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**Analysis on Demand and Supply-side Responses during the Expansion
of Health Insurance Coverage in Vietnam: Challenges and Policy Implications
toward Universal Health Coverage**

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Vietnam is one of the leading countries moving towards universal health coverage (UHC) among developing and emerging countries. This paper examines how utilisation and the supply side have responded to the expansion of health insurance coverage. In the analysis, we use provincial panel data of 2006 to 2012 for every two years, which is constructed from several data sources. The results show that the utilisation has only slightly responded to the expansion of health insurance coverage, and nearly no positive supply-side response has been observed during the expansion. Also, the results of detailed analysis of health workers imply that there has been an unbalanced allocation of health workers between provincial hospitals and commune health stations despite the importance of commune health stations in providing primary healthcare. Our further analysis also reveals that the out-of-pocket (OOP) burden has not decreased and the affordability of healthcare services has not changed in response to health insurance coverage. Based on our findings, we argue that supply-side factors might have constrained utilisation, and that health insurance has hardly eased liquidity constraints.

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1. Introduction

Achieving universal health coverage (UHC) is one of the most important issues in emerging and developing countries. Among other countries such as Brazil, Chile, China, Mexico, Rwanda, and Thailand, Vietnam has expanded its health coverage through a universal health insurance scheme over the last decade. This paper aims to reveal the overall picture of how health insurance coverage expansion is influencing the utilisation and supply of healthcare services in Vietnam, and addresses what can be done to achieve the goal of UHC proposed by the World Health Organization (WHO) that ‘all people have access to healthcare services and do not suffer financial hardship paying for them’ (WHO 2010, pp. ix).

Previous impact evaluations of public health insurance in Vietnam have generally focused on healthcare utilisation and health-related spending of health service seekers among specific beneficiaries, mainly using micro data and employing difference-in-differences (DID) estimation. Studies estimating the impact on utilisation have shown mixed results. Some claim statistically significant increases in utilisation owing to the introduction of public health insurance such as the report of Wagstaff (2007), which estimates the impact of the health insurance for the poor, and that of Nguyen (2012), which focuses on voluntary health insurance, while others show no impact on utilisation such as Wagstaff (2010) and Axelson et al. (2009), both of whom evaluate the impact of health insurance on the poor. Guindon (2014) finds that different groups of insured people are affected differently as an increase in admissions is observed for the poor and for students, while an increase in the number of outpatients is only seen in children under six. In addition, evaluation results of out-of-pocket (OOP) payments are not consistent. Jowett et al. (2004) focusing on voluntary health insurance, Wagstaff and Pradhan (2005) mostly focusing on formal workers’ coverage, and Wagstaff (2010) focusing on health insurance for the poor revealed a significant decrease in the OOP burden. Despite these positive findings, Nguyen (2012) and Axelson et al. (2009) claim that the OOP burden has not decreased for voluntary health insurance or for the poor, respectively.

Hence, findings of previous studies are inconclusive, and an overall picture of the impact of health insurance coverage is missing. Also, none of the literature in Vietnam has hitherto explored supply-side responses. Previous studies outside of Vietnam have indeed suggested the importance of supply-side responses to the expansion of health insurance coverage. For instance, according to a study in Thailand by Gruber et al. (2014), the supply-side factor appears to be critical for access to healthcare and for the amelioration of health problems. Moreover, Kondo and Shigeoka (2013)’s study in Japan suggests that a slow supply-side response to the dramatic increase in demand due to universal health coverage constrains hospital utilisation. Thus, this study uses provincial panel data to look at the general equilibrium effects, which include a shift in the supply of healthcare services as well as the demand for them due to the expansion of health insurance coverage.

Vietnam's public health insurance scheme was started in 1992 (the coverage rate was 5 per cent in 1993: VSS 2010), and the coverage had grown to 66 per cent by 2012 (figure in 2012: VHLSS calculated by the author). The beginning of the scheme covered workers at state-owned and non-state-owned enterprises with more than 10 workers, pensioners, socially disadvantaged people, and staff of international representative organisations in the country (Decree No. 299/HDBT issued by the Council of Ministers 1992). Since then, the government has gradually expanded the coverage. A notable change was observed in 2002 as the Health Care Funds for the Poor (HCFP) policy was implemented for the purpose of helping the poor access public health care services and reducing health care expenditures. Moreover, in accordance with changes in legal documents, we can see three periods of health insurance policy in recent years: in 2005 (Decree No. 63/2005/ND-CP (Government of Vietnam 2005)) expanding the enrolment to workers of non-state-owned companies with fewer than 10 employees; in 2008 (Law on Health Insurance issued by National Assembly (2008)) expanding the coverage to children under six years old and the near-poor by incorporating them into the compulsory group; and changing the rate of co-payment, and expanding coverage of people in 2014 by issuing Health Insurance Law 46/2014/QH13 issued by National Assembly (2014))

For analysis, we use a provincial panel data set from 2006 to 2012 for every two years. Provincial panel data has several advantages over micro data in our analysis for achieving the purpose of this study. Firstly, micro data are only available for short-period panel data (two years), and, as in the previous paper, impact evaluation can only be performed among certain types of health insurance groups due to difficulties in identifying control groups. Thus, the results will not be adequate for capturing the overall picture. Secondly, heterogeneity issues that arise in using micro data are difficult to overcome. Although the Vietnamese health insurance scheme is supposed to be compulsory for most people, compulsory does not mean legally enforceable. Hence, there are always unobservable factors affecting enrolment decisions such as worries or uncertainty about illnesses, and these factors are likely to be correlated with outcome variables (e.g., people who worry that they are ill are likely to have health insurance, and are likely to go to hospital). When aggregating data at the provincial level, on the other hand, we can assume that people with these unobservable factors exist randomly across provinces. Hence, aggregating data at the provincial level is beneficial. Also, with the aggregation, we can use provincial data from 2006 to 2012 for every two years, which enables us to control provincial time-invariant unobserved factors with panel estimation.

Our empirical results show small positive effects of public health insurance on admissions and inpatient days, and no effect on outpatient visits in Vietnam. In addition, we also merely observe supply-side responses. Additionally, our further analyses reveal that health insurance is not serving its purpose of reducing the OOP burden and unaffordability of healthcare services. Therefore, liquidity constraints may also be a reason for the only slight increase in utilisation.

The rest of this paper is organised as follows. Section 2 overviews the health insurance scheme and

healthcare delivery in the country. Section 3 introduces an analytical model and data. Then, we present the results of analyses followed by discussion. Finally, we conclude this paper with some policy implications.

2. Overview of the health insurance scheme and healthcare service delivery

2.1. Health insurance scheme during our study period

Vietnam's public health insurance scheme was started in the early 1990s with a coverage rate of 5 per cent. By 2006, the coverage increased to 56.14 per cent. During our study period, the coverage was expanded to 57.92 per cent in 2008, 61.59 per cent in 2010, and 66.29 per cent in 2012.

As a basic framework, the health insurance scheme has been individual based, and throughout our study period, the scheme includes two groups: the compulsory and the voluntary groups. The compulsory group comprises those who are mandated to have health insurance, yet not everyone in this group has health insurance in practice, and compulsory does not mean legally enforceable. Differences between the compulsory and the voluntary groups are premiums and co-payment rates such that the economically disadvantaged compulsory group, to whom lower co-payment rates apply, can receive subsidies while the voluntary group, to whom higher co-payment rates apply, receives no subsidies.

There have been various policy changes and modifications to the scheme since its introduction as documented in great detail in the Joint Annual Health Review (published every year since 2007), and this section summarises the policy changes affecting our study period of 2006 to 2012. We focus on the expansion of the coverage target, premiums, and benefit packages as they particularly influence demand-side behaviour.

