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ERASMUS UNIVERSITEIT ROTTERDAM
INSTITUTE OF
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The World Bank
Human Development Network
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&
Development Research Group
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Abstract

With the movement toward universal health coverage gaining momentum, the global health research community has made significant efforts to advance knowledge about the impact of various schemes to expand population coverage. The impacts on efficiency, quality, and gaps in service utilization of reforms to provider payment methods are less well studied and understood. The current paper contributes to this limited knowledge by evaluating the impact of a shift by Vietnam's social health insurance agency from reimbursing hospitals on a fee-for-service basis to making a capitation payment to the district hospital where the enrollee lives. The analysis uses panel data on hospitals over the period 2005–2011 and multiple cross-section data sets from the Vietnam Household Living Standards Surveys to estimate impacts on efficiency, quality, and equity. The paper finds that capitation increases hospitals' efficiency, as measured by recurrent expenditure and drug expenditure per case, but has no effect on surgery complication rates or in-hospital deaths. In response to the shift to capitation, hospitals scaled down service provision to the insured and increased provision to the uninsured (who continue to pay out-of-pocket on a fee-for-service basis). The study points to the need to anticipate the intended and unintended effects of any payment reform and the trade-offs among policy objectives.

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Getting Incentives Right: An Impact Evaluation of District Hospital Capitation Payment in Vietnam

Ha Thi Hong Nguyen[a], Sarah Bales[b], Adam Wagstaff[c], and Huyen Dao[d]

[a] Human Development Network, The World Bank, Washington DC, USA
[b] National University of Singapore, Singapore
[c] Development Research Group, The World Bank, Washington DC, USA
[d] Research and Development Center for Community Health Strategy, Hanoi, Vietnam

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Introduction

With the movement toward universal health coverage (UHC) gaining momentum over the last few years, the global health research community has made significant efforts to advance our knowledge on the impact of various schemes to expand population coverage. A review in 2010 looked specifically at the empirical evidence of the impact of health insurance in developing countries (Escobar, Griffin, and Shaw 2010). This was updated with a recent and more thorough systematic literature review on the impact of UHC interventions on access, financial protection, and health status (Giedion, Alfonso, and Diaz 2013). While the review shows that effects of UHC schemes vary across contexts, designs, and implementation processes, it consolidates rather consistent and considerable evidence that UHC improves access to health care and, to a less certain degree, has positive effects on financial protection and health status. The review also distills a number of important lessons for policy and research in UHC.

Much less work has been done on the impacts on service utilization and financial protection of supply-side reforms, including reforms to provider payment systems. Yet provider payment, as an important element of strategic purchasing, is highly pertinent to the ultimate goals that UHC is all about – ensuring everyone gets the care they need and that families do not suffer undue financial hardship as a result of getting the care they need. As coverage expands in these countries, issues of financial sustainability, efficiency, and quality of care become even more salient. At the minimum, getting provider incentives right is essential in contributing to the achievement of UHC in an efficient manner; doing it wrong could have negative effects on efficiency and might take a country even further from the UHC goals. Unfortunately, our knowledge on what works and what does not is rather thin to provide sufficient guidance for many countries in their efforts to improve the strategic purchasing aspect of UHC.

The current paper contributes to this limited knowledge by evaluating the impact of district hospital capitation payment in Vietnam. The country promulgated a Health Insurance Law in 2008 which laid out a roadmap to UHC. According to the Law and its sub-legal guiding documents, Vietnam should be close to achieving universal insurance coverage by 2020. The social health insurance policy encourages shifting from fee-for-service (FFS) payments to health care providers towards other methods. In particular, there is a roadmap for capitation contracts to be applied for payments to first level facilities (mostly district hospitals) to reach 60% of facilities by 2013 and 100% by 2015. Fee-for-service and eventually case-based payments are applied to referral facilities.

The shift in hospital payment from FFS to capitation and case-based payments is not unique to Vietnam. Across many transitional economies and other developing countries, reform on the purchasing side goes hand-in-hand with development of the pooling functions. Roughly three-fourths of all countries in Europe and Central Asia were reported to adopt a provider-purchaser split over the last two decades (Moreno-Serra and Wagstaff 2010). A typical model there is case-based payment for tertiary care and capitation payment for primary care. This has been applied in Armenia, Estonia, Latvia, Slovak Republic, Georgia, Kyrgyz, and Turkey, just to name a few (Kutzin, Cashin, and Jakab 2012; Gotsadze 2012). On other continents, social health insurance schemes in Argentina, Brazil, Nicaragua, Thailand, and Ghana have adopted, or are currently piloting, capitation payment as a means to remunerate public and private providers. The level of interest in reforming the way providers are paid is ever mounting while empirical evidence on the results is not catching up.

The current study evaluates the impact of district hospital capitation reform in Vietnam on efficiency, quality of care, and equity by analyzing a rather unique hospital panel data set combined with a panel of population level data. In particular, the ability to look at insured and non-insured service intensity separately allows us to tell a more nuanced story of hospital responses to different incentives generated by multiple payers and payment methods. Given the prevalence of mixed payment arrangements across the globe, the study results apply not only to Vietnam but many other countries which are embarking on or undertaking provider payment reforms.

In the next section, we provide a brief review of existing empirical research on impact of capitation payment with a focus on developing countries. We then describe the context of this study – the development of reforms on the demand and supply sides of the health system in Vietnam. Following the description of data and methods, we present the results of estimating capitation effects on efficiency, quality, and equity, and we discuss the implications of our findings in Vietnam and international contexts.

Existing research on the impact of provider capitation payment

In health care, capitation is defined as a payment method where "the provider is paid, in advance, a predetermined fixed rate to provide a defined set of services for each individual enrolled with the provider for a fixed period" (Langenbrunner, Cashin, and O'Dougherty 2010). The key principle is that the payment to a provider is not linked to the inputs that the provider uses or the volume of services provided. If the provider incurs costs that are greater than the per capita budget, the provider is liable for them. On the other hand, if the provider achieves efficiency gains, it can usually retain and reinvest this surplus. The theoretical impact of capitation has been amply elaborated (Schneider and Hanson 2007): capitation payment imposes financial risks on providers and discourages them from oversupplying care. It provides incentives to produce efficiently, ostensibly by adjusting treatment intensity within a medically acceptable quality range. However, it may also lead to dumping and cream skimming of insured patients or skimping on quality of care. If providers have multiple revenue sources, they may try to shift cost across different financiers (Schneider and Hanson 2007).

