^{T} > P_{iF}^{T}$ will be true only if $P_{iP}^{m} > w_i * (\tau_{iF} - \tau_{iP})$, suggesting that the total cost of obtaining the free health care could outweigh the total cost of health care obtained from the other health facility when non-monetary costs are accounted for.

Next, to derive the conditional indirect utility function, one can substitute H_{ij} as a function of the quality of care and the initial health condition, and C_{ij} as a function of

[78] The time used in purchasing medicine is generally lower than the time spent in seeking health care at a health facility.

income and the total health care price. The utility function in a general form can be written as:

$$U_{ij} = U_{ij}\left(H_{ij}(Q_{ij}, H_{i0}, \boldsymbol{X}_i), Y_i - \left(P_{ij}^m + w_i * \tau_{ij}\right)\right). \tag{8}$$

By assuming that the utility is a strictly increasing function of health status and the aggregate consumption good (i.e., $\frac{\partial U_{ij}}{\partial H_{ij}} > 0$ and $\frac{\partial U_{ij}}{\partial C_{ij}} > 0$), the implication is that an improvement in the quality of care from provider *j* has a positive impact on the utility of individual *i*, while an increase in the distance or travel time to provider *j* has a negative effect on his utility. Nevertheless, whether the quality of care or the travel distance has more impact on health care choices is indeterminate and remains an empirical question.

To maximize his utility, individual *i* will choose health care choice *j* that gives the highest expected utility. That is:

$$U_i^* = \max_{j \in \{S,F,P\}} U_{ij}\left(H_{ij}(Q_{ij}, H_{i0}, \boldsymbol{X}_i), Y_i - \left(P_{ij}^m + w_i * \tau_{ij}\right)\right) \tag{9}$$

To illustrate, the utility functions for individual *i* when doing nothing or self-medicating, visiting the registered health facility, and visiting the other health facility can be written based on equation (6) as:

$$U_{iS} = U_{iS}(H_{iS}(Q_{iS}, H_{i0}, \boldsymbol{X}_i), Y_i - P_{iS}^m), \tag{10}$$

$$U_{iF} = U_{iF}(H_{iF}(Q_{iF}, H_{i0}, \boldsymbol{X}_i), Y_i - w_i * \tau_{iF}), \tag{11}$$

and $$U_{iP} = U_{iP}\left(H_{iP}(Q_{iP}, H_{i0}, \boldsymbol{X}_i), Y_i - (P_{iP}^m + w_i * \tau_{iP})\right), \tag{12}$$

respectively.

For illustrative purposes, assume that the utility function has a simple linear function of H_{ij} and C_{ij}:[79]

$$U_{ij} = \lambda_i H_{ij} + (1 - \lambda)_i C_{ij} = H_{ij} + \left(Y_i - P_{ij}^T\right), \tag{13}$$

where λ_i and $(1 - \lambda)_i$ are the weights of H_{ij} and C_{ij}, respectively, on the utility function.

Suppose that individual *i* has a serious illness and that his utility is much higher from seeking health care from a professional health provider than from self-medicating or doing nothing. Consequently, he needs to choose between which health care providers to obtain health care service from. In this case, individual *i* will choose to visit the other health facility and pay out-of-pocket for health care if $U_{iP} > U_F$; that is, if

$$H_{iP} + \left(Y_i - (P_{iP}^m + w_i * \tau_{iP})\right) > H_{iF} + (Y_i - w_i * \tau_{iF})$$

or $$H_{iP} - H_{iF} > P_{iP}^m - w_i * (\tau_{iF} - \tau_{iP}).\text{[80]} \tag{14}$$

In other words, visiting the other health facility is chosen over visiting the registered health facility if the monetary value of the difference in the expected improvements in health is greater than the monetary cost of paying out-of-pocket for health care subtracted by the difference in the non-monetary costs of the two alternatives.

The above theoretical model illustrates a broad mechanism by which individual characteristics and health care alternative specific characteristics affect an individual's health care choice. However, this theoretical model cannot determine the magnitude in which each of these factors impacts health care choices; that needs to be examined

[79] This functional form assumes additive separability. As a result, income will not have an impact on which health care alternative is chosen. This assumption is unlikely to hold in practice.
[80] For illustrative purposes, this expression assumes that health is measured in monetary terms.

empirically. Thus, to analyze the health seeking behavior in the context of the HCFP in Vietnam, the empirical specifications based on this theoretical framework are developed and explained in the next section.

5.4. Empirical Specification

This section presents two empirical specifications that address the two specific research questions: (i) What are the determinants of the HCFP beneficiaries' decisions to seek care and, if sought, of the type of health facilities visited? and (ii) Is there any bypassing behavior among the HCFP beneficiaries and, if so, what are the characteristics of those who bypass public facilities? In the first part, both individual characteristics and health care alternative specific characteristics are used to predict the probability that the individual chooses one of six health care alternatives, including: (i) doing nothing; (ii) using self-prescribed medicine; (iii) using traditional medicine; (iv) visiting the commune health center; (v) visiting a higher level public health facility; and (vi) visiting a private health facility. The second part deals with possible bypassing behavior of the HCFP beneficiaries, and it investigates what factors affect the probabilities that an individual bypasses the nearest health facility or the registered health facility where he can receive the services at little or no cost. In the context, the person-specific information on his or her registered health facility is used to calculate "bypassing". In particular, an individual is classified as "bypassing to a higher level public facility" if he or she chooses to seek health care at a higher level public facility that is further away from his or her registered health facility. Alternatively, an individual is classified as "bypassing to a private health facility" if he or she chooses to seek health care at a private facility to which the distance is greater than or equal to the distance to his or her registered health facility. Moreover, individual and household characteristics as well as the characteristics of the individual's registered health facility are used to predict the probability that the individual chooses to bypass or not. Thus, while the health care alternatives in the first sub-section are differentiated by the types of health providers, the choices in the second sub-section are distinguished by the individual's willingness to travel further and/or to pay additional costs for preferred health care services.

5.4.1 Determinants of Health Care Choice

To translate the maximization problem in equation (9) in Section 5.3 into an estimable empirical specification, the corresponding latent utility for alternative j, where j's are the six alternatives mentioned above, can be written in a linear function as:

$$U_{ij} = a + \boldsymbol{X}_i'\beta_j + \boldsymbol{Z}_{ij}'\gamma + u_{ij} \tag{15}$$

where $\boldsymbol{X}_i$ is a set of "case-specific variables" which are specific characteristics of each individual, and $\boldsymbol{Z}_{ij}$ is a set of "alternative-specific variables" which are specific characteristics of each health care choice available to person i.[81] The case-specific variables consist of individual and household characteristics, such as age, sex, marital status, years of schooling, whether the person has any chronic diseases, household income per capita, and the location of the household (i.e. region). Ideally, the alternative-specific variables include the distance that the individual i travels to receive medical care from the nearest provider j (τ_{ij}) and the quality of health care from provider j (Q_{ij}).[82]

[81] The initial health status discussed in Section 3 is dropped from this specification, as it is assumed to be captured by individuals' characteristics and health conditions (e.g. has chronic condition etc).
[82] Unfortunately, the data from the health facility questionnaire include only the characteristics of commune health centers and regional polyclinics. These characteristics include the numbers of health personnel, such as doctors, nurses, pharmacists, physician assistants; the numbers of beds and rooms; availability of

However, given that health facility characteristics are available only for the commune health centers, this empirical model assumes that the characteristics of all other choices, except distance, are constant across individuals, and only the characteristics of commune health centers vary across individuals. Finally, u_{ij} is the residual term in the regression equation. Note that this residual term could be unobserved characteristics, such as individuals' perceptions on the quality of care or the ability of health workers at health facility j to treat person i's sickness.

It is important to note that measurement of the quality of care is still debated in the literature. Given the information available on the commune health center's health personnel, equipment, and infrastructure characteristics, the measures of quality of care in this chapter are based on the "objective" quality indices, which are similar to those used in Gauthier and Wane (2008).   In particular, there are three groups of objective quality indices. The first group includes the number of health personnel, such as doctors, nurses, physician assistants, per 1,000 persons in the commune. The second is comprised of the availabilities of medicine, general equipment (such as scale, growth chart, etc.), and medical supplies (such as needles, rubber gloves, etc.). Finally, the third includes characteristics of the health facility's infrastructure, such as the sources of water supply, types of toilet, the sanitary level of the facility, and whether the facility has water and facilities for hand-washing. Since there are many variables in this category, a composite index is computed by using principal components analysis.

---

medicine and medical supplies; and other characteristics of the health facility's infrastructure. Almost all communes have commune health centers, but only about 3 percent of all communes have regional polyclinics.

Returning to the latent utility specification in equation (15), the individual chooses the alternative that gives the highest utility. However, since U_{ij} is not observable, a set of binary variables must be defined. Denote y_{ij} as an indicator function where: $y_{ij} = 1$ if $U_{ij} > U_{ik}, \forall k \neq j \in \{1,2,3,4,5,6\}$, and $y_{ij} = 0$ otherwise. Then, the associated probabilities that a health care choice j is chosen can be written as:

$$p_{ij} = Pr\left(y_{ij} = 1 | \boldsymbol{X}_i, \boldsymbol{Z}_{ij}\right) = Pr\left(U_{ij} > U_{ik}, \forall k \neq j \in \{1,2,3,4,5,6\}\right). \qquad (16)$$

The model based on equation (14) can be estimated using a discrete choice estimation method. Since both individual characteristics and alternative specific characteristics are available in this dataset, a mixed logit model, which is a more general form of the multinomial logit model, will be used to estimate the impacts of both case-specific and alternative-specific variables on the probability that the individual chooses the six health care choices.[83,84] The specification of the mixed logit model can be written as:

$$p_{ij} = \frac{\exp\left(\boldsymbol{X}_i'\beta_j + \boldsymbol{Z}_{ij}'\gamma\right)}{\sum_{k=1}^{6}\exp\left(\boldsymbol{X}_i'\beta_k + \boldsymbol{Z}_{ik}'\gamma\right)}, \qquad j = 1, \ldots, 6. \qquad (17)$$

Since the focus of this chapter is on barriers that block access to health care, and distance is likely to be one of the main barriers in this context, a hypothesis to be tested in this sub-section is that the individual is less likely to visit the health facility that is further away even if the direct cost of health care services at that facility is very low or zero. Moreover, the availability of health professionals, medicine, and equipment at the local

---

[83] The term "mixed logit" used in this context refers to a model that is a combination of a multinomial logit model and a condition logit model. It is not to be confused with a random parameter logit model, which is also referred to as a mixed logit model.

[84] The mixed logit model assumes that the independent of irrelevant alternatives (IIA) condition holds. This assumption will be relaxed later in the sensitivity analysis.

health facility, which are predictive of the "perceived" quality of care, are expected to have a positive impact on the probability of visiting commune health facilities, and a negative impact on the probabilities of all other choices.

5.4.2 Bypassing Behaviors

In addition to examining individual's health care choice, another objective of this chapter is to investigate the bypassing behaviors, if any, of the HCFP beneficiaries. Traditionally, bypassing is defined as the phenomenon in which an ill individual travels past a closer health facility in order to seek treatment from another health facility that is further away; that is, a "bypassed" facility is one that is closer to an individual than the one chosen by the ill individual for treatment (Akin & Hutchinson, 1999). This chapter proposes a new definition of bypassing by incorporating the fact that a certain health facility is designated as a registered facility for an insured person, and in order to receive the benefits (i.e. free or low-cost health care services) provided by the health insurance the insured person needs to seek health care from this particular facility. Evidently, the insured often choose to bypass their designated health facilities, which are usually public primary care units, and instead they seek health care from private health facilities or from higher-level public facilities without a referral from their registered facility. In both cases, "bypassers" incur higher health expenditures than if they had chosen to seek care at the designated facilities.

In the context of the HCFP in Vietnam, approximately 64 percent of the primary care units designated as registered facilities for the HCFP beneficiaries are commune health centers (CHCs), and the rest are regional polyclinics. In general, each commune has one CHC located near the community center, and it is the nearest public health facility for people in the commune.[85] The CHC provides mainly primary care, and if a higher level of care is needed, patients can be referred to higher level public facilities, which provide secondary or tertiary care for little or no cost (if the patient has a referral) but are usually further away. Although the referral does not incur additional costs to the patients, this process may take a long time. As a result, patients may opt out of the referral line and pay out-of-pocket for the health care at the higher level public facilities. Moreover, an alternative to the CHC is private doctors' clinics, which are usually run by doctors who also work in the public sector. In most cases, private clinics are located near the community center, and thus have similar travel distances as the CHC. However, the main differences between the CHC and private clinic are the patient's out-of-pocket health expenditure and the time spent waiting for the services (waiting times are much lower at private clinics). Thus, given the context explained above, a HCFP beneficiary is considered to "bypass" his registered health facility if and only if he: (i) seeks health care from a higher-level public facility that is further away *without* a referral, or (ii) seeks health care from a private facility. This creates two types of bypassing behaviors.

To examine the bypassing behavior of the HCFP beneficiaries, a two-level nested logit model is employed in order to take into account the two bypassing types that are nested within the choice of bypassing. In addition, this model relaxes the independence of irrelevant alternatives (IIA) assumption, which allows the error terms of the choices within the same group to be correlated. In the first level of the model, an individual

[85] In some cases, there can be a regional polyclinic instead of the commune health center, or in very few cases there may be both of them within the same commune. In these cases, the regional polyclinics are the nearest public health facilities for people in the commune.

chooses among three choices: (i) doing nothing or self-medicating, (ii) visiting the registered facility[86] (i.e. no bypassing), and (iii) bypassing the registered facility to go to other health facility. Then, conditional on bypassing the registered facility, the second level of the model determines whether the individual will choose to seek health care from a higher level public facility or a private facility. This two-level nested logit model is depicted in a tree structure in Figure 5-1.

To illustrate, define *j* as the top-level alternative (nest) where *j=1, 2,* and *3* if an individual choose to self-medicate, seek care at the registered facility, and bypass, respectively. Also, define *k* as the bottom-level alternative (branch) where *k=1* if the individual chooses a higher-level public facility, and *k=2* if the individual chooses a private facility. The utility for the alternative *jk* can be written as:

$$U_{jk} = V_{jk} + \varepsilon_{jk} \;=\; \boldsymbol{z}_j'\alpha + \boldsymbol{x}_{jk}'\beta_j + \varepsilon_{jk}, \qquad (18)$$

where $j \in J= \{1, 2, 3\}$ *and* $k \in K= \{1, 2\}$; $\boldsymbol{z}_j$ is the set of variables that change over nests only (e.g. characteristics of health facilities); $\boldsymbol{x}_{jk}$ is the set of variables that change over nests and branches (e.g. distance to a specific type of health facility); and $\varepsilon_{jk}$is the error term.

Let y_{jk} be a binary indicator variable that equals one if alternative *jk* is chosen, and zero otherwise. The associated probability that alternative *jk* is chosen can be written as:

$$p_{jk} = \Pr\big(y_{jk} = 1\big) = Pr\big(U_{jk} > U_{lm}, \forall l \neq j, m \neq k\big) \qquad (19)$$

[86] The designated facility is presumably the nearest public health facility to the individual's home.

The nested logit model assumes that the error terms have the generalized extreme value (GEV) joint cumulative distribution function. Following Amemiya (1985), the probability of choosing health facility k, given the choice of bypassing j can be expressed as:

$$p_{k|j} = \frac{\exp\,(\boldsymbol{x}'_{jk}\beta_j/\rho_j)}{\sum_{m=1}^{2}\exp\,(\boldsymbol{x}'_{jm}\beta_j/\rho_j)}, \tag{20}$$

where ρ_j is a measure of the degree of independence in unobserved utility among the alternatives in nest j, and $0 \leq \rho_j \leq 1$ for the model to be consistent with utility-maximizing behavior. A higher value of ρ_j implies greater independence and less correlation among the alternatives within the same nest. Hence, when $\rho_j = 1$ for all j, the nested logit model reduces to the multinomial logit model. Note that, in this context, $\rho_j = 1$ for j = 1 and 2 because the "self-medicate" and "seek care at the registered facility" nests each has only one branch. This leaves only the value of the dissimilarity for the "bypass" nest to be between 0 and 1.

Moreover, the probability of choosing nest j can be written as:

$$p_j = \frac{\exp\,(\boldsymbol{z}'_j\alpha + \rho_j I_j)}{\sum_{l=1}^{3}\exp\,(\boldsymbol{z}'_l\alpha + \rho_l I_l)}, \tag{21}$$

where $I_j = ln\left(\sum_{m=1}^{2}\exp\,(\boldsymbol{x}'_{jm}\beta_j/\rho_j)\right)$ is called the inclusive value.

Following equations (20) and (21), the probability that the choice of bypassing j is chosen in the first level and the health facility k is chosen in the second level can be derived as:

$$p_{jk} = p_j \times p_{k|j} = \frac{\exp(\boldsymbol{z}'_j\alpha + \rho_j I_j)}{\sum_{l=1}^{3}\exp(\boldsymbol{z}'_l\alpha + \rho_l I_l)} \times \frac{\exp(\boldsymbol{x}'_{jk}\beta_j/\rho_j)}{\sum_{m=1}^{2}\exp(\boldsymbol{x}'_{jm}\beta_j/\rho_j)} \,. \tag{22}$$

To estimate, the dependent variable (p_{jk}) includes the choices of self-medicating/doing nothing, visiting a registered facility, bypassing to a higher level public facility, and bypassing to a private clinic. The explanatory variables include the same individual and household characteristics that are used in predicting health care choices in the previous sub-section, the difference in the distance between the registered health facility and the next higher-level public health facility, and the characteristics of the CHCs, which reflect the quality of care at the registered facility.[87]

5.5. Data and Descriptive Statistics

5.5.1. Data

The data used are from three sets of questionnaires in the 2006 Vietnam Household Living Standards Survey (VHLSS), which is a large nationally representative survey conducted by the General Statistics Office (GSO) of Vietnam. The first is the VHLSS household questionnaire, which collected information on both household and individual characteristics, including demographics, education, employment, health and health care, income, consumption expenditures, fixed assets and durable goods, and housing characteristics. In the health and health care section, the survey collected detailed information on individuals' health conditions, the type of health facilities used, the type of health insurance, the health facilities where they registered, time and expenses

[87] All explanatory variables are included in the second-level model since all of them are individual-specific variables, and Stata 12 program does not allow putting the same explanatory variables in more than one place. By specifying the explanatory variables in the second level (branch), these variables are also taken into account when estimating the nests in the first-level model.

for both outpatient and inpatient treatments as well as the types of health facilities visited, and health behavior on self-treatment (i.e. whether the individual purchases his or her own medicine with or without a prescription).

The second questionnaire is the VHLSS commune questionnaire, which implemented in rural areas only. This questionnaire includes questions on the types of health care facilities available in the commune, the distance and travel time required from the commune center to the nearest health facility of each type, and the type of transportation used most often to travel from the commune center to that health facility. The types of health facilities are: commune health center (CHC), regional polyclinic, district hospital, provincial hospital, private hospital, private doctor's office, private nurse's office, doctor assistant's office, midwife's office, state pharmacy, private pharmacy, and oriental drugstore. Moreover, the distances to the nearest health facility of each type are reported only when that type of health facility is not available within the commune. For the health facility that is available within the commune (such as commune health centers), the distance is deliberately reported as a missing value, because it is assumed to be zero.

Finally, the third questionnaire is the health facility questionnaire, which collected detailed information of commune health centers and regional polyclinics in rural areas. This information includes: the characteristics of health workers, such as education, specialization, whether the worker practices privately, and absenteeism; the characteristics of the health facility, including access to utilities, actually hours open for examination, number of patient visits, medicine and equipment availability, and observed sanitary level; and the finances of the facility. The health facility questionnaire was administered only in rural areas, so the sample in this analysis will be restricted to the individuals who live in rural areas.