Expansion of the coverage target

Expansion was achieved through several policy changes. In 2005, small-scale non-state-owned companies (fewer than 10 employees) are included in the health insurance scheme by Decree No. 63/2005/ND-CP in 2005 (Government of Vietnam 2005). In 2007, Joint Circular No. 06/2007/TTLB-BYT-BTC (issued by the Ministry of Health and the Ministry of Finance 2007) was introduced to enhance voluntary participation in the health insurance scheme. In 2009, the Law on Health Insurance (issued by the National Assembly 2008) became effective. Under the provision of the law, children under six years old and the near-poor were included in the compulsory group. In 2010, students and pupils were added to the compulsory group. Since 2010, the government also targeted farmers as well as workers in the sectors of agriculture, forestry, fishery, and salt production to enrol in the health insurance scheme by January 2012.

Premium rates and subsidies

Premium rates and subsidies vary depending on which category each individual belongs to, and several changes were made in our study period. According to the Ministry of Health and Health Partnership Group (2008; 2010; 2011), the premium rate for wage earners, pensioners, people receiving social welfare benefit, and stipend receivers was 3 per cent of their income (salary, wage, pension, stipend, or minimum salary) up to 2009. However, the changes occurred in accordance with Decree No. 62/2009/ND-CP, starting from 1 January 2010 as the insurance premium increased to 4.5 per cent of their income.

For the poor, the premium rate has gradually increased from the initial VND 50,000 (2002) to 394,200 (2010), which is approximately 4.5 per cent of the minimum salary (Ministry of Health and Health Partnership Group 2011). For students, the change in the premium occurred as they were incorporated into the compulsory group in 2010. In 2005, Joint Circular No. 22/2005/TTLT-BYT-BTC set the annual premium for students ranging from VND 30,000-50,000 depending on their residential location (urban/rural), and in 2007 Joint Circular No. 14/2007/TTLT-BYT-BTC announced a premium increase, reaching VND 120,000 per year for urban residents and VND 100,000 per year for rural residents. After the inclusion in the compulsory group, it was set at 3 per cent of the minimum wage by Decree No. 62/2009/ND-CP (Ministry of Health and Health Partnership Group 2010).

Despite an increment in the premium rate, many people are unaffected because of subsidies for enrolment. The poor have been subsidised for 100 per cent since 2002 throughout our study period; thus, they are totally unaffected. The near-poor were entitled to 50 per cent of the premium between 2008 and 2012 and to 70 per cent since 2012, and students and farming households with average living standards have been subsidised for a minimum of 30 per cent of the premium since 2010. Because the near-poor, and students and farming households, have started to enrol in the health insurance scheme since 2008, and 2010, respectively, we can assume that they are also unlikely to be affected. Taken together, during our study period, nearly 50 per cent of the insured population was fully subsidised and 30 per cent was partly subsidised (Ministry of Health and Health Partnership Group 2011). This suggests that most people see a drastic reduction in healthcare service prices when enrolling in the health insurance scheme; hence, we can expect an increase in demand in response to the expansion of health insurance coverage if only premium rates and subsidies are concerned.

Benefit packages

There have been several changes in benefit packages. In 2005, Decree No. 63/2005/ND-CP (Government of Vietnam 2005) eliminated 20 per cent of the co-payment rate of healthcare costs for all insured patients including those with voluntary health insurance although technologically advanced medical treatment was covered only partially. In 2007, Joint Circular No. 06/2007/TTLT-BYT-BTC changed the benefit for voluntary health insurance as the co-payment rate became 20 per cent of the total cost if the cost exceeded VND 100,000. In 2009, co-payment was re-defined as 20 per cent for wage earners, the near-poor, and the voluntary group, 5 per cent for the poor and other social welfare

recipients, and 0 per cent for children under six, and this co-payment rate continued until 2014 (VSS 2010, Ministry of Health and Health Partnership Group 2013). In 2012, the benefit package for the poor was expanded to cover monthly welfare receivers and people with severe illnesses needing high-cost treatment such as cancer treatment, kidney dialysis, and heart disease treatment. Moreover, the benefit for the poor and ethnic groups became more generous to include indirect costs such as food and transportation costs by Decision No. 14/2012/QD-TTg (Ministry of Health and Health Partnership Group 2013). The changes in the co-payment rate show that, from 2009 to 2014, voluntary enrollees and wage earners faced a drastic increase in healthcare costs as co-payment became four times more than the previous year.

Shortcomings of benefit packages and their improvement

Despite an effort to increase the benefit, insured people are still suffering catastrophic healthcare expenditure and impoverishment due to illness because patients often face the problem of additional payment for drugs and technologically advanced treatment. The health insurance does not cover medicines outside the drug list and medicines purchased outside hospitals. Also, health insurance benefit does not cover technologically advanced treatment when the cost goes beyond the ceiling.

Indeed, high expenditure on drugs is contributing to a higher OOP burden. Although the drug list includes a wide range of drugs, this problem still arises due to irrational drug prescription (prescribing drugs outside of the coverage) for marketing purposes or the hospital's intention not to overspend the health insurance fund allocated to their hospital (Ministry of Health and Health Partnership Group 2013).¹ Additionally, drug prices are rather high as shown by a study that found that drug prices were on average 46.6 times (for brand-name drugs) and 11.4 times (for generic drugs) higher than international prices in 2005 adjusted for purchasing power parity (Nguyen et al. 2009). High drug prices have been a problem despite many government attempts such as introduction of Pharmaceutical Law No. 34/2005/QH11 followed by Decree No. 79/2006/ND-CP, which detailed regulation of the law, and Joint Circular No. 11/2007/TTLT-BYT-BTC-BCT, which implemented the law (Ministry of Health and Health Partnership Group 2013). As Nguyen et al. (2010) suggests, these regulations have been insufficient for controlling drug prices and making it easier for patients to access drugs. Further government interventions have been made since 2011 such as drug coverage expansion in accordance with Circular No. 31/2011/TT-BYT, Circular No. 10/2012/TT-BYT, and Circular No. 45/2013/TT-BYT, promulgated in 2011, 2012, and 2013, respectively. Also, strong drug price control started from 2012 by the Ministry of Health in cooperation with the Ministry of Finance, Ministry of Industry, other related agencies, and provincial peoples' committees (Ministry of Health and Health Partnership Group 2012).²

¹ The insurance fund is allocated to each hospital based on the total contribution of those insured who have registered the hospital as their primary contact point.

² According to the Ministry of Health and Health Partnership Group (2012), drug prices were generally under control in

As well as payment for drugs, the problem of payment for technologically advanced treatment has been discussed in various literature. According to government Decision No. 36/2005/QĐ-BYT (issued by the government of Vietnam 2005), there are 177 technologically advanced medical services including dialysis, transplants, certain types of cancer treatment, cardiovascular operations, etc. During our study period, patients can generally receive treatment for free up to VND 7 million, and patients are responsible for co-payment if the costs are beyond VND 7 million. When the fee surpasses VND 20 million, patients have to pay the whole amount that is beyond VND 20 million (VSS 2010). Although some costs are covered by the insurance, it is still a huge burden for poor and near-poor households. Since 2009, gradual amendment has been made. For example, in 2009, the Law on Health Insurance set most medical treatment free for the poor including technologically advanced medical treatment except in-vitro fertilisation. Also, in 2012, prices of treatment including some technologically advanced treatment were modified to have an upper limit by Circular No. 04/2012/TTLT-BYT-BTC (Ministry of Health and Health Partnership Group 2012).

