Risk aversion and the impact of health insurance on household vulnerability: New evidence from rural Vietnam

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Abstract

This study provides new evidence on the impact of health insurance coverage on household vulnerability using Vietnam Access to Resources Household Surveys (VARHS) during 2010-2012. The outcomes of interest are the probability of falling into poverty (VEP) and the magnitude of utility loss (VEU). Since the data set is not from an intervention program, the propensity score- matching method is employed to construct treatment and control groups. Risk aversion is calculated and used as an important explanatory variable for health insurance enrollment. The estimates show that health insurance coverage helps rural households in Vietnam reduce the idiosyncratic component of utility loss by 81 per cent and has the added benefit of reducing the probability of being poor by about 19 per cent. The reverse effect of the risk aversion on health insurance enrollment implies not only a potential 'rigidity' effect on health insurance demand but also deficiencies in health insurance market. The study suggests practical implications for the government to attain its goal of universal health insurance coverage.

Keywords: health insurance, impact evaluation, vulnerability, risk aversion, VARHS, Vietnam.

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1 Introduction

One of the worst shocks to households is a serious illness of one of its members. This has a negative and significant effect on consumption and income. Illness raises two important economic costs: the cost of medical care and income loss due to reduced labor supply. The unpredictable nature of these two costs makes households unable to smooth their consumption over periods of major illness. This is particularly true in developing countries where few individuals have health insurance. In addition, households in developing countries find it difficult to access the formal credit market. Therefore, they have to rely on informal coping mechanisms such as drawing on savings, selling assets, transfers from other families or social support networks. Low-income households who cannot use these channels to smooth their consumption are more likely to fall into a poverty trap. In other words, the burden of health care pushes individuals experiencing illness into poverty or forces them into deeper poverty.

There are a huge number of studies investigating the impact of health insurance on health status, health service use or out-of-pocket payment. Scholars have also conducted several studies that focus on the relationship between health insurance coverage and *ex-post* poverty. Recently, some studies have examined the impact of money transfers such as microfinance and remittance on *ex-ante* vulnerability. However, there is no study for any country that measures the impact of health insurance coverage on household vulnerability. This paper attempts to fill this gap in the empirical literature and in this case health insurance has been considered as one of the crucial strategies for coping with vulnerability arising from idiosyncratic shocks. In this sense, this paper is the first to investigate the role of health insurance in mitigating vulnerability[1].

Using the propensity score matching method and data from Vietnam Access to Resources Household Surveys (VARHS) during 2010-2012, we investigate whether having

[1] *"Research into alternative health care financing strategies and related mechanisms for coping with the direct and indirect costs of illness is urgently required to inform the development of appropriate social policies to improve access to essential health services and break the vicious cycle between illness and poverty."* (McIntyre et al. 2006)

health insurance coverage has any impact on the probability of falling into poverty (VEP) and the magnitude of utility loss (VEU). In particular, households risk preference has been taken into account when measuring health insurance demand. Our estimates show that health insurance helps rural households in Vietnam reduce the idiosyncratic component of utility loss by 81 per cent. In addition, health insurance helps rural households in Vietnam reduce the probability of becoming poor by about 19 per cent. In addition, the reverse effect of the risk aversion on health insurance enrollment implies not only a potential 'rigidity' effect on health insurance demand but also deficiencies in the health insurance market. Therefore, the study suggests implications for both demand side and supply side of the health insurance market so that the government is able to reach its goal of universal health insurance coverage.

The remainder of the paper is structured as follows. Section 2 reviews studies on the topic of vulnerability and health insurance impact. Section 3 provides an overview of health insurance schemes in Vietnam. Section 4 and Section 5 are dedicated to data description and analytical framework, respectively. Section 6 discusses the results and the last section concludes the paper.

2 Literature review

Concepts of vulnerability

The concept of vulnerability is interpreted in various ways in different contexts. In economics, the concept of vulnerability emerges from that of poverty. From the traditional view of poverty as reflected in World Development Report 1990, the notion of poverty consists of material deprivation and low achievement in education and health (World Bank 1990). Later, the term 'vulnerability' is mentioned when examining the relationship between poverty and uncertainty of income (Morduch 1994). Since then, 'vulnerability' is often used to extend the traditional concept of poverty. While poverty measurement is based on fixed standards such as income or expenditure during a short period of time,

vulnerability broadens the poverty notion by including the potential risk of adverse shocks such as income loss, bad health (idiosyncratic risks) and natural disasters (covariate risks). For example, in the work of Glewwe & Hall (1998) and Cunningham & Maloney (2000), vulnerability is defined as exposure to negative shocks to welfare. It is also defined as "the probability or risk today of being in poverty or to fall into deeper poverty in the future" (World Bank 2001) or "the ex-ante risk that a household will, if currently non-poor, fall below the poverty line, or if currently poor, will remain in poverty" (Chaudhuri 2003).

In an excellent summary of risk and vulnerability, Hoddinott & Quisumbing (2003) classify approaches to assessing vulnerability into three methods according to their distinct definitions: vulnerability as expected poverty (VEP); vulnerability as low expected utility (VEU); and vulnerability as uninsured exposure to risk (VER). All three methods predict changes in welfare, but with different welfare measurements. The difference between VEP and VEU lies in their definitions of welfare: in VEP consumption is regarded as welfare, while VEU uses utility derived from consumption. While VEP and VEU commonly use a benchmark for a welfare indicator (z) and estimate the probability of falling below this benchmark (p), VER evaluates whether downside risks or observed shocks result in welfare loss. In other word, VER assesses the household's ability to smooth or insure consumption when faced with income shocks, while maintaining a minimum level of assets.

Health insurance and household vulnerability

The relationship between health insurance coverage and household vulnerability emerges from the impact of health shocks on poverty and vulnerability. Illness, a major part of idiosyncratic shocks, can push non-poor household into poverty, or poor households into extreme poverty (Calvo & Dercon 2005, Carter et al. 2007, Dercon 2004)[2]. According to World Bank (2003), illness pushes households into poverty, through lost wages,

[2]The authors show that a random event (e.g. a flood, a drought, an illness, an unemployment spell) can have a permanent effect for households, pushing them into poverty.

high spending for catastrophic illness, and repeated treatment for other illnesses. Moreover, health shocks are not only one of the most sizable, but also one of the least predictable shocks (Gertler & Gruber 2002)[3]. Although several empirical studies show that households are able to fully or partially insure themselves against production shocks and weather shocks, they are less able to cope with health shocks (Fafchamps & Lund 2003). With production shocks, households tend to choose less risky activities and with weather shocks, households try to learn and understand them in order to deal with them to some extent. However, this is not the case with health shocks which are likely to make households more vulnerable than other types of shocks (Duflo 2005).