5.5.2. Descriptive Statistics

5.5.2.1. Individual Characteristics and Health Care Choices

Although this study focuses on the health care choices of HCFP beneficiaries, the first set of estimates includes all persons who reported that they had suffered from an illness or injury during the four weeks prior to the interview. To begin, it is useful to review the characteristics of all persons who were ill or injured in the past four weeks. The 2006 VHLSS asked questions in the health and health care section of 39,071 individuals. Among these individuals, 7,290 reported that they were ill or injured in the past four weeks. The demographic characteristics and health insurance status of these individuals are reported in the first two columns of Table 5-1. The average age of this group is approximately 36 years old; about 45 percent of them are male; and the average years of schooling is 5.6 years. Moreover, among the three types of health insurance, the HCFP programs account for about 23 percent of the selected sample.

Next, the sample is further restricted to the HCFP beneficiaries who are at least six years old, for the following two reasons. First, the questions on health conditions, such as whether the person had any chronic condition, were asked of only persons who were 6 years and older. Second, as of 2005, children younger than six years old were required by the Vietnamese government to be covered by a separate program called "Free care for children under 6," which is now a part of CHI. The descriptive statistics of this subgroup of the HCFP beneficiaries are shown in the last two columns of Table 5-1. On average, the people in this subgroup are older and have lower education, and there are slightly more females and married persons, when compared to all persons who were sick in the past four weeks. Moreover, 59 percent of HCFP beneficiaries are individuals who have "Free Health Care Certificates," suggesting that more than half of people who are covered by the HCFP program in 2006 previously had health insurance benefits under the Free Health Care Certificate program.

In addition to demographic characteristics, Table 5-2 reports some health conditions of persons who were six years or older and had been sick or injured in the past four weeks. Again, the characteristics of all persons are presented as for comparison with the characteristics of HCFP beneficiaries. Interestingly, the numbers in Table 5-2 reveals that HCFP beneficiaries tend to have poorer health when compared to the general population, conditional on being sick or injured in the past four weeks. More specifically, the average number of days that the HCFP beneficiaries were sick, the number of days that they were not able to work, and the number of days that they needed to stay in bed are all greater than those numbers for the general population. In contrast, the chronic health conditions for the two groups are not significantly different. Nevertheless, these self-reported health conditions may reflect different concepts of "being sick" across rich and poor people.

The next variables of interest are the health care choices that are used as the dependent variable in the first part of the analysis. Table 5-3 shows the different health care providers chosen for out-patient care during the four weeks before the interview. In the survey, a sizable proportion of people reported that they have been sick but said that they did not have any out-patient visits; these people are classified as using self-treatment or doing nothing. Among those who reported an illness or injury in the past four weeks, approximately 30 percent chose to do nothing or to self-medicate. This number is consistent with both anecdotal evidence and the literature, which indicate that a substantial portion of Vietnamese choose to self-medicate when they are sick (Chang & Trivedi, 2003). Of the remaining 70 percent, most chose either to visit a commune or village health center or to visit a private clinic. Two findings are worth mentioning here. First, the HCFP beneficiaries choose to visit commune or village health centers more than the general population. This likely reflects that many HCFP beneficiaries live in mountainous areas, and hence there may not be as many private clinics as there are in urban areas. Moreover, approximately 17 percent of sick HCFP beneficiaries who are six years or older choose to self-medicate. This number is somewhat lower than the percentage of people who choose to self-medicate among the general population (21 percent), which includes the uninsured people, suggesting that there may be fewer "modern" pharmacies in the areas where the HCFP beneficiaries live.

Another dependent variable is the insured's health care choices and their bypassing patterns. As mentioned in Section 5.4, bypassing in this context is assessed not only in terms of travel distance but also in terms of the willingness to pay extra costs for health care. The statistics in Table 5-4 are obtained from people who are insured by CHI, VHI, or HCFP, since the concern here is whether the insured seek health care from their designated health facilities. Among all the insured, about 50 percent do not bypass; that is, they seek health care either from their designated facilities or from the closest public facility. At the same time, about 23 percent of the insured choose to bypass their registered facility, and among the "bypassers" the proportion of people who visit a higher level public facility (11.5 percent) is about the same as the proportion of those who visit a private facility (12.4 percent). Similarly, the proportions of the two types of the bypassers among the HCFP beneficiaries are slightly smaller than those of all the insured.

In addition to the health care choices for outpatient care in the past 4 weeks and inpatient care in the past 12 months, the VHLSS household questionnaire also asked all the insured if they used their health insurance cards/free health care certificates for diagnosis or treatment in the last 12 months, and the reason if they chose not to use the health insurance cards. Table 5-5 presents the percentage of different self-reported reasons for not using the card according to the respondent's health insurance type. The statistics reveal that the main reasons for not using the card are the same across different health insurance groups. In particular, among the listed reasons, the insured did not use their health insurance cards mostly due to "cumbersome procedure" (22.6 percent) and "lower quality when using health insurance" (12.2 percent). However, almost 50 percent of the respondents answer "other reasons," which suggests that other factors could potentially have more influence on the insured's decision not to use the health insurance card.

5.5.2.2. Access to Health Care

In order to examine the problem of barriers that block access to health care, an important explanatory variable is the travel distances from the commune center to the nearest CHC, regional polyclinic, district hospital, provincial hospitals, other hospital (private, specialized, and central hospital), private doctor's office, state and private pharmacies, oriental medicine store, and other medicine provider. It is important to note that for the health facilities that are located within the commune, both distance and time are recoded as zero since the values for both variables were recorded as missing in the original dataset.[88]

Table 5-6 illustrates the average travel distance (in kilometers) from the community center to each type of health facility.[89] As expected, the average distance to the commune health center is the smallest, followed by the distance and travel time to the nearest private pharmacy and the nearest private doctor's assistant office, respectively. In contrast, the distances to other hospitals and provincial hospitals are the largest. Note that not all communes have this information for all types of health facilities. For instance, out of the total of 2,280 communes, only 1,774 (about 78 percent) have information on the distance from the community center to the nearest regional polyclinic. To account for the missing values in the regression analysis, different types of health facilities that provide health care services at the same level of care are grouped together. More specifically, private pharmacy is grouped together with state pharmacy; regional polyclinic is grouped with district hospital, provincial hospital is grouped with other hospital, and doctor's assistant's office and private nurse's office are grouped with private doctor's office.[90]

To see a relationship between distances to different health facilities and health care choices, Figure 5-2 shows the distance from the commune center to different types of health care facilities for people who make different health care choices. The *x-axis*

[88] Again, the distance and time are recorded as missing because they are assumed to be zero.
[89] The average travel time to each type of health facility is also available, but since the distance and time data show similar pattern, only travel distances are shown here.
[90] Regional polyclinics and district hospitals are considered to be secondary-level care providers, while the provincial hospitals and other specialized hospitals are tertiary-level care providers.

indicates the groups of people who chose different health care choices, and for each group there are four bars representing the average travel distances to the nearest regional polyclinic/district hospital, provincial/other hospital, private health facility, and pharmacy, respectively. Note that the distance to the nearest CHC is not shown here because almost all CHCs are located within the community center and therefore the travel distance is zero. Comparing the average distances across different health care choices reveals that people do not necessarily choose the health facility that has the shortest distance from the community center. This suggests that distance may not be the most important determinant of health care choices.

5.5.2.3. Characteristics of CHCs and Regional Polyclinics in Rural Areas

The 2006 VHLSS health facility questionnaire collected information from 2,307 health facilities in 2,241 communes in rural areas. Among these health facilities, 2,166 are CHCs, and 141 are regional polyclinics. In addition, out of all communes in the sample, 2,100 of them have only a CHC, 75 have only a regional polyclinic, and 66 have both a CHC and a regional polyclinic. In the cases where there are both types of health facilities, the characteristics are inferred from the average numbers calculated from both facilities.[91]

Table 5-7 shows the numbers of all types of health workers, the proportions of those who practice privately, and the proportions of those who were absent from the health facility at the time of interview. In total, there are 12,178 health workers, most of whom are physician assistants, while doctors and nurses account for only about 14

[91] After excluding the missing values, there are 2,183 communes that have information on health facility characteristics.

percent and 15 percent, respectively, of all health workers. However, among all kinds of health workers, doctors have the highest percentage of people practicing privately. That is, about 34 percent of all doctors reported that they also worked in private practice, and among those who work in the private sector, the average amount of time spent in private practice is 16 hours per week. For other health workers, the proportions who work in the private sector are much lower, ranging from 11 percent to 16 percent. With regard to the proportion of health workers who are absent from the facility at the time of interview, doctors and physician assistants[92] have the two highest rates of absence (about 13-15 percent), whereas the absence rates for midwives, nurses, and pharmacists are only 7, 10, and 12 percent, respectively.

When considering the availability of health personnel in the health facility in each commune, the ratios of each type of health workers per population are calculated from the number of each type of health workers in, and the population living in, the commune. Table 5-8 shows that, on average, there is 1 doctor, 1.3 nurses, 0.5 pharmacists, 1.2 midwives, and 3.8 physician assistants per 10,000 persons. These numbers are quite low when compared to the country's average health workers ratios, most likely because these health facilities are CHCs and regional polyclinics in rural areas.[93]

In addition to the availability of health workers, Table 5-8 also presents general characteristics, including number of years the facility has been operating, number of beds and rooms, number of operating hours per week, and whether the facility has someone on

---

[92] Doctors and physician assistants are different in their education levels. While doctors have medical degrees (above college level), physician assistants generally have high-school or less than high-school degrees.

[93] According to Dung (2010), there are on average 6.5 doctors, 7.2 nurses, and 1.3 pharmacists per 10,000 persons.

call 24 hours per day and 7 days per week. On average, the health facilities have been operating for 30 years, which is about the same period of time since the expansion of primary health care unit after the *Doi Moi* reforms. The average numbers of beds, in-patient beds, and rooms in each health facility are 7, 5, and 8, respectively. Moreover, 98 percent of all health facilities have a health worker on call 24 hours per day and 7 days per week, and the number of hours of operation is about 48 hours per week (weekend included).

Furthermore, the health facility questionnaire also collects information on the availability of general equipment (growth chart, scale, etc.), medical supplies (needles, gloves, etc.), medicine availability, and other infrastructure characteristics. The questionnaire also asked whether each item on the specified list of general equipment, medical supply, and medicine was currently available at the health facility. On average, the health facility has about 10 out of 13 items available for general equipment, and 6 out of 7 items available for medical supply. For medicine availability, there are a maximum of 16 medicine types and a scale of 1-3 for the quantity of each available medicine. Based on these numbers, an index of medicine availability was also calculated, with a maximum value of 48. Although 9 out of 16 medicine types are available, the medicine index on average is only about 20, due to the fact that most medicines are available in a small quantity.[94] Finally, with regard to characteristics of the infrastructure, although only 33 percent of all health facilities have electricity without any cut,[95] most have water

[94] The scales 1, 2, and 3 refer to the quantities less than 10, from 10 to less than 100, and 100 or more, respectively.

[95] Almost all health facilities (98 percent) have access to electricity, but the extent to which electricity has been cut varies across facilities (the average numbers of months that electricity has been cut at least once a week is 3 months per year).

and facilities for washing hands, a flush toilet with a septic tank, and are considered to be clean or moderately clean.

5.6. Results

5.6.1. Determinants of health care choice

This section presents estimation results of the impacts of traveling distance and other individual characteristics on health care choices, using the mixed logit model. Due to the lack of commune health facilities data for urban areas, the sample is restricted to individuals living in rural areas. Moreover, individuals who choose to visit traditional doctors or to visit other health centers are also excluded because the sample size of this group is very small (less than 2 percent) and there are a large number of missing values for the distance to the nearest oriental/traditional medicine store. After grouping health facilities according to their ownership (i.e. public vs. private) and their levels of care, there are five health care choices in total: (i) do nothing or self-medicate;[96] (ii) visit a commune health center (primary level); (iii) visit a regional polyclinic or district hospital (secondary level); (iv) visit an "other" hospital (tertiary level);[97] and (v) visit a private clinic. For simplicity in interpreting the results, the group of people who choose to do nothing or self-medicate is used as the base category. Moreover, females who are not married, do not have any chronic condition, have no health insurance, and live in Red River Delta region are the omitted group.

[96] This group includes people who reported that they have been ill in the past four weeks but did not seek any out-patient care and people who purchased medicine without a prescription.
[97] Other hospitals include provincial hospitals, central hospitals, and other hospitals.

5.6.1.1. Health care choices for all persons age 6+

Table 5-9 and Table 5-10 present the coefficients and the corresponding marginal effects, respectively, of a mixed logit model, where all persons six years or older are included in the analysis. Since the marginal effects reveal the impact of each factor on the probability of choosing each health care choice, they are easier to interpret. Thus, the results discussed below will be based on mainly on the marginal effects. However, when the sign and significance level of the marginal effect of a variable differ from its coefficient, the marginal effect of that variable will be discussed. Note that the sign and significance level of the marginal effect are not necessarily the same as those of the coefficient, because the coefficient in a mixed logit model indicates the relative likelihood of choosing this choice compared to the base choice, whereas the marginal effect indicates the effect of that variable on the probability of choosing that choice among all choices.[98]

Based on Table 5-10, the distance to a particular type of health facility has a negative marginal effect on the probability of choosing that particular facility but a positive effect on the probabilities of choosing all other health care choices. However, the marginal effect of the interaction term between household expenditure and the distance to the chosen facility is positive, which suggests that the negative impact of distance of the probability of visiting the health facility is offset by the positive impact of household expenditure, and accordingly the marginal effect of distance will be less negative for richer individuals.

[98] The marginal effects of a variable across all choices will add up to zero.

Considering individual characteristics, age has a significantly positive impact on visiting the commune health center, but a significantly negative impact on visiting provincial hospital and on doing nothing. In addition, the years of schooling, whether the person has any chronic condition, and number of days being ill have statistically significant negative effects on visiting the commune health center, but the marginal effects of these three variables are all positive and statistically significant on visiting provincial or other hospitals. These results reflect that people who have more severe health problems tend to need higher level of care and, thus, they would need to visit provincial or other hospitals, where there are more advanced treatments and specialists available. Moreover, people with higher education are more likely to be aware of their health problems and are better at navigating through the health care system. As a result, these people would be more likely to seek care at provincial or other public hospitals.

Furthermore, the marginal effects of all health insurance variables have the expected signs. In particular, CHI, VHI, or HCFP all have significantly positive effects on visiting the commune health center and regional polyclinics, whereas they have significantly negative effects on visiting private clinics and on doing nothing or self-medicating. These results are sensible in that the three types of health insurance require that the beneficiaries use of health services at their registered health facilities, most of which are commune health centers and regional polyclinics. Moreover, when considering the magnitude of the marginal effects of each health insurance type across different health care choices, the marginal effect of HCFP on the probability of visiting a commune health center is higher than the marginal effect on the probability of visiting a regional polyclinic. In contrast, the marginal effects of CHI and VHI on the probability of visiting a commune health center are lower than the marginal effects on the probability of visiting a regional polyclinic. These results reflect the fact that both CHI and VHI beneficiaries, in general, are in higher socioeconomic groups and have better access to regional polyclinics or district hospitals, which are usually further away from the commune.

With regard to household characteristics, household expenditure has a significantly negative impact on visiting the commune health center, but a significantly positive effect on self-medicating or doing nothing. This finding can be explained in at least two ways. First, health care services at the commune health center as inferior goods may be perceived as an inferior good for a richer person. Second, a person from a high income household may have enough knowledge to treat himself, and hence is less likely to visit the commune health center.

In addition to demographic characteristics and health insurance, another set of variables of interest are the characteristics of health facilities that are considered to be "objective" quality indices. Given the data limitations, the only variables available are the characteristics of commune health centers, including the number of health personnel (doctors, nurses, pharmacists, and doctor assistant), the number of beds and rooms, equipment availability, medicine availability, and the number of years since first operating. The numbers of different types of health personnel are divided by the population (1000 persons) in the commune in order to account for variation in population across different communes.

Some of the results in Table 5-10 are somewhat surprising. In particular, the number of doctors in the commune health center has a significantly positive impact on visiting private clinics. This result is counter-intuitive, since one would expect to see that people are more likely to visit commune health centers when the number of doctors is higher. One possibility is that these doctors may have their own private clinic in the same commune. As a result, having more doctors officially employed at the commune health centers may increase the opportunity for people to visit private clinics. However, when looking at the numbers of nurses and doctor assistants at the commune health center, both variables have significantly positive effect on visiting the commune health center. This result suggests that the availability of nurses and doctor assistants at the commune health center may have a greater impact than the number of doctors on people's decisions to visit the commune health center. In fact, the statistics on the proportions of health workers who practice privately in Table 5-7 supports the conjecture that doctors are more likely to "moonlight" than nurses and doctor assistants.

Lastly, to address the impact of health facility quality on the health care choices of people with different health insurance types, the interactions between health insurance types and characteristics of the commune health center are included in the next regression, of which the coefficients and marginal effects are shown in Table A-6 and Table A-7, respective, in the **Appendix 4**. Overall, the results show that the coefficients of distance to health facilities, individual characteristics, and household characteristics are almost exactly the same as the coefficients of these variables in Table 5-9. However, the marginal effects of the interaction terms in Table A-7 suggest that the impacts of commune health center characteristics vary across different health insurance groups. For instance, for CHI beneficiaries, the number of doctors at the commune health center does not a statistically significant impact on any health care choice. In contrast, for VHI beneficiaries, the number of doctors at the commune health center has a significantly positive impact on visiting the commune health center and on visiting a private clinic. Similarly, for the HCFP beneficiaries, the number of doctors at the commune health center has a significantly positive impact on visiting a private clinic. Again, these findings imply a similar pattern as that shown in Table 5-10. That is, the availability of doctors at the commune health center can increase the likelihood of visiting a private clinic due to the existence of "moonlighting" doctors, particularly at the commune health centers where VHI and HCFP beneficiaries visit.

5.6.1.2. Health care choices for HCFP beneficiaries age 6+

Since the focus of this paper is on health care choices of HCFP beneficiaries, the empirical results in Table 5-11 and Table 5-12 are based on the sample restricted to sick HCFP beneficiaries who are six years or older. Similar to the results when all sick persons who are six years or older are included in the sample, Table 5-11 shows that the coefficient on distance to health facilities is negative and statistically significant at the 1 percent level. However, the magnitudes of the marginal effects of distances to different health facilities on all health care choices in Table 5-12 are larger than those of the marginal effects in Table 5-10, suggesting that distance has a larger negative impact on the probability of seeking health care for HCFP beneficiaries than for the general population. Moreover, both the coefficient and marginal effect of household expenditures are negative and statistically significant for visiting the commune health center, suggesting that health care services at commune health center are viewed as inferior goods by HCFP beneficiaries.

Regarding the "objective" quality of care, most of the coefficients and the marginal effects on the commune health center characteristics have signs and statistical significance levels similar to those for the HCFP beneficiaries in Table A-6 and Table A-7 in the **Appendix 4**. In particular, the number of doctors at the commune health center has a positive and statistically significant coefficient for visiting a private clinic. Moreover, the coefficient on the number of nurses is positive and statistically significant not only for visiting the commune health center but also for visiting the regional polyclinic. Similarly, the number of doctor assistants also has a positive and statistically significant coefficient for visiting the commune health center. Note that, both the number of nurses and the number of doctor assistants have significantly negative impacts on self-medicating or doing nothing. Again, these results reaffirm the belief that the availability of nurses and doctor assistants at the commune health center plays a crucial role on patients' decisions to seek health care at the commune health center, as opposed to self-medicate or do nothing. Nevertheless, the finding that the number of nurses increases the likelihood of visiting a regional polyclinic needs further interpretation. One possible explanation is that, as there are more nurses available at the commune health center, it is more likely that the patients who previously visit the commune health center are transferred to regional polyclinic for a higher level of care. Alternatively, it could be the numbers of nurses at the commune health center and at the regional polyclinic are highly correlated.

Finally, there are some unexpected results in Table 5-11. In particular, the coefficient on the number of beds is negative and statistically significant for visiting the commune health center and for visiting a regional polyclinic. Likewise, the coefficient on the availability of medical supplies is negative and marginally statistically significant (at 10% level) for visiting the commune health center. These results are counter-intuitive since one would expect that more beds and medical supplies available at the commune health center would increase the likelihood of visiting that facility, instead of self-medicating or doing nothing. Nonetheless, the marginal effects of these two variables in Table 5-12, despite being negative, are not statistically significant, suggesting that neither of them have statistically significant impacts on the health choices of HCFP beneficiaries.