2.2 Healthcare service delivery

The Law on Health Insurance has entitled patients to receive health services at any healthcare facility without any geographical- and technical-level restrictions. In Vietnam, healthcare has been provided by public institutions; yet, in recent years, the private sector is growing. Public institutions are structured by level from central to local: provincial hospitals (PH) followed by district hospitals (DH) and commune health stations (CHS), and they are intended to cover the whole country. They provide four types of services: curative care, primary health care, preventive medicine, and population and family planning. On the other hand, private health facilities are concentrated in very few economically advanced urban areas, and the services are not covered by public health insurance (Ministry of Health and Health Partnership Group 2013). Because our study focuses on the country's market-wide change in response to the expansion of health insurance coverage, we do not include the private sector in our analysis.³ In the rest of this section, we provide a summary of the healthcare infrastructure, human resource management, and prices of healthcare.

Healthcare infrastructure

In the initial year of our study period, 2006, there were 13,433 public healthcare facilities with 197,684 beds (23.5 per 10,000 population) in total according to Health Statistics Yearbook 2006 (Ministry of Health 2006), and 99 per cent of communes were covered by CHS. The Ministry of Health and Health Partnership Group (2008), however, reported that at the end of 2008, among the country's entire district

2012.

³ The fact of the rapid growth of the private sector is worth noting to understand the picture of healthcare service delivery in Vietnam. In 2014, there were 170 private hospitals nationwide, with 8,627 hospital beds, accounting for 11 per cent of total hospitals and 4.2 per cent of total hospital beds (Ministry of Health and Health Partnership Group 2014). Although we do not include the private sector in our analysis for the reason stated in the main text, we have to be careful when examining big cities, especially Ho Chi Minh, where private hospitals are concentrated.

hospitals/health centres, almost none of the district facilities met the national standards for buildings. For example, none of the hospitals held sufficient physical space, and most facilities lacked medical equipment so that most facilities only had between 30 and 50 per cent of the standard equipment, and some only reached 20 per cent. Also, some health facilities even lacked electricity and clean water.

To improve the situation, from 2008 to 2012, large investments were made to build and upgrade the infrastructure of district hospitals in accordance with Decision No. 47/2008/QD-TTg, which established some new hospitals as well as renovating many hospitals (Ministry of Health and Health Partnership Group 2013). By Decision No. 930/2009/QD-TTg, funds have also been allocated to 51 provincial hospitals, 48 specialised tuberculosis hospitals, 35 mental health hospitals, 23 pediatric /obstetric-pediatric hospitals, and five oncology hospitals/centres. By 2012, 235 district hospitals, 46 polyclinics, and 30 provincial and central hospitals had been completed and started operation, and the number of public healthcare facilities increased to 13,836 with 273,565 beds (30.8 per 10,000 population) (Ministry of Health and Health Partnership Group 2013).

Human resource management: Quantity and quality

By virtue of the government effort, the country has achieved considerable progress in increasing the number of health workers. In 2001, there were 29.2 health workers per 10,000 population, and it has increased to 32.2 by 2006. By 2012, it grew to 45.86, which is 1.4 times higher than the figure of 2006 (the data obtained from Health Statistics Yearbook 2001, 2006, 2012 (Ministry of Health 2001; Ministry of Health 2006; Ministry of Health 2013)). Despite the great progress, there are two main challenges that the government is striving to overcome during our study period.

The first challenge is to balance the distribution of health workers between urban and rural areas, and between curative and preventive care. In 2007, Decision No. 1544/2007/QD-TTg was enforced to particularly train health workers who are from disadvantaged and mountainous areas of the northern region, central region, the Mekong Delta region, and the central highlands by permitting enrolment to university without entrance exams that are required of other applicants (Ministry of Health and Health Partnership Group 2009). Furthermore, in order to provide skilled health workers in rural areas, for a speedy solution, Decision No. 1816/QD-BYT was implemented in 2008 to rotate health workers among higher-level and lower-level hospitals for three months, which has been strictly monitored and managed by the Ministry of Health since the introduction (Ministry of Health and Health Partnership Group 2009). In 2009, the government also introduced improvement of working conditions of health workers in those socio-economically disadvantaged regions such as through Decision No. 46/2009/QD-TTg to provide a special salary supplement for staff and workers in selected hospitals, and Decision No. 75/2009/QD-TTg to provide village health workers with a stipend (Ministry of Health and Health Partnership Group 2009). However, gaps in workers' satisfaction between urban and rural areas, and between curative and preventive medicine, are still repeatedly reported (Bach

Xuan Tran et al. 2011; Witter et al. 2011).⁴

The second challenge is to improve the quality of health workers. There are concerns about the declining quality of medical school enrollees and the low quality of training. Deterioration of enrollees' quality is partly due to a rise in the enrolment quotas of medical universities. Under the growing pressure of self-financing given the low state budget, low tuition fees, and the introduction of Decree No. 43/2006/ND-CP in 2006 to increase autonomy and financial responsibility, universities had to increase their admission quotas. This also created high student-to-instructor ratios that are likely to lower the quality of teaching (Ministry of Health and Health Partnership Group 2009). As another reason for this issue, some universities claim the negative consequences of direct entrance from disadvantaged areas. This often results in having students with insufficient basic knowledge. The quality of training is another issue. For example, there are insufficient instructors to teach basic human sciences. Also, the training curriculum has not been updated for a long time with a lack of training facilities for new graduates (Ministry of Health and Health Partnership Group 2009). Indeed, due to there being no national examination to obtain a medical practitioner certificate in Vietnam, the quality of health workers is difficult to control (Fan et al. 2012). Although Decision No. 29/2008/QD-BYT was issued by the Ministry of Education and Training to regulate the quality assurance of universities and other training institutions in 2008, the quality of health workers has not been improved to be satisfactory, and in 2012 Directive No. 05/CT-BYT was issued to improve the quality of medical services (Ministry of Health and Health Partnership Group 2009; Ministry of Health and Health Partnership Group 2013).

Prices of healthcare

Prices for healthcare services are set by each hospital within bands because hospitals have been guaranteed hospital autonomy since 2006 by Decree No. 43/2006/ND-CP. This is often criticised as the salaries of hospital workers being interlocked with hospital net revenue, and this incentivises hospital staff to gain additional income by over-servicing healthcare (Ministry of Health and Health Partnership Group 2013). Moreover, the most common payment method, fee-for-services (FFS) provider payments, is making price control even more difficult. Thus, since 2008, the government has strongly recommended hospitals to change the payment type from FFS to capitation, particularly for the insured population, to cut down the health costs for the government (Nguyen et al. 2013). However, the outcome does not seem to be positive. The Ministry of Health and Health Partnership Group (2013) reported that the capitation currently conducted does not significantly differ from FFS, and the only difference is that hospitals are allowed to retain a surplus up to 20 per cent of the capitation fund. Thus,

⁴ Since 2013, more policies were introduced to adjust the balance such as increasing the number of universities to train medical staff from these areas who are committed to returning to their localities, regulating temporary staff secondment for medical staff (Decision No. 14/2013/QD-TTg), and sending voluntary young doctors to remote areas (Decision No. 585/QD-BYT) (Ministry of Health and Health Partnership Group 2013).

the problem of overserving of medical treatment has not been resolved.

In addition to official payments, informal payments are a problem. According to Towards Transparency (2011), the practice of bribery is worsening. In 2010, 29 per cent of urban residents who used health services over the previous 12 months had paid bribes. This is more than double the number who paid bribes in 2007. Although the anti-corruption framework is reported to be strong (Global Integrity 2009), in practice, implementation is lacking and law enforcement is weak (Freedom House 2011). These hidden costs might increase the OOP burden and prevent access to healthcare.