Empirical studies with rigorous evidence on impact of capitation payment, on the other hand, are rather limited (Moreno-Serra and Wagstaff 2010; Gosden et al. 2011). Even in the developed countries that have advanced significantly with various methods of paying providers, observational studies typically dominate rigorous evaluation in the literature. To illustrate the point, a recent search of multiple international databases on the impact of capitation, FFS, salary, and mixed system of payment yielded 332 seemingly relevant articles (Gosden et al. 2011). After the authors applied rigorous screening criteria to include only studies with randomized control trials, controlled before and after, or interrupted time series design, eight papers were selected, reporting on four impact evaluation studies (two in the United States, one in Canada, and one in Denmark). The authors commented that the most important conclusion from the review is the scarcity of good evidence, presumably due to the practical difficulty of having robust experimental design for policy intervention such as the method to pay providers (Gosden et al. 2011).

The limited evidence found in the review by Gosden and colleagues nevertheless confirms common wisdom on the impact of capitation versus FFS. Specifically, FFS was found to result in more contacts for primary care, curative, and specialist care. There was no evidence of effects on patient health status.

Outside the developed countries, studies evaluating the impact of provider payment typically rely on small samples, non-experimental design, or qualitative information. An exception is a recent cross-country analysis by Moreno-Serra and Wagstaff (2010). The study used panel data on 28 countries in Europe and Central Asia over the period of 1990-2004 to explore the impact of the shift from historical budgets on hospital throughputs, national health spending, and mortality from causes amenable to medical care. Specifically on the impact at the hospital level, the authors found that compared with historical budgets, FFS increased inpatient admissions while patient-based payment (i.e. based on diagnosis, age or insurance status) had no effect (Moreno-Serra and Wagstaff 2010). Another well-designed study comes from an earlier experience in Hainan province, China (Yip and Eggleston 2001). Provider payment reform in this context involved moving from FFS to negotiated prepayment for bundled services. It was found to have slowed the growth rate for overall expenditures, in particular growth in spending on expensive drugs (Yip and Eggleston 2001; Yip and Eggleston 2004). The results led the authors to recommend "cautious optimism regarding the effectiveness of prospective payment for controlling costs" (Yip and Eggleston 2001).

Utilizing cross-sectional data from 52 health centers in Rwanda, Schneider and Hanson (2007) estimated the cost impact of user fees paid by the uninsured patients and capitation paid by insurance. They found significant differences in cost between the two payment forms. However, it was not clear if the difference is due to incentive differences or a less severe case mix among the insured population. Capitation effects appear to be more pronounced in the case of Thailand, where it was employed as early as 2000 by the Thai Social Security Scheme. Here, Mills et al. (2000) found that compared with FFS, capitation decreased the total value of prescriptions by 0-24% and hospital days by up to 80%. The response appeared to be stronger in the private hospitals, which were reported to have different pay schedules for doctors seeing insured versus FFS patients, sometimes even providing fewer drugs per chronic case or developing strategies to 'dump' higher cost Social Security patients and deter them from re-

registering with the hospitals (Mills et al. 2000). Differential responses to different incentives by Thai hospitals were also documented by Hirunrassamee and Ratanawijitrasin (2009), who suggested that these in turn have implications for quality of life and survival time among cancer and epilepsy patients. However, the evidence was established through a case study in three hospitals and so the observed differences cannot be taken as rigorous evidence of impact.

In summary, the existing literature generally provides evidence in line with the textbook predictions of capitation effects on provider behaviors. However, the body of evidence is rather thin and much of it is based on small samples and non-experimental designs. Although most studies look at capitation and FFS in a context of a mixed payment system, none was able to address the potential cost shifting between the two categories of patients.

Reform of public hospitals in Vietnam and district hospital capitation payments

Health reform in Vietnam started during the Renovation ("*Doi moi*") period in 1986, which transformed the economy from central planning to a market-oriented economy (Lieberman and Wagstaff 2008). Under *Doi moi*, health reform was associated with the introduction of user fees in public facilities, the legalization of private medical practice, and the commercialization of the pharmaceutical industry (Dao, Waters, and Le 2008). In 1993, shortly after the introduction of user fees, social health insurance started with formal-sector employees. It expanded through the years to cover different beneficiary groups, some of them on a contributory basis, others based on government subsidies. At present, the membership categories can be classified into six groups: (1) civil servants and formal sector employees; (2) retirees and people receiving subsidies, such as people of merit, war heroes; (3) the poor and near poor; (4)

pupils and students; (5) children under age 6; and (6) the rest of the population, mostly informal-sector workers and dependents of formal-sector workers. Combined coverage reached 67% of the population in 2012, with over 60% of beneficiaries receiving full or partial subsidies (Ministry of Health 2013). The uninsured population, mostly farmers and people working in the informal sector, continue to pay user fees in public institutions. With the rapid expansion of insurance in recent years, Vietnam Social Security, the government agency in charge of pooling and managing all insurance schemes, has become a powerful purchaser of health services. Fee-for-service is a predominant mode of provider payment applied by both social health insurance and user fee-paying patients.

In tandem with efforts to expand insurance coverage, recent health sector reforms have put a strong focus on the supply side of the public system. Hospital autonomization reform was first introduced in 2002 and was implemented around the same time with the policy of 'social mobilization,' which encouraged the mobilization of private investments in public facilities. The combination of autonomy and social mobilization was part of a larger agenda to increase the efficiency of public health facilities through measures similar to those adopted in state-owned enterprise reforms, but also to reduce their dependence on the state budget. These reforms gave hospitals greater freedom in decision-making on inputs, hiring and firing of staff, remuneration of staff, and the ability to mobilize private capital to invest in medical equipment and infrastructure (Wagstaff and Bales 2012; London 2013).