5.6.1.3. Sensitivity analysis

To relax the IIA assumption in the mixed logit model above, a two-level logit model is analyzed, by grouping the health care alternatives in three nests: (i) No care (self-medicate or do nothing), (ii) seek care from a public facility (visit commune health center, regional polyclinic, or other public hospital), and (ii) seek care from a private facility. When all persons age six years or older are included in the model, the log-likelihood ratio test for IIA cannot reject the null hypothesis that all dissimilarity parameters equal 1 (chi2 = 4.58 with p-value = 0.2051). This suggests that the mixed logit model is appropriate and gives unbiased estimates. It is fortunate that the nested logit model does not appear be needed, because when the sample is further restricted to HCFP beneficiaries age six years or older, the nested logit model does not converge.

5.6.2. Bypassing behavior

This section presents empirical results for the two-level nested logit model on bypassing behavior among the insured population. In the first part of the analysis, the sample includes all individuals who are insured by CHI, VHI, or HCFP, and in the second part the sample is restricted to HCFP beneficiaries. For each group, the results are separated into two levels based on the decision tree, where the top level shows the decision to seek health care from the registered facility (i.e. no bypass, bypass, or no care), and the bottom level shows the choice of health facility in the event of bypassing (i.e. a higher level public facility or a private facility).[99] The explanatory variables include individual characteristics, in particular age, gender, marital status, years of schooling, number of days ill, reasons for seeking health care, and the type of registered facility; and household characteristics, including household expenditures, household size, and the regional location of the household. In addition to individual and household characteristics, a variable on distance calculated from the difference between the distance to the registered health facility and the distance to the next higher level public facility is included as an alternative-specific explanatory variable. This measure of distance indicates how difficult it is for an insured person to bypass to a higher level public facility. Finally, the last set of explanatory variables includes the characteristics of the commune health center, which indicate the quality of the registered facility.

[99]Individuals who were transferred from a lower level public facility to a higher level public facility are coded as "no bypass."

5.6.2.1. All insured persons age 6+

Table 5-13 presents the results from the two-level nested logit model, and people who choose to do nothing are the base (omitted) group. Unlike the results for the mixed logit model on health care choices, the coefficient of age is positive but not statistically significant for any choice. Moreover, the coefficient on male is negative and statistically significant for bypassing to a higher level facility, whereas the coefficient on "married" is positive and statistically significant for not bypassing and for bypassing to a private facility. The finding that males are less likely to bypass to a higher level public facility than to self-medicate or do nothing could be explained by the fact that women are more likely to have complicated health problems or are more assertive in seeking a higher level of care, and hence they are more likely to visit a higher public health facility for more advance procedures. To explain why married persons to be more likely not to bypass, or to bypass to private health facility, it could be because married persons are less willing to travel further in order to seek health care due to more responsibility within the household. Furthermore, years of schooling and household income both have positive and statistically significant coefficients for bypassing to a higher level public health facility. These findings suggest that more educated and wealthier people are more likely to be aware of their health problems or more knowledgeable about health care options, and are more likely to demand a higher level of care.

In addition to general demographic characteristics, health conditions also have impacts on the likelihood of seeking health care at a public facility. In particular, having a chronic condition has a negative and statistically significant coefficient on "no bypass" and "bypass to a higher level facility." This result suggests that people who have chronic conditions are less likely to visit either their registered facility or a higher level public facility than to self-medicate or do nothing, possibly because these chronic conditions may not need immediate attention from a health professional. On the contrary, the number of days that the individual is ill has a negative and statistically significant coefficient on "no bypass" and "bypass to a higher level facility." This finding is counterintuitive, as one would expect that people who have been ill for a longer period of time would be more likely to visit either their registered facility or a higher level public facility than to self-medicate or do nothing because the number of days being ill can be an indicator of the severity of their illness. However, this result could be due to an endogeneity problem, since the number of days being ill could be counted after the individual had made a decision on health care choice.[100]

Furthermore, the coefficient on the difference between the distance to the next higher level public facility and the distance to the registered facility is positive and statistically significant for both no bypassing and bypassing to a higher level public facility. These results could be due to the fact that the difference between the distance to the next higher level public facility and the distance to the registered facility can be seen as a disincentive for individuals to seek care at a higher level public facility. Hence, the larger this difference is, the more likely the individuals will not bypass their registered facility.

With regard to the types of registered facility types, the coefficient on having a regional polyclinic or district hospital as the registered facility is negative and statistically

[100] When the number of days being ill is excluded from the regression, the coefficients on other variables do not change much.

significant for bypassing to a higher level public facility, but it is positive and statistically significant for bypassing to a private facility. Similarly, the coefficient on having other public health facility (provincial or regional hospital) as the registered facility is also negative for bypassing to a higher level public facility, but positive for bypassing to a private facility. These results reveal that, when compared to the insured whose registered facility is the commune health center, the insured whose registered facility is a regional polyclinic or other public facility are less likely to bypass to a higher level public facility, but they are more likely to bypass to a private clinic. The fact that these people are less likely to bypass to a higher level public facility presumably reflects that they already register at a higher level public facility. Nonetheless, the finding that the insured who designated with a higher level public facility are more likely to visit a private clinic can reflect the fact that these people may not always need a higher level of care, but instead they may live in the areas where there are private clinics available and they could afford to pay for more expensive but convenient services at these private facilities.

Finally, the estimated coefficients on commune health center characteristics are similar to the results for the mixed logit model. More specifically, the coefficient on the number of doctors per 1,000 persons is positive and statistically significant for bypassing to a private clinic. Again, this finding supports the argument of "moonlighting" doctors in the public sector. Moreover, the coefficient of the number of nurses per 1000 person is positive and statistically significant for both the "no bypass" and "bypass to a higher facility" groups. This suggests that, as there are more nurses available at the commune health center, the insured are more likely to seek health care, either by visiting the registered facility (i.e. no bypass) or by visiting a higher level public facility, rather than to self-medicate or do nothing (i.e. no care). In addition to the number of nurses, the index of medicine availability and the infrastructure index have positive and statistically significant coefficients for the "no bypass" group, indicating that the insured are more likely to visit the registered facility than to seek no care when their commune health center has more medicine available and scores better in terms of infrastructure, particularly the infrastructure pertaining to the sanitary level.

5.6.2.2. HCFP beneficiaries age 6+

Table 5-14 shows the results for the two-level nested logit model in which only HCFP beneficiaries are included in the sample. In general, the results are similar to those in Table 5-13. In particular, both coefficients on the number of days being ill and the difference between the distance to the registered facility and the distance to the next higher level public facility are positive and statistically significant for both "no bypassing" and "bypassing to a higher level public facility". Nevertheless, the statistical level of significance is only at 10%. Furthermore, the number of doctors at the commune health center has a positive and statistically significant coefficient on bypassing to a private clinic. In addition, the number of nurses at the commune health center and the index of medicine availability have positive and statistically significant coefficient on "no bypassing" and "bypassing to a higher level public facility." Overall, these results are almost exactly the same as the results on the bypassing behavior of all insured shown in Table 5-13.

However, a more interesting result for the bypassing behavior of HCFP beneficiaries is that, whereas the coefficient on years of schooling is not statistically significant, household expenditure has a negative and statistically significant (at 10% level) coefficient on “no bypass”, but a positive and statistically significant (at 5% level) coefficient on “bypass to a higher level public facility.” These results reveal that individuals from richer households are less likely to visit their designated facilities (i.e. no bypass) and, at the same time, are more likely to bypass to a higher level facility than to self-medicate or do nothing. The latter finding is not surprising in that individuals from richer households are more likely to demand a higher level of health care because they are able to afford more expensive health care services. However, the finding that, as household expenditures increases, individuals are less likely to seek care at the designated facilities than to self-medicate or do nothing could be indicate that certain features of the designated facilities may not satisfy the patients’ expectation. Consequently, richer patients are willing to give up the almost free health care at the designated facilities and choose to self-medicate or to do nothing instead.

5.7. Conclusions and Discussion

The analyses in this chapter focus on the determinants of health care choices and bypassing behavior of the rural population in Vietnam, with a particular interest on health seeking behavior of the HCFP beneficiaries. In evaluating access to health care, distance is still an important barrier that impedes people from seeking health care from professional health providers. However, the negative impact of distance is lower for higher income households. In other words, in households with higher incomes, individuals have less difficulty in traveling to a more distant health facility.

In addition to distance, other individual and household characteristics including education, severity of illness, health insurance, and household expenditure have significant impacts on health care choices. Obviously, people who have health insurance are more likely to visit public health facility, as those health care services would cost less or almost nothing for them. However, not all of the insured choose to visit the commune health centers, which were designated as the primary care units and the registered health facility for most people with HCFP insurance. In particular, individuals who have a higher education or who have a more serious illness are more likely to visit a higher level public facility or to a visit private clinic, as opposed to visiting the commune health center.

Another interesting finding from this analysis is that there is an evidence of moonlighting of government health workers, particularly doctors. More specifically, the number of doctors at the commune health center has a positive impact on the probability that people visiting a private clinic. Also, it appears to be the case that, as a result of moonlighting doctors, the availability of nurses and doctor assistants turns out to play a more important role on the insured’s decisions to seek care at the commune health center. These results suggest that the low utilization of primary health care at public health facilities is not only a demand-side problem, but it also reflects a supply-side problem. That is, government workers may not receive sufficient remuneration, which creates an incentive for them to need to work in the private sector. As a consequence, the insured could be induced to seek care at a private clinic instead of using their health insurance benefits.

Alternatively, the finding that the number of doctors at the commune health center has a positive effect on visiting a private clinic could be explained by the fact that the availability of doctors in the commune reflects the economic environment of the commune. A commune that is more “economically desirable” may induce not only richer households but also more doctors and other health workers to stay. As a result, this commune would have more (or even better-quality) doctors available in both public and private sectors, and since people in this commune tend to be better-off, they would be willing to pay more for “quality” and “convenience” that could be obtained from health care services at private facilities.

In terms of bypassing behavior, education, severity of illness, and household expenditures are still the main factors that affect the decision of the insured to seek health care at the registered facility, or to bypass to another health facility (either a higher level public facility or a private clinic). In particular, individuals who have higher education, are more ill, and have higher income tend to bypass to a higher level public facility. These results are as expected, since richer and more educated people would be able to afford more expensive health care, whereas people who are sicker would be willing to pay more or travel further to seek better health care. However, a more interesting finding is that, among the HCFP beneficiaries, higher household expenditure decreases the likelihood of visiting the registered facility. This result could indicate that the health care services provided by the designated facilities of the HCFP beneficiaries are viewed as inferior goods for people in the relatively richer group among the HCFP beneficiaries.

All of the results discussed above suggest that the low utilization of publicly provided health care is driven by both access and quality problems. On one hand, the distance from the household location to the health facility remains a major obstacle in getting access to health care, particularly when the patients need to seek higher level of care. However, distance becomes less of a problem once households' incomes increase. On the other hand, the low-cost health care provided at public health facilities appears to be of poorer quality, as it is seen as an inferior good by individuals from richer households. Since richer people can afford to pay more for the health care, they are more likely to give up the low cost public health care services and opt for other alternatives, such as seeking health care from private providers. Moreover, the finding of bypassing to a higher level public facility also implies that the range of primary care services provided at the commune health center may not be broad enough to serve the needs of the population, or that it may be limited by the capacity of health workers, medicine and medical equipment available.

Thus, at least two policy implications can be drawn. First, while the government attempts to expand health care coverage to the poor population by subsidizing the cost of their health care, it is equally important to improve the primary health care services, provided at the designated health facilities, both in terms of the range of services and the quality of services. This improvement involves not only investing in medicine, medical equipment, and physical infrastructure at the commune health centers, but also creating incentives for public health workers, particularly doctors, to work exclusively in the public sector. A certain requirement, such as a minimum number of doctors per 10,000 persons, could be imposed in order to ensure more equal access to health care in different areas. Note that this suggested requirement can only be a "necessary" but *not* "sufficient" condition.

Another implication is that the improvement in health care access and utilization of health care among the poor in Vietnam cannot be done alone; it needs to be accompanied by a general improvement in the overall socioeconomic status, such as income and education, of the population. A clear example is that the negative impact of distance becomes lessened when households' incomes are higher. This implication, however, would be more relevant to long-term development goals.

The analyses and results in the chapter are still subject to a number of limitations. First, only the data on the characteristics of the commune health centers are available. The lack of data on the characteristics of other health facility types prevents one from using them as alternative-specific variables. Second, the only observable non-monetary cost in this study is measured through the distance between the household location and the nearest health facility. However, other non-monetary costs, such as the time spent on waiting to receive health care at the health facility, are not available and have not been accounted for in this analysis. This extra cost could be another key determinant of health care choices. Third, the quality of health care is hard to measure, and the characteristics of health facility, such as availability of health workers, availability of medicine, and other physical characteristics, may not be good indicators of health care quality. Finally, the sample in this analysis is restricted to rural areas. As a result, the results may not hold for urban areas. These limitations should be addressed in future work, when new and richer datasets become available.

Figure 5-1 Nested Logit Model for Bypassing Behavior of Insured Persons

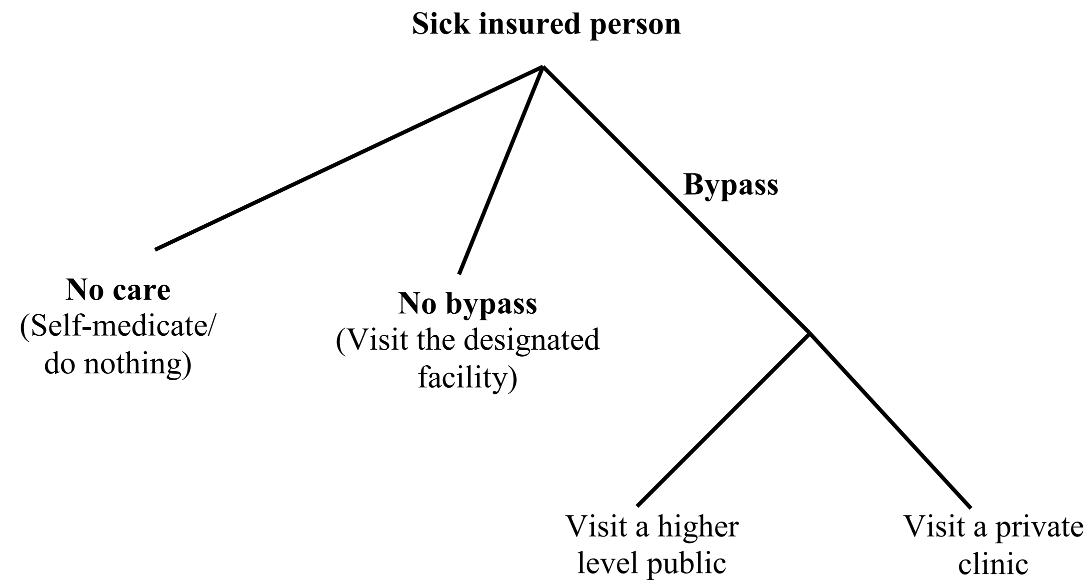


Table 5-1 Descriptive Statistics on Demographic Characteristics and Health Insurance for Persons Who Were Sick or Injured in the Past 4 Weeks

Individual Characteristics	All Persons		HCFP Beneficiaries (Age 6+)	
	Mean	S.D.	Mean	S.D.
Age	36.23	24.28	40.48	22.60
Sex (Male = 1)	0.449	-	0.417	-
Years of schooling	5.609	4.45	4.772	3.70
Marital Status:				
Single	0.394	-	0.307	-
Married	0.489	-	0.538	-
Widowed	0.103	-	0.137	-
Divorced	0.009	-	0.010	-
Separated	0.005	-	0.007	-
Health insurance/health certificate:				
Compulsory health insurance (CHI)	0.194	-		
Voluntary health insurance (VHI)	0.163	-		
Health care fund for the poor (HCFP):				
Free health care certificate	0.154	-	0.592	-
Health insurance for the poor	0.074	-	0.408	-
No health insurance	0.415	-		
Number of observations	7,290		1,266	

Source: VHLSS Household Questionnaire (2006)

Table 5-2 Health Conditions of Persons Age 6+ Who Were Sick or Injured in the Past 4 Weeks

Variable	All Persons			HCFP beneficiaries		
	Mean	S.D.	N	Mean	S.D.	N
No. days being sick	5.782	5.965	6,272	6.362	6.487	1,244
No. days not able to work	3.044	5.575	6,272	3.805	6.394	1,244
No. days staying in bed	2.509	5.678	2,978	3.090	6.395	667
Have any chronic diseases[a]	0.268	0.443	6,396	0.271	0.445	1,266

Source: VHLSS Household Questionnaire (2006)

[a] This question was also asked of persons who reported of being sick or injured in the past 4 weeks but did not seek any out-patient care.

Table 5-3 Health Care Choices for Out-Patient Care of Persons Age 6+ Who Were Sick or Injured in the Past 4 Weeks

Health Care Choice	All Persons Age 6+		HCFP Age 6+	
	Frequency	Percent	Frequency	Percent
Visit commune health center	1188	21.77	399	39.23
Visit regional polyclinic	145	2.66	40	3.93
Visit district hospital	662	12.13	134	13.18
Visit provincial hospital	401	7.35	36	3.54
Visit other hospital	169	3.10	18	1.77
Visit private clinic	1026	18.80	110	10.82
Visit traditional doctor	108	1.98	19	1.87
Visit other health center	89	1.63	11	1.08
Self-medicate	1163	21.32	176	17.31
Do nothing [a]	505	9.26	74	7.28
Total	5456	100	1017	100

Source: VHLSS Household Questionnaire (2006)

[a] These statistics are obtained from people who reported of being sick and also answered questions in the self-treatment section. However, there is a discrepancy between the number of people who reported of being sick and people sought care or self-medicated. As a result, people who were sick in the past 4 weeks and neither sought treatment from any providers nor self-medicated are classified as "do-nothing."