Most studies on health problems and health insurance impact focus on financial loss and healthcare service usage while other papers measure the impact of health insurance on household poverty status. For instance, McIntyre et al. (2006) finds that health care payments place a considerable stress on households in low- and middle- income countries. The burden of health care payments pushes individuals experiencing illness into poverty or forces them into deeper poverty.

One of the main strategies adopted by many agricultural families who face high costs of health care is to sell livestock. Another strategy is using intra-household labor substitution to compensate for labor lost. Also, inter-household transfers of resources might take a small role (Sauerborn et al. 1996). Similarly, a study for Russia shows that chronic diseases resulted in higher levels of household healthcare expenditure in Russia and productivity losses are significantly attributed to reduced labor supply and reduced household labor income. The authors find that households in Russia depend on informal coping mechanisms in the face of chronic diseases, irrespective of insurance cover

[3]Using a panel data for Indonesia, Gertler & Gruber (2002) demonstrate that major illness induces significant economic costs and is associated with a fall in consumption. Similarly, Gertler et al. (2009) prove that micro-financial saving and lending institutions can help Indonesian families smooth consumption after a major illness. Moreover, Jalan & Ravallion (1999) observe that wealthier Chinese households are better able to insure consumption against income shocks. Studies of Rosenzweig & Wolpin (1993) and Fafchamps et al. (1998) present that sale of stocks can help insure consumption. Empirical results across countries also advocate that households find difficult to cope with all income shocks, especially those with low assets (Harrower & Hoddinott 2004, Skoufias & Quisumbing 2005).

(Abegunde & Stanciole 2008).

Another piece of research shows that about 25.9 per cent of households in forty low- and middle-income countries borrow money or sell items to pay for health care. The health shocks are more severe among the poorest households and in countries with less health insurance. Healthcare systems in developing countries have been failing to insure families against the financial risks of seeking health care (Kruk et al. 2009).

Literature on health shocks has proved the importance of health insurance. For example, a study for India highlights the fact that community-based health insurance schemes in India can protect poor households from the unpredictable risk of medical expenses (Kent 2002). Another study using an Indonesian panel data set suggests that public insurance or subsidies for medical care may improve household welfare by providing consumption insurance (Gertler & Gruber 2002).

However, there is currently no study investigating the impact of health insurance on household vulnerability. Some attempts has been made to examine the measure the impact of microfinance on vulnerability or household consumption over time (Khandker 1998, Morduch 1999, Zaman 1999). A study of Swain & Floro (2012) indicate that vulnerability of members of the Indian Self Help Group (SHG) is not significantly higher than in non-SHG members, although the SHG members experience a high incidence of poverty. Nevertheless, the SHG members for more than one year face significantly reduced vulnerability. Another study by Puhazhendi & Badatya (2002) suggests that microfinance allows consumption smoothing and helps households mitigate the negative effects of shocks.

Health insurance impact in Vietnam

A large number of studies using Vietnam data have been conducted to look at the incidence of out-of-pocket for health care as well as the effects of health insurance on various types of household spending. For example, Wagstaff & Doorslaer (2003), using the data set of 1993-1998, find that 80 per cent of health spending in Vietnam was paid out-of-

pocket in 1998. The out-of-pocket spending is mainly non-hospital expenditure rather than inpatient care expenses. This primarily forces poor households to become poorer rather than leading non-poor households into poverty. Later, Wagstaff (2007) shows that the incomes of urban households are more vulnerable to health shocks than rural households. The author suggests that transfers from relatives, friends or neighbors partially offset income losses and extra medical spending, even among insured households. The paper also finds that households with a health shock consume less food, but spend more on items such as housing and electricity.

Nguyen (2010) reviews Vietnam's policies on health services and provides an assessment of public health facilities and the access of people to health care services in Vietnam. He finds that the poor and ethnic minorities are more likely to be enrolled in health insurance than other people. Health insurance helps the insured increase health care utilization and reduces out-of-pocket spending. The density of medical staff is also positively correlated with outpatient health care utilization. However, the quality of health care services and the access to health care services remain limited in poor, remote and mountainous areas (Nguyen 2010).

Chaudhuri & Roy (2008) use data drawn from the 199293 and 199798 Vietnam Living Standard Surveys (VLSS) and the 2002 Vietnam Household and Living Standards Survey (VHLSS) to estimate the probability that an individual will seek treatment and the determinants of out-of-pocket payments. They show that the rich are more able to use health insurance effectively with low out-of-pocket payments than are those with lower incomes. In contrast, the poor suffer higher out-of-pocket payments and are thus discouraged from seeking treatments until their ailment become serious. When pro-poor policies are instituted, the healthcare inequality becomes less serious (Chaudhuri & Roy 2008). Further, the insured patients, especially those at lower income levels, are more likely to use outpatient facilities and public providers (Jowett et al. 2004).

In a study on how households in Vietnam cope with health care expenses, Kim et al. (2011) examine a rural commune in Hanoi and show that households of all income levels

borrow to finance treatment costs but the poor and near-poor are more heavily dependent. The likelihood of reducing food consumption to pay for extremely high-cost treatment versus low-cost treatment increases most for the poor in both inpatient and outpatient contexts. Decreased funding and increased costs of health care rendered Dai Dong's population vulnerable to the consequences of detrimental coping strategies such as debt and food reduction (Kim et al. 2011).

Thanh et al. (2010) indicate that Vietnam's health care funds for the poor (HCFP) significantly reduces the health care expenditure (HCE) as a percentage of total expenditure, and increases the use of the local public health care among the poor. However, the impact of HCFP on the use of the higher levels of public health care and the use of go-to-pharmacies are not significant (Thanh et al. 2010). Sepehri et al. (2006) use Vietnam Living Standard Surveys 1993 and 1998 to show that health insurance reduces out-of-pocket expenditure by around 36 per cent to 45 per cent. Sepehri et al. (2011) find that insurance reduces out-of-pocket expenditures more for those enrollees using district and higher level public health facilities than those using commune health centers. Compared to the uninsured patients using district hospitals, compulsory and voluntary insurance schemes reduce out-of-pocket expenditure by 40 per cent and 32 per cent, respectively. However, for contacts at the commune health centers, both the compulsory health scheme and the voluntary health insurance scheme have little influence on out-of-pocket spending, while the HCFP reduces out-of-pocket spending by about 15 per cent.