With autonomy, social mobilization, increased coverage of social health insurance, and the existing FFS payment mechanism, a complex set of incentives influenced health service providers. Autonomy combined with FFS payments encouraged generation of a net revenue surplus by increasing service provision. Private capital permitted investment in equipment that not only sent a signal of higher quality to attract more patients, but also allowed provision of large profit margins for high tech services. Having a third-party payer, which also reimbursed hospitals on an FFS basis, increased the purchasing power of groups that were previously unable to afford medical services, while lessening concerns about providers charging for more expensive drugs and services because patients would not have to pay directly. Hospital surpluses can be partially redistributed to staff in the form of income top-ups, which provided internal incentives within facilities for physicians to overprescribe or to prescribe more expensive services and drugs.

An impact evaluation of the earlier reform of the supply side, i.e. public hospital autonomy, found that autonomization led to increased hospital admissions and outpatient visits, higher out-of-pocket spending on hospital care, and higher spending per treatment episode including more lab tests and imaging per case (Wagstaff and Bales 2012). The effects, however, manifested themselves in tertiary more than in secondary level hospitals; this may be due to the limited capacity of the district hospitals to raise revenues from social mobilization (London 2013).

Capitation policy

Increased awareness of the shortcomings of the FFS mechanism, particularly in relation to cost control, has led policy makers to seek an alternative mechanism that would incentivize greater efficiency. Capitation payments were first introduced in 2005 in a decree approving revised health insurance regulations. The 2008 Law on Health Insurance again stipulated capitation and case mix payments as a potential replacement for FFS. Although application of capitation is in principle voluntary, there is pressure for the provinces to adopt it especially after the Insurance Law. Whether facilities have the choice to participate or not, however, is an empirical question as the practice varies across localities. Capitation is being rapidly rolled out and there are no reports of facilities switching back to FFS.

In its current design, capitation-based payment is calculated at the province level using the following formula:

$$C_t = \sum_i (Exp_{it-1} * N_{it}) * K$$

where C_t is the per capita amount paid by insurance to a district hospital in year t, *i* denotes six insurance membership groups mentioned earlier, Exp_{it-1} is the average insurance reimbursement for membership group *i* in year *t-1*; N_{it} is the total number of enrollees in group *i* in year *t*, and K is the adjustment factor to account for inflation and technology cost increase. K has been set at 1.1 allowing for a 10% increase in expenditure each year.

The amount C_t does not include health promotion and prevention, which is under the responsibility of commune health stations and is largely implemented through vertical programs. C_t also does not include some high tech services (kidney dialysis, heart surgery and cancer treatment), which continue to be paid on an FFS basis. On the other hand, C_t does include treatment costs at commune health stations and full or partial reimbursement of charges incurred by enrollees at referral hospitals (the amount depends on whether the patient was officially referred or not). In the case of referrals, insurance claims are determined on an FFS basis, copayments are deducted (with a higher copayment rate for self-referred patients), and the difference is deducted from the capitation amount assigned to the district hospital. At the end of the year, district hospitals can retain a surplus up to a maximum of 20% of the capitation fund and can use these funds to invest in equipment or facilities, recruit staff, or top up salaries of staff. On the other hand, if a hospital incurs a deficit, it can appeal to have up to 60% of the deficit reimbursed by justifying to the insurance agency that the deficit was due to new investments in costly services or recent epidemics in the catchment population, or other reasons considered justifiable.

A number of features in the current design thus make this capitation scheme unique to Vietnam and some of them create rather perverse incentives. First, instead of adjusting the per capita amount based on age and sex, the standard and simplest risk adjustment method, the base payment in Vietnam reflects the composition of insured members registering for care at a given facility. And since at the end of the day, reimbursement is capped within premium revenues, this results in different capitation amounts for different membership groups that do not necessarily reflect health risks. To illustrate the point, Figure 1 shows the average capitation rate for each of the insurance membership groups in 2011. The poor and children under 6, whose premium is fully subsidized, have the lowest capitation rate. On the other hand, formal-sector workers, voluntary groups, and the retirees have the highest capitation rates. While it is possible that retirees (due to age) and voluntary members (through adverse selection) could be high risk groups, there is no compelling reason why the poor and small children should have lower health risks than formal sector workers.

Another perverse incentive created by the current design is the limited ability of the district hospitals to control their own budget. They cannot directly prevent patients from bypassing (although they can do so indirectly by improving quality to attract patients) and they cannot control the service costs at the referral hospitals. For example, the authors' conversation with a district hospital in a typical northern province revealed that in 2011, only 40% of the capitation amount allocated to the hospital was actually spent within the hospital, with the rest being spent by commune health stations and referral hospitals. At the same time, with the ability to recoup at least 60% of any deficit that the hospital can justify, the providers apparently do not bear the full financial risk of capitation.

While provinces did not report any major opposition to capitation payment, there is some indication that physicians prefer FFS because it puts less pressure on them to follow professional standards or to avoid referrals. And a large number of hospitals experienced deficit in their capitation fund, suggesting that capitation rates are underestimated (Kieu 2013). A recent study of the impact of capitation payments on four district hospitals in Vietnam showed that hospitals that have piloted capitation appeared to become highly cost-conscious (Tran 2012). There is some evidence of a decline in hospitalizations and shortened length of inpatient stay when hospitals are paid on a capitation basis, suggesting a potential for cost saving (Ministry of Health 2013).

Data and methods

Data

The main source of data used in this study is a panel of annual hospital inventory surveys covering the period 2005-2011. Information identifying which year the health insurance contract was changed from FFS to capitation comes from administrative records of Vietnam Social Security. Supplementary information on total population, total insured and uninsured for each district was estimated from the Vietnam Household Living Standards Surveys in 2006, 2008, and 2010 using the survey expansion factors (inverse of probability weights).

The hospital inventory survey was initiated in 1996 with technical and financial assistance from the World Bank. A second survey was implemented in 2000, again with external assistance. Subsequently, the Ministry of Health has implemented the inventory by itself on an annual basis for purposes of determining hospital class (standard) and granting awards for excellent hospitals. While earlier surveys suffered from lack of uniformity in questions and data entry errors, the more recent surveys have benefitted from efforts at ensuring uniformity of questions over time and computerized data entry at facilities.