Table 5-4 Health Care Choices and Bypassing Patterns of the Insured

Health Care Choice	All Insured		HCFP	
	Frequency	Percent	Frequency	Percent
Visit registered facility	1,214	51.77	555	54.63
Bypass:				
Visit a higher level facility	271	11.56	110	10.83
Visit a private facility	290	12.37	112	11.02
Self-medicate	396	16.89	166	16.34
Do nothing	174	7.42	73	7.19
Total	2,345	100	1,016	100

Source: VHLSS Household Questionnaire (2006)

Table 5-5 Percentage of Self-Reported Reasons for Not Using Health Insurance Cards to Obtain Health Care

Reason	Health Insurance Type			All
	CHI	VHI	HCFP	
Health insurance not reimburse at health facility	9.85	10.65	7.45	9.31
Lower quality when using health insurance	13.23	10.81	13.16	12.22
Cumbersome procedures	22.17	25.84	19.23	22.59
Health insurance card/certificate not available	4.38	5.87	10.28	7.13
Others	50.36	46.83	49.88	48.75
Number of observations	1096	1943	1732	4771

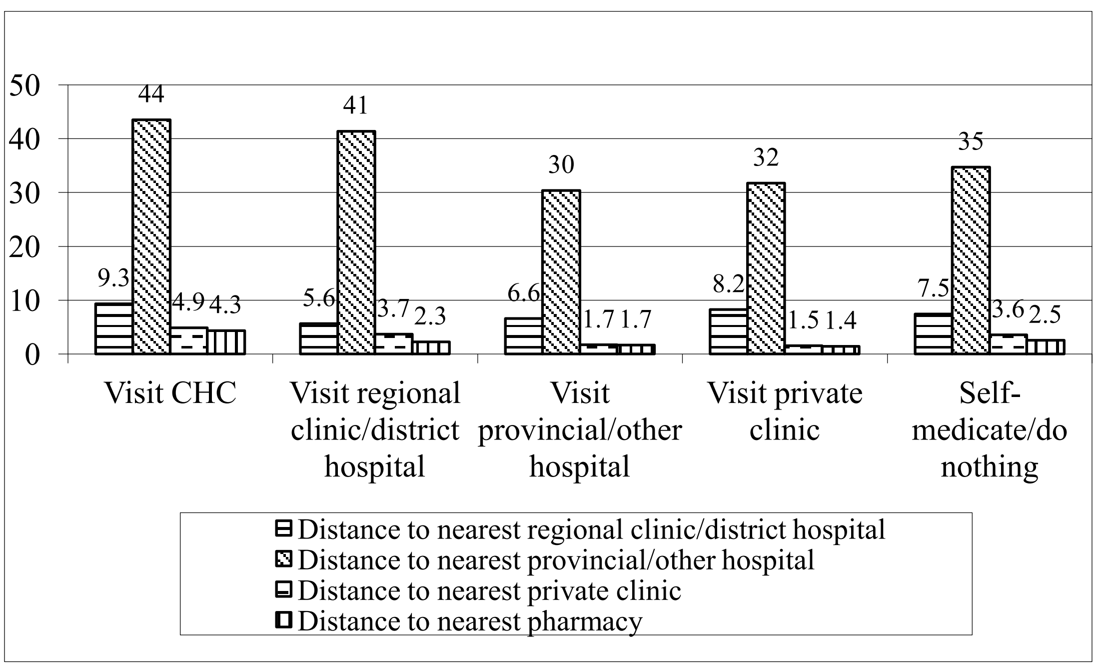
Source: VHLSS Commune questionnaire (2006)

Table 5-6 Average Distance from Community Center to the Nearest Health Facility (kilometers)

Health Facility	No. of Observations	Mean	s.d.	Min	Max
Commune health center	2264	0.052	0.699	0	20
Regional polyclinic	1774	9.565	11.808	0	180
District hospital	2197	11.923	10.443	0	110
Provincial hospital	2180	40.574	32.679	0	300
Other hospital	1563	70.657	88.483	0	800
Private doctor office	1848	6.680	16.757	0	185
Doctor's assistance office	1789	4.220	12.311	0	185
Private nurse office	1595	4.167	11.645	0	145
Private pharmacy	2025	3.434	8.805	0	88
Public pharmacy	1907	8.375	10.493	0	110
Oriental medicine store	1725	7.595	16.145	0	265

Source: VHLSS Commune questionnaire (2006)

Figure 5-2 Distances to Different Health Care Providers for People with Different Health Care Choices (kilometers)



Source: VHLSS Commune Questionnaire (2006)

Table 5-7 Number of Health Workers from All CHCs and Regional Polyclinics

Training/Specialization	# of obs.	Whether Practice Privately		Whether Absent from the Facility	
		Mean	s.d.	Mean	s.d.
Doctor	1795	0.335	0.472	0.151	0.410
OB/pediatric P.A.	1600	0.146	0.354	0.131	0.398
Other P.A.	4283	0.163	0.369	0.155	0.426
Nurse	1986	0.110	0.313	0.100	0.300
Midwife	1909	0.109	0.311	0.074	0.262
Pharmacist	605	0.124	0.330	0.126	0.479
Total	12,178				

Source: VHLSS Health Facility Questionnaire (2006)

Table 5-8 Characteristics of CHCs/Regional Polyclinics

Variable	# of obs.	Mean	s.d.	Min	Max
General characteristics:					
Number of years operating	2077	30.092	13.660	0	52
Number of beds	2183	6.929	4.374	0	120
Number of rooms	2180	7.751	3.463	1	41
Facility has someone on call 24/7	2183	0.979	0.141	0	1
Number of hours open per week	2183	48.421	7.800	0	63
Medical supplies:					
Number of equipment available	2183	9.680	1.529	0	13
Number of medical supplies available	2183	5.923	1.063	0	7
Number of medicine available	2183	9.470	2.905	0	16
Index of medicine availability	2183	19.516	7.608	0	48
Characteristics of health workers:					
Number of doctors per 1000 persons	2175	0.103	0.116	0	1.180
Number of nurses per 1000 persons	2175	0.131	0.199	0	2.161
Number of pharmacists per 1000 persons	2175	0.050	0.088	0	0.950
Number of midwives per 1000 persons	2175	0.122	0.146	0	1.345
Number of physician assistants per 1000 persons	2175	0.379	0.326	0	4.348
Other physical characteristics of the health facility:					
Facility has electricity (without any cut)	2183	0.325	0.467	0	1
Facility is clean or moderately clean	2183	0.985	0.121	0	1
Facility has water and facilities for washing hands	2183	0.935	0.244	0	1
Facility has flush toilet with sewage pipes/septic tank	2183	0.706	0.453	0	1
Infrastructure index	2183	0.008	1.079	-7.7	1.6

Source: VHLSS Health Facility Questionnaire (2006)

Table 5-9 Mixed Logit Results for Health Care Choices Model for All Persons Age 6+

(Self-medicate/Do Nothing is the Base Group.)

Variable	CHCs		Polyclinics		Provincial_hospital		Private_clinic	
	Coef	se	coef	se	coef	se	coef	se
Alternative-specific variable								
Distance (1,000 km)	-14.987***	4.553	-14.987***	4.553	-14.987***	4.553	-14.987***	4.553
Distance *x* HH expenditure	3.382**	1.321	3.382**	1.321	3.382**	1.321	3.382**	1.321
Case-specific variable:								
Individual characteristics:								
Age	0.013***	0.003	0.008**	0.004	-0.002	0.005	0.008**	0.003
Male	-0.075	0.106	-0.077	0.124	-0.265*	0.152	-0.100	0.111
Married	-0.004	0.120	0.210	0.144	0.539***	0.179	0.043	0.126
Years of schooling	-0.017	0.016	0.014	0.018	0.068***	0.022	0.015	0.016
Has chronic condition	-0.115	0.134	-0.015	0.156	0.873***	0.173	0.286**	0.137
No. of days being ill	-0.006	0.011	0.032***	0.011	0.055***	0.012	0.016	0.011
Health insurance:								
CHI	1.087***	0.179	1.462***	0.198	0.690***	0.247	-0.213	0.219
VHI	0.614***	0.155	1.101***	0.171	0.762***	0.200	-0.174	0.163
HCFP	1.067***	0.145	0.840***	0.183	0.351	0.239	0.031	0.168
Household characteristics:								
Household expenditures	-0.245***	0.055	-0.085	0.055	-0.023	0.066	-0.051	0.045
Household size	0.000	0.037	0.009	0.042	-0.096*	0.052	0.021	0.038
Region (Red River Delta is omitted):								
Northeast	-0.668***	0.206	-0.232	0.251	-0.562*	0.305	-1.095***	0.223
Northwest	-0.536**	0.215	-0.462*	0.274	-0.895***	0.347	-1.533***	0.278
North Central	-1.644***	0.403	-0.215	0.435	-2.083*	1.081	-1.431***	0.475
Central Coast	-0.833***	0.238	-0.354	0.284	-0.650*	0.378	-2.067***	0.336
Central Highlands	-0.040	0.232	0.752***	0.247	0.319	0.310	0.177	0.233
Southeast	-0.314	0.214	-0.341	0.270	-0.204	0.321	0.020	0.213

Mekong River Delta	-1.108***	0.209	-0.367*	0.222	0.149	0.232	-0.307*	0.170
Characteristics of commune health center:								
No. of doctors[1]	0.577	0.526	0.311	0.639	-0.348	0.844	2.505***	0.596
No. of nurses[1]	1.680***	0.391	2.166***	0.457	1.440**	0.623	0.697	0.469
No. of pharmacists[1]	0.542	0.649	-0.155	0.808	-0.848	1.063	1.138	0.748
No. of doctor assistant[1]	0.588**	0.230	-0.309	0.297	0.842**	0.363	-0.203	0.284
No. of beds	-0.036	0.068	-0.115	0.110	-0.190	0.161	-0.092	0.084
No. of rooms	-0.007	0.018	-0.042*	0.022	-0.004	0.027	-0.039**	0.019
General equipment availability	0.044	0.043	0.030	0.052	0.050	0.067	0.005	0.047
Medical supply availability	-0.083	0.060	-0.036	0.072	-0.043	0.090	0.059	0.066
Index of medicine availability	0.002	0.007	0.006	0.008	0.020**	0.010	0.002	0.007
Infrastructure index	0.126**	0.052	0.110*	0.060	0.001	0.071	0.152***	0.057
No. of years since first operation	0.016***	0.005	0.016**	0.006	0.009	0.008	0.021***	0.006
Intercept	-0.763	0.529	-1.954***	0.631	-2.804***	0.791	-1.265**	0.572
Statistics:								
Number of observations	15025							
Number of cases	3005							
Log-likelihood	-4204.1799							
Chi-square	675.34							
Prob > chi-square	0.00							

Note: * p<.1; ** p<.05; *** p<.01

[1] Number per 1000 persons

Table 5-10 Marginal Effects from a Mixed Logit Model on Health Care Choices for All Persons Age 6+

Variable	CHC		Regional polyclinic		Provincial hospital		Private clinic		Do nothing or self-medicate	
	dp/dx	SE	dp/dx	SE	dp/dx	SE	dp/dx	SE	dp/dx	SE
Alternative-specific variable										
Distance to CHC (D1)	-2.957***	0.903	0.609***	0.189	0.297***	0.090	0.814***	0.251	1.236***	0.382
Distance to polyclinic (D2)	0.609***	0.189	-1.914***	0.588	0.165***	0.050	0.453***	0.140	0.687***	0.213
Distance to district hosp. (D3)	0.297***	0.090	0.165***	0.050	-1.017***	0.306	0.221***	0.067	0.335***	0.101
Distance to private clinic (D4)	0.814***	0.251	0.453***	0.140	0.221***	0.067	-2.407***	0.735	0.919***	0.283
Distance to pharmacy (D5)	1.236***	0.382	0.687***	0.213	0.335***	0.101	0.919***	0.283	-3.177***	0.969
HHexpenditure*D1	0.667**	0.261	-0.137**	0.054	-0.067**	0.026	-0.184**	0.072	-0.279**	0.110
HHexpenditure*D2	-0.137**	0.054	0.432**	0.170	-0.037**	0.015	-0.102**	0.040	-0.155**	0.061
HHexpenditure*D3	-0.067**	0.026	-0.037**	0.015	0.230**	0.089	-0.050**	0.019	-0.076**	0.029
HHexpenditure*D4	-0.184**	0.072	-0.102**	0.040	-0.050**	0.019	0.543**	0.213	-0.207**	0.082
HHexpenditure*D5	-0.279**	0.110	-0.155**	0.061	-0.076**	0.029	-0.207**	0.082	0.717**	0.281
Case-specific variable:										
Individual characteristics:										
Age	0.002***	0.000	0.000	0.000	-0.001**	0.000	0.000	0.000	-0.002***	0.001
Male	-0.001	0.018	-0.001	0.014	-0.014	0.009	-0.006	0.016	0.022	0.018
Married	-0.022	0.020	0.020	0.016	0.033***	0.011	-0.007	0.017	-0.024	0.021
Years of schooling	-0.006**	0.003	0.001	0.002	0.005***	0.001	0.002	0.002	-0.002	0.003
Has chronic condition	-0.057***	0.020	-0.018	0.016	0.069***	0.015	0.037*	0.020	-0.032	0.022
No. of days being ill	-0.004**	0.002	0.003***	0.001	0.003***	0.001	0.001	0.001	-0.003*	0.002
Health insurance:										
CHI	0.128***	0.032	0.160***	0.031	0.001	0.015	-0.129***	0.017	-0.159***	0.023
VHI	0.055**	0.028	0.128***	0.026	0.028*	0.015	-0.099***	0.017	-0.111***	0.022
HCFP	0.175***	0.027	0.053**	0.023	-0.011	0.013	-0.083***	0.018	-0.134***	0.022
Household characteristics:										
Household expenditures	-0.042***	0.010	0.001	0.006	0.005	0.004	0.008	0.007	0.028***	0.008
Household size	0.000	0.006	0.002	0.005	-0.007**	0.003	0.004	0.005	0.000	0.006
Region (Red River Delta is omitted):										
Northeast	-0.060*	0.031	0.031	0.031	-0.009	0.018	-0.110***	0.023	0.148***	0.041
Northwest	-0.013	0.035	0.004	0.032	-0.025	0.016	-0.144***	0.021	0.179***	0.045
North Central	-0.174***	0.033	0.077	0.069	-0.057***	0.019	-0.111***	0.037	0.266***	0.083

Central Coast	-0.066*	0.034	0.032	0.037	-0.007	0.022	-0.172***	0.017	0.213***	0.050
Central Highlands	-0.058*	0.031	0.107***	0.036	0.009	0.020	-0.004	0.029	-0.055	0.037
Southeast	-0.045	0.032	-0.028	0.027	-0.005	0.019	0.034	0.032	0.044	0.039
Mekong River Delta	-0.158***	0.024	-0.005	0.025	0.042**	0.020	0.005	0.024	0.115***	0.034
Characteristics of commune health center:										
No. of doctors [1]	-0.028	0.086	-0.056	0.071	-0.075	0.053	0.367***	0.082	-0.208**	0.095
No. of nurses[1]	0.177***	0.061	0.171***	0.048	0.030	0.039	-0.066	0.064	-0.313***	0.073
No. of pharmacists[1]	0.068	0.104	-0.067	0.089	-0.083	0.066	0.170*	0.103	-0.088	0.120
No. of doctor assistants[1]	0.123***	0.037	-0.067**	0.033	0.052**	0.022	-0.068*	0.040	-0.041	0.043
No. of beds	0.006	0.012	-0.008	0.013	-0.010	0.011	-0.006	0.013	0.018	0.013
No. of rooms	0.003	0.003	-0.004	0.003	0.001	0.002	-0.005*	0.003	0.005	0.003
General equipment	0.006	0.007	0.001	0.006	0.002	0.004	-0.003	0.007	-0.006	0.008
Medical supply	-0.017*	0.010	-0.003	0.008	-0.002	0.006	0.016*	0.009	0.006	0.011
Medicine availability	-0.000	0.001	0.000	0.001	0.001**	0.001	-0.000	0.001	-0.001	0.001
Infrastructure	0.012	0.009	0.004	0.007	-0.006	0.004	0.014*	0.008	-0.025***	0.009
No. of operating years	0.001	0.001	0.001	0.001	-0.000	0.000	0.002**	0.001	-0.003***	0.001
Predicted probability	0.2704		0.1503		0.073		0.2009		0.305	

Note: * p<.1; ** p<.05; *** p<.01

[1] Number per 1000 persons

Table 5-11 Mixed Logit Results for Health Care Choices of HCFP Beneficiaries Age 6+

(Self-medicate/Do Nothing is the Base Group.)

Variable	CHCs		Polyclinics		Provincial_hospital		Private_clinic	
	coef	se	coef	se	coef	se	coef	se
Alternative-specific variable								
Distance (1,000 km)	-28.239*	14.728	-28.239*	14.728	-28.239*	14.728	-28.239*	14.728
Distance *x* HH expenditure	3.274	7.702	3.274	7.702	3.274	7.702	3.274	7.702
Case-specific variable:								
Individual characteristics:								
Age	0.020***	0.007	0.016*	0.009	-0.019	0.015	0.016*	0.009
Male	0.172	0.252	-0.159	0.322	-0.106	0.490	0.477	0.325
Married	-0.215	0.277	0.003	0.345	1.869***	0.626	-0.011	0.349
Years of schooling	-0.038	0.039	0.093*	0.050	-0.058	0.082	-0.073	0.052
Has chronic condition	-0.103	0.322	0.147	0.396	0.565	0.547	0.406	0.380
No. of days being ill	0.012	0.027	0.044	0.031	0.083**	0.035	0.059**	0.029
Household characteristics:								
Household expenditures	-0.553***	0.176	-0.324	0.214	0.148	0.397	-0.202	0.133
Household size	0.012	0.079	-0.022	0.103	-0.125	0.157	0.030	0.098
Region (Red River Delta is omitted):								
Northeast	-1.638***	0.544	-1.381*	0.722	0.251	0.933	-1.692**	0.672
Northwest	-0.840	0.526	-0.560	0.701	-0.610	1.210	-2.158**	0.844
North Central	-2.421***	0.748	-0.746	0.852	-14.720	1,025.841	-1.072	0.853
Central Coast	-1.240**	0.519	-1.137	0.693	1.009	0.976	-3.087***	0.920
Central Highlands	-0.865	0.548	0.207	0.660	1.106	0.861	-0.369	0.636
Southeast	0.068	0.506	0.407	0.648	-0.692	1.279	-0.003	0.630
Mekong River Delta	-1.240**	0.499	-0.951	0.704	-13.988	432.077	-0.130	0.520

Characteristics of commune health center:								
No. of doctors[1]	1.770	1.160	2.500*	1.343	-1.502	2.610	3.824***	1.478
No. of nurses[1]	2.629***	0.916	4.510***	1.020	4.012**	1.562	1.835	1.200
No. of pharmacists[1]	-0.088	1.272	-0.002	1.543	0.828	2.566	1.848	1.600
No. of doctor assistant[1]	1.593***	0.502	0.877	0.575	1.228	1.041	0.692	0.666
No. of beds	-0.562**	0.236	-0.774**	0.306	-0.884	0.570	-0.374	0.341
No. of rooms	0.092*	0.048	0.055	0.061	-0.080	0.089	0.051	0.058
General equipment availability	0.008	0.084	0.015	0.113	-0.038	0.201	0.025	0.130
Medical supply availability	-0.265*	0.136	-0.239	0.170	0.162	0.297	-0.262	0.178
Index of medicine availability	0.006	0.019	-0.001	0.024	0.047	0.036	0.022	0.023
Infrastructure index	0.174	0.123	0.160	0.152	0.392	0.271	0.141	0.165
No. of years since first operation	0.021*	0.012	0.026	0.016	0.025	0.023	0.029*	0.016
Intercept	1.199	1.117	-0.827	1.462	-2.843	2.462	-1.177	1.490
Statistics:								
Number of observations	2930							
Number of cases	586							
Log-likelihood	694.7938							
Chi-square	179.68							
Prob > chi-square	0.00							

Note: * p<.1; ** p<.05; *** p<.01
[1] Number per 1000 persons

Table 5-12 Marginal Effects in a Mixed Logit Model on Health Care Choices of HCFP Beneficiaries Age 6+