3. Empirical model and data

3.1 Model

For the purpose of estimating the overall demand-side and supply-side responses to the expansion of health insurance coverage, we use the following model in our empirical estimation:

$$Y_{pt} = \alpha * HI_{pt} + \sum_{t=2008,2010,2012} \delta_t * 1(year \geq t) + \sum_{t=2008,2010,2012} \lambda_t * 1(year \geq t) * HI_{pt} + X_{pt}\beta + \eta_p + \varepsilon_{pt}.$$

Here, p denotes a province ($p = 1, \dots, 63$), and t denotes a time period ($t = 2006, 2008, 2010, 2012$). Outcome variable Y can either be the measure of utilisation of healthcare services, including the logarithm of the number of outpatients, the logarithm of the number of admissions, and the logarithm of inpatient days, or the supply-side outcome variables such as the logarithm of the number of healthcare facilities, the logarithm of the number of beds, and the logarithm of the number of health workers. The logarithm is used to consider non-linearity effects and avoid measurement dependence.

α captures the effect of health insurance coverage when this effect in the year 2006 continues into subsequent years as well. To control year effects and (plus) continued effects after year t , we include a set of dummy variables that take 1 for the observation year and onwards ($\sum_{t=2008,2010,2012} \delta_t * 1(year \geq t)$). With the sustained year-trend effects (the observation year and onwards) held constant, we create the interaction terms of health insurance coverage and year-related dummy variables (the observation year and onwards) as described in the model as $\sum_{t=2008,2010,2012} \lambda_t * 1(year \geq t) * HI_{pt}$. The sum of these terms plus parameter α captures the effect of health insurance of the particular year and onwards when such an effect of the corresponding year continues into the subsequent year as well. As control variables (X_{pt}), the logarithm of the prefectural population and provincial health budget as well as a constant term are included. Finally, in the estimation, we control time-invariant provincial effects (η_p) as fixed effects. ε_{pt} is an error term.

Note that we estimate the movement from one equilibrium point to another. In other words, we do not directly estimate either the elasticity of demand or the supply curve, but we estimate the general equilibrium effects, which may include a shift in the supply of healthcare services as well as demand

for them. When healthcare utilisation is considered, we assume that the utilisation is determined by the sensitivity of demand to the expansion of health insurance (decreasing the cost of healthcare). When supply is considered, we assume it is determined by supply-side responses to such demand shifts.⁵

3.2 Data

Our data were derived from the Vietnam Household Living Standards Survey (VHLSS) and Health Statistical Yearbook. A series of VHLSSes was conducted by the General Statistical Office (GSO) of Vietnam, and the Health Statistical Yearbook is published by the Ministry of Health of Vietnam. A VHLSS is conducted every two years to systematically monitor the living standards of Vietnamese society and it includes questions on health insurance. The Health Statistical Yearbook is published annually to report a macro-level health overview including the number of healthcare facilities and utilisation of each province. We use provincial data from 2006 to 2012 for every two years. The data source of each variable is indicated in Appendix 1.

Health insurance coverage rate

To obtain the health insurance coverage rate, we use VHLSS 2006, 2008, 2010, and 2012 to simply aggregate the data for each province to calculate the percentage of the insured, which includes both those with a free healthcare certificate and those with health insurance.⁶ In our data, we are not able to identify different types of insurance due to data limitation.

As shown in Figure 1, there was about a 10 per cent increase in the average health insurance coverage rate between 2006 and 2012, and a greater coverage increment occurred in the provinces with a lower coverage rate.

Figure 1 about here.

⁵ Because of the length of available data years, it might be difficult to capture the long-term impact. Hence, we run the additional regression using the lagged variable of health insurance coverage. Also, we have included the linear time trend for the sensitivity check.

⁶ The coverage rate of 2004 is actually obtainable from VHLSS 2004; however, we do not include the data in 2004 to avoid showing misleading effects of health insurance. Between 2002 and 2004, user fee exemption and free medical treatment for the poor and ethnic minorities were implemented. It was then changed to 100 per cent subsidy for health insurance in 2005, and the direct exemption policy was no longer implemented. As fee exemption did not require health insurance, people with fee exemption were not counted as 'the insured' in 2004 and were then counted as 'the insured' after switching to health insurance with 100 per cent subsidy. The data shows a large increase in the coverage from 2004 to 2006 as it recorded an increment of over 15 per cent, and we suspect that the transfer from fee exemption to health insurance with 100 per cent subsidy may be the major reason for the increment of the coverage. In practice, a greater increase occurred in poverty-stricken provinces, which are mainly located in the northern midlands and mountainous areas, notably Ha Giang Province (poverty rate of 41.5 per cent in 2006) and Cao Bang Province (poverty rate of 38.0 per cent in 2006). In these provinces, the coverage increased by approximately 60 per cent between 2004 and 2006. Thus, this dramatic increase in the coverage between 2004 and 2006 may not necessarily indicate an improvement in health coverage for the people. For this reason, we excluded the data in 2004 from our analysis.

Utilisation and supply-side variables of healthcare services

In our analysis, we examine both changes in the utilisation of healthcare services and supply-side responses to the expansion of health insurance coverage. To observe how utilisation has changed, we use the variable of utilisation of healthcare facilities measured by admissions, inpatient days, and outpatient visits. Admissions mean the total number of patients admitted to healthcare facilities as inpatients in each province per calendar year, and inpatient days mean the sum of the days in healthcare facilities amongst all inpatients. The number of outpatients is the total number of patients who visit healthcare facilities for some reason.

For the supply-side variables, we observe the number of healthcare facilities, number of beds, and number of health workers. Healthcare facilities include PH and DH. The number of CHS is not included because 99 per cent of communes already had CHS by 2006. The number of beds is the total sum of beds in each province. Health workers include doctors, nurses, midwives, and medical technicians. In the analysis, we examine in detail how supply has responded in terms of the number of doctors, nurses, midwives, and medical technicians as well as the total number of health workers. We additionally run separate regressions for the number of each profession for PH, for DH, and for CHS because a large number of inpatients and outpatients are treated at PH or DH. If health workers are effectively allocated to respond to an increase in health insurance coverage, the total number of each health profession in the provinces (summing up all levels of health facilities), in PH alone, and in DH alone, would all increase. Thus, in our model, λ_t should become positive and statistically significant.

4. Estimation Results – Demand-side and supply-side responses

Table 1 shows the marginal effect of health insurance of the particular year in the top row and onwards when such an effect of the corresponding year continues into the subsequent year as well.⁷ Table 2 then presents the result of additional analysis of health workers that divides healthcare facilities into different levels: PH, DH, and CHS.⁸

Table 1 about here

⁷ As there is a possibility of an endogeneity issue when a provincial health budget is included (more of the provincial health budget might be allocated in areas of lower hospital utilisation), we exclude the health budget variable for the robustness check. Also, for the sensitivity check, we exclude Ho Chi Minh from our analysis because demand and supply patterns in Ho Chi Minh Province are largely different from the other provinces. The results are consistent with the main results provided here.

⁸ The coefficients of the regression results are shown in Appendix 2.

The results show that the expansion of health insurance increased admissions and inpatient days, although the increase in outpatient visits is not statistically significant. For admissions, there was about a 1.17 per cent increase corresponding to a 1 per cent increase in health insurance coverage in 2012. As for inpatient days, there was about a 1.09 per cent, 1.43 per cent, and 1.73 per cent increase corresponding to a 1 per cent increase in health insurance coverage in 2008, 2010, and 2012, respectively.

On the other hand, there was nearly no positive response of the supply side.⁹ Healthcare facilities showed a slight decreasing trend, and it was statistically significant in 2010 and 2012.¹⁰ The number of beds did not respond to the increase in health insurance coverage. For health workers, we can see a small increase in the total number of doctors responding to the changes in 2012. However, none of the others showed any sign of increase. Medical technicians were even showing a decreasing trend with some statistical significance.