The hospital inventory was meant to provide a complete census of all hospitals in the country although coverage fell short in the earlier years. The proportion of total hospital beds covered by the survey increased from 78% in 2005 to 93% in 2011. Coverage of district and inter-district regional hospitals, the sample of this study, reached 99% in 2011. In the 2005–2006 survey, five provinces provided no district hospital data and ten provinces reported on less than half of their district hospitals, although the provinces with underreporting actually come from all regions of the country and represent a mix of economic status.

For data cleaning, the authors set up a system of hospital codes and did multiple checks on trends over time on key variables in order to detect miscoding of hospitals in the panel. Common problems with the data included misrecording of currency units (Vietnamese dong (VND) or million VND instead of the requested thousand VND) or the sum of the components not equaling the aggregate numbers reported. These were checked and only changed if trend amounts per bed or per patient were clearly deviating by large amounts (a magnitude of 1000 or 0.001). Checks were done to ensure consistency in definition and scope of variables over time. Costs and revenue amounts were adjusted to real 2004 prices using the General Statistics Office consumer price index for medical goods and services.

Table 1 shows the sample of district hospitals used in this study. The number of hospitals increased from 432 in 2005 to over 600 in 2010 and 2011. No hospital in the sample was contracted by capitation in 2005, and the number remains rather small throughout 2006-2008. A dramatic increase from 27 to 174 took place between 2009 and 2010, presumably under the effect of a Health Insurance Law sub-legal document issued in 2009. Thus in this sample, already in 2011, capitation was implemented in 361 of 605 district hospitals (60% - the target level set for 2013).

Table 1 also shows the number of district hospitals given autonomy status and the number that received both autonomy and capitation by year (columns 3 and 4, respectively). Already in 2005, 173 of 432 district hospitals had implemented the autonomization policy (40%). By 2009, all hospitals in the sample had been autonomized. Throughout the period, most capitated hospitals had also been autonomized, although some have been autonomized but not yet capitated.

Outcome variables

We are interested in the effects of capitation on efficiency, quality and equity in use of services. The hospital inventory survey contains data on a large number of variables that could be, more or less, grouped into these three categories. In addition, the merged data set with additional information from the Vietnam Household Living Standards Surveys was used to assess separately the effects on user-fee versus insured patients. Each group of outcomes is described in detail below.

Efficiency: Efficiency variables used in this analysis include total recurrent expenditure, total expenditure per case, drug costs per case, and total lab test and imaging services per case. Additional variables to get at efficiency include domestically produced share of the value of drugs used, average length of inpatient admission, and C-section share of all deliveries. The last variable, C-section rate is not exactly an efficiency indicator, but rather an indicator of how hospitals respond to the cost constraint. Specifically, because district hospitals under capitation are responsible for costs incurred at the referral hospital, and C-section costs much more at that referral level, one would expect hospitals to refer fewer C-section cases.

A challenge arises when we normalize expenditure and service intensity by case. The hospital inventory surveys recorded information on outpatient contacts and inpatient days (OP and IP). Without additional information on intensity of staff time and resource use for the different types of patients, aggregating all OP and IP services is somewhat arbitrary. We follow Vujicic, Addai, and Bosomprah (2009) and define case as Total Case=OP contacts/3 + IP days.

Quality: Quality variables include the number of complications per 100 surgeries, the proportion of inpatients reported as having been cured or experiencing reduced severity of illness, and the inverse, i.e. the proportion of inpatients reported as becoming more severely ill at discharge, and the in-hospital mortality rate among inpatients. The data on adverse events are likely to be an undercount because they are based on self-reporting and most hospitals do not yet have effective adverse event reporting systems. Furthermore, mortality is measured as in-hospital while common practice is to discharge patients to die at home when treatment alternatives run out.

Equity: We examine two different sets of equity indicators. The first set indicates whether hospitals have become less generous with hospital-discretionary exemptions and reductions in fees. Note exemptions and reductions in this case are for uninsured patients, and typically are approved on a case-by-case basis by the hospital managers. The second set of equity indicators assesses differential treatment intensity among user fee and insured patients, with the latter broken down by insurance membership groups (children under 6, all other members except children under 6 and the poor). The information on insurance for the poor suffers from excessive missing values and hence is not included in the analysis. To obtain treatment per capita, we use service provision information from the hospital inventory per group (uninsured, children under 6, other insured patients), divided by the estimated number in the group (i.e. uninsured and insured patients in the respective district). As mentioned above, the latter was estimated from the Vietnam Household Living Standards Surveys in the corresponding years.

Descriptive statistics

Table 2 provides descriptive statistics of the samples used for various estimations. Because of the low response problem of hospital surveys and the fact that not all hospitals can be matched with Living Standards Surveys, the number of observations varies by outcomes. The full set of data contains 3,818 hospital-year observations spanning the period of 7 years (2005-2011). Missing data is a particular problem for quality measures and for indicators denoting service intensity per capita (which requires merging hospital with household data). For most outcomes, a natural log transformation was performed to address the skewness in the distribution of the variables. Table 2 shows mean and standard deviation values in unlogged form for ease of interpretation as well as the natural log form for most variables (which is the form used in the estimation).

As shown in Table 2, an average hospital in our sample has 97 beds and 106 staff. The staff and bed sizes vary greatly among hospitals. Drug expenditure accounts for 45% of total recurrent expenditure per case (63 versus 140 VND). The overall C-section rate in the sample is nearly 11% and average length of stay is six days. Domestically produced drugs account for roughly 70% of the value of drugs used in the hospitals.

Among the equity measures, the differences in service intensity between the insured and uninsured are noteworthy. On average, an insured person (who is not among the poor or children under 6) has 1.28 OP contacts and 0.10 IP admissions per year from the hospitals in the sample. The corresponding figures for an uninsured individual are 0.93 and 0.06. The value of drugs used per insured patient as reported by the hospitals is 90.4 thousand VND while it is only 36.2 thousand VND for the uninsured.