Variable	CHC		Regional polyclinic		Provincial hospital		Private clinic		Do nothing or self-medicate	
	dp/dx	SE	dp/dx	SE	dp/dx	SE	dp/dx	SE	dp/dx	SE
Alternative-specific variable										
Distance to CHC (D1)	-7.059*	3.681	2.218	1.672	0.050	3.782	1.804	1.362	2.986	2.246
Distance to polyclinic (D2)	2.218	1.672	-3.700*	2.117	0.015	1.158	0.552	0.420	0.914	0.692
Distance to district hosp. (D3)	0.050	3.782	0.015	1.158	-0.099	7.439	0.013	0.942	0.021	1.559
Distance to private clinic(D4)	1.804	1.362	0.552	0.420	0.013	0.942	-3.112*	1.799	0.744	0.563
Distance to pharmacy (D5)	2.986	2.246	0.914	0.692	0.021	1.559	0.744	0.563	-4.665*	2.621
HHexpenditure*D1	0.818	1.925	-0.257	0.621	-0.006	0.439	-0.209	0.505	-0.346	0.836
HHexpenditure*D2	-0.257	0.621	0.429	1.014	-0.002	0.134	-0.064	0.155	-0.106	0.256
HHexpenditure*D3	-0.006	0.439	-0.002	0.134	0.011	0.863	-0.001	0.109	-0.002	0.181
HHexpenditure*D4	-0.209	0.505	-0.064	0.155	-0.001	0.109	0.361	0.854	-0.086	0.208
HHexpenditure*D5	-0.346	0.836	-0.106	0.256	-0.002	0.181	-0.086	0.208	0.541	1.277
Case-specific variable:										
Individual characteristics:										
Age	0.003	0.004	0.000	0.002	-0.000	0.009	0.000	0.001	-0.003	0.003
Male	0.024	0.055	-0.043	0.039	-0.001	0.060	0.046	0.032	-0.026	0.042
Married	-0.057	0.287	0.016	0.106	0.008	0.597	0.011	0.086	0.021	0.141
Years of schooling	-0.012	0.012	0.017***	0.006	-0.000	0.012	-0.007	0.006	0.003	0.006
Has chronic condition	-0.066	0.084	0.018	0.054	0.002	0.162	0.052	0.055	-0.007	0.058
No. of days being ill	-0.004	0.009	0.004	0.005	0.000	0.016	0.005	0.004	-0.004	0.005
Household characteristics:										
Household expenditures	-0.100*	0.058	0.005	0.034	0.002	0.133	0.019	0.027	0.074	0.053
Household size	0.003	0.023	-0.004	0.013	-0.000	0.035	0.003	0.010	-0.001	0.014
Region (Red River Delta is omitted):										
Northeast	-0.233	0.157	-0.043	0.087	0.008	0.576	-0.062	0.050	0.330	0.384
Northwest	-0.078	0.104	0.018	0.081	0.000	0.017	-0.118***	0.045	0.178	0.123
North Central	-0.398**	0.177	0.054	0.124	-0.008	0.295	-0.002	0.086	0.354**	0.171
Central Coast	-0.131	0.445	-0.027	0.163	0.016	1.197	-0.139***	0.027	0.281	0.631
Central Highlands	-0.208	0.216	0.112	0.245	0.010	0.762	-0.001	0.110	0.087	0.264
Southeast	-0.018	0.124	0.053	0.082	-0.002	0.160	-0.013	0.056	-0.021	0.084
Mekong River Delta	-0.225	0.375	-0.038	0.128	-0.011	0.692	0.086	0.107	0.187	0.168

Characteristics of commune health center:										
No. of doctors[1]	0.004	0.489	0.115	0.169	-0.011	0.863	0.260*	0.143	-0.368	0.330
No. of nurses[1]	0.179	0.319	0.346*	0.186	0.006	0.459	-0.056	0.114	-0.475***	0.142
No. of pharmacists [1]	-0.141	0.232	-0.030	0.157	0.002	0.169	0.209	0.160	-0.040	0.201
No. of physician assistants [1]	0.283**	0.132	-0.024	0.053	0.001	0.051	-0.043	0.060	-0.216**	0.091
No. of beds	-0.054	0.086	-0.049	0.045	-0.002	0.113	0.010	0.035	0.095***	0.037
No. of rooms	0.016	0.017	-0.001	0.009	-0.000	0.037	-0.001	0.007	-0.013	0.014
General equipment availability	-0.001	0.018	0.001	0.013	-0.000	0.013	0.002	0.013	-0.002	0.013
Medical supply availability	-0.031	0.048	-0.005	0.023	0.001	0.097	-0.007	0.019	0.043	0.038
Index of medicine availability	0.000	0.007	-0.001	0.003	0.000	0.011	0.002	0.003	-0.001	0.004
Infrastructure index	0.021	0.047	0.004	0.020	0.001	0.069	0.001	0.018	-0.028	0.020
No. of operating years	0.001	0.003	0.001	0.002	0.000	0.002	0.001	0.002	-0.004**	0.002
Predicted probability	0.5065		0.1551		0.0035		0.126		0.2087	

Note: * p<.1; ** p<.05; *** p<.01

[1] Number per 1000 persons

Table 5-13 Nested Logit Results (All Insured Persons Age 6+)

	No Bypass		Bypass			
			Bypass_further		Bypass_private	
	coef	**Se**	**coef**	**se**	**coef**	**se**
Individual characteristics:						
Age	0.009	0.006	0.004	0.008	0.002	0.008
Male (Yes=1)	-0.162	0.183	-0.506*	0.283	0.149	0.295
Married (Yes=1)	0.715***	0.222	0.507	0.326	0.790**	0.342
Years of schooling	0.000	0.026	0.094**	0.041	-0.043	0.043
Has chronic condition (Yes=1)	-0.784***	0.255	-1.168***	0.431	-0.003	0.429
No. of days being ill	0.053***	0.017	0.071***	0.023	0.050*	0.028
Seek treatment for chronic disease	19.939	825.91	20.790	825.91	20.648	825.91
Seek treatment for other disease	20.248	572.70	19.237	572.70	21.748	572.70
Health insurance (VHI as base):						
CHI	-0.009	0.279	-0.891**	0.434	0.154	0.436
HCFP	0.088	0.249	-0.435	0.366	0.338	0.391
Distance(higher)-Distance(designated)	9.609**	3.749	13.483**	6.821	7.246	6.429
Registered facility (CHC as base):						
Regional polyclinic	0.041	0.224	-1.950***	0.500	1.667***	0.547
Other public facility	0.451	0.404	-6.427**	2.644	2.020**	0.794
Household characteristics:						
Household expenditures	-0.080	0.081	0.315***	0.111	-0.036	0.127
Household size	-0.056	0.062	-0.131	0.089	0.040	0.096
Region (Red River Delta is omitted):						
Northeast	0.853**	0.387	0.888	0.583	-0.536	0.662
Northwest	0.943**	0.378	0.395	0.579	-0.572	0.670
North Central	0.842	0.530	0.306	0.869	0.684	1.051
Central Coast	0.043	0.401	-0.642	0.659	-2.051**	0.840
Central Highlands	0.594	0.418	1.272**	0.596	-0.127	0.622
Southeast	0.764*	0.428	0.708	0.620	0.844	0.650
Mekong River Delta	0.010	0.403	-0.069	0.629	0.347	0.524
Characteristics of commune health center:						
No. of doctors[1]	-0.008	0.751	-0.764	1.271	4.218***	1.474
No. of nurses [1]	1.880***	0.542	1.969***	0.688	0.897	1.093
No. of pharmacists[1]	0.144	0.304	-0.311	0.423	0.214	0.678
No. of physician assistants[1]	0.161	0.157	0.757***	0.226	-0.683*	0.377
No. of beds[1]	0.049	0.034	-0.018	0.053	0.018	0.057
No. of rooms[1]	-0.009	0.011	-0.002	0.017	0.003	0.019
General equipment availability	0.091	0.081	0.123	0.118	0.211	0.130
Medical supply availability	-0.121	0.110	-0.383**	0.163	0.199	0.185
Index of medicine availability	0.028**	0.014	0.030	0.021	0.004	0.021
Index of physical	0.369***	0.095	0.220	0.136	0.431***	0.167

characteristics						
No. of years since first operation	-0.006	0.009	0.025*	0.014	0.004	0.016
Intercept	-2.806***	1.065	-4.218***	1.571	-10.051***	2.072
Dissimilarity parameters:						
/nocare_tau	1					
/nobypass_tau	1					
/bypass_tau	2.266					
LR test for IIA	chi2(2) = 7.18 (Prob > chi2 = 0.0275)					
Statistics:						
Number of observations	6,884					
Number of cases	1,721					
Log-likelihood	-1279.1685					
Chi-square	223.02 (Prob>chi2 = 0.00)					

Note: * p<.1; ** p<.05; *** p<.01

[1] Number per 1000 persons

Table 5-14 Nested Logit Results (HCFP Beneficiaries Age 6+)

	No Bypass		Bypass			
			Bypass_further		Bypass_private	
	coef	se	coef	se	coef	se
Individual characteristics:						
Age	0.010	0.009	0.004	0.014	0.020	0.016
Male (Yes=1)	0.182	0.309	0.363	0.503	0.491	0.601
Married (Yes=1)	0.520	0.335	0.412	0.505	0.717	0.643
Years of schooling	0.003	0.047	0.118	0.076	-0.086	0.105
Has chronic condition (Yes=1)	-0.557	0.436	-1.202*	0.706	-0.348	0.815
No. of days being ill	0.044*	0.024	0.065*	0.035	0.002	0.058
Seek treatment for chronic disease	19.611	1,029.6	19.847	1,029.6	23.378	1,029.6
Seek treatment for other disease	21.155	934.506	19.419	934.505	24.910	934.508
Distance(higher)-Distance(designated)	13.442*	7.275	21.794*	13.087	1.789	13.191
Registered facility (CHC as base):						
Regional polyclinic	-0.167	0.395	-3.595***	1.373	3.302**	1.410
Other public facility	-0.806	0.858	-56.310	2,367.763	1.247	2.000
Household characteristics:						
Household expenditures	-0.346*	0.191	0.469**	0.215	-0.014	0.357
Household size	-0.033	0.096	-0.209	0.135	0.052	0.173
Region (Red River Delta is omitted):						
Northeast	1.473*	0.827	2.146*	1.172	0.454	1.397
Northwest	2.583***	0.761	2.619**	1.102	-0.245	1.755
North Central	2.518***	0.852	2.009	1.382	3.668**	1.848
Central Coast	1.489*	0.763	0.546	1.281	-0.022	1.606
Central Highlands	1.576*	0.912	3.240***	1.191	0.152	1.560
Southeast	2.541***	0.806	2.302*	1.205	2.483*	1.319
Mekong River Delta	1.792**	0.795	0.415	1.497	3.963***	1.272
Characteristics of commune health center:						
No. of doctors[1]	0.520	1.160	-1.093	1.919	7.080**	3.164
No. of nurses[1]	1.504**	0.676	2.024**	0.857	1.626	1.670
No. of pharmacists[1]	0.750*	0.423	0.661	0.558	0.461	1.110
No. of physician assistants[1]	-0.161	0.208	0.183	0.301	-1.115*	0.673
No. of bed[1]	0.101*	0.057	0.082	0.085	0.054	0.107
No. of rooms[1]	0.024	0.019	0.032	0.030	0.079*	0.043
General equipment availability	0.045	0.126	-0.045	0.194	0.006	0.250

Medical supply availability	-0.168	0.165	-0.289	0.264	-0.040	0.336
Index of medicine availability	0.047*	0.025	0.078**	0.038	0.058	0.050
Index of physical characteristics	0.388**	0.154	-0.008	0.210	0.786*	0.419
No. of years since first operation	-0.014	0.014	0.030	0.024	-0.021	0.032
Intercept	-5.013***	1.753	-8.484***	2.718	-16.711***	4.526
Dissimilarity parameters:						
/nocare_tau	1.000					
/nobypass_tau	1.000					
/bypass_tau	4.009[101]					
LR test for IIA	chi2(2) = 9.67 (Prob > chi2 = 0.0080)					
Statistics:						
Number of observations	2,936					
Number of cases	734					
Log-likelihood	-1279.1685					
Chi-square	127.57 (Prob>chi2 = 0.01)					

Note: * p<.1; ** p<.05; *** p<.01

[1] Number per 1000 persons

[101] This similarity parameter is significantly larger than 1, suggesting that the two choices within this nest could be separated into two different nests. Nevertheless, by imposing the IIA assumption, the results based on mixed logit model are very similar to the results from this nested logit model.

Chapter 6 Conclusion

Public health insurance is becoming an important tool in the development process in many developing countries. On one hand, it has been proven to improve the population's health, which indirectly enhances the productivity of workers and, in turn, can promote economic growth. On the other hand, it provides households with financial protection against catastrophic loss from uncertain medical expenditures, which can prevent households from falling into poverty due to sickness. The three essays in this dissertation address the impacts and challenges in implementing two public health insurance programs, namely the UCS in Thailand and the HCFP in Vietnam. The analyses altogether provide some evidence of how well a public health insurance program can serve as a government intervention tool to expand the population's access to health care, as well as to improve households' financial situations.

The results found from the three essays are interrelated. The first essay finds that the UCS does not reduce households' precautionary savings, but it instead produces only an income effect in the long run, as can be seen from the increases in both households' savings and consumption. Because the UCS is financed by general tax revenues, this result implies that there is income redistribution from the general population to the UCS beneficiaries. Nonetheless, the income transfer found in the first essay is subject to the condition that the UCS beneficiaries take up the benefits provided by the UCS.

To address the concern on low utilization of health care services provided by the UCS, the second essay examines the determinants of the UCS beneficiaries' decisions to seek care at the UCS facilities or to seek care from other alternatives. It reveals that the “better-off” are less likely to use the health care services provided by the UCS, and instead choose to seek care from private facilities. In contrast, individuals from low-income households and those with more restricted budget constraints are more likely to seek care from UC facilities. The overall finding suggests that quality of health care provided by the UCS is the main factor affecting the decision of UCS beneficiaries to choose other health care alternatives instead of seeking health care at UC facilities. Nevertheless, this study is subject to major data limitations. Lack of information on characteristics of UC facilities, in particular, deters the analysis from capturing the impact of health care quality on individuals’ health care choices.

In order to further investigate individuals’ responses to publicly provided health care, the third essay then reassesses the low-utilization problem of public health insurance in the context of the HCFP program in Vietnam. In this study, the richness of the data available allows for the investigation of the impact of health facility characteristics on individuals’ health care choices and their decisions to bypass a nearby health facility to a more distant health facility. Similar to the findings in the second essay, the results in the context of Vietnam’s HCFP program indicate that individual and household characteristics, including education, severity of illness, health insurance, and household expenditures, have significant impacts on health care choices. Interestingly, this study finds evidence of moonlighting by government health workers, particularly doctors. In addition, the findings on bypassing behaviors in this study are consistent with previous studies (e.g. Akin and Hutchinson (1999)) in that individuals who are more educated and have higher income are more likely to bypass local public health facilities than those in lower socioeconomic classes.

Despite the dissimilarities in the contexts, the two case studies share some similar findings. Subsidized public health insurance programs appear to be "the last resource," particularly for poorer populations, while richer populations that can afford other health care alternatives choose to forgo the free or low-cost health care services provided by the government. This pattern not only indicates the problems associated with quality of public health care, but also reflects the unmet demand for "quality" health care as the government attempts to expand health insurance coverage to the population. The findings, particularly in the second and third essays, suggest the need to improve the efficiency in delivering primary health care. For instance, by improving the ability of the primary care units or the "gatekeepers" to manage health care services according to people's needs, the quality-related problems, such as long queues due to congestion, could be lessened. Lastly, data limitations in these studies indicate a need for richer data, such as the information related to quality of health care. Accordingly, a collection of such data should be the next item on the research agenda of public health insurance policy.

The three studies in this dissertation are by no means intended to provide definitive policy suggestions. Moreover, the supply-side impacts of public health insurance are not addressed in this dissertation due to the scope of the analyses. Nonetheless, by shedding some light on the impacts and challenges in implementing public health insurance schemes in Thailand and Vietnam, these three studies serve as a starting point for future research to delve deeper into more practical policy implications.

Bibliography

Acton, J. P. (1975). Nonmonetary factors in the demand for medical services: Some empirical evidence. *Journal of Political Economy , 83* (3), 595-614.

Aizer, A. (2007). Public health insurance, program take-up, and child health. *The Review of Economics and Statistics , 89* (3), 400-415.

Akin, J. S., & Hutchinson, P. (1999). Health-care facility choice and the phenomenon of bypassing. *Health Policy and Planning , 14* (2), 135-151.

Amemiya, T. (1985). *Advanced Econometrics.* Cambridge, MA: Harvard University Press.

Angrist, J. D., & Pischke, J.-S. (2009). *Mostly Harmless Econometrics: An Empiricist's Companion.* Princeton: Priceton University Press.

Borah, B. (2006). A mixed logit model of health care provider choice: analysis of NSS data from rural India. *Health Economics , 15* (9), 915-932.

Brown, P. H., & Theoharides, C. (2009). Health-seeking behavior and hospital choice in China's New Cooperative Medical System. *Health Economics , 18*, S47-S64.

Bureau of Policy and Strategy, Ministry of Public Health. (n.d.). *Bureau of Policy and Strategy, Ministry of Public Health*. Retrieved September 14, 2011, from Bureau of Policy and Strategy, Ministry of Public Health: http://bps.ops.moph.go.th/index.php?mod=bps&doc=5

Cameron, A. C., & Trivedi, P. K. (2010). *Microeconometrics Using Stata (Revised Edition).* College Station: Stata Press.

Cameron, A. C., & Trivedi, P. K. (2005). *Microeconometrics: Methods and Applications.* New York: Cambridge University Press.

Chang, F.-R., & Trivedi, P. K. (2003). Economics of self-medication: theory and evidence. *Health Economics* , 721-739.

Chou, S.-Y. L.-T. (2004). Health insurance and saving over the life cycle: a semiparametric smooth coefficient estimation. *Journal of Applied Econometrics , 19*, 295-322.

Chou, S.-Y., Liu, J.-T., & Hammitt, J. K. (2003). National health insurance and precautionary savings: Evidence from Taiwan. *Journal of Public Economics , 87*, 1873-1894.

Currie, J. (2004). The take up of social benefits. *NBER Working Paper 10488* .

Currie, J., & Gruber, J. (1996). Health insurance eligibility, utilization of medical care and child health. *Quarterly Journal of Economics , 111* (2), 431-466.

Das, J., Hammer, J., & Leonard, K. (2008). The quality of medical advice in low-income countries. *Journal of Economic Perspectives , 22* (2), 93-114.

Deaton, A. (1985). Panel data from times series of cross sections. *Journal of Econometrics , 30*, 109-126.

Deaton, A. (1992). *Understanding Consumption.* Oxford: Clarendon Press.

Dor, A., Gertler, P., & van der Gaag, J. (1987). Non-price rationing and the choice of medical care providers in rural Cote D'Ivoire. *Journal of Health Economics , 6*, 291-304.

Dung, N. T. (2010, October 12). *Social Health Insurance in Vietnam.* Retrieved September 26, 2011, from International Labor Office: http://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---ilo-hanoi/documents/presentation/wcms_145792.pdf

Ekman, B., Nguyen, T. L., Duc, H. A., & Axelson, H. (2008). Health insurance reform in Vietnam: A review of recent developments and future challenges. *Health Policy and Planning* , 252-263.

Fleisher, L., Gottret, P., Leive, A., Schieber, G. J., Tandon, A., & Waters, H. R. (2008). Assessing Good Practive in Health Financing Reform. In P. Gottret, G. J. Schieber, & H. R. Waters, *Good Practices in Health Financing: Lessons from Reforms in Low- and Middle-Income Countries* (pp. 3-86). Washington, DC: The World Bank.

Gauthier, B., & Wane, W. (2008, January). Bypassing health providers: The quest for better price and quality of health care in Chad. *World Bank Policy Research Working Paper 4462* .

Gertler, P. L. (1987). Are user fees regressive? The welfare implications of health care financing proposals in Peru. *Journal of Econometrics , 36*, 67-88.

Gertler, P., & van der Gaag, J. (1990). *The Willingness to Pay for Medical Care: Evidence from Two Developing Countries.* Washington, D.C.: The World Bank.

Giang, T. L. (2008). *Social Health Insurance in Vietnam: Current Issues and Policy Recommendations.* International Labour Organization.

Gruber, J., & Yelowitz, A. (1999). Public health insurance and private savings. *Journal of Political Economy , 107* (6), 1249-1275.

Gruber, J., Hendren, N., & Townsend, R. (2011). The Impact of Universal Healthcare in Thailand: Supply and Demand Effects. *AEA Annual Meetings.* Denver.

Ha, D. A. (2011). *Social Health Insurance as a Means to Achieving Universal Coverage and More Equitable Health Outcomes (Sub-report of Vietnam).* Hanoi.

Hanson, K., McPake, B., Nakamba, P., & Archard, L. (2005). Preferences for hospital quality in Zambia: results from a discrete choice experiment. *Health Economics , 14*, 687-701.

Hanvoravongchai, P., & Hsiao, W. (2007). Thailand: Achieving Universal Coverage with Social Health Insurance. In W. C. Hsiao, & R. P. Shaw, *Social Health Insurance for Developing Nations* (pp. 133-154). The World Bank.

Hjortsberg, C. (2003). Why do the sick not utilise health care? The case of Zambia. *Health Economics , 12*, 755-770.

Jack, W. (2002). Public intervention in health insurance markets: Theory and four examples from Latin America. *The World Bank Research Observer , 17* (1), 67-88.