In summary, the evaluation methods used in these studies are propensity score matching (PSM), double difference and triple difference methods. Authors try to eliminate any biases in the estimated insurance coefficient arising from the unobservable factors that are correlated with both insurance status variable and the outcomes of interest. Most studies find a limited impact of insurance on out-of-pocket payments, with the exception of Jowett et al. (2003) on a voluntary program in Hai Phong. The differences impact of health insurance among studies are attributed to differences in methods and target

groups and the outcomes of interest. For examples, both Bales et al. (2007) and Wagstaff (2007) use data from VHLSS 2002 and 2004 to estimate impacts of free health insurance on the poor. They find a significant positive impact of the program on the reduction of out-of-pocket health care spending. However, while Wagstaff (2007) finds a positive impact of the health insurance on health care utilization, Bales et al. (2007) does not. This might be the reason why Wagstaff re-conducted the research using different methods in 2010. This time, the results suggest that the HCFP has had no impact on use of services, but has substantially reduced out-of-pocket spending (Wagstaff 2010).

Unfortunately, there is no paper measuring the impact of health insurance coverage on household vulnerability even though there are a number of studies exploring risks and household responses to risks in Vietnam. These studies include Hasegawa (2010), Klasen & Waibel (2010), Imai et al. (2011), Wainwright & Newman (2011), Montalbano & Magrini (2012), and Tuyen (2013). Therefore, this study will contribute to the empirical literature by filling this gap.

Choice under risk and health insurance demand

According to Phelps (2013), people seem to dislike risk and prefer a less risky situation to a more risky situation, other things being equal. They are thus risk averse and are willing to pay for insurance in order to eliminate the chance of really risky losses. Therefore, a household's purchase of health insurance in this study is regarded as a choice under risk and uncertainty, partially reflecting the households risk preference. This section summarizes the literature on risk preference as the framework for risk aversion measures used in this study.

Since Bernoulli (1954) provided the foundations for the concepts of expected utility and risk aversion, individual risk preference has become a fundamental building block of a huge range of economic theory (Isaac & James 2000). A comprehensive review of choice under risk theories can be seen in Starmer (2000). In general, they are classified into two major groups: expected utility theory and non-expected utility theory. Therefore,

risk preference or risk aversion which is derived from theory can be estimated in two different ways. First, the conventional way to estimate risk aversion comes primarily from an idea of expected utility theory that assumes individuals optimize their preference function when they make choices among prospects (or uncertain outcomes). The studies following this concept include Von Neumann & Morgenstern (1944); Friedman & Savage (1948); and Rothschild & Stiglitz (1970). Among empirical studies are the works of Pratt (1964) and Arrow (1965), who employed a concave utility function U to derive formal measures of absolute risk aversion. Second, the prospect theory provides another framework to calculate risk aversion. This theory assumes that individuals make their choices by decision heuristics, or rules, under particular conditions. In other words, problem context is an important determinant of choice-rule selection. Two of the most widely discussed studies are Kahneman & Tversky (1979) and Tversky & Kahneman (1992). The studies of Gächter et al. (2010) and Abdellaoui (2000) are two empirical studies that follow this path.

The relationship between individuals' risk preference and health insurance demand has been investigated in Friedman (1974), Bleichrodt & Pinto (2000, 2002) and Barseghyan et al. (2013)[4]. In addition, the relationship of risk preference and other aspects of health choice has been studied in Nightingale & Grant (1988), Nightingale (1988), Richardson (1994), Bleichrodt & Gafni (1996), Bridges (2003), Picone et al. (2004), Lusk & Coble (2005), Zhang & Rashad (2008), Andersen et al. (2008), and Einav et al. (2010). These studies explain why we choose to add a risk aversion index into the probit model for estimating health insurance coverage.

[4]The relationship between an individuals' economic behaviour and risk aversion has been investigated in many empirical studies. For example, Bowman et al. (1999), Heidhues & Kőszegi (2008) with consumption behaviour; financial markets (Benartzi & Thaler 1995, Odean 1998, Haigh & List 2005); trade policy (Tovar 2009); labor supply (Camerer et al. 1997, Goette et al. 2004, Fehr et al. 2007).

3 Overview of the health insurance system in Vietnam

Health insurance system in Vietnam

After 1986, when the government launched economic reforms, the healthcare system in Vietnam was transformed from a centralized one of free universal access to a user-pay system. The pharmaceutical industry was also privatized. Out-of-pocket spending on health care went up rapidly. It reached 71 per cent of health spending (mostly on drugs) in 1993 and 80 per cent in 1998, creating a huge burden for ill households, especially the poor (Wagstaff & Lieberman 2009).

In 1993, Vietnam introduced a compulsory health insurance (CHI) program, which was initially aimed at the formal sector worker. A voluntary health insurance scheme was later added to cover the self-employed, informal sector employees, and dependents of CHI members. Later, all employees in the formal sectors were required to enroll, rather than only those in large institutions.

In the early 2000s, other important changes in health insurance were introduced: copayments were scrapped and the benefit package made more generous, and the insurer was permitted to contract with private providers. The health sector was decentralized and much of the revenue was raised locally. Some hospitals were given greater autonomy. In 2002, the insurance system was reformed. The central government launched the Health Care Fund for the Poor (HCFP) program, to provide insurance coverage for the poor and other disadvantaged groups. Later, the government continued to expand coverage through a decree called Decision 139, which asked local governments to provide free health care to the poor, ethnic minority households living in the remote areas and households living in communes officially classified as "special poor"[5]. However, service provision

[5]In October 2002, Vietnam's government introduced a new health care fund program for the poor through Decision 139. This decision mandated all provincial governments to provide free health care to three groups: households defined as poor according to official government poverty standards introduced in November 2000; all households regardless of their own assessed income living in communes covered

proved to be poor due to the troublesome application process, limited funds, and lack of public awareness of the scheme itself. Households still suffered from high out-of-pocket spending.

In 2008, the government enacted the Health Insurance Law that became effective in 2009. It aimed to achieve universal health insurance coverage. Under the provision of the Law, children under 6 years old and the near poor became a compulsory group. Later in 2010, students and pupils (who used to be in the voluntary group) were included. Moreover, farmers, workers in agriculture, forestry, fisheries, and salt production sectors were targeted to be included in 2012 (Matsushima & Yamada 2014).

According to JAHR (2013), the household out-of-pocket payment share of total health spending in Vietnam is much higher than the WHO recommendation (30-40%)[6]. Households without health insurance cards, households in rural areas and poor households have lower out-of-pocket spending on health, but higher catastrophic spending and impoverishment due to health spending. Since 2010, in Vietnam the out-of-pocket payment share of total health expenditure and the proportion of population facing catastrophic spending and impoverishment due to health spending have decreased compared to previous years. The health insurance share of total health spending and the volume of medical services reimbursed by insurance have both increased over time. This result can be attributed to some recent social and health policies especially policies on healthcare for the poor and children under six years - along with healthcare subsidies for beneficiaries of social welfare policies, and most recently, the Law on Health Insurance that commenced in 2009.

Vietnam has a goal of universal health insurance, and many policies on health insurance have been promulgated and effectively implemented (Somanathan 2014). The

by a program set up as a result of another policy known as Decision 135 dating from 1998, which provides support and services to especially disadvantaged communes; and ethnic minorities living in the province of Thai Nguyen and the six mountainous provinces designated by Decision 186 as facing special difficulties.