Note in Table 2 that several outcomes are rather rare events. For example, in the clinical quality of care, the rate of inpatient death is 0.13% while 0.74 out of 100 inpatient admissions resulted in worsened conditions. Likewise, among the treatment intensity measures, only roughly 1% of OP contact or IP admissions actually received fee reduction or exemption from the hospitals. The low probability weakens our power to detect true differences.

Identification strategy

It is possible that hospitals that pioneered in applying capitation are fundamentally different from other hospitals who took longer to embrace the new payment method. For example, the front runners may have innovative managers who are motivated to adopt new policies. This in turn can affect the outcomes of interest independent of capitation payment. Fortunately, the ability to observe the same hospitals over time helps address the potential bias due to time-invariant unobservables.

We estimate the following hospital fixed effect model:

$$Y_{it} = \alpha_i + T_t + \beta Capitation_{it} + \Omega X_{it} + \varepsilon_{it} \qquad (1)$$

where Y_{it} is the outcome of interest (typically in log form) for hospital i in year t; α_i is hospital fixed effect; T_t is year fixed effect (t=2005-2011); $Capitation_{it}$ denotes whether hospital i in year t was contracted using capitation method (versus FFS); X is a vector of time variant hospital characteristics which may affect Y; and ε is the random error which is assumed to be unrelated to *capitation timing*. The vector X specifically contains the total number of beds and total number of staff, which are proxies for the hospital size, and a dummy indicating autonomy status (see more below). In Equation 1, the coefficient of interest β denotes the effect of switching from FFS to capitation on the outcome.

Note that β would be biased if there are some trends in the country that differentially affected capitated hospitals during the study period. From our knowledge of the country, it appears that the only such possible trend could be the policy on hospital autonomy described above. In principle, autonomized hospitals could have more decision space to respond to the incentives and disincentives created by capitation. In reality, however, it has been found that autonomization has little effect at the district hospital level (Wagstaff and Bales, 2012; London, 2013). As shown in Table 1, almost all capitated hospitals were also autonomized in each of our study years. This makes it impossible for us to test the differential effect of autonomization on capitated hospitals due to multicollinearity. Nevertheless, we control for autonomization independently by including this variable in Equation 1 as one of the *Xs*.

In addition to (1), we also estimate a multi-product cost function to assess specifically the issue of efficiency. Following Wagstaff and Bales (2012), the multi-product cost function estimates the (natural log of) total recurrent expenditure as a linear combination of OP contacts and IP admissions, their squares and their cubes, and their interactions. It has the following form:

$$Y_{it} = \alpha_i + T_t + \beta Capitation_{it} + \Omega X_{it} + \lambda_1 OP_{it} + \lambda_2 OP_{it}{}^{\wedge 2} + \lambda_3 OP_{it}{}^{\wedge 3} + \lambda_4 IP_{it} + \lambda_5 IP_{it}{}^{\wedge 2} + \lambda_6 IP_{it}{}^{\wedge 3} + \lambda_7 OP_{it} * IP_{it} + \varepsilon_{it} \quad (2)$$

where Y in this specific case is the log of total recurrent expenditure; OP is total number of outpatient contacts; IP is total number of inpatient admissions; and the rest are defined as in (1).

The effects of capitation on efficiency, quality, and equity

Efficiency

Table 3 shows the estimation results of capitation impact on natural log of total recurrent expenditure per case. Model 1 utilizes Equation 1 with case being defined as a combination of 3 OP contacts and 1 IP admission. Model 2 uses the same definition of case and additionally controls for autonomy status of the hospitals. Model 3 tests the sensitivity of results to case definition by equating a case to 1 OP combined with 1 IP. All models control for the total number of beds and staff and are in log-linear form.

As shown in Model 1, capitation has the expected negative sign on recurrent expenditure per case and is statistically significant with a t-statistic of 2.2: adopting capitation resulted in a reduction in recurrent expenditure per case of 4.8%. The result remains the same whether autonomy is controlled for (Model 2) or if case is defined differently (Model 3). The autonomy coefficient in Model 2 is also negative, but is small and statistically insignificant. All three models reveal a gradual increase of expenditure over time, which is in line with the general trend in the country.

In Table 4, we show the result of the multi-product cost function estimation (Equation 2). The capitation coefficient is quite similar to that in Table 3. For each combination of OP contacts and IP admissions, capitated hospitals have 4.6% lower cost compared to non-capitated hospitals. The result thus suggests that capitation indeed encouraged hospitals to be more efficient and produce the same outputs at a lower cost. Similar to Table 3, Table 4 confirms that cost of medical care in district hospitals increased significantly over the years.

Table 5 presents estimation results for all outcomes related to efficiency. The coefficients for total expenditure from the multi-product cost function and for expenditure per case from Tables 4 and 3 are included for completeness. Except for total expenditures, all outcomes are estimated using Equation 1 and are similar to Model 2 in Table 3.

Table 5 further confirms the efficiency and cost-cutting story with a negative and strongly significant coefficient for drug value per case. Capitated hospitals incurred 8.3% lower drug expenditures per case compared to non-capitated hospitals. They seemed to also use fewer lab and image tests as well as having a shorter length of stay although the differences are small and not statistically significant. In particular, we see a small (0.81 percentage point) but significant increase in the C-section rate, suggesting that capitated hospitals have a tendency to perform C-sections themselves rather than referring the mothers to higher level. As noted earlier, since capitated hospitals are responsible for patient charges at referral hospitals, keeping patients will give them better control over costs. Unfortunately, we do not have information to investigate further whether the increase in C-section rates was medically acceptable or not.

Clinical quality

For clinical quality of care (Table 6), capitation coefficients for all indicators are rather small. They also do not support one consistent story, i.e. whether capitation results in better or worse quality. For example, it appears that complications per surgeries and deaths per inpatients increased, yet the proportion of hospitalizations resulting in cure or improvement also increased. However, none of the coefficients is significantly different from zero. This result should not be surprising for several reasons. As pointed out earlier, adverse health outcomes are rather rare events, thus limiting our power to detect the true differences. There is also no uniformly applied definition of "better" or "worse" conditions, so these indicators are prone to random measurement error which could bias the results toward the null. Of course, it could be the case that capitated hospitals were able to achieve gains in efficiency without sacrificing some ultimate health status outcomes.