Jappelli, T., Pistaferri, L., & Weber, G. (2007). Health care quality, economic inequality, and precautionary saving. *Health Economics , 16* (4), 327-346.

Jones, A. (2000). Health econometrics. In A. Culyer, & J. Newhouse, *Handbook of Health Economics* (1 ed., Vol. 1, pp. 265-344). Elsevier.

Jowett, M., Deolalikar, A., & Martinsson, P. (2004). Health insurance and treatment seeking behaviour: evidence from a low-income country. *Health Economics , 13*, 845-857.

Kimball, M. (1990). Precautionary savings: a panel study. *Review of Economics and Statistics , 79* (2), 241-247.

Klemick, H., Leonard, K. L., & Masatu, M. C. (2009). Defining access to health care: Evidence on the importance of quality and distance in rural Tanzania. *American Journal of Agricultural Economics , 91* (2), 347-358.

Kong, M. K., Lee, J., & Lee, H. (2008). Precautionary motive for saving and medical expenses under health uncertainty: Evidence from Korea. *Economics Letters* , 76-79.

Kotlikoff, L. (1989). Health insurance and precautionary savings. In L. Kotlikoff, *What Determines Savings?* (pp. 141-162). Cambridge: MIT Press.

Lieberman, S. S., & Wagstaff, A. (2009). *Health Financing and Delivery in Vietnam.* Washington, DC: The World Bank.

Limwattananon, S., Tangcharoensathien, V., & Prakongsai, P. (2007). Catastrophic and poverty impacts of health payments: Results from national household surveys in Thailand. *Bulletin of the World Health Organization* , 600-606.

Maynard, A., & Qiu, J. (2009). Public insurance and private savings: who is affected and by how much? *Journal of Applied Econometrics , 24* (2), 282-308.

McKenzie, D. (2001). Consumption Growth in a Booming Economy: Taiwan 1976-96. *Yale Economic Growth Center Discussion Paper No. 823.*

McKenzie, D. (2005). Measuring inequality with asset indicator. *Journal of Population Economics , 18*, 229-260.

Moffit, R. (1983). An economic model of welfare stigma. *The American Economic Review , 73* (5), 1023-1034.

Mwabu, G. M. (1989). Nonmonetary factors in the household choice of medical facilities. *Economic Development and Cultural Change , 37* (2), 383-392.

Na Ranong, A. (2006). The 30 Baht Health Care Scheme and Health Security in Thailand. *The National Institute of Development Administration (NIDA) Paper* .

Na Ranong, V., Na Ranong, A., & Wongmonta, S. (2005). *Impact of the 30-baht program on healthcare expenditures among different income groups.* Bangkok, Thailand: Thailand Development Research Institute.

National Statistical Office. (n.d.). *National Statistical Office of Thailand*. Retrieved from http://service.nso.go.th/nso/nso_center/project/search_center/23project-th.htm

National Statistical Office. (2007). *Summary Statistics of Health and Welfare Survey.* Bangkok, Thailand: National Statitics Office.

NESDB. (2003). *The 30-baht Program.* Bangkok, Thailand: National Economic and Social Development Board.

Nguyen, T.-H. (2008). The economics of not using the health insurance care: A case study of Vietnam. *Vietnam Development Forum (VDF) Tokyo* (pp. 85-112). Tokyo: National Graduate Institute for Policy Studies.

NHA 2006-2007 Working Group. (2009). *Thai National Health Accounts: sustainable updatets of 2006 and 2007 and diversification.* Technical Report, WHO.

Oanh, T. T., Tien, T. V., Luoang, D. H., Tuan, K. A., Phoung, N. K., Cuong, L., et al. (2009, March). Assessing Provincial Health Systems in Vietnam: Lessons from Two Provinces. *Health Systems 20/20 project* . Bethesda, MD: Abt Associates Inc.

O'Donnell, O., van Doorslaer, E., Rannan-Eliya, R. P., Somanathan, A., Garg, C. C., Hanvoravongchai, P., et al. (2005, June). Explaining the incidence of catastrophic expenditures on health care: Comparative evidence from Asia. *EQUITAP ProjectL Working Paper #5* .

Palumbo, M. (1999). Uncertain medical expenses and precautionary saving near the end of the life cycle. *Review of Economic Studies , 66*, 395-421.

Pannarunothai, S. (2002). Medical Welfare Scheme: Financing and Targeting the Poor. In P. Pramualratana, & W. Wibulpolprasert, *Health Insurance Systems in Thailand* (pp. 62-78). Nonthaburi, Thailand: Health System Research Institute.

Panpiemrat, J., Sampantaruk, K., Puttitanun, T., & Piyanirun, T. (2007). *Evaluating and Analyzing Impacts of the Universal Health Care Coverage.* Bangkok, Thailand: Thailand Development Research Institute.

Paxson, C. H. (1992). Using weather variability to estimate the response of savings to transitory income in Thailand. *American Economic Review , 82*, 15-33.

Picone, G., Uribe, M., & Wilson, R. (1998). The effect of uncertainty on the demand for medical care, health capital and wealth. *Journal of Health Economics , 17*, 171-185.

Puenpatom, R. (2006). Effects of Thai healthcare policy on household demand, hospital efficiency and household earnings. *Ph.D. Dissertation* . Washington State University.

Remler, D., Rachlin, J., & Glied, S. (2001). What can the take-up of other programs teach us about how to improve take-up of health insurance programs? *American Journal of Public Health* .

Rodklai, A. (2011, July 7). *Prachatai.* Retrieved November 14, 2011, from http://prachatai.com/print/35916

Sakunphanit, T. (2006). *Thailand: Universal Health Care Coverage Through Pluralistic Approaches.* ILO Subregrional Office for East Asia.

Santerre, R. E., & Neun, S. P. (2007). *Health Economics: Theories, Insights, and Industry Studies* (4th Edition ed.). Mason, Ohio: Thompson South-Western.

Sepehri, A., Moshiri, S., Simpson, W., & Sarma, S. (2008). Taking account of context: how important are household characteristics in explaining adult health-seeking behavior? The case of Vietnam. *Health Policy and Planning , 23*, 397-407.

Sepehri, A., Sarma, S., & Serieux, J. (2009). Who is giving up the free lunch? The insured patients' decision to access health insurance benefits and its determinants: Evidence from a low-income country. *Health Policy , 92*, 250-258.

Sinha, T., Ranson, M., Chatterjee, M., Acharya, A., & Mills, A. (2006). Barriers to accessing benefits in a community-based insurance scheme: lesson learnt from SEWA Insurance, Gujarat. *Health Policy and Planning , 21* (2), 132-142.

Sosa-Rubi, S., Omar, G., & Harris, J. (2009). Heterogenous impacts of the "Seguro Popular" program on the utilization of obstetrical services in Mexico, 2001-2006: a multinomial probit model with a discrete endogenous variable. *Journal of Health Economics , 28*, 20-34.

Sriratanaban, J. (2002). Civil Servant Medical Benefit Scheme: Unregulated Fee-for-Service and Cost Escalation. In P. Pramualratana, & S. Wibulpolprasert, *Health Insurance Systems in Thailand* (pp. 43-50). Nonthaburi, Thailand: Health System Research Institute.

Srithamrongsawat, S. (2002). The Health Card Scheme: A Subsidized Voluntary Health Insurance Scheme. In P. Pramualratana, & S. Wibulpolprasert, *Health Insurance*

Systems in Thailand (pp. 62-78). Nonthaburi, Thailand: Health System Research Institute.

Starr-McCluer, M. (1996). Health insurance and saving. *American Economic Review , 86*, 285-295.

Sukunphanit, T. (2006). *Thailand: Universal Health Care Coverage Through Pluralistic Approaches.* ILO Subregrional Office for East Asia.

Suraratdecha, C., Saithanu, S., & Tangcharoensathien, V. (2005). Is universal coverage a solution for disparities in health care? Findings from three low-income provinces of Thailand. *Health Policy , 73*, 272-284.

Train, K. E. (2003). *Discrete Choice Methods with Simulation.* Cambridge: Cambridge University Press.

Trivedi, P. K. (2004). Patterns of Health Care Utilization in Vietnam: Analysis of 1997-98 Vietnam Living Standards Survey Data. In P. Glewwe, N. Agrawal, & D. Dollar, *Economic Growth, Poverty, and Household Welfare in Vietnam* (pp. 391-423). Washington, DC: The World Bank.

Vietnam General Statistics Office. (2008). *Vietnam Household Living Standard Survey 2006.* Hanoi: Statistical Publishing House.

Wagstaff, A. (2010). Estimating Health Insurance Impacts under unobserved heterogeneity: The case of Vietnam's Health Care Fund for the Poor. *Health Economics , 19*, 189-208.

Wibulpolprasert, S. (2011). *Thailand Health Profile 2008-2010.* Nonthaburi, Thailand: Office of the Permanent Secretary for Public Health, Ministry of Public Health.

Wibulpolprasert, S., & Thaiprayoon, S. (2008). Thailand: Good Practice in Expanding Health Coverage - Lessons from the Thai Health Care Reforms. In P. Gottret, G. J. Schieber, & H. R. Waters, *Good Practices in Health Financing: Lessons from Reforms in Low- and Middle-Income Countries* (pp. 355-383). Washington, DC: The World Bank.

Wooldridge, J. M. (2002). *Econometric Analysis of Cross Section and Panel Data.* Cambridge: The MIT Press.

World Bank. (2011). *2011 World Development Indicators.* Washington, DC: The World Bank.

Appendices

Appendix 1 Derivations of Optimal Consumption Path

This appendix explains how to derive the optimal consumption path and the optimal consumption level at time *t*. To begin with, the Euler equation for consumption derived from the consumer's utility maximization problem is:

$$U_C(C_t, H_t) = \beta(1+r)E_t[U_C(C_{t+1}, H_{t+1})]. \tag{A1}$$

With the felicity utility function, this Euler equation can be rewritten as:

$$exp(-\propto C_t) = \beta(1+r)E_t[exp(-\propto C_{t+1})] \tag{A2}$$

Using the fact that $E_t[\exp\,(x)] = exp\left[E_t(x) + \frac{Var(x)}{2}\right]$, one can rewrite the expected marginal utility of consumption in period *t+1* as:

$$E_t[exp(-\propto C_{t+1})] = exp\left[E_t(-\propto C_{t+1}) + \frac{Var(-\propto C_{t+1})}{2}\right].$$

Hence,

$$exp(-\propto C_t) = \beta(1+r)exp\left[-\propto . E_t(C_{t+1}) + \frac{\alpha^2 Var(C_{t+1})}{2}\right]$$

Take natural log on both sides:

$$-\propto C_t = ln(\beta(1+r)) - \propto (C_{t+1} - \varepsilon_{t+1}) + \frac{\alpha^2 Var(C_{t+1})}{2}$$

$$\propto (C_{t+1} - C_t) = ln(\beta(1+r)) + \propto \varepsilon_{t+1} + \frac{\alpha^2 Var(C_{t+1})}{2}$$

$$C_{t+1} - C_t = \frac{ln(\beta(1+r))}{\propto} + \varepsilon_{t+1} + \frac{\alpha Var(C_{t+1})}{2} \tag{A3}$$

where ε_{t+1} is the expectation error of consumption.

To find the variance for C_{t+1}, one needs to find the relationship between C_t and H_t. First, the first order condition with respect to M_t can be rewritten as:

$$E_t\left[\frac{\partial V_t}{\partial A_t}\right] = \frac{\lambda}{1+r} E_t\left[\frac{\partial V_t}{\partial H_t}\right] \tag{A4}$$

By using the Envelope Theorem and the first order conditions, equation (A4) can be rewritten as:

$$U_C(C_t, H_t) = \frac{\lambda}{1+r}\left\{U_H(C_t, H_t) + \beta E_t\left[\omega(1+r)\frac{\partial V_{t+1}}{\partial A_{t+1}} + (1-\delta)\frac{\partial V_{t+1}}{\partial H_{t+1}}\right]\right\}$$

$$U_C(C_t, H_t) = \frac{\lambda}{1+r}\left\{U_H(C_t, H_t) + \beta E_t\left[\omega(1+r)\frac{\partial V_{t+1}}{\partial A_{t+1}} + (1-\delta)\frac{(1+r)}{\lambda}\frac{\partial V_{t+1}}{\partial A_{t+1}}\right]\right\}$$

$$(1+r)U_C(C_t, H_t) = \lambda U_H(C_t, H_t) + \lambda\frac{\beta(1+r)(1-\delta+\omega\lambda)}{\lambda}E_t\left[\frac{\partial V_{t+1}}{\partial W_{t+1}}\right]$$

$$(1+r)U_C(C_t, H_t) = \lambda U_H(C_t, H_t) + \lambda\frac{\beta(1+r)(1-\delta+\omega\lambda)}{\lambda}.\frac{1}{\beta(1+r)}U_C(C_t, H_t)$$

$$(1+r)U_C(C_t, H_t) = \lambda U_H(C_t, H_t) + (1-\delta+\omega\lambda)U_C(C_t, H_t)$$

$$U_C(C_t, H_t) = \left(\frac{\lambda}{r+\delta-\omega\lambda}\right)U_H(C_t, H_t) \qquad \text{(A5)}$$

Given the specified utility function, equation (A5) can be expressed as:

$$exp(-\propto C_t) = \left(\frac{\lambda}{r+\delta-\omega\lambda}\right)exp(-\gamma H_t)$$

$$-\propto C_t = ln\left(\frac{\lambda}{r+\delta-\omega\lambda}\right) - \gamma H_t$$

$$H_t = \frac{\propto}{\gamma}C_t + \frac{1}{\gamma}ln\left(\frac{\lambda}{r+\delta-\omega\lambda}\right) \qquad \text{(A6)}$$

Furthermore, updating equation (5) by one period gives:

$$E_t[exp(-\propto C_{t+1})] = \left(\frac{\lambda}{r+\delta-\omega\lambda}\right)E_t[exp(-\gamma H_{t+1})] \qquad \text{(A7)}$$

$$exp\left[-\propto. E_t(C_{t+1}) + \frac{\alpha^2 Var(C_{t+1})}{2}\right] = \left(\frac{\lambda}{r+\delta-\omega\lambda}\right)exp\left[-\gamma E_t(H_{t+1}) + \frac{\gamma^2 Var(H_{t+1})}{2}\right]$$

This implies that: $\frac{\alpha^2 Var(C_{t+1})}{2} = \frac{\gamma^2 Var(H_{t+1})}{2}$

or $Var(C_{t+1}) = \frac{\gamma^2}{\alpha^2}Var(H_{t+1}) = \frac{\gamma^2}{\alpha^2}Var(\eta_{t+1})$

Substitute $Var(C_{t+1})$ in equation (A3), and one obtains:

$$C_{t+1} = C_t + \frac{ln(\beta(1+r))}{\propto} + \frac{\gamma^2}{2\alpha}\sigma^2 + \varepsilon_{t+1}, \qquad \text{(A8)}$$ [102]

where $\sigma^2 = Var(\eta_{t+1})$.

[102] This is equation (13) in the theoretical model section.

Similarly, to derive the optimal condition for the current and next period medical care levels, one can rewrite equation (A8) as:

$$\frac{1}{\beta(1+r)} exp(-\propto C_t) = \left(\frac{\lambda}{r+\delta-\omega\lambda}\right) exp\left[-\gamma E_t\big((1-\delta)H_t + \lambda M_t + \eta_{t+1}\big) + \frac{\gamma^2 Var(H_{t+1})}{2}\right]$$

$$-ln(\beta(1+r)) - \propto C_t = ln\left(\frac{\lambda}{r+\delta-\omega\lambda}\right) - \gamma(1-\delta)H_t - \gamma\lambda M_t + \frac{\gamma^2 Var(H_{t+1})}{2}$$

Substitute H_t as a function of C_t from equation (A6), and one obtains:

$$-ln\big(\beta(1+r)\big) - \propto C_t = ln\left(\frac{\lambda}{r+\delta-\omega\lambda}\right) - \gamma(1-\delta)\left[\frac{\propto}{\gamma} C_t + \frac{1}{\gamma} ln\left(\frac{\lambda}{r+\delta-\omega\lambda}\right)\right] - \gamma\lambda M_t + \frac{\gamma^2 Var(H_{t+1})}{2}$$

$$\gamma\lambda M_t = \alpha\delta C_t + ln\big(\beta(1+r)\big) + \delta ln\left(\frac{\lambda}{r+\delta-\omega\lambda}\right) + \frac{\gamma^2 Var(H_{t+1})}{2}$$

$$M_t = \frac{\alpha\delta}{\gamma\lambda} C_t + \frac{ln\big(\beta(1+r)\big)}{\gamma\lambda} + \frac{\delta}{\gamma\lambda} ln\left(\frac{\lambda}{r+\delta-\omega\lambda}\right) + \frac{\gamma Var(H_{t+1})}{2\lambda} \quad \text{(A8)}$$

Next, update M_t by one period:

$$M_{t+1} = \frac{\alpha\delta}{\gamma\lambda} C_{t+1} + \frac{ln\big(\beta(1+r)\big)}{\gamma\lambda} + \frac{\delta}{\gamma\lambda} ln\left(\frac{\lambda}{r+\delta-\omega\lambda}\right) + \frac{\gamma Var(H_{t+2})}{2\lambda}$$

$$M_{t+1} = \frac{\alpha\delta}{\gamma\lambda} C_{t+1} + \frac{ln\big(\beta(1+r)\big)}{\gamma\lambda} + \frac{\delta}{\gamma\lambda} ln\left(\frac{\lambda}{r+\delta-\omega\lambda}\right) + \frac{\gamma Var(H_{t+1})}{2\lambda} + \eta_{t+1} \quad \text{(A9)}$$

Subtracting (A8) from (A9) gives:

$$M_{t+1} - M_t = \frac{\alpha\delta}{\gamma\lambda}(C_{t+1} - C_t) + \frac{\gamma Var(H_{t+1})}{2\lambda} + \eta_{t+1} - \frac{\gamma Var(H_{t+1})}{2\lambda}$$

$$M_{t+1} - M_t = \frac{\alpha\delta}{\gamma\lambda}\left(\frac{ln(\beta(1+r))}{\propto} + \varepsilon_{t+1} + \frac{\gamma^2}{2\alpha} Var(\eta_{t+1})\right) + \eta_{t+1}$$

Thus, $M_{t+1} - M_t = \frac{\delta ln(\beta(1+r))}{\gamma\lambda} + \frac{\delta\gamma}{2\lambda}\sigma^2 + \xi_{t+1},$[103] (A10)

where ξ_{t+1} is the expectation error of the medical care consumption.