[6]Household out-of-pocket spending on health accounts for from 8.3 to 11.0% of household capacity to pay and approximately 4.6 to 6.0% of total household expenditure. There were 3.9 to 5.7% of households, or approximately 1 million households facing catastrophic spending and 2.5 to 4.1% of households, or approximately 600000 households facing impoverishment due to health spending between 2002 and 2010.

government fully subsidizes health insurance premiums for over 27 million beneficiaries of social assistance policies, including the poor and children under age 6; and it has continuously expanded entitlements and increased health insurance premium subsidies for the near poor, pupils and students. Health insurance has also expanded medical care and rehabilitation service coverage at each level. In 2012, about 59.31 million people were insured, accounting for 66.8 per cent of the population[7]. In some mountainous provinces with a large number of poor and ethnic minorities population coverage was over 75 per cent. Frequency of use of medical services reimbursed by insurance reached 2.02 visits per person. There were 15.6 inpatient visits for every 100 people in the population. The health insurance fund has become an important funding source for health care. In 2012, the health insurance fund reimbursed facilities for medical services worth approximately 33,419 billion VND (1.7 billion USD). The health insurance fund has contributed to strengthening and upgrading the health service delivery network, the range of pharmaceuticals and technical services available at medical facilities to better meet people's demand for health care.

Health Insurance schemes

Currently, Vietnam has two insurance schemes: a compulsory health insurance and a voluntary scheme. The compulsory scheme initially included two groups: (*a*) formal workers (both state and private sectors) and civil servants; and (*b*) retirees, dependents of military and police officers, members of Parliament, Communist Party officials, war heroes, and meritorious people. This scheme later included children younger than 6 years, and from 2003, also covered the poor, ethnic minority households living in the remote areas, and households living in communes officially classified as "special poor". Since 2010, students in schools, colleges and universities, who used to be in the voluntary insurance group, have also been included. From 2012, the near poor, farmers, workers in the sectors of agriculture, forestry, fisheries, and salt producers have been targeted for

[7]The uninsured are mainly the near poor and residents of the rural areas

inclusion. Voluntary health insurance is intended for the remaining population.

Since 1992, the health insurance coverage rate has increased considerably. In 1993, only 5.4 per cent of the total population were covered. The figure in 2010 was around 60 per cent, but by 2012, the figure had grown to 66.8 per cent. Around 60 per cent of the insured have been completely or partially financed by the state budget (Matsushima & Yamada 2014, JAHR 2013). However, as can be seen in Table 1, Vietnam health insurance policies faced difficulties in reaching those non-poor workers and their families in the informal sector, who belong to the voluntary group. Using the statistics in 2010, the enrollment rate was only 53.4 per cent for the private enterprises. While most of the poor and the recipients of social allowance were covered, about 20 per cent of children under 6 years old remained uninsured despite the fact that their enrolment costs were fully paid by the state budget. Similarly, the enrollment rate for the near poor was just 11.38 per cent, although this targeted group was eligible for at least 50 per cent of subsidies from the government. More importantly, the coverage for the unemployed remained zero. Therefore, there were still many vulnerable people left without health insurance (Matsushima & Yamada 2014).

Health insurance premiums and subsidies

According to the Health Insurance Law 2008, the contribution rate for most groups is 4.5 per cent[8] of the monthly minimum salary[9] or the monthly contract salary depending on their sources of income (Matsushima & Yamada 2014). In 2010, the premium was about 380,000 VND per person per year. The government subsidized 100 per cent of premiums for the very poor and for children under 6 years of age, and subsidizes at least 50 per cent of the premium for the near poor and at least 30 per cent of premiums for students. For the formal sector workers, employers contributed 3 per cent of the minimum salary and

[8]In the period 1992-2009, this figure is 3% (Tien et al. 2011)

[9]The minimum salary is determined by the government and serves as a reference for many other calculation, especially payments from the state budget. In 2009, the minimum salary level is equivalent to US$ 35. In case of health insurance, minimum salary is used to calculate the premium of the poor, the near poor, children under 6, the meritorious people, students

Table 1: Breakdown of the insured population in 2010

Target groups	Target populations (thousand)	Covered people (thousand)	Percent covered (%)
Total	85,666	51,903	59.64
Compulsory groups	67,114	47,176	70.29
Employees of enterprises and other companies	11,911	6,361	53.40
Civil servants	3,142	3,142	100.00
Foreign students	3	3	100.00
Part-time officers at commune level	182	0	0.00
Pensioners	920	920	100.00
Recipients of social allowances	1,305	1,254	96.09
Unemployed people	80	0	0.00
Local authorities	41	40	97.56
Meritorious people	2,113	2,113	100.00
Veterans	374	350	93.58
Members of national assembly and peoples council	123	119	96.75
Privileged social groups	843	384	45.55
The poor	13,945	13,511	96.89
Dependents of meritorious people	869	0	0.00
Dependents of army and police officers	1,281	297	23.19
Children under 6	10,103	8,183	81.00
Near poor people	6,081	692	11.38
Students and pupils	13,798	9,807	71.08
Voluntary groups	18,552	3,917	21.11
Relatives of employees	6,820	0	0.00
Farmers, self-employees, members of cooperatives	11,732	3,917	33.39

Source: VSS (2011) cited in Tien et al. (2011).

the employees paid 1.5 per cent. The voluntary group paid 4.5 per cent of the minimum salary but the premium rate could reduce to 3 per cent of the minimum salary if the enrollees were dependents of salaried workers or civil servants (Tien et al. 2011)[10].

Benefits

The insurance is effective when the insured are provided with medical care at the community health center or district hospital where they are registered, or at higher-level health facilities to which they are have been referred. Patients can choose to register for the community health center or district hospital they wish to be treated within the given options by the government (JAHR 2009). If the insured prefer to be treated in other commune health centers or district level hospitals, they must then pay the hospital directly, and the out-of-pocket will be reimbursed later at their place of residence, except in emergency cases. In the case of an emergency, the treatment will be given for free. The insured can also use private clinics and receive limited benefit from the health insurance scheme.

When the insured receives medical care at the registered health facilities, different benefits apply depending on the category of the insured. Not all insured people can receive free medical consultation and treatment because the co-payment system has been commenced since January 2010. The level of the costs covered by the SHI depends on the group with a variation of 100% - 95% - 80% of the total health expenditure (For details of the groups see Table 2). People who are not covered for 100 per cent must pay the balance directly to the hospital (VSS 2010).