Equity

Table 7 presents estimation results for two set of equity measures. In panel A, we show the capitation effects on the proportion of OP contacts and IP admissions respectively for which fees were exempted or reduced at the discretion of the hospital manager. None of the coefficients is significant, and in fact, a large number of hospitals failed to report this figure in the hospital inventory. This is also a low probability event (roughly 1% of hospitals in the sample reported doing this– Table 2).

Panel B in Table 7 assesses specifically the treatment intensity for capitated and uninsured patients (paying on a FFS basis) separately, with the former broken down to children under 6 and other insured members (except the poor). In panel B, the first group of coefficients shows the effects of adopting capitation on treatment intensity for children under 6. For both OP and IP, capitation coefficients are positive and insignificant. The second groups of coefficients show capitation effects for the insured patients (except the poor and children under 6). The effects on all three indicators under assessment are negative and strongly significant ($p < 0.01$). For the insured population, capitation is responsible for a 15% decrease in per capita OP contacts, an almost 16% decrease in IP admissions, and a 21% decrease in monetary value of drugs used in the hospital per capita.

When it comes to uninsured patients (the third set of coefficients), we see the opposite result. All coefficients are positive. However, only the coefficient for inpatient admission is significant. It is roughly the size of the capitation coefficient in the IP estimate for insured patients. Thus, capitated hospitals almost fully compensated for a 16% decrease in IP admissions among the insured with a 16% increase among the uninsured. The coefficient for drug is rather appreciable, although not statistically significant.

An interesting question is how the differential effects of capitation change the insured-uninsured differences in service utilization described in Table 2. Figures 2-4 plot the OP contact, IP admission, and monetary value of drugs used per insured and uninsured patient. The left bars show the simple sample means while the right bars show the sample means after factoring in the effects of capitation as shown in panel B of Table 7. Capitation in all three cases narrows the gap in the intensity of treatment and resources used between the insured and uninsured. Note, however, that "intensity" is rather roughly defined and drug value reflects in-hospital drug use only.

Sensitivity analyses

We performed several additional analyses to test the results sensitivity to data issues and assumptions (table not shown). These include: (1) excluding 5 provinces which did not report hospital data in the hospital inventory surveys in 2005-06; (2) excluding two major cities Ha Noi and Ho Chi Minh, where registration for primary care is more likely to be at the tertiary hospitals than district hospitals; (3) using alternative definition of case (Total Case=OP contacts + IP admissions); (4) dropping the autonomy variable from the covariates; and (5) dropping earlier adopters (hospitals adopting capitation before 2009) from the sample. The last test addresses the possibility that earlier adopters have time-varying unobservables (not captured by our diff-in-diff model) that are different from those of the hospitals that adopted capitation after the Insurance Law in 2008. The coefficients on the capitation variable in all cases remain similar in the order of magnitude and statistical significance as the ones presented in Tables 5-7.

Discussion

We find that district hospitals in Vietnam responded positively to capitation by improving the efficiency of their operations. For each combination of IP admissions and OP contacts, capitation resulted in an almost 5% decrease in total recurrent expenditure. On a per case basis, capitation reduced recurrent expenditure by nearly 5% and drug expenditure by more than 8%. There appears to be some reduction in the number of lab and image tests performed per case and length of IP stay, although such changes are not statistically significant. Moreover, the gain in efficiency has not resulted in adverse effects on treatment outcomes, namely in-hospital deaths and surgery complications. Lack of data does not allow us to estimate effects on other quality measures, such as the application of standard clinical protocols or patient satisfaction.

On equity, our results are somewhat similar to previous studies in Thailand, which documented differential responses to different payment methods. For the group of largely adult insured patients, the evidence is strong and consistent that hospitals scaled down on intensity of services (OP and IP care) as well as resources used (drugs). At the same time, induced demand took place resulting in an increase of IP admission among the uninsured, who continue to pay on an FFS basis. Interestingly, small children do not seem to be subject to this response. Maybe this is a more sensitive group for cost cutting targets, or maybe it is more difficult to shift costs to the uninsured as every child under 6 is eligible for insurance.

While capitation appears to narrow the gap in treatment intensity between the insured and uninsured, the implication of this effect is not straightforward. First, it is not clear that the insured have been receiving "too many" services. Although earlier literature suggested that insurance has led to both patient and provider moral hazard in Vietnam (World Bank et al. 2001), this argument does not take into account differential age structure of the two groups at the time.

Second, by "enjoying" more services, the uninsured at the same time have to pay more out-of-pocket, perhaps not at their initiative. Further inquiry into this issue is warranted to assess the welfare impact of capitation in reducing services among the insured while increasing services among the uninsured.

One might argue that our study is limited by the shortcomings of the hospital data set (the multiple missing observations for several outcomes, if systematic, could bias our results one way or another) and by the lack of information on several important outcomes. However, we see no compelling reason for the missing cases to be systematic. We do not have direct data on the number of uninsured and insured patients seeking care in hospitals and have to estimate these from the Living Standards Surveys; nevertheless, our results are very robust to various analytical samples and methods used.

Our study contributes to the scant literature on the impact of capitation provider payment in developing countries. Despite its non-standard design and the fact that providers do not bear the full financial risk, the Vietnam case again exemplifies the text book effects of capitation. This suggests that providers are sensitive even to a small level of incentives. Moreover, our study clearly points to the need to anticipate intended and unintended effects of any payment policy and the trade-offs among policy objectives. For all the optimism over capitation as a new payment method in many countries, perhaps a more sophisticated, blended capitation could be used, which employs performance based incentives and disincentives for quality as well as important health indicators (for example, see the Turkish model in World Bank 2013). In any case, the importance of collecting relevant data and closely monitoring the policy impact cannot be more strongly emphasized.