Equation (A8) is the optimal condition for the current and next period consumption level. Based on this equation and the equation of motion, one can solve for the optimal level of current consumption by using backward substitution. For simplicity, assume that the interest rate (r)

[103] This is equation (14) in the theoretical section.

equals zero, and suppose that *T=2*, which implies that $A_3=0$. Then, one can derive for A_2 from the equation of motion in period 2:

$$C_2 = A_2 + Y_2 - M_2 - A_3 = A_2 + Y_2 - M_2$$

$$A_2 = -Y_2 + C_2 + M_2$$

Substitute A_2 in the equation of motion in period 1, and one have:

$$C_1 = A_1 + Y_1 - M_1 - A_2$$

$$C_1 = A_1 + Y_1 - M_1 + Y_2 - C_2 - M_2 \qquad \text{(A11)}$$

Or, $A_1 = C_1 - Y_1 + M_1 - Y_2 + C_2 + M_2$

Also, from equation (A7), one can write C_2 in terms of C_1:

$$C_2 \;=\; C_1 + \frac{ln\beta}{\propto} + \frac{\gamma^2\sigma^2}{2\alpha} + \varepsilon_2$$

Similarly, from equation (A10), one can write M_2 in terms of M_1:

$$M_2 = M_1 + \frac{\delta ln\beta}{\gamma\lambda} + \frac{\delta\gamma\sigma^2}{2\lambda} + \xi_2$$

Substitute C_2 and M_2 in equation (A11) above, and obtain:

$$C_1 = A_1 + Y_1 - M_1 + Y_2 - \; C_1 - \frac{ln\beta}{\propto} - \frac{\gamma^2\sigma^2}{2\alpha} - \varepsilon_2 - M_1 - \frac{\delta ln\beta}{\gamma\lambda} - \frac{\delta\gamma\sigma^2}{2\lambda} - \xi_2$$

$$2C_1 = A_1 + \omega H_1 - 2M_1 + \omega H_2 - \left(\frac{1}{\propto} + \frac{\delta}{\gamma\lambda}\right) ln\beta - \left(\frac{\gamma}{\alpha} + \frac{\delta}{\lambda}\right)\frac{\gamma\sigma^2}{2} - \varepsilon_2 - \xi_2$$

Define $\left(\frac{1}{\propto} + \frac{\delta}{\gamma\lambda}\right) ln\beta \equiv \Omega$, and substitute H_2:

$$2C_1 = A_1 - \Omega + \omega H_1 - 2M_1 + \omega[(1-\delta)H_1 + \lambda M_1 + \eta_2] - \left(\frac{\gamma}{\alpha} + \frac{\delta}{\lambda}\right)\frac{\gamma\sigma^2}{2} - \varepsilon_2 - \xi_2$$

$$2C_1 = A_1 - \Omega + (2-\delta)Y_1 - (2-\omega\lambda)M_1 - \left(\frac{\gamma}{\alpha} + \frac{\delta}{\lambda}\right)\frac{\gamma\sigma^2}{2} + \omega\eta_2 - \varepsilon_2 - \xi_2$$

Thus, $C_1 = \frac{A_1-\Omega}{2} + \left(1-\frac{\delta}{2}\right)Y_1 - \left(1-\frac{\omega\lambda}{2}\right)M_1 - \left(\frac{\gamma}{\alpha} + \frac{\delta}{\lambda}\right)\frac{\gamma\sigma^2}{4} + \frac{\omega\eta_2-\varepsilon_2-\xi_2}{2}$.[104] (A12)

[104] This is equation (17) in the theoretical section.

Appendix 2 Predicting the Types of Health Insurance in SES data by using Information from HWS Data for 2001 and 2004

One of the main problems in using the SES data in this study is the lack of variables on health insurance. Although these variables are available in the HWS, the households surveyed in 2001 and 2004 in the SES data are not the same as the households surveyed in HWS data. As a result, for the 2001 and 2004 samples I cannot identify the type of the individual's health insurance by simply merging the SES and HWS data, as it is done in the 2007 sample. To overcome this problem, I use the information from the HWS data to predict the type of health insurance that each individual most likely has. This section explains the methods that I use to predict the types of health insurance in the 2001 and 2004 SES data.

2001 Data

In the 2001 SES, there is no question on the type of health insurance that an individual has. However, there are two questions at the household level asking whether household members enrolled in the Low-income Health Card (LICS) Scheme and whether household members enrolled in the Voluntary Health Card (VHCS) Scheme. Moreover, the HWS data reveal that there are some correlations between the type of health insurance and the household and individual characteristics. These characteristics include individual's employment status (i.e. whether the person is self-employed, work for the government/state enterprise, work in formal private-sector worker, or economically inactive), age, occupation, household head's income. Given this information, I calculate predicted health insurance types using two main methods. The first method is a prediction based on a set of rules that classify different types of health insurance according to the individual's employment status and two household variables in the SES. The second method is a prediction based on a multinomial logit model, in which the dependent variable is the type of the individual's health insurance, and the independent variables are household and individual characteristics that are commonly available in both SES and HWS. The estimated coefficients obtained from the estimation in the HWS data will be used to predict the probability of having each type of health insurance in the SES data.

Method 1: Prediction based on a set of rules

In the first method, I use the fact that certain health insurance types are associated with the individual's employment status, together with the household questions on whether household members have low-income health card (LICS) and whether they have voluntary health card (VHCS), to determine the proportion of different types of health insurance. Based on these known associations, I create a set of rules to determine the individual's health insurance. In order to verify these rules, I also analyze the correlation between these characteristics and the individual's health insurance in the HWS data. After revising these rules, I come up with the following seven rules.

Rule #1: Individuals are covered by the CSMBS if they are government employees, or they are spouses, children (age less than or equal to 20), or parents of government employees.

Rule #2: Individuals are covered by the State Enterprise health coverage if they are state enterprise employees or children of state enterprise employees.

Rule#3: Individuals are covered by the SSS if they are private employees and their income is greater than 5000 baht. (Note: In principle, people who work in the formal private sector should be covered by SSS, but based on the HWS data many workers particularly in small enterprises are not covered by SSS. So, I use income criteria to distinguish people who are and are not covered by SSS.)

Rule#4: If the answer to the household question 'whether household members have low-income health card' is yes, then all individuals in that household is covered by MWS.

Rule#5: If the answer to the household question 'whether a household has a voluntary health card' is yes, and no one in the household has a low-income health card, then all individuals in that household have VHCS.

Rule#6: If the individual is self-employed or has certain occupations (e.g. managers) and has income more than 20,000 baht, then s/he has private health insurance.

Rule#7: The residuals from rule#1-rule#6 are the uninsured people.

In order to verify this prediction, I use the same rules to calculate the predicted percentages of different health insurance types from HWS data, and then compare them to the actual percentages of health insurance types in HWS. In Table A-1, the actual percentages of health insurance from HWS data; the second column reports the predicted percentages of health insurance using the proposed rules and HWS data; and the last column reports the predicted percentages of different health insurance types calculated from SES data. Based on these results, the predicted percentages of the uninsured and VHCS are overestimated in the SES by approximately 4% and 3%, respectively, while the predicted percentages of MWS are underestimated by approximately 3%.

Table A-1 Predicted Health Insurance Types in 2001 from HWS and SES Using Rules

Health insurance	Actual % in HWS	Predicted% in HWS (replicate)	Predicted % in SES
Uninsured	28.97%	35.96%	33.50%
CSMBS/State enterprise	8.50%	7.95%	7.47%
SSS	7.22%	6.24%	6.38%
VHCS	23.42%	25.30%	26.06%
MWS/LICS	28.93%	24.24%	25.53%
Private	1.28%	0.30%	1.06%
Other	1.70%		
Total (All persons)		100%	100%

Source: HWS and SES, 2001

Method 2: Prediction based on multinomial logit models

In the second method, I estimate the likelihood that each individual will have a particular type of health insurance in the HWS data, and use the estimated coefficient to predict the probability that the individual will have that particular health insurance in the SES data. Then, the type of health insurance that gives the highest probability will most likely be the health insurance that the individual has. More specifically, I use a multinomial logit model in which there are six different choices (no insurance, CSMBS, SSS, VHCS, MWS, and private health insurance) to estimate the likelihood that the individual has each type of health insurance. The explanatory variables include region, area, age, sex, marital status, employment status, occupation, industry, income, and household head's employment status. From this estimation, I obtain five different sets of coefficients from this multinomial model (where uninsured is the base group). Then, I use these sets of coefficients to predict the probabilities that an individual will have each type of health insurance. To illustrate, from the multinomial logit model, I obtain a set of coefficients $\hat{\beta}_j$'s for the health insurance type *j*, where *j* = 1, 2, 3, 4, and 5 represents CSMBS, SSS, VHCS, MWS, and private health insurance, respectively. Then, the predicted probability that an individual having health insurance type *j* can be calculated as:

$$Prob(insurance = j) = \frac{\exp(\hat{\beta}_j'\boldsymbol{X})}{\sum_{j=1}^{5} \exp(\hat{\beta}_j'\boldsymbol{X})},$$

where X is a vector of explanatory variables from the SES data and $\hat{\beta}_j{}'s$ are the estimated coefficients obtained from the HWS data.

Next, the probability of being uninsured is calculated by subtracting the sum of probabilities of the five choices from 1 (since the sum of probabilities in a multinomial logit model is 1). Finally, I determine the type of health insurance that the individual by choosing the health insurance type that gives the highest probability. For instance, Prob(insurance=CSMBS) = 1 if Prob(ins=CSMBS) =max{ Prob(ins=uninsured), Prob(ins=CSMBS), Prob(ins=SSS), Prob(ins=VHCS), Prob(ins=MWS), Prob(ins=private HI)}.

The results of this method are shown in the last three columns of Table A-2. In the column "predicted percentage (2)", I include all types of health insurance when estimating the multinomial logit model in the HWS data, and the regressors include region, area, sex, marital status, occupation, industry, income, and household head's income. The results suggest that I underestimate the percentage of uninsured population by almost 10%, and overestimate the percentages of CSMBS, VHCS, and MWS by approximately 2%, 5% and 4%, respectively. In the column "predicted percentage (3)", I use the same sets of regressors as in the previous model, but exclude people who have private health insurance from the multinomial logit model, because this group appears to be insignificant. The results are similar to the column "predicted percentage (3)" in that I underestimate the percentage of the uninsured by about 7%, and overestimate the percentages of VHCS and MWS by approximately 5% and 7%, respectively.

Table A-2 Comparison of Actual and Predicted Percentages of Different Health Insurance Types in 2001

Type of health insurance	Actual percentage (from HWS)	Predicted percentage based on rules (1)	Predicted percentage based on regression		
			Predicted percentage (2)	Predicted percentage (3)	Predicted percentage (4)
None	28.97%	33.50%	18.62%	21.92%	24.91%
CSMBS	8.50%	7.47%	10.94%	6.22%	13.70%
SSS	7.22%	6.38%	7.79%	7.69%	6.32%
VHCS	23.42%	26.06%	28.96%	28.15%	28.54%
MWS	28.93%	25.53%	33.68%	36.03%	25.86%
Private HI	1.28%	1.06%	0.02%	excluded	0.67%
Other	1.70%				
Total	100%	100%	100%	100%	100%

Source: HWS and SES, 2001

Finally, I estimate another multinomial logit model in which all types of health insurances are included, and the regressors include region, area, sex, marital status, occupation, industry, income, household head's income, and two additional variables indicating whether household members are covered by MWS and/or VHCS. These last two variables are available at the household level in the SES data, but they are not readily available in the HWS data. As a result, I use individual health insurance type in the HWS data to compute these two household-level variables by specifying that household members are covered by MWS (or VHCS) if the head of household is covered by MWS (or VHCS).[105] The predicted percentages of different health insurance types according to this model are reported in the column “predicted percentage (4)”.

2004 Data

The 2004 data are less problematic because the major types of health insurance are readily available in the SES questionnaire. That is, the survey asks whether the individual has one of the following health insurance schemes: UCS, CSMBS, SSS, or private health insurance. However, for the purpose of this analysis, I need to distinguish the UCS beneficiaries between those who are exempted from paying the 30-baht copayment and those who are required the 30 baht copayment. The former group (UCE) comprises of individuals who previously had MWS (or Low-income Card Scheme) before the UCS implementation, and accordingly they are in the control group. The latter group (UCP) includes individuals who previously had no health insurance (or may have Voluntary Health Card), and this group is the treatment group. Thus, the task here is to differentiate between the two groups under the UCS by using the information, particularly variables, commonly available in the both data sets.

To do so, I restrict the sample to individuals who are covered by UCS in both data sets. Then, in the HWS data (which I have information on what type of UCS beneficiaries each individual is), I use a bivariate logit model to predict the probability that the individual belongs to the UCE group. In this model, the explanatory variables

---

[105] The SES do not specify whether the answer “yes” to the question “whether household members are covered by MWS (or VHCS)” means that ALL household members are covered by MWS (or VHCS), or that *at least one* household members are covered by MWS (VHCS). By replicating this variable under the condition that the answer is yes if the household head is covered by MWS (or VHCS), the constructed variables in the HWS give the closest percentages as those in the SES.

include region, area, age, sex, marital status, employment status, occupation, industry, income, and household head's income. After running a logit model, I use the coefficients estimates obtained from the HWS data (beta's) to calculate the probability that the individual has UCE insurance in the SES data by using the following equation:

$$Prob(insurance = UCE) = \frac{\exp(\hat{\beta}'_{UCE}\boldsymbol{X})}{1+\exp(\hat{\beta}'_{UCE}\boldsymbol{X})}$$

where $\boldsymbol{X}$ is the vector of explanatory variables in the SES data and $\hat{\beta}'s$ are from HWS data. Then, after obtaining the probability of UCE, I use a cut-point of 0.5 to determine who has UCE and UCP; that is, if the Pr(insurance=UCE)>0.5, then the individual belongs to UCE group. Note that the determination of this cut-point number can be arbitrary, but I make this judgment based on the criteria that this cut-point gives the closest percentages of predicted different types of health insurance to the actual percentages shown in the HWS data.

Table A-3 Predicted and Actual Percentages of Health Insurance Types in 2004

Type of health insurance	**Actual percentage (from HWS)**	**Predicted percentage (from SES)**
None	5.61%	4.91%
UC-exempt 30baht copay (UCE)	30.65%	30.49%
UC-required copay (UCP)	42.95%	44.37%
CSMBS	9.40%	9.70%
SSS	10.44%	8.45%
Private	0.78%	2.09%
HI provided by employers	0.14%	n/a
Other health insurance	0.04%	n/a
Total (for all individuals)	100%	100%

Source: HWS and SES, 2004

Table A-3 shows the actual percentages of health insurance types (based on HWS) and the predicted percentages obtained from the calculation described above, and it includes all individuals in the sample. Essentially, the predicted percentages of all types of health insurance except the UCE and UCP can be treated as the actual percentages, since they are obtained directly from the questions in the SES. Thus, the only predicted percentages here are the percentages of UCE and UCE, which are relatively close to the actual percentages in the HWS data. More specifically, the discrepancies between the actual and the predicted percentages for UCE and UCP are 0.16% and -1.42%, respectively.

To test the robustness of the method described above, I apply the same logit regression model with more restricted samples of individuals with different age groups. First, I restrict the sample in the HWS to individuals who are younger than 60 years old, and apply the estimates obtained from the logit model to individuals who are younger than 60 years old in the SES data. In this case, I use a cut-point of 0.35; that is, if Pr(UCE)>0.35, then the individual is predicted to have UCE. The reason for choosing 0.35 instead of 0.5 cut point is because it gives closer predicted percentages as the actual percentages in the SES data. The discrepancies between the actual and predicted percentages for UCE and UCP are 1% and -2.39%, respectively. Finally, I repeat the same methods with the sample of individuals whose ages are between 15-60 years old, and I use a cut-point at Pr>0.3. Again, the cut-point number is arbitrary, and it is chosen based on the comparison with the actual percentages found in the SES data. Here, the discrepancies between the actual and predicted percentages for UCE and UCP are 1.77% and -2.67%, respectively.

Thus, it appears that the predicted percentages of health insurance types are relatively close to the actual percentages. However, these percentages are sensitive to the cut-points used in differentiating between UCP and UCE beneficiaries, especially when the samples are restricted to different age groups of the population.

Appendix 3 Robustness Analyses in Essay 2

Table A-4 Mixed Logit Model (Controlling for Province Dummies)

	Self-medicate		Visit UC Facility		Visit Non-UC Facility	
	coef	se	coef	se	coef	se
Alternative specific variables:						
Distance (1,000 km.)	-12.073**	4.940	-12.073**	4.940	-12.073**	4.940
Number of doctors per 10,000 persons	-0.039	0.070	-0.039	0.070	-0.039	0.070
Case specific variables:						
Individual characteristics:						
Age	0.050***	0.015	-0.002	0.014	-0.026*	0.015
Age2	-0.001***	0.000	0.000	0.000	0.000	0.000
Male	-0.075	0.138	-0.207	0.133	-0.319**	0.140
Married	0.488***	0.171	0.375**	0.165	0.557***	0.176
Years of schooling	0.003	0.020	-0.012	0.020	-0.016	0.021
Required 30-baht copayment	0.232	0.167	-0.132	0.163	0.146	0.170
Disease groups:						
Respiratory	2.190***	0.190	1.190***	0.184	1.823***	0.192
Digestive	1.306***	0.300	0.996***	0.290	1.327***	0.301
Cardiovascular	-0.517	0.444	1.829***	0.361	1.529***	0.377
Musculoskeletol	-0.004	0.177	-0.805***	0.172	0.015	0.185
No. of days not being able to work	-0.205***	0.031	0.016	0.012	0.001	0.013
Household characteristics:						
Household size	-0.002	0.047	0.063	0.044	-0.066	0.047
Whether other HH member was sick (hhmemsick)	1.744	1.735	3.157*	1.662	2.037	1.761
Log(hh_income)	0.135	0.153	0.089	0.147	0.733***	0.152
Log(hh_income)x hhmemsick	-0.242	0.187	-0.407**	0.180	-0.304	0.189
Urban	0.565***	0.140	0.122	0.135	0.316**	0.142
Province:						
Samut Prakan	-15.489	1,756.1	-14.848	1,756.1	-14.650	1,756.1
Nonthaburi	-14.953	1,756.1	-15.370	1,756.1	-15.366	1,756.1
Pathum Thani	-14.269	1,756.1	-14.280	1,756.1	-14.129	1,756.1
Phra Nakhon si Ayutthaya	-14.739	1,756.1	-14.878	1,756.1	-15.804	1,756.1
Ang Thong	-15.487	1,756.1	-15.108	1,756.1	-15.020	1,756.1
Lop Buri	-15.919	1,756.1	-16.235	1,756.1	-16.249	1,756.1
Sing Buri	-15.150	1,756.1	-15.616	1,756.1	-14.440	1,756.1
Sa Kaeo	-16.223	1,756.1	-16.327	1,756.1	-17.376	1,756.1
Chon buri	-13.844	1,756.1	-13.833	1,756.1	-13.550	1,756.1
Chanthaburi	-15.254	1,756.1	-15.643	1,756.1	-15.493	1,756.1
Chachoengsao	-14.495	1,756.1	-15.060	1,756.1	-14.795	1,756.1
Prachin Buri	-14.463	1,756.1	-15.369	1,756.1	-14.720	1,756.1
Saraburi	-15.071	1,756.1	-14.583	1,756.1	-15.005	1,756.1
Buri Ram	-0.997	2,056.0	0.795	2,056.0	0.833	2,056.0

Surin	-14.667	1,756.1	-14.494	1,756.1	-15.050	1,756.1
Si Sa Ket	-15.836	1,756.1	-15.297	1,756.1	-15.712	1,756.1
Ubon Ratchathani	-15.508	1,756.1	-14.722	1,756.1	-14.829	1,756.1
Yasothon	-14.874	1,756.1	-14.668	1,756.1	-15.197	1,756.1
Chaiyaphum	-16.522	1,756.1	-15.104	1,756.1	-15.301	1,756.1
Amnat Charoen	-16.167	1,756.1	-15.647	1,756.1	-15.219	1,756.1
Loei	-15.993	1,756.1	-14.232	1,756.1	-14.799	1,756.1
Nong Khai	-15.925	1,756.1	-15.862	1,756.1	-15.619	1,756.1
Maha Sarakham	-14.770	1,756.1	-14.622	1,756.1	-14.125	1,756.1
Roi Et	-14.941	1,756.1	-14.538	1,756.1	-14.276	1,756.1
Mukdahan	-13.279	1,756.1	-13.149	1,756.1	-13.857	1,756.1
Lamphun	-14.381	1,756.1	-13.979	1,756.1	-14.332	1,756.1
Uttaradit	-15.789	1,756.1	-15.944	1,756.1	-16.032	1,756.1
Phayao	-13.932	1,756.1	-13.026	1,756.1	-13.067	1,756.1
Chiang Rai	-0.287	1,924.3	0.653	1,924.3	0.382	1,924.3
Uthai Thani	-15.360	1,756.1	-15.469	1,756.1	-14.788	1,756.1
Tak	-15.943	1,756.1	-15.890	1,756.1	-15.934	1,756.1
Phitsanulok	-15.344	1,756.1	-14.866	1,756.1	-14.924	1,756.1
Phetchabun	-13.638	1,756.1	-13.371	1,756.1	-13.088	1,756.1
Ratchaburi	-15.071	1,756.1	-15.872	1,756.1	-15.503	1,756.1
Kanchanaburi	-14.832	1,756.1	-15.129	1,756.1	-15.111	1,756.1
Suphanburi	-13.673	1,756.1	-14.348	1,756.1	-14.116	1,756.1
Samut Sakhon	-0.770	2,680.3	1.313	2,680.3	0.515	2,680.3
Samut Songkhram	-30.975	2,318.8	-14.803	1,756.1	-14.128	1,756.1
Phetchaburi	-14.846	1,756.1	-15.574	1,756.1	-14.637	1,756.1
Prachuap Khiri Khan	-14.575	1,756.1	-14.248	1,756.1	-14.989	1,756.1
Krabi	-14.051	1,756.1	-14.056	1,756.1	-13.396	1,756.1
Phangnga	-15.292	1,756.1	-15.135	1,756.1	-14.341	1,756.1
Phuket	-15.611	1,756.1	-15.832	1,756.1	-15.793	1,756.1
Surat Thani	-14.306	1,756.1	-14.217	1,756.1	-14.564	1,756.1
Chumphon	-13.751	1,756.1	-13.903	1,756.1	-14.306	1,756.1
Songkhla	-16.270	1,756.1	-15.390	1,756.1	-14.722	1,756.1
Satun	-14.508	1,756.1	-14.153	1,756.1	-13.662	1,756.1
Phatthalung	-14.670	1,756.1	-13.959	1,756.1	-13.662	1,756.1
Pattani	-15.978	1,756.1	-15.807	1,756.1	-16.423	1,756.1
Narathiwat	-16.360	1,756.1	-16.300	1,756.1	-16.381	1,756.1
Intercept	13.656	1,756.1	15.894	1,756.1	9.793	1,756.1
Statistics:						
Number of observations	20,200					
Number of cases	5,050					
Log-likelihood	-5,372.776					
Wald Chi-square	1288.91 (Prob > chi2 = 0.0000)					