In 2013, the co-payment paid by the insured was 14.76 per cent of the total health insurance-covered medical care cost nationwide. The out-of-pocket payment accounts for almost 60 per cent of the total health expenditure. The Government of Vietnam wants to take progressive steps to reduce out-of-pocket payments made by patients to under 40 per cent by 2015 (Rousseau 2014). Health insurance also covers for technologically advanced medical services including dialysis, transplants, certain types of cancer treatments and

[10]More detail in Table 3 of Tien et al. (2011)

Table 2: Benefits for basic medical services

100% medical consultation and treatment costs	95% of medical consultation and treatment costs	80% of the cost
– Specialized technical officers – Specialized technical non-commissioned officers – Professional officers – Professional non-commissioned officers of the People's Public security – Meritorious persons – Children under 6	– Persons on pension or monthly working capacity loss allowance – People on monthly social welfare allowance as prescribed by law – Poor household members, ethnic minorities living in areas with difficult or exceptionally difficult socio-economic conditions – Other categories of the insured	– Other categories of the insured

Source: VSS (2010) cited in Matsushima & Yamada (2014).

cardiovascular operations etc. However, there is a ceiling which is defined as 40 months of minimum salary (VSS 2010, Tien et al. 2011). In 2012, the minimum salary is between VND 1.4 million to 2 million depending on residential area. The ceiling is equivalent to US$ 2,682.8 to US$ 3,838.8 (US$=VND 20,865.50) and therefore the technologically advanced treatment could result in extremely high out-of-pocket expenditure (Matsushima & Yamada 2014).

Providers

Health care providers are both public and non-public. Prior to November 2011, all public providers were automatically approved to participate in social health insurance, while private providers needed certification and permission. The private sector has grown steadily during the recent years, but mainly provides outpatient health services and is still much smaller than the public sector, especially for inpatient treatment (World Health Organization, 2009)[11]. In 2014, Vietnam Social Security (VSS) contracted with 1,627 public establishments and 484 private ones (Rousseau 2014). As a result, the proportion

[11]There has been significant growth in the number of private hospitals in Vietnam since the Government of Vietnam allowed private investment in the health sector. The number of private hospitals more than doubled between 2004 and 2008 to reach 82 by 2008. However, this number constituted only 7% of total hospitals, and 4.4% of total hospital beds. Private hospitals were located mainly in urban and wealthy areas (Hort 2011)

using private health care services is much higher for the uninsured than the insured. According to the 2006 VHLSS, the proportion of the number of outpatient contacts in private health establishment to the total number of outpatient contacts was 23 per cent for people having voluntary health insurance. The figure for the uninsured people was 43 per cent. Because inpatient treatments are mainly provided by the public health sector, the proportion of private inpatient contacts to the total inpatient contacts was only 1.2% and 3.6% for the insured and uninsured people, respectively (Nguyen 2012).

4 Data

Vietnam Access to Resources Household Surveys (VARHS)

Data for this empirical analysis is extracted from two waves of Vietnam Access to Resources Household Survey (VARHS) implemented in 2010 and 2012. The VARHSs are longitudinal datasets that have been biannually conducted by the University of Copenhagen (Denmark) in collaboration with the Centre Institute of Economic Management (CIEM), the Institute for Labor Studies and Social Affairs (ILSSA), and the Institute of Policy and Strategy for Agriculture and Rural Development (IPSARD).

These surveys were carried out in rural areas of 12 provinces[12] of Vietnam in the summer of each year, producing a balanced panel of 2,045 households spread over 161 districts and 456 communes. They all were conducted during the same three-month period each year to ensure consistency and facilitate reasonable comparisons across time. The VARHS investigates issues surrounding Vietnamese rural household's access to resources and the constraints that these households face in managing their livelihoods. Along with detailed demographic information on household members, the surveys include sections

[12]They are evenly distributed throughout Vietnam, in seven out of eight regions, with Ha Tay in Red River Delta; Lao Cai and Phu Tho in Northeast; Lai Chau and Dien Bien in Northwest; Nghe An in North Central Coast; Quang Nam and Khanh Hoa in South Central Coast; Dac Lac, Dac Nong and Lam Dong in Central Highland; and Long An in Mekong River Delta. Therefore, these provinces can represent the regional climate and geography throughout the country. However, The sample is statistically representative at the provincial but not at the national level (Markussen et al. 2012).

on household assets, savings, credit (both formal and informal), formal insurance, shocks and risk-coping, informal safety nets and the structure of social capital (Wainwright & Newman 2011). There is also a variety of information on communes where households lived at the time they were surveyed.

Health insurance

In Section 9 of the VARHS questionnaires, there are questions about all the types of insurance that a household held at the time of interview. They include health insurance (voluntary and compulsory for labor[13]), free health insurance for the poor and free health insurance for children under 6 year old. Other types of insurance consist farmer insurance, fire insurance, life insurance, social insurance, unemployment insurance, education insurance and vehicle insurance. In this study, we focus on the impact of health insurance in general (both voluntary and compulsory for labor) which is essential for universal health insurance policy in Vietnam. However, other types of insurance are mentioned in the later discussion on the impact of risk attitude on health insurance demand.

Risk attitudes

In VARHS 2010 and 2012, there are three questions that enable the derivation of risk aversion for each individual. The first question is a simple unpaid lottery experiment in which respondents are required to accept or to reject each of six lotteries with different payoffs. In each lottery, the winning prize is unchanged at VND 6,000 and the loss varies from VND 2,000 to VND 7,000 (Table 3).

That exact question in the questionnaire is:

> *"You are given the opportunities of playing a game where you have a 50:50 chance of winning or losing (for example, a coin is tossed so that you have an equal chance of it turning up either heads or tails). In each case choose whether you would accept or reject the option of playing:"*

The VARHS dataset in 2010 and 2012 also contain information that we can use to estimate

[13]There is no way to separate these two types of health insurance.

Table 3: Questionaires about risk preference in VARHS

	Lottery	Accept	Decline
a.	You have a 50% chance of losing 2,000 VND and a 50% chance of winning 6,000 VND	◯	◯
b.	You have a 50% chance of losing 3,000 VND and a 50% chance of winning 6,000 VND	◯	◯
c.	You have a 50% chance of losing 4,000 VND and a 50% chance of winning 6,000 VND	◯	◯
d.	You have a 50% chance of losing 5,000 VND and a 50% chance of winning 6,000 VND	◯	◯
e.	You have a 50% chance of losing 6,000 VND and a 50% chance of winning 6,000 VND	◯	◯
f.	You have a 50% chance of losing 7,000 VND and a 50% chance of winning 6,000 VND	◯	◯

Source: VARHS 2010 and 2012.

absolute risk aversion. The exact two questions in the VARHS questionnaire are:

> *"Consider an imaginary situation where you are given the chance of entering a state-run lottery where only 10 people can enter and 1 person will win the prize. How much would you be willing to pay for a 1 in 10 chance of winning a prize of 2,000,000 VND?"*

and,

> *"How much would you be willing to pay for a 1 in 10 chance of winning a prize of 20,000,000 VND?"*

The answers to these questions are regarded as reservation prices above which households reject the lottery.