Table 2 about here

In Table 2, we can see more details. The number of doctors increased in PH, although there was a decreasing trend in CHS. The number of nurses also increased in PH, yet there seems to be no change in DH and CHS. For medical technicians and midwives in terms of statistical significance, there was a slight negative response of the number of medical technicians in DH and the number of midwives in CHS in 2012. As a whole, although some results are significantly different from 0 at the conventional level, the marginal effects are very small implying around 1 per cent changes for most cases. Also, the detailed results of the hospital levels indicate that nurses might have moved to PH from DH or CHS, or that there was unequal distribution between rural and urban areas considering that there were no changes in the total number of nurses as is observed in Table 1.¹¹

⁹ The results of the regression using the lagged variable of health insurance coverage and the regression-controlled linear time trend show consistent results as the main analysis.

¹⁰ Although the result of our analysis did not show an increase in the number of healthcare facilities in response to health insurance coverage expansion, the number of healthcare facilities should have increased with policy implementation (Decision No. 47/2008/QD-TTg; Decision No. 930/2009/QD-TTg) (Ministry of Health and Health Partnership Group 2012). These may not have been reflected in the data used as many started their operation in 2011 and 2012, and some more are to be operationalised after our study period.

¹¹ In order to take different qualifications for each profession into consideration, we ran several more regressions by dividing each profession into different types of qualification (results are provided upon request). We do this because the duration of training differs between qualifications. For example, there are doctors and assistant doctors. Doctors are educated for six years, while assistant doctors are educated for three years. For nurses, there are nurses with a degree (four years of education), with junior college/secondary graduation (three years of education), and with elementary training. Midwives and medical technicians also have different levels of qualifications as nurses do. We assume that professionals

5. Discussion – Reasons constraining utilisation

The aim of UHC is to enable all people to have access to healthcare. Nonetheless, our results show only a small increase in the utilisation of healthcare services resulting from the expansion of health insurance coverage in Vietnam. We argue that there are two possible reasons.

First, the supply capacity including the number of healthcare facilities and beds does not respond to the expansion of health insurance coverage. Our estimation results also show a very small increase in the number of health workers where health insurance coverage has expanded. It is possible that doctors have more patients each day, and the slight increase in admissions and inpatient days might reflect these increases in individual capacity. However, there is a limit to the number of patients that doctors can examine each day given the time constraint, and this is probably why the increase in outpatients is not statistically significant.

Second, there is a possibility that health insurance is not preventing a high OOP burden including informal payments. According to Tran et al. (2011), the number of households in Vietnam that suffer from catastrophic expenditure in healthcare, which is calculated as households in which health-related payments exceed 40 per cent of the household's capacity to pay, is decreasing yet it is still high as it was 8.2 per cent in 2004, 5.1 per cent in 2006, and 5.5 per cent in 2008. To test our concern, we conducted additional estimations by using the average amount of OOP per household (CPI adjusted) and the percentage of people who cannot afford healthcare in each province as outcome variables.¹² The estimation models are the same as the main estimation.¹³ In the estimation, unaffordability was measured as the percentage of households who answered 'No' to the question 'Could the household afford the medical check/treatment?' In Table 3, we present the marginal effect of our targeted variables.¹⁴

qualified with a shorter period of training are more likely to respond to the changes that have occurred with the expansion of health insurance coverage since it is quicker for them to be qualified. We used the same estimation models as the main estimation, and ran regressions for four different cases: the provincial total (the sum of PH, DH, and CHS) of each profession with different qualifications, number of each profession with different qualifications for PH, number of each profession with different qualifications for DH, and number of each profession with different qualifications for CHS. Despite our assumption, we did not find any increase in qualification with a shorter period of training such as elementary qualification. Neither did we find any increase in the number of junior college/secondary qualified health workers or assistant doctors. Instead, we found some increase in the number of health workers with qualifications that need a longer training period such as nurses with a degree or doctors.

¹² Descriptive statistics are provided in Appendix 1.

¹³ As a sensitivity check, we ran the regressions without health budget, and without Ho Chi Minh Province for this estimation as well. The results are consistent with the main results provided here. We also ran the regression whereby the controlled linear time trend shows consistent results with the results provided here. The coefficients of the regression results are shown in Appendix 3.

¹⁴ Whole results are provided upon request.

Table 3 about here

As Table 3 shows, there were no effects of health insurance coverage on OOP and affordability. We can consider several reasons for this result. As reviewed earlier, there has been a shortfall in the health insurance scheme whereby the co-payment rate increased for many insured people in 2009; thus, there should have been some increases in payment since 2009. In addition, the payment method for health insurance and guaranteed autonomy of hospitals has been making price control difficult. Nguyen et al. (2013) even reveal that the shift in payment method to the capitation payment scheme from FFS, which was piloted and has been in practice since 2006, caused discrimination against insured people. This happened because the adjustment of the per capita amount is based on the composition of insured members registered at hospitals, and reimbursement is capped within premium revenues. It created the lowest capitation rate for the poor and children under six due to full subsidisation by the government. Indeed, these groups are those at the most risk of illnesses and are the most frequent hospital users. Thus, hospitals have scaled down their services to insured people and the number of uninsured patients has increased despite the expansion of health insurance coverage. Hence, people might have chosen not to use health insurance. Although capitation was not implemented in all facilities, in 2011, 59 out of 63 provinces introduced capitation payment in 40.3 per cent of facilities. Thus, the finding by Nguyen et al. (2013) might explain some reasons for the non-decreasing OOP burden and unaffordability. In addition to these issues related somewhat to the health insurance scheme, there has also been a problem of informal payments. Indeed, there are even some reports that patients bribe doctors and nurses to secure quicker treatment and to receive adequate attention such as mentioned in Ha (2011), and the overcrowding problem is becoming more severe in recent years.

6. Policy implications and conclusion

The purpose of our study is to examine market-wide changes during the expansion of health insurance coverage, and address what measures can be taken to achieve the goal of UHC set by the WHO that ‘all people have access to healthcare services and do not suffer financial hardship paying for them’ (WHO 2010, pp. ix). The results of our analysis show that the expansion of health insurance coverage neither increased demand nor eased financial hardship indicating that the goal has not yet been achieved. In fact, guaranteeing financial security is one of the keys to meeting the aim of providing healthcare to all the people. Our findings also imply that supply-side factors are probably constraining the capability of the recent healthcare system.

To overcome the issue of financial protection, the government can intervene by modifying the health insurance scheme such as abolishing the co-payment rate for the poor as well as decreasing the co-payment rate for non-poor insured people, and enforcing some strict measures for drug prices and medical treatment fees. Also, it is critical to strengthen anti-corruption enforcement to eradicate the

practice of informal payment. In practice, the government has started to make some improvements. For example, the Health Insurance Law amended in 2014 exempts poor household members or ethnic minorities living in regions facing socio-economic difficulties from medical examination and treatment expenditures at CHS and their inpatient treatment costs at PH and central hospitals. Also, drug price control has been tightened since 2011. Therefore, these efforts should be evaluated to see how efficiently financial protection is provided when people access healthcare services.