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A-5 Mixed Logit Model (Rural Area Only)

	Self-medicate		Visit UC Facility		Visit Non-UC Facility	
	coef	se	coef	se	coef	se
Alternative specific variables:						
Distance (1,000 km.)	-6.635	8.322	-6.635	8.322	-6.635	8.322
Number of doctors per 10,000 persons	0.071	0.072	0.071	0.072	0.071	0.072
Case specific variables:						
Individual characteristics:						
Age	0.043**	0.020	-0.012	0.018	-0.031	0.020
Age2	-0.001**	0.000	0.000	0.000	0.000	0.000
Male	-0.171	0.183	-0.373**	0.172	-0.569***	0.186
Married	0.823***	0.232	0.864***	0.216	0.931***	0.238
Years of schooling	-0.013	0.027	-0.016	0.026	-0.037	0.028
Required 30-baht copayment	0.123	0.213	-0.253	0.203	-0.040	0.217
Disease groups:						
Respiratory	2.032***	0.247	1.389***	0.235	1.726***	0.251
Digestive	1.543***	0.462	1.490***	0.439	1.945***	0.456
Cardiovascular	-1.044*	0.569	1.280***	0.398	1.138***	0.429
Musculoskeletol	-0.125	0.239	-0.764***	0.224	0.199	0.245
No. of days not being able to work	-0.429***	0.059	0.006	0.011	-0.016	0.016
Household characteristics:						
Household size	-0.043	0.062	0.002	0.057	-0.150**	0.062
Whether other HH member was sick (hhmemsick)	0.548	2.278	3.518*	2.114	3.512	2.287
Log(hh_income)	0.205	0.201	0.282	0.186	0.939***	0.198
Log(hh_income)x hhmemsick	-0.128	0.248	-0.480**	0.231	-0.480*	0.248
Region (Central is omitted):						
North	-0.134	0.228	0.411*	0.215	0.190	0.236
Northeast	-0.211	0.264	0.659***	0.241	0.542**	0.265
South	-0.151	0.277	0.405	0.259	0.643**	0.271
Private clinics per 10,000 persons	-1.051	1.296	0.109	1.164	-0.785	1.323
Intercept	-1.474	1.797	-1.037	1.655	-6.908***	1.775
Statistics:						
Number of observations			9,652			
Number of cases			2,413			
Log-likelihood			-2,654.104			
Wald Chi-square			482.36 (Prob > chi2 = 0.0000)			

Note: *** p<0.01, ** p<0.05, * p<0.

Appendix 4 Mixed Logit Results When Controlling for Interactions between Health Insurance Types and Commune Health Center Characteristics

Table A-6 Mixed Logit Results for Health Care Choices Model for All Persons Age 6+ (Controlling for Interactions between Health Insurance Types and Commune Health Center Characteristics)

Variable	CHCs		Polyclinics		Provincial_hospital		Private_clinic	
	Coef	se	coef	se	coef	se	Coef	se
Alternative-specific variable								
Distance	-14.292***	4.635	-14.292***	4.635	-14.292***	4.635	-14.292***	4.635
Distance *x* HH expenditure	3.466***	1.345	3.466***	1.345	3.466***	1.345	3.466***	1.345
Case-specific variable:								
Individual characteristics:								
Age	0.013***	0.003	0.007*	0.004	-0.003	0.005	0.008**	0.003
Male	-0.084	0.108	-0.057	0.126	-0.247	0.154	-0.082	0.112
Married	0.014	0.121	0.223	0.146	0.524***	0.181	0.067	0.126
Years of schooling	-0.014	0.016	0.016	0.018	0.075***	0.022	0.018	0.017
Has chronic condition	-0.108	0.136	0.010	0.158	0.931***	0.176	0.327**	0.138
No. of days being ill	-0.007	0.011	0.029***	0.011	0.054***	0.012	0.012	0.011
Health insurance:								
CHI	1.337	1.195	0.774	1.320	-0.130	1.759	-4.390**	1.841
VHI	-2.807**	1.294	-0.044	1.266	-1.551	1.595	-2.313*	1.349
HCFP	1.263	0.910	0.724	1.204	-1.843	1.950	-0.902	1.234
Household characteristics:								
Household expenditures	-0.262***	0.056	-0.102*	0.055	-0.041	0.067	-0.077*	0.045
Household size	-0.003	0.037	-0.000	0.043	-0.078	0.053	0.019	0.038
Region (Red River Delta is omitted):								
Northeast	-0.081	0.168	0.238	0.207	-0.414*	0.250	-0.540***	0.176
Northwest	0.020	0.197	-0.153	0.254	-0.632**	0.321	-1.172***	0.256
North Central	-1.238***	0.409	-0.114	0.437	-2.106*	1.088	-1.122**	0.468
Central Coast	-0.495**	0.225	-0.053	0.264	-0.640*	0.349	-1.692***	0.319

Central Highlands	0.092	0.231	0.938***	0.245	0.424	0.305	0.318	0.228
Southeast	-0.206	0.210	-0.186	0.267	-0.052	0.311	0.135	0.200
Mekong River Delta	-1.125***	0.212	-0.322	0.224	0.144	0.231	-0.255	0.169
Characteristics of commune health center:								
CHI *x* No. of doctors[1]	-2.036	1.529	-2.139	1.634	-2.661	2.089	-0.136	2.238
CHI *x* No. of nurses [1]	3.210***	1.232	2.895**	1.312	4.089**	1.614	1.258	1.793
CHI *x* No. of pharmacists[1]	0.589	1.871	-1.009	2.087	-1.662	2.708	2.529	2.474
CHI *x* No. of doctor assistants[1]	-1.265*	0.754	-1.396*	0.805	0.345	0.874	0.041	1.015
CHI *x* No. of beds	0.515	0.364	0.418	0.381	0.187	0.474	-0.273	0.560
CHI *x* No. of rooms	0.037	0.061	-0.050	0.065	-0.047	0.089	-0.070	0.079
CHI *x* General equipment	-0.057	0.134	0.092	0.141	0.004	0.197	0.424**	0.189
CHI *x* Medical supply	-0.205	0.169	-0.050	0.175	-0.168	0.224	0.183	0.221
CHI *x* Medicine availability	0.052**	0.025	0.034	0.026	0.076**	0.031	-0.032	0.032
CHI *x* Infrastructure index	0.049	0.138	0.096	0.149	0.151	0.219	-0.101	0.167
CHI *x* No. of operating years	0.003	0.012	-0.001	0.013	0.008	0.018	-0.002	0.016
VHI x No. of doctors[1]	5.125***	1.655	2.746	1.731	2.206	2.261	5.538***	1.840
VHI x No. of nurses [1]	2.979**	1.165	-0.653	1.288	-3.167*	1.777	-0.648	1.405
VHI x No. of pharmacists[1]	6.179***	2.105	3.006	2.289	2.869	2.780	5.590**	2.325
VHI x No. of doctor assistants[1]	-0.511	0.657	-1.399*	0.756	-1.176	0.963	-0.681	0.788
VHI x No. of beds	0.021	0.348	-0.012	0.395	0.379	0.455	0.112	0.417
VHI x No. of rooms	-0.075	0.053	-0.072	0.054	0.019	0.067	-0.109*	0.059
VHI x General equipment	0.304***	0.115	0.284**	0.115	0.136	0.137	0.185	0.122
VHI x Medical supply	0.065	0.168	-0.122	0.164	0.131	0.208	0.107	0.180
VHI x Medicine availability	0.003	0.018	-0.017	0.019	0.007	0.022	-0.013	0.019
VHI x Infrastructure index	0.375**	0.147	0.288**	0.139	0.122	0.160	0.308**	0.151
VHI x No. of operating years	-0.014	0.012	0.004	0.012	-0.005	0.015	0.007	0.013
HCFP x No. of doctors[1]	1.509	1.097	2.346*	1.276	-0.700	2.183	3.291**	1.375
HCFP x No. of nurses [1]	2.286***	0.837	4.159***	0.945	3.748***	1.416	2.033*	1.079
HCFP x No. of pharmacists[1]	0.239	1.217	0.406	1.487	0.154	2.483	2.141	1.505
HCFP x No. of doctor assistants[1]	1.362***	0.460	0.757	0.539	1.149	0.830	0.621	0.608
HCFP x No. of beds	-0.630***	0.217	-0.738**	0.289	-0.614	0.471	-0.593*	0.305

HCFP x No. of rooms	0.089**	0.045	0.050	0.057	0.005	0.080	0.061	0.054
HCFP x General equipment	0.027	0.079	0.056	0.108	-0.039	0.178	0.058	0.116
HCFP x Medical supply	-0.276**	0.123	-0.281*	0.154	0.104	0.267	-0.206	0.159
HCFP x Medicine availability	0.011	0.017	0.005	0.023	0.017	0.030	0.018	0.021
HCFP x Infrastructure index	0.115	0.111	0.069	0.138	0.516*	0.288	0.151	0.146
HCFP x No. of operating years	0.000	0.009	0.012	0.012	0.044**	0.018	0.014	0.012
Intercept	-0.155	0.249	-1.688***	0.303	-1.924***	0.390	-0.468*	0.254
Statistics:								
Number of observations	15025							
Number of cases	3005							
Log-likelihood	-4146.7664							
Chi-square	734.09							
Prob > chi-square	0.00							

Note: * p<.1; ** p<.05; *** p<.01

[1] Number per 1000 persons

Table A-7 Marginal Effects from a Mixed Logit Model on Health Care Choices for All Persons Age 6+ (Controlling for Interactions between Health Insurance Types and Commune Health Center Characteristics)

	CHC		Regional polyclinic		Provincial hospital		Private clinic		Self-medicate or do nothing	
	dp/dx	SE	dp/dx	SE	dp/dx	SE	dp/dx	SE	dp/dx	SE
Alternative-specific variable										
Distance to CHC (D1)	-2.829***	0.922	0.596***	0.197	0.277***	0.090	0.784***	0.258	1.172***	0.386
Distance to polyclinic (D2)	0.596***	0.197	-1.857***	0.608	0.156***	0.051	0.443***	0.146	0.661***	0.219
Distance to district hosp (D3)	0.277***	0.090	0.156***	0.051	-0.946***	0.305	0.206***	0.067	0.307***	0.100
Distance to private clinic(D4)	0.784***	0.258	0.443***	0.146	0.206***	0.067	-2.303***	0.750	0.870***	0.286
Distance to pharmacy (D5)	1.172***	0.386	0.661***	0.219	0.307***	0.100	0.870***	0.286	-3.010***	0.980
HHexpenditure*D1	0.686**	0.267	-0.145**	0.057	-0.067**	0.026	-0.190**	0.075	-0.284**	0.111
HHexpenditure*D2	-0.145**	0.057	0.450**	0.176	-0.038**	0.015	-0.107**	0.042	-0.160**	0.063
HHexpenditure*D3	-0.067**	0.026	-0.038**	0.015	0.229**	0.089	-0.050**	0.019	-0.074**	0.029
HHexpenditure*D4	-0.190**	0.075	-0.107**	0.042	-0.050**	0.019	0.559**	0.218	-0.211**	0.083
HHexpenditure*D5	-0.284**	0.111	-0.160**	0.063	-0.074**	0.029	-0.211**	0.083	0.730**	0.284
Case-specific variable:										
Individual characteristics:										
Age	0.002***	0.000	0.000	0.000	-0.001**	0.000	0.000	0.000	-0.002***	0.001
Male	-0.005	0.018	0.001	0.014	-0.013	0.009	-0.003	0.016	0.020	0.018
Married	-0.020	0.020	0.021	0.016	0.030***	0.011	-0.004	0.017	-0.027	0.021
Years of schooling	-0.006**	0.003	0.001	0.002	0.005***	0.001	0.002	0.002	-0.002	0.003
Has chronic condition	-0.060***	0.020	-0.017	0.017	0.071***	0.015	0.042**	0.020	-0.037	0.022
No. of days being ill	-0.004**	0.002	0.003**	0.001	0.003***	0.001	0.001	0.001	-0.003	0.002
Health insurance:										
CHI	0.355	0.217	0.067	0.156	-0.025	0.065	-0.315***	0.048	-0.082	0.177
VHI	-0.292***	0.090	0.162	0.212	-0.034	0.061	-0.177**	0.090	0.341	0.241
HCFP	0.307*	0.166	0.056	0.147	-0.092*	0.049	-0.175*	0.091	-0.095	0.149
Household characteristics:										
Household expenditures	-0.043***	0.010	0.001	0.007	0.005	0.004	0.006	0.007	0.032***	0.008
Household size	-0.000	0.006	0.000	0.005	-0.005	0.003	0.004	0.005	0.001	0.006
Region (Red River Delta is omitted):										
Northeast	0.006	0.029	0.058**	0.028	-0.020	0.013	-0.077***	0.020	0.032	0.030

Northwest	0.074**	0.037	0.012	0.031	-0.025*	0.015	-0.135***	0.020	0.075*	0.039
North Central	-0.139***	0.043	0.079	0.069	-0.058***	0.017	-0.091**	0.044	0.209**	0.084
Central Coast	-0.026	0.036	0.061	0.038	-0.016	0.018	-0.160***	0.019	0.140***	0.046
Central Highlands	-0.054*	0.031	0.127***	0.037	0.008	0.019	0.002	0.029	-0.082**	0.034
Southeast	-0.039	0.033	-0.019	0.028	0.000	0.019	0.041	0.031	0.017	0.036
Mekong River Delta	-0.163***	0.024	0.000	0.026	0.040**	0.019	0.014	0.025	0.110***	0.033
Characteristics of commune health center:										
CHI *x* No. of doctors[1]	-0.255	0.240	-0.160	0.167	-0.111	0.120	0.194	0.323	0.331	0.296
CHI *x* No. of nurses [1]	0.366**	0.173	0.158	0.120	0.159*	0.087	-0.122	0.247	-0.561**	0.250
CHI *x* No. of pharmacists[1]	0.052	0.281	-0.216	0.211	-0.147	0.155	0.430	0.343	-0.120	0.362
CHI *x* No. of doctor assistants[1]	-0.201*	0.118	-0.134	0.083	0.062	0.047	0.114	0.145	0.158	0.141
CHI *x* No. of beds	0.096*	0.055	0.039	0.037	0.002	0.026	-0.088	0.080	-0.049	0.073
CHI *x* No. of rooms	0.014	0.009	-0.005	0.006	-0.002	0.005	-0.011	0.011	0.005	0.012
CHI *x* General equipment	-0.038*	0.021	0.001	0.014	-0.006	0.012	0.069***	0.027	-0.025	0.026
CHI *x* Medical supply	-0.045*	0.026	-0.002	0.018	-0.009	0.013	0.045	0.031	0.012	0.032
CHI *x* Medicine availability	0.009**	0.004	0.002	0.003	0.004**	0.002	-0.010**	0.004	-0.005	0.005
CHI *x* Infrastructure index	0.008	0.023	0.012	0.016	0.009	0.013	-0.024	0.024	-0.006	0.025
CHI *x* No. of operating years	0.001	0.002	-0.000	0.001	0.001	0.001	-0.001	0.002	-0.000	0.002
VHI x No. of doctors[1]	0.553**	0.275	-0.053	0.190	-0.063	0.136	0.494*	0.253	-0.932***	0.284
VHI x No. of nurses[1]	0.714***	0.191	-0.154	0.142	-0.251**	0.108	-0.202	0.196	-0.106	0.209
VHI x No. of pharmacists[1]	0.735**	0.326	-0.072	0.241	-0.043	0.160	0.427	0.301	-1.047***	0.379
VHI x No. of doctor assistants[1]	0.017	0.110	-0.126	0.085	-0.043	0.058	-0.021	0.110	0.173	0.117
VHI x No. of beds	-0.009	0.056	-0.010	0.043	0.023	0.026	0.012	0.057	-0.016	0.063
VHI x No. of rooms	-0.006	0.009	-0.003	0.006	0.005	0.004	-0.011	0.008	0.016*	0.009
VHI x General equipment	0.036*	0.020	0.017	0.013	-0.003	0.008	0.002	0.017	-0.052***	0.019
VHI x Medical supply	0.010	0.029	-0.023	0.018	0.007	0.013	0.016	0.025	-0.009	0.028
VHI x Medicine availability	0.002	0.003	-0.002	0.002	0.001	0.001	-0.002	0.003	0.001	0.003
VHI x Infrastructure index	0.043	0.026	0.011	0.016	-0.007	0.010	0.018	0.022	-0.065***	0.022
VHI x No. of operating years	-0.003*	0.002	0.001	0.001	-0.000	0.001	0.002	0.002	0.001	0.002
HCFP x No. of doctors[1]	0.034	0.160	0.148	0.129	-0.149	0.134	0.385**	0.182	-0.417*	0.217
HCFP x No. of nurses[1]	0.095	0.111	0.341***	0.086	0.129	0.082	0.019	0.139	-0.584***	0.170

HCFP x No. of pharmacists[1]	-0.090	0.172	-0.025	0.153	-0.030	0.153	0.317	0.194	-0.172	0.245
HCFP x No. of doctor assistants [1]	0.182***	0.063	0.010	0.053	0.032	0.050	-0.015	0.081	-0.209**	0.094
HCFP x No. of beds	-0.049	0.035	-0.045	0.032	-0.012	0.030	-0.029	0.043	0.135***	0.044
HCFP x No. of rooms	0.012*	0.006	0.001	0.006	-0.003	0.005	0.003	0.007	-0.013	0.009
HCFP x General equipment	0.001	0.013	0.005	0.012	-0.005	0.011	0.007	0.017	-0.008	0.016
HCFP x Medical supply	-0.034*	0.019	-0.020	0.016	0.018	0.017	-0.011	0.022	0.046*	0.025
HCFP x Medicine availability	0.001	0.003	-0.001	0.002	0.001	0.002	0.002	0.003	-0.003	0.003
HCFP x Infrastructure index	0.002	0.018	-0.006	0.015	0.029	0.018	0.009	0.021	-0.033	0.022
HCFP x No. of operating years	-0.002	0.001	0.001	0.001	0.003**	0.001	0.001	0.002	-0.002	0.002
Predicted probability	0.2719		0.1535		0.0713		0.2019		0.3015	

Note: * p<.1; ** p<.05; *** p<.01

[1] Number per 1000 persons