5 Analytical framework and methodology

Building on household economics literature and our previous paper on sources of vulnerability and household coping strategies in Vietnam, we suggest in this article that health insurance can help households reduce the accidental financial loss due to healthcare cost.

Households therefore do not have to reduce consumption as an inevitable coping strategy. In addition, health insurance reduces the probability of selling productive assets that are necessary to generate future household income. As well, household members do not have to suffer their illness without medical treatment due to their difficult financial situation[14]. This section describes how we measure vulnerability, risk aversion and finally estimate the impact of health insurance and risk aversion on vulnerability.

Vulnerability as Expected Poverty (VEP)

Vulnerability as expected poverty is a vulnerability measure which was first proposed and applied to Indonesian household data by Chaudhuri (2003). This household vulnerability is defined as the likelihood that a household will fall into poverty in the next period. VEP can be estimated through the following procedures, beginning with the consumption function:

$$lnc_i = \alpha + \beta X_i + e_i \tag{1}$$

where c_i is per capita consumption expenditure for household i, X_i reprerents a vector of observable household characteristics and commune characteristics (e.g. characteristics of head, location, assets, prices, shocks), β is a vector of parameters to be estimated, and e_i is a mean-zero disturbance term that captures idiosyncratic shocks that lead to different levels of per capita consumption.

The variance of the disturbance term is:

$$\sigma^2_{e,i} = \theta X_i \tag{2}$$

Chaudhuri et al. (2002) and Chaudhuri (2003) acknowledge that the error term (e_i) is not the same for all households (heteroskedasticity). Therefore, we adopt the three-step Feasible Generalized Least Squares (FGLS) technique proposed by Amemiya (1977).

[14]We consider if health insurance affects both idiosyncratic and covariate shocks. Zimmerman & Carter (2003), Morduch (2004) and Dercon (2005) show that the impact of microfinance on the latter is likely to be weak.

Firstly, we estimate Equation 2 by employing the ordinary least squares (OLS) technique. Next we predict the residuals from the regression and regress the predicted residuals on the same covariates included in the specification of the consumption process. Then we have the error variance estimating process as follows:

$$\widehat{e}^2_{i,OLS} = \rho + \widehat{\delta} X_i + \eta_i \tag{3}$$

The prediction of Equation 3 is used to weight the previous equation, thus leading to the transformed version:

$$\frac{\widehat{e}^2_i}{\widehat{e}^2_{i,OLS}} = \frac{\rho}{\widehat{e}^2_{i,OLS}} + \frac{\widehat{\delta} X_i}{\widehat{e}^2_{i,OLS}} + \frac{\eta_i}{\widehat{e}^2_{i,OLS}} \tag{4}$$

According to Chaudhuri (2003), the OLS estimation of Equation 4 generates an asymptotically FGLS estimate, δ^{FGLS}, and thus e^2_i is a consistent estimate of the variance of the idiosyncratic component of household consumption. Having obtained an efficient estimate of the variance as the predicted value of Equation 4, $(\widehat{\delta}^2_{i,FGLS})$, we now take the square root and transform Equation 1 as follows:

$$\frac{lnc_i}{\widehat{\delta}_{i,FGLS}} = \frac{\alpha}{\widehat{\delta}_{i,FGLS}} + \frac{\beta X_i}{\widehat{\delta}_{i,FGLS}} + \frac{e_i}{\widehat{\delta}_{i,FGLS}} \tag{5}$$

An OLS estimation of Equation 5 generates a consistent and asymptotically efficient estimate of α^{FGLS}, β^{FGLS}. Once we obtain these estimates, it is possible to predict both the expected log consumption and its variance:

$$\widehat{E}[lnC_i|X_i] = \alpha^{FGLS} + \beta^{FGLS} X_i \tag{6}$$

$$\widehat{V}[lnC_i|X_i] = \rho^{FGLS} + \delta^{FGLS} X_i \tag{7}$$

The VEP index thus measures 'vulnerability to poverty' as the probability that household

i will be poor, as follows:

$$\widehat{v}_{i,Chaudhuri} = \widehat{Pr}(lnc_i < lnz|X_i) = \Phi\left(\frac{lnz - \widehat{E}[lnC_i|X_i]}{\sqrt{\widehat{V}[lnC_i|X_i]}}\right) \tag{8}$$

Vulnerability as low Expected Utility (VEU)

Ligon & Schechter (2003) define vulnerability as the variation between the utility derived from a certainty-equivalent consumption (z_{ce}) at and above which the household would not be considered vulnerable and the expected utility of consumption. This certainty-equivalent consumption is similar to the poverty line. Consumption of household (c_i) has a distribution that illustrates different states of the world, so the form of vulnerability measure is given below:

$$V_i = U_i(z_{ce}) - EU_i(c_i) \tag{9}$$

where U_i is a weakly concave, strictly increasing function. The equation can be rewritten as:

$$V_i = [U_i(z_{ce}) - U_i(Ec_i)] + [U_i(Ec_i) - EU_i(c_i)] \tag{10}$$

The first bracketed term is the variation between utility at z_{ce} and utility at expected consumption (c_i) of household i. The second term captures the risk (both covariate and idiosyncratic risks) faced by household i. It can be decomposed as shown below:

$$\begin{aligned} V_i = [U_i(z_{ce}) - U_i(Ec_i)] & \quad \text{[Poverty or inequality]} \\ +[U_i(Ec_i) - EU_i(E(c_i|x_t))] & \quad \text{[Covariate or aggregate risk]} \\ +[EU_i(E(c_i|x_t)) - EU_i(c_i)] & \quad \text{[Idiosyncratic risk]} \end{aligned} \tag{11}$$

where E($c_i|x_t$) is the commune expected value of consumption, conditional on a vector of covariant variables (x_t).

The authors disintegrate unexplained risk and measurement error out of idiosyncratic risk and assume that the poverty line (z) is the mean consumption. So Equation 11 can

be rewritten as:

$$\begin{aligned} V_i = [U_i(z_{ce}) - U_i(Ec_i)] & \quad \text{[Poverty or inequality]} \\ +[U_i(Ec_i) - EU_i(E(c_i|x_t))] & \quad \text{[Covariate or aggregate risk]} \\ +[EU_i(E(c_i|x_t)) - EU_i(c_i|x_t, x_{it})] & \quad \text{[Idiosyncratic risk]} \\ +[EU_i(c_i|x_t, x_{it}) - EU_i(c_i)] & \quad \text{[Unexplained risk and measurement error]} \end{aligned} \tag{12}$$

where E($c_i|x_t, x_{it}$) is the household expected value of consumption, conditional on a vector of covariant variables (x_t) and household's characteristics (x_{it}).