In addition to advancing financial protection, it is critical to upgrade the supply capacity. The Vietnamese government has already taken further steps since the latter years of our study period to increase the supply capacity including establishing and renovating healthcare facilities (Decision No. 930/2009/QD-TTg) as well as improving the quantity and quality of health workers (Decision No. 46/2009/QD-TTg; Decision No. 29/2008/QD-BYT). Although our analyses do not show an increase in supply capacity, it cannot be achieved in the short run. Hence, our result does not imply that the current government policy intervention should be denied. Nevertheless, attention should be paid to our results that there is a possibility that these advancements are not responding to the progress of health insurance coverage. Also, the problem of unequal distribution of health workers needs to be resolved. While our data did not reflect it, the government policy of rotating doctors between higher- and lower-level hospitals (Decision No. 1816/QD-BYT) may be one of the ways to mitigate this issue. Moreover, the quality improvement of health workers should be enhanced with the already-implemented policy of Directive No. 05/CT-BYT aiming to improve healthcare service quality.

In conclusion, the contribution of our paper is that we have provided a more comprehensive picture of demand-side and supply-side responses to the expansion of health insurance coverage. The results indicate that there are no significant market-wide changes owing to insufficient financial protection and supply constraint despite government efforts. Overlooking the policy intervention of the government shows that there have been many policies implemented for better practice of the health insurance scheme and healthcare service delivery. Hence, it is critical to evaluate each policy regarding how effective and efficient the intervention is, and to analyse what needs to be done to improve the means of implementation such as monitoring or incentivising health workers.

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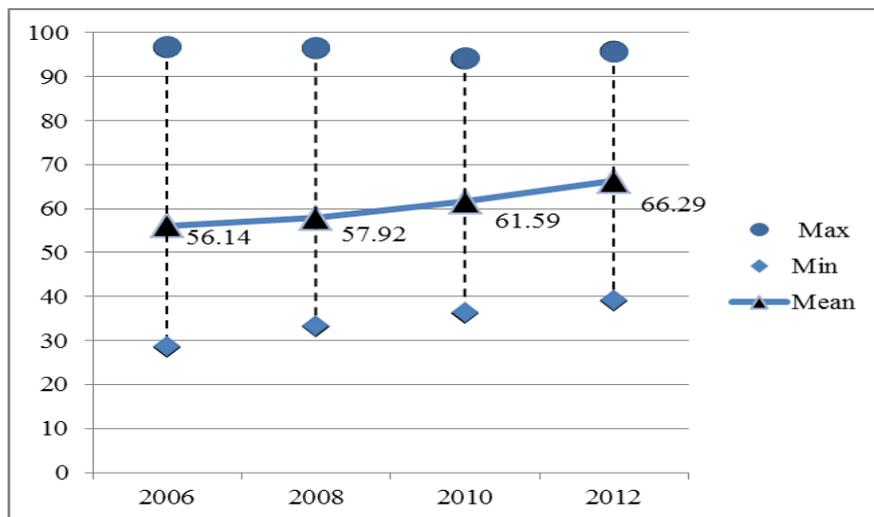


Figure 1 Health insurance coverage rate.
 Source: VHLSS 2006, 2008, 2010, 2012.

Table 1 Marginal effect of health insurance coverage on utilisation and supply-side factors

<i>UTILISATION</i>	2008	2010	2012
Log of admissions	0.0062934 (0.0040)	0.00681 (0.0045)	0.0117106 * (0.0063)
Log of outpatients visits	0.0054185 (0.0077)	0.0115624 (0.0099)	0.00249963 (0.0157)
Log of inpatient days	0.0108889 ** (0.0056)	0.0143089 ** (0.0067)	0.0173393 ** (0.0086)
<i>SUPPLY-SIDE FACTORS</i>			
Log of healthcare facilities	-0.0006297 (0.0006)	-0.011092 * (0.0007)	-0.0020676 ** (0.0010)
Log of DH	0.0031057 (0.0026)	0.0037884 (0.0028)	0.0038915 (0.0039)
Log of PH	-0.0061253 (0.0048)	-0.004367 (0.0053)	-0.0018229 (0.0075)
Log of number of beds	0.0010624 (0.0015)	-0.000153 (0.0016)	-0.0023232 (0.0026)
Log of health workers	0.0000361 (0.0014)	-6.72E-05 (0.0017)	-0.0012297 (0.0031)
Log of number of doctors	0.0021166 (0.0017)	0.0029415 * (0.0017)	0.0057518 ** (0.0026)
Log of number of nurses	0.0049764 (0.0035)	0.0007068 (0.0051)	-0.0058722 (0.0077)
Log of number of midwives	-0.0010631 (0.0038)	-0.002018 (0.0061)	-0.0049844 (0.0094)
Log of number of medical technicians	-0.0014423 (0.0026)	-0.005867 * (0.0034)	-0.0118595 ** (0.0058)

NOTE:

The marginal effects of health insurance of the particular year and onwards when such an effect of the corresponding year continues into the subsequent year as well are reported. See the text in detail for reported estimators in the table.

Province-level clustered standard errors are in parentheses.

*** $P < 0.01$, ** $P < 0.05$, * $P < 0.1$

Table2. Marginal effect of health insurance coverage on supply-side factors (health workers)

<i>SUPPLY-SIDE FACTORS (health workers)</i>	2008	2010	2012
Log of health workers at PH	0.001336 (0.0016)	0.00145 (0.0020)	0.0009293 (0.0035)
Log of number of doctors at PH	0.0070542** (0.0032)	0.0087067** (0.0099)	0.0014506** (0.0064)
Log of number of nurses at PH	0.100875** (0.0042)	0.0140507** (0.0055)	0.0172187** (0.0089)
Log of number of midwives at PH	-0.002767 (0.0048)	-0.0088387 (0.0072)	-0.0178178 (0.0110)
Log of number of medical technicians at PH	0.0018216 (0.0027)	0.0003754 (0.0035)	-0.0019348 (0.0058)
Log of health workers at DH	-0.001285 (0.0023)	-0.0003195 (0.0033)	-0.0000456 (0.0048)
Log of number of doctors at DH	-0.001786 (0.0022)	0.0001439 (0.0031)	0.0032787 (0.0011)
Log of number of nurses at DH	0.0063 (0.0047)	0.0073 (0.0075)	0.0082 (0.0108)
Log of number of midwives at DH	-0.0005 (0.0061)	-0.0001 (0.0086)	-0.0014 (0.0124)
Log of number of medical technicians at DH	-0.0018 (0.0047)	-0.0081 (0.0061)	-0.0156* (0.0093)
Log of health workers at CHS	-0.002179 (0.0018)	-0.0016894 (0.0020)	-0.0064397* (0.0030)
Log of number of doctors at CHS	0.0017197 (0.0022)	0.0000772 (0.0020)	-0.001458 (0.0033)
Log of number of nurses at CHS	0.0079036 (0.0065)	0.0115176 (0.0051)	0.0131194 (0.0117)
Log of number of midwives at CHS	0.0047955 (0.0050)	-0.0067417 (0.0081)	-0.0021443* (0.0127)
Log of number of medical technicians at CHS	0.0005714 (0.0097)	-0.0047926 (0.0119)	-0.0227965 (0.0158)

NOTE:

The marginal effects of health insurance of the particular year and onwards when such an effect of the corresponding year continues into the subsequent year as well are reported. See the text in detail for the reported estimators in the table. Province-level clustered standard errors are in parentheses.

*** $P < 0.01$, ** $P < 0.05$, * $P < 0.1$

Table 3 Marginal effect of health insurance coverage on OOP and unaffordability

	2008	2010	2012
Log of OOP	-0.0062908 (0.0041)	-0.007763 (0.0062)	-0.003374 (0.0083)
Unaffordability (%)	-0.62975 (0.0041)	-0.7854 (0.0063)	-0.36525 (0.0083)

NOTE:

The marginal effects of health insurance of the particular year and onwards when such an effect of the corresponding year continues into the subsequent year as well are reported. See the text in detail for the reported estimators in the table.

Province-level clustered standard errors are in parentheses.