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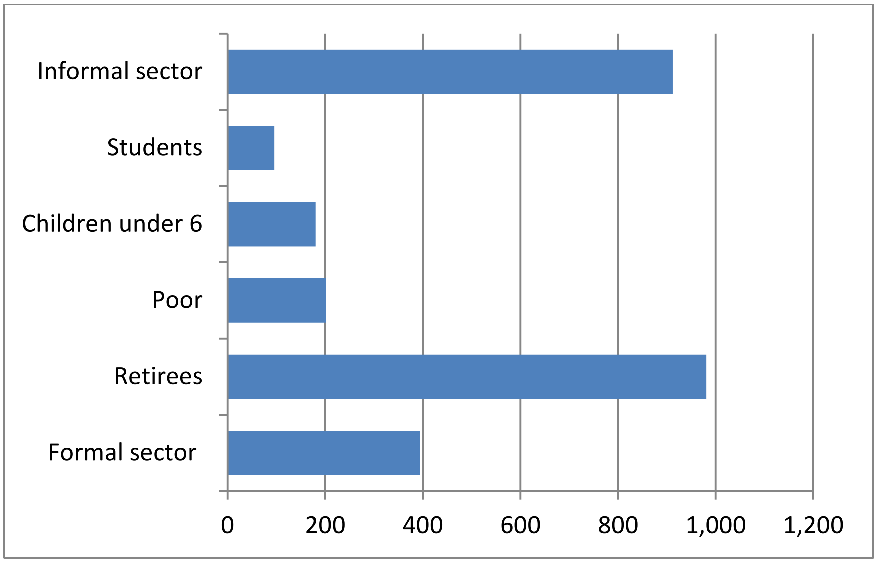
Figure 1. Average capitation rate by insurance membership type, 2011 (‘000 VND)



Source: Nguyen (2012)

Figure 2. Change in insured-uninsured difference in OP service use at the effect of capitation

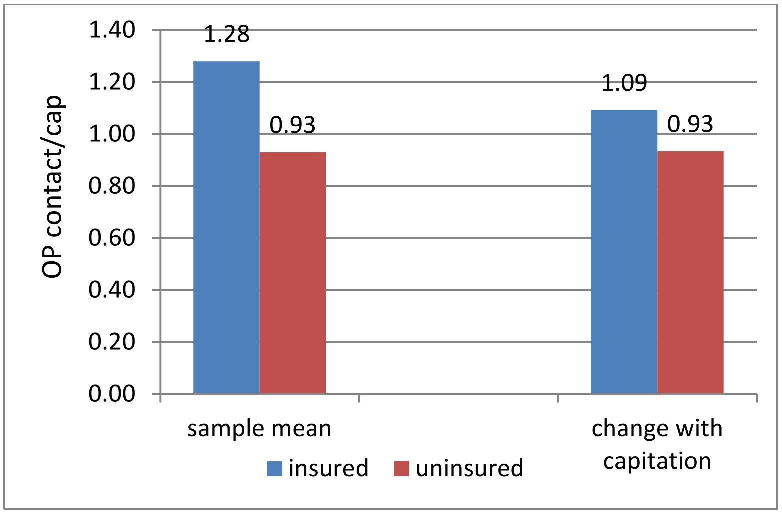


Figure 3. Change in insured-uninsured difference in IP service use at the effect of capitation

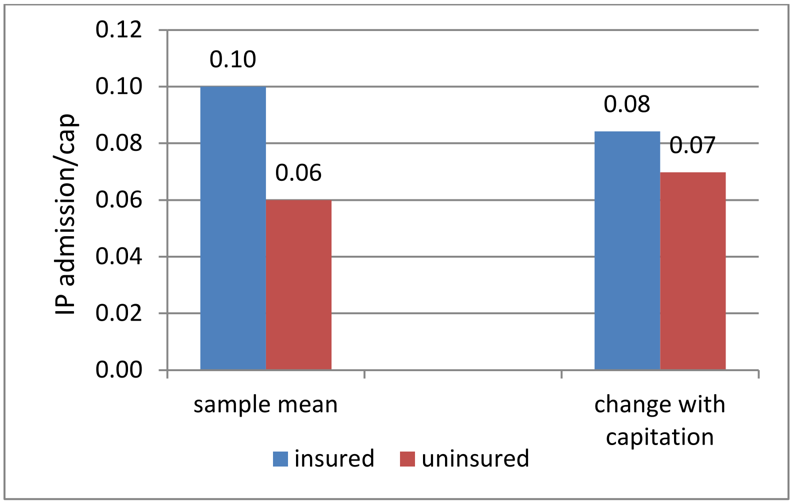


Figure 4. Change in insured-uninsured difference in drug value at the effect of capitation

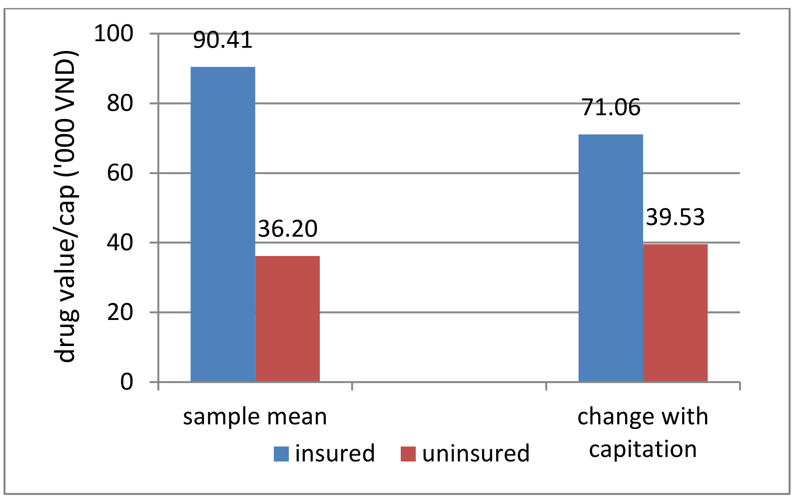


Table 1. Capitation and autonomy through the years in the analytical sample

Year	Capitation	Autonomy	Capitation and autonomy	Total
2005	0	173	0	432
2006	10	250	7	434
2007	10	407	9	565
2008	16	522	15	567
2009	27	583	27	583
2010	174	632	174	632
2011	361	605	361	605
Total				3,818