Ligon & Schechter (2003) normalize the expenditure and income per capita so that the average expenditure and income per capita over all households in all periods becomes unity, and therefore z in the above equation equals one. Thus, households do not have vulnerability if resources are distributed in a way that households receive the expected consumption expenditure with certainty.

This VEU approach is useful because it reveals the contribution of each major factor on household vulnerability to poverty. However, it needs a panel data and the result may be sensitive to the function form of utility and the utility measurement[15].

Ligon and Schechter (2003) propose a particular form for utility:

$$U(c) = \frac{c^{1-\gamma}}{1-\gamma} \tag{13}$$

Where γ is household coefficient on relative risk aversion or household sensitivity to risk and inequality. From the empirical literature, γ=2 is a good approximation of this measure.

Components of Equation 12 can be estimated by applying restricted least squares for

[15]Hoddinott & Quisumbing (2003) agrue that the relative components of the decomposition are not likely to be affected by function even though the results may be.

expected consumption and then substituting each of them into utility function 13:

$$Ec_{it} = \frac{1}{T}\sum_{t=1}^{T} c_{it} \tag{14}$$

$$E(c_{it}|\bar{X}_t) = \alpha_i + \eta_t \tag{15}$$

$$E(c_{it}|\bar{X}_t, X_{it}) = \alpha_i + \eta_t + \beta X_{it} \tag{16}$$

where α_i capture the effect of household fixed characteristics; η_t capture the impact of changes in covariates or aggregates which are the same across households; and β reflects effects of household characteristics or other observable factors on consumption.

In Equation 16, the income variable may be endogenous if it is treated as an explanatory variable for consumption because there may be a feedback relationship between income and consumption. Therefore, we employ the instrumental variable (IV) estimation for Equation 16 in which income is perceived as an endogenous variable.

Risk aversion calculation

Three questions in the VARHS data enable us to measure individual risk aversion in two ways. The observed choices of individuals in the lottery enables us to classify respondents with regard to their level of risk aversion.

First, we derive individual risk aversion from the lottery choice by applying the cumulative prospect theory of Tversky & Kahneman (1992). According to these authors, individuals will be indifferent between accepting and rejecting the lottery if:

$$w^{+}(0.5).v(G) = w^{-}(0.5)\lambda^{risk}v(L) \tag{17}$$

where G is the gain and L is the loss in a given lottery; $v(x)$ is the utility of the outcome $x \in [G, L]$, λ^{risk} is the coefficient of risk aversion in the choice task; $w^{+}(0.5)$ and $w^{-}(0.5)$ represent the probability weights for the 0.5 chance of gaining G or losing L, respectively

(Gächter et al. 2010). Then we can produce the cumulative risk aversion by the formula below[16]:

$$\lambda^{risk} = \frac{w^{+}(0.5)}{w^{-}(0.5)} \times \frac{v(G)}{v(L)} \tag{18}$$

In this study, we only consider monotonic acceptance decisions (99.47% of respondents in our analytical data show monotonicity). The results of risk aversion estimation are presented in the Table A.4, using a different assumption on probability weighting and diminishing sensitives for gains and losses. In the model (1), or the benchmark model, both probability weighting and diminishing sensitivity are not important. Model (2) assumes the same probability weighting for gains and losses, or $w^{+}(0.5)/w^{-}(0.5) = 1$, but allows for diminishing sensitivities for gains and losses (this study uses the median estimates of Booij & Van de Kuilen (2009) where $\alpha = 0.95$ and $\beta = 0.92$). Model (3) assumes indifferent diminishing sensitivity but allows for differences in probability weights for gains and losses. We use the estimates from Abdellaoui (2000) in which $w^{+}(0.5) = 0.394$ and $w^{-}(0.5) = 0.456$ for the median individual, implying $w^{+}(0.5)/w^{-}(0.5) = 0.86$. This probability weighting difference is one of the largest gaps between gains and losses in the literature, providing an upper bound for our estimation. Model (4) simultaneously assumes that both probability weighting and diminishing sensitivities are essential.

We also estimate risk aversion under the expected utility theory by employing the methods of Pratt (1964) and Arrow (1965). Following these studies, we assume that households are initially endowed with income w and have a twice differentiable, concave utility function U so that $U'(w) > 0$ and $U"(w) < 0$. The prize of the lottery is defined by z and the probability of winning that prize is α. The maximum price that an individual is willing to pay for the lottery ticket, or the reservation price, is λ. Therefore, the initial wealth will become $w - \lambda$ after purchasing the lottery ticket and increase to $w - \lambda + z$ if he or she wins the prize.

[16]If we assume that the same weighting function is used for both gains and losses, $w^{+} = w^{-}$, then the ratio $v(G)/v(L) = \lambda^{risk}$ will define an individual's implied risk aversion in the lottery choice task. Using a linear assumption on $v(x)$ that $v(x) = x$ for small amounts, we have a simple measure of risk aversion: $\lambda^{risk} = G/L$.

To deduce the value of the Pratt-Arrow measure of absolute risk aversion $A(w) = -U"(w)/U'(w)$, the expected utility theory implies that the utility of wealth w, without participation in the lottery, is equal to expected utility when participating at reservation price λ (Hartog et al. 2002):

$$U(w) = (1-\alpha)U(w-\lambda) + \alpha U(w-\lambda+z) \tag{19}$$

A second order of the Taylor series expansion of $U(w-\lambda)$ and $U(w-\lambda+z)$ around $U(w)$ gives:

$$U(w) = U(w) + \alpha z U'(w) - \lambda U''(w) + 0.5U''(w)[(1-\alpha)\lambda^2 + \alpha(z-\lambda)^2] \tag{20}$$

After solving for $A(w)$, we have the Pratt-Arrow measure of absolute risk aversion as:

$$A(w) = -\frac{U''}{U'} = \frac{\alpha z - \lambda}{0.5\lambda^2 + 0.5\alpha z^2 - \alpha\lambda z} \tag{21}$$

Risk aversion estimated results are provided in Table A6 of the Appendix. We expect a close relationship between the risk aversions estimated from the two approaches. The pairwise correlation between risk parameters is calculated and presented in the Table A9. Apparently, there is a strong correlation between the risk parameters calculated by the prospect theory and by expected utility theory. We also classify households into groups of high, medium and low aversion and summarize the results in Table A7 and Table A8 of the Appendix.

Propensity score matching

For an accurate estimation of a program impact, panel data with at least one survey serves as baseline data in which all participants have not yet received the benefit from the program. In our data, we do not have the true baseline data. Households might have health insurance in both the 2010 and 2012 surveys. Dropping households who have

health insurance in 2010 then applying the difference-in-difference method to estimate the average treatment effect on the treated (ATT) for the year 2012 would lead to a biased estimate. Therefore, we employ the method of propensity score matching which has been previously applied by Nguyen (2012).