*** $P < 0.01$, ** $P < 0.05$, * $P < 0.1$

Appendix 1. Descriptive statistics and data source

	Number of observations	Mean	Standard deviation	Min	Max	Data source
Health insurance coverage(%)	252	60	16	29	97	VHLSS 2006, 2008, 2010, 2012
<i>UTILISATION</i>						
Admissions	251	160,572	154,439	5,562	1,400,000	Health Statistics Yearbook 2006, 2008, 2010, 2012
Outpatients visits	250	2,908,108	3,681,826	3,239	29,800,000	Health Statistics Yearbook 2006, 2008, 2010, 2012
Inpatient days	249	1,061,656	1,095,176	16,122	9,200,000	Health Statistics Yearbook 2006, 2008, 2010, 2012
<i>SUPPLY- SIDE VARIABLES</i>						
Number of healthcare facilities	252	187	110	60	674	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of DH	252	5	4	0	29	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of PH	252	10	4	2	27	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of beds	252	3,298	2,984	648	23,893	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of health workers	252	3,298	2,984	648	23,893	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of doctors	252	3,879	3,261	1,019	28,415	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of nurses	252	1,490	989	362	6,806	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of midwives	252	439	377	93	4,336	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of medical technicians	252	164	181	32	1,655	Health Statistics Yearbook 2006, 2008, 2010, 2012
<i>Health workers at PH</i>						
Number of health workers	252	3,298	2,984	648	23,893	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of doctors	252	3,879	3,261	1,019	28,415	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of nurses	252	1,490	989	362	6,806	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of midwives	252	439	377	93	4,336	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of medical technicians	252	4	6	0	45	Health Statistics Yearbook 2006, 2008, 2010, 2012
<i>Health workers at DH</i>						
Number of health workers	252	1,280	812	323	5,749	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of doctors	252	486	302	114	1,951	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of nurses	252	282	223	26	1,552	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of midwives	252	138	91	10	681	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of medical technicians	252	61	40	6	245	Health Statistics Yearbook 2006, 2008, 2010, 2012
<i>Health workers at CHS</i>						
Number of health workers	252	1,649	2,249	299	20,749	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of doctors	252	485	503	92	4,270	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of nurses	252	429	741	12	7,256	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of midwives	252	149	284	13	3,656	Health Statistics Yearbook 2006, 2008, 2010, 2012
Number of medical technicians	252	100	152	11	1,404	Health Statistics Yearbook 2006, 2008, 2010, 2012
<i>OOP & Affordability</i>						
OOP (Thousand VND)	252	2,345	1,224	330	6,956	VHLSS 2006, 2008, 2010, 2012
Unaffordability (%) :Percentage of households who cannot afford health care	252	2	4	0	33	VHLSS 2006, 2008, 2010, 2012
<i>Other controls</i>						
Population (Thousand)	252	1,366	1,139	290	7,664	Health Statistics Yearbook 2006, 2008, 2010, 2012
Hospital budget (Million VND)	252	267,219	319,875	41,945	2,761,595	Health Statistics Yearbook 2006, 2008, 2010, 2012

Appendix 2. Regression results: Impact of health insurance coverage on utilisation and supply-side factors (coefficient)

VARIABLES	Log of admissions	Log of outpatient visits	Log of inpatient days	Log of health facilities	Log of PHU	Log of DII	Log of number of beds	Log of number of healthcare professionals	Log of number of doctors	Log of number of nurses	Log of number of midwives	Log of number of medical technicians
<i>HI</i>	0.00803* (0.00415)	-0.000266 (0.00925)	0.0117* (0.00600)	-0.000578 (0.000663)	-0.00732 (0.00566)	0.00309 (0.00309)	0.00186 (0.00177)	-0.000293 (0.00153)	0.000559 (0.00142)	0.00920** (0.00379)	-0.00339 (0.00422)	-0.000659 (0.00280)
<i>Year × 2008*HI</i>	0.158* (0.0841)	0.00323 (0.182)	-0.00517 (0.112)	0.0293 (0.0177)	0.00477 (0.127)	0.0542 (0.0758)	0.114** (0.0440)	0.0914** (0.0596)	-0.0548 (0.158)	0.881*** (0.183)	-0.604*** (0.0690)	0.159** (0.0690)
<i>Year × 2010*HI</i>	-0.111 (0.109)	0.327 (0.233)	-0.396* (0.226)	0.0216 (0.0249)	0.144 (0.177)	-0.0223 (0.0839)	0.130** (0.0564)	0.214*** (0.0633)	0.0917 (0.0841)	0.169* (0.0882)	0.345*** (0.105)	0.341** (0.133)
<i>Year × 2012*HI</i>	-0.315 (0.212)	0.0324 (0.276)	-0.176 (0.307)	0.0663** (0.0275)	-0.0363 (0.112)	0.0294 (0.0854)	0.0847 (0.0623)	0.127** (0.0522)	-0.0881 (0.0704)	0.182* (0.0964)	0.189** (0.0741)	0.223* (0.112)
<i>Year × 2008</i>	-0.00174 (0.00152)	0.00568 (0.00436)	-0.000800 (0.00166)	-0.000251 (0.000302)	0.00119 (0.00217)	1.98e-05 (0.00116)	-0.000795 (0.000735)	0.000329 (0.000808)	0.00156 (0.000958)	-0.00422 (0.00278)	0.00233 (0.00313)	-0.000783 (0.00119)
<i>Year × 2010</i>	0.000315 (0.00180)	0.00614 (0.00509)	0.00342 (0.00253)	-0.000480 (0.000480)	0.00176 (0.00297)	0.000683 (0.00196)	-0.00122 (0.00122)	-0.000862 (0.000904)	0.000798 (0.000895)	-0.00427 (0.00262)	-0.000955 (0.00338)	-0.00442** (0.00204)
<i>Year × 2012</i>	0.00490* (0.00268)	0.0134* (0.00764)	0.00303 (0.00336)	-0.000958* (0.000540)	0.00255 (0.00324)	0.000103 (0.00206)	-0.00217 (0.00156)	-0.00170 (0.00118)	0.00284* (0.00149)	-0.00658** (0.00311)	-0.00297 (0.00371)	-0.00599** (0.00299)
<i>Log of population</i>	0.643 (0.431)	-1.074 (1.637)	1.319*** (0.493)	0.260 (0.195)	-0.678 (0.687)	-0.00827 (0.578)	0.381 (0.401)	0.871** (0.431)	0.996*** (0.358)	-0.307 (0.869)	1.337** (0.599)	0.591 (0.493)
<i>Log of hospital budget</i>	0.0516 (0.0483)	-0.707 (0.431)	0.197 (0.131)	-0.00979 (0.0134)	0.0571 (0.0810)	-0.00831 (0.0478)	0.0568* (0.0310)	0.0136 (0.0240)	-0.00462 (0.0215)	0.131* (0.0704)	-0.0136 (0.0794)	0.0361 (0.0324)
Constant	6.319** (3.102)	30.11** (13.41)	1.371 (3.762)	3.393** (1.366)	5.682 (4.989)	2.116 (4.187)	4.323 (2.761)	1.665 (3.156)	0.132 (2.623)	5.987 (6.190)	-2.855 (4.005)	0.156 (3.340)
Observations	251	251	249	252	251	252	252	252	252	252	252	252
Required	0.138	0.075	0.054	0.246	0.257	0.089	0.682	0.809	0.496	0.810	0.414	0.552
Number of provinces	63	63	63	63	63	63	63	63	63	63	63	63

NOTE:

Provincial dummies are included in all models.