Table 2. Descriptive statistics of the analytical sample

Outcomes and covariates	unlogged			natural log		
	Obs	Mean	Std. dev.	Obs	Mean	Std. dev.
Efficiency and cost cutting measures						
Total expenditure ('000 VND)	3818	9,971	13,50	3786	15.74	0.85
Total expenditure per case (‘000 VND)	3759	140.08	92.23	3759	4.76	0.60
Drug expenditure per case (‘000 VND)	3628	63.02	48.16	3628	3.90	0.72
Number of tests per case	3745	1.26	1.13	3735	-0.08	0.81
C-section rate (%)	3709	10.66	11.19			
Share of domestic drugs (%)	3557	70.49	17.03			
Length of stay	3785	6.07	1.73	3785	1.77	0.25
Quality measures						
Complications per 100 surgeries	1821	0.01	0.17			
IP treatment resulted in cure or better condition (%)	3562	92.62	8.37			
IP treatment resulted in more severe conditions (%)	3802	1.74	2.44			
Inpatients death (% of all IP admissions)	3522	0.13	0.21			
Equity measures						
% OP contacts for which fees were exempted or reduced	3808	0.93	5.16	1492	-1.74	2.37
% IP admissions for which fees were exempted or reduced	3805	1.17	11.18	2068	-0.81	1.60
OP contact per capita (children under 6)	2563	1.30	1.89	2513	-0.19	0.98
IP admission per capita (children under 6)	2563	0.21	0.23	2506	-1.98	1.03
OP contact per capita (insured except poor and under 6)	2126	1.28	1.60	2108	-0.17	0.93
IP admission per capita (insured except poor and under 6)	2119	0.10	0.13	2092	-2.70	0.93
Drug value per capita (insured except poor and under 6)	2073	90.41	140.3	2073	4.00	1.00
OP contact per capita (uninsured)	2892	0.93	1.92	2777	-0.79	1.30
IP admission per capita (uninsured)	2792	0.06	0.19	2689	-3.46	1.12
Drug value per capita (uninsured)	2836	36.20	942.1	2836	1.87	1.25
Hospital time variant characteristics						
Total beds	3818	96.78	60.38			
Total staff	3474	106.06	67.99			
Autonomy (yes=1)	3818	0.83	0.37			

Table 3. Capitation impact on hospital recurrent expenditure per case

	(1) Case = OP/3+IP		(2) Case = OP/3+IP		(3) Case = OP+IP	
	coef	t	coef	t	coef	t
Capitation	-0.048**	-2.21	-0.049**	-2.26	-0.051**	-2.20
Autonomy			-0.028	-0.98		
Year 2006	0.058***	2.98	0.061***	3.10	0.055**	2.57
Year 2007	0.196***	8.09	0.206***	7.95	0.215***	7.83
Year 2008	0.315***	12.38	0.328***	11.50	0.324***	11.51
Year 2009	0.715***	26.90	0.731***	24.63	0.727***	24.68
Year 2010	0.956***	31.95	0.972***	29.66	0.969***	29.50
Year 2011	1.190***	35.55	1.206***	33.23	1.196***	32.91
Total beds	-0.001	-1.36	-0.001	-1.38	-0.000	-0.54
Total staff	0.000	0.66	0.000	0.65	0.000	0.31
Constant	4.267***	102.30	4.281***	95.74	3.653***	77.05
Observations		3,436		3,436		3,440
R2		0.702		0.702		0.672

*** p<0.01, ** p<0.05

Table 4: Results of the total cost function

	coef	t
Capitation	-0.046**	-2.11
Year 2006	0.136***	8.64
Year 2007	0.323***	14.05
Year 2008	0.441***	18.34
Year 2009	0.883***	33.34
Year 2010	1.116***	37.89
Year 2011	1.374***	40.97
Total beds	0.000	0.76
Total staff	0.001*	1.89
Total IP, IP^2, IP^3	Yes	
Total OP, OP^2, OP^3	Yes	
Total IP*total OP	Yes	
Constant	14.529***	203.05
Observations	3,454	

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

Table 5. Capitation impact on efficiency

	coef	t	Obs
Total recurrent expenditure	-0.046**	-2.11	3,454
Recurrent expenditure per case	-0.049**	-2.26	3,436
Drug value per case	-0.083***	-2.67	3,328
Lab and image tests per case	-0.019	-0.72	3,406
C-section rate	0.806**	2.04	3,392
Share of value of domestic drugs	-0.924	-0.87	3,261
Length of stay	-0.005	-0.54	3,452

*** p<0.01, ** p<0.05

All models control for total beds, total staff, and autonomy. Coefficients are from the linear model for C-section rate and share of domestic drug value and from the log-linear model for all other outcomes.

Table 6: Capitation impact on quality of care

	coef	t	Obs
Complications per 100 surgeries	0.018	1.07	1,713
% IP resulted in cure or better condition	.040	0.09	3,264
% IP resulted in worsened condition	-0.022	-0.16	3,464
Deaths per 100 inpatients	0.012	1.36	3,220

All models control for total beds, total staff, and autonomy. Coefficients are from the linear model.

Table 7: Capitation impact on equity

	Coef	t	Obs
Panel A. Fee exemption or reduction for patients at the hospital discretion			
% OP contact for which fees were exempted or reduced	-0.068	-0.29	1,358
% IP admission for which fees were exempted or reduced	-0.000	0.00	1,898
Panel B. Differential treatment intensity for capitated vs. FFS patients			
Capitation – children under 6			
OP contact per capita (under 6)	0.044	0.82	2,372
IP admission per capita (under 6)	0.037	0.66	2,365
Capitation - insured except poor and under 6			
OP contact per capita	-0.147***	-3.20	1,996
IP admission per capita	-0.158***	-3.01	1,982
Drug value per capita	-0.214***	-3.83	1,969
FFS – uninsured			
OP contact per capita	0.004	0.06	2,589
IP admission per capita	0.162***	2.64	2,510
Drug value per capita	0.092	1.53	2,645

*** p<0.01

All models control for total beds, total staff, and autonomy. Coefficients are from the log linear model.