Let denotes H_{2010} and H_{2012} as the binary variables of health insurance in the years 2010 and 2012 respectively. In 2010, Y_1^{2010} and Y_0^{2010} denote potential outcomes with and without health insurance, respectively. Similarly, in 2012, Y_1^{2012} and Y_0^{2012} denote outcomes with and without health insurance.

The impact of health insurance on vulnerability can be presented as below:

$$ATT_{2012} = E(Y_1^{2012}|H_{2012} = 1) - E(Y_0^{2012}|H_{2012} = 1) \tag{22}$$

The equation can be rewritten as:

$$ATT_{2012} = Pr(H_{2010} = 1|H_{2012} = 1)ATT_{2012a} + Pr(H_{2010} = 0|H_{2012} = 1)ATT_{2012b} \tag{23}$$

where $Pr(H_{2010} = 1|H_{2012} = 1)$ and $Pr(H_{2010} = 0|H_{2012} = 1)$ are the proportion of households with and without health insurance in 2010 among households who have health insurance in 2012. The ATT_{2012a} and ATT_{2012b} are defined as follows:

$$ATT_{2012a} = E(Y_1^{2012}|H_{2012} = 1, H_{2010} = 1) - E(Y_0^{2012}|H_{2012} = 1, H_{2010} = 1) \tag{24}$$

$$ATT_{2012b} = E(Y_1^{2012}|H_{2012} = 1, H_{2010} = 0) - E(Y_0^{2012}|H_{2012} = 1, H_{2010} = 0) \tag{25}$$

Here ATT_{2012a} is the average effect of health insurance on people who have health insurance in both 2010 and 2012, whereas ATT_{2012b} represents the average effect of health insurance on the newly insured households in 2012. ATT_{2012a} and ATT_{2012b} will be equal to ATT_{2012} under an assumption that the enrolment in health insurance in 2010 is not correlated with the enrolment in health insurance in 2012. If the assumption does not

hold, we need to make other assumption to identify ATT_{2012}.

First, we can write ATT_{2012} conditional on X as follow:

$$\begin{aligned} ATT_{2012,X} = & Pr(H_{2010} = 1|X, H_{2012} = 1)[E(Y_1^{2012}|X, H_{2012} = 1, H_{2010} = 1) \\ & - E(Y_0^{2012}|X, H_{2012} = 1, H_{2010} = 1)] \\ & + Pr(H_{2010} = 0|X, H_{2012} = 1)[E(Y_1^{2012}|X, H_{2012} = 1, H_{2010} = 0) \\ & - E(Y_0^{2012}|X, H_{2012} = 1, H_{2010} = 0)] \end{aligned} \tag{26}$$

$ATT_{2012,X}$ can be seen as the weighted average of the impact of health insurance on the newly insured households in 2012 and the impact of health insurance on the insured households in both 2010 and 2012 (conditional on X)

We suggest two identification assumptions as follows:

$$\begin{aligned} & E(Y_0^{2012}|X, H_{2010} = 0, H_{2012} = 1) - E(Y_0^{2012}|X, H_{2010} = 0, H_{2012} = 0) \\ & = E(Y_0^{2010}|X, H_{2010} = 0, H_{2012} = 1) - E(Y_0^{2010}|X, H_{2010} = 0, H_{2012} = 0) \end{aligned} \tag{27}$$

$$\begin{aligned} & E(Y_0^{2012}|X, H_{2010} = 1, H_{2012} = 1) - E(Y_1^{2010}|X, H_{2010} = 1, H_{2012} = 1) \\ & = E(Y_0^{2012}|X, H_{2010} = 1, H_{2012} = 0) - E(Y_1^{2010}|X, H_{2010} = 1, H_{2012} = 0) \end{aligned} \tag{28}$$

The first assumption shows that difference in the non-health-insurance outcome (conditional on X) between households uninsured in both the years and those insured only in the year 2012 is constant overtime. The second assumption indicates that difference between the non-health-insurance outcome in the year 2012 and the health-insurance outcome in the year 2010 is the same for households insured in both ears and those insured in 2010 but not in 2012.

Rearrange and then substitute two assumptions (29) and (30) into (28) to get:

$$ATT_{2012,X} = Pr(H_{2010} = 1|X, H_{2012} = 1) \times \begin{pmatrix} [E(Y_1^{2012}|X, H_{2010} = 1, H_{2012} = 1) \\ -E(Y_0^{2012}|X, H_{2010} = 1, H_{2012} = 0)] \\ -[E(Y_1^{2010}|X, H_{2010} = 1, H_{2012} = 1) \\ -E(Y_1^{2010}|X, H_{2010} = 1, H_{2012} = 0)] \end{pmatrix}$$
$$+ Pr(H_{2010} = 0|X, H_{2012} = 1) \times \begin{pmatrix} [E(Y_1^{2012}|X, H_{2010} = 0, H_{2012} = 1) \\ -E(Y_0^{2012}|X, H_{2010} = 0, H_{2012} = 0)] \\ -[E(Y_0^{2010}|X, H_{2010} = 0, H_{2012} = 1) \\ -E(Y_0^{2010}|X, H_{2010} = 0, H_{2012} = 0)] \end{pmatrix} \tag{29}$$

$ATT_{2012,X}$ is identified because all terms in the equation are observed. We can then rearrange it as follows:

$$\begin{aligned} ATT_{2012,X} = & \begin{pmatrix} Pr(H_{2010} = 1|X, H_{2012} = 1)E(Y_1^{2012}|X, H_{2010} = 1, H_{2012} = 1) \\ +Pr(H_{2010} = 0|X, H_{2012} = 1)E(Y_1^{2012}|X, H_{2010} = 0, H_{2012} = 1) \end{pmatrix} \\ & - \begin{pmatrix} Pr(H_{2010} = 1|X, H_{2012} = 1)E(Y_0^{2012}|X, H_{2010} = 1, H_{2012} = 0) \\ +Pr(H_{2010} = 0|X, H_{2012} = 1)E(Y_0^{2012}|X, H_{2010} = 0, H_{2012} = 0) \end{pmatrix} \\ & - \begin{pmatrix} Pr(H_{2010} = 1|X, H_{2012} = 1)E(Y_1^{2010}|X, H_{2010} = 1, H_{2012} = 1) \\ +Pr(H_{2010} = 0|X, H_{2012} = 1)E(Y_0^{2010}|X, H_{2010} = 0, H_{2012} = 1) \end{pmatrix} \\ & - \begin{pmatrix} Pr(H_{2010} = 1|X, H_{2012} = 1)E(Y_1^{2010}|X, H_{2010} = 1, H_{2012} = 0