Province-level clustered standard errors are in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Appendix 3. Regression results: Impact of health insurance coverage on utilisation (health workers)
(coefficient)

VARIABLES	Provincial Hospital				
	Log of number of healthcare professionals	Log of number of doctors	Log of number of nurses	Log of number of midwives	Log of number of medical technicians
<i>HI</i>	0.000972 (0.00214)	0.00519 (0.00324)	0.00871 (0.00565)	8.57e-06 (0.00533)	0.00258 (0.00299)
<i>Year>=2008*HI</i>	0.114* (0.0663)	-0.0404 (0.0810)	1.372*** (0.181)	-1.256*** (0.236)	0.173** (0.0781)
<i>Year>=2010*HI</i>	0.142** (0.0654)	0.0344 (0.0639)	0.0429 (0.115)	0.375*** (0.121)	0.161 (0.116)
<i>Year>=2012*HI</i>	0.0979 (0.0665)	-0.247 (0.172)	0.0810 (0.140)	0.281** (0.115)	0.125 (0.115)
<i>Year>=2008</i>	0.000364 (0.00134)	0.00186 (0.00152)	0.00138 (0.00341)	-0.00278 (0.00381)	-0.000762 (0.00139)
<i>Year>=2010</i>	0.000114 (0.00152)	0.00165 (0.00150)	0.00396 (0.00348)	-0.00607 (0.00412)	-0.00145 (0.00209)
<i>Year>=2012</i>	-0.000520 (0.00190)	0.00580* (0.00329)	0.00317 (0.00429)	-0.00898** (0.00435)	-0.00231 (0.00306)
<i>Log of population</i>	0.465 (0.452)	0.512 (0.493)	-2.041*** (0.705)	2.319*** (0.679)	-0.0580 (0.533)
<i>Log of hospital budget</i>	0.0412 (0.0477)	0.0345 (0.0397)	0.130 (0.131)	-0.0171 (0.0763)	0.0591 (0.0604)
Constant	3.134 (3.367)	1.573 (3.693)	16.53*** (5.276)	-10.65** (4.473)	3.663 (3.744)
Observations	252	252	252	252	252
R-squared	0.675	0.410	0.890	0.820	0.519
Number of provinces	63	63	63	63	63

VARIABLES	District Hospital				
	Log of number of healthcare professionals	Log of number of doctors	Log of number of nurses	Log of number of midwives	Log of number of medical technicians
<i>HI</i>	-0.00274 (0.00222)	-0.00343** (0.00169)	0.00560 (0.00461)	-0.00231 (0.00683)	-0.00205 (0.00509)
<i>Year>=2008*HI</i>	0.0122 (0.0882)	-0.0831 (0.0865)	0.637*** (0.238)	-0.532** (0.235)	0.0936 (0.116)
<i>Year>=2010*HI</i>	0.205** (0.0810)	0.0473 (0.110)	0.119 (0.137)	0.262 (0.172)	0.530** (0.232)
<i>Year>=2012*HI</i>	0.148** (0.0676)	-0.00964 (0.0671)	0.112 (0.114)	0.0921 (0.111)	0.279* (0.143)
<i>Year>=2008</i>	0.00145 (0.00158)	0.00164 (0.00150)	0.000653 (0.00401)	0.00186 (0.00409)	0.000200 (0.00191)
<i>Year>=2010</i>	0.000965 (0.00179)	0.00193 (0.00184)	0.00108 (0.00397)	-0.000442 (0.00416)	-0.00624* (0.00325)
<i>Year>=2012</i>	0.000274 (0.00200)	0.00313* (0.00182)	0.000870 (0.00389)	-0.000509 (0.00472)	-0.00747* (0.00403)
<i>Log of population</i>	1.099** (0.521)	1.089** (0.463)	-0.536 (0.788)	2.203** (0.926)	0.609 (0.785)
<i>Log of hospital budget</i>	-0.0214 (0.0294)	-0.0313 (0.0264)	0.111 (0.0939)	-0.0632 (0.116)	0.00655 (0.0772)
Constant	-0.467 (3.697)	-1.075 (3.250)	6.873 (5.327)	-9.583 (5.897)	-0.511 (5.280)
Observations	252	252	252	252	252
R-squared	0.691	0.264	0.715	0.231	0.343
Number of provinces	63	63	63	63	63

VARIABLES	Commune Health Station				
	Log of number of healthcare professionals	Log of number of doctors	Log of number of nurses	Log of number of midwives	Log of number of medical technicians
<i>HI</i>	0.00222 (0.00198)	-0.000173 (0.00198)	0.00208 (0.00699)	0.0125* (0.00654)	0.00881 (0.0106)
<i>Year>=2008*HI</i>	0.0802 (0.0747)	-0.0967 (0.124)	-0.533** (0.210)	0.923*** (0.250)	0.528 (0.415)
<i>Year>=2010*HI</i>	0.357*** (0.101)	0.266 (0.165)	0.333** (0.145)	0.325** (0.154)	-0.292 (0.597)
<i>Year>=2012*HI</i>	0.0937* (0.0559)	0.0210 (0.0583)	0.103 (0.123)	0.111 (0.101)	0.510 (0.542)
<i>Year>=2008</i>	-4.22e-05 (0.00118)	0.00189 (0.00187)	0.00582 (0.00364)	-0.00774* (0.00459)	-0.00823 (0.00629)
<i>Year>=2010</i>	-0.00387*** (0.00116)	-0.00164 (0.00145)	0.00361 (0.00348)	-0.0115** (0.00503)	-0.00536 (0.00835)
<i>Year>=2012</i>	-0.00475*** (0.00157)	-0.00154 (0.00196)	0.00160 (0.00406)	-0.0147*** (0.00540)	-0.0180** (0.00726)
<i>Log of population</i>	1.098*** (0.401)	1.236*** (0.369)	-1.010 (1.093)	1.642** (0.737)	4.574* (2.492)
<i>Log of hospital budget</i>	0.0289 (0.0302)	0.0115 (0.0271)	0.127 (0.0915)	0.108 (0.108)	0.232 (0.146)
Constant	-1.591 (2.932)	-2.762 (2.598)	10.46 (7.851)	-9.137* (4.911)	-34.44* (18.16)
Observations	252	252	252	252	169
R-squared	0.708	0.322	0.201	0.584	0.087
Number of provinces	63	63	63	63	53

NOTE:

Provincial dummies are included in all models.

Province-level clustered standard errors are in parentheses.

*** $P < 0.01$, ** $P < 0.05$, * $P < 0.1$

Appendix 4. Impact of health insurance coverage on OOP and unaffordability (coefficient)

VARIABLES	Log of OOP	Unaffordability (%)
<i>HI</i>	-0.00842* (0.0045)	0.0959 (0.0007)
<i>Year>=2008*HI</i>	0.00213 (0.0028)	-0.0681 (0.0005)
<i>Year>=2010*HI</i>	-0.00147 (0.0042)	-0.0358 (0.0005)
<i>Year>=2012*HI</i>	0.00439 (0.0037)	-0.0375 (0.0005)
<i>Year>=2008</i>	0.192 (0.1420)	2.58 (0.0250)
<i>Year>=2010</i>	0.578*** (0.1530)	-4.57* (0.0241)
<i>Year>=2012</i>	-0.416* (0.2320)	-1.44 (0.0110)
<i>Log of population</i>	-1.016 (0.6650)	-5.09 (0.0715)
<i>Log of hospital budget</i>	-0.0192 (0.0616)	1.17 (0.0120)
Constant	14.89*** (4.6350)	21.00 (0.4710)
Observations	252	252
R-squared	0.746	0.227
Number of provinces	63	63

NOTE:

Provincial dummies are included in all models.

Province-level clustered standard errors are in parentheses.

*** $P < 0.01$, ** $P < 0.05$, * $P < 0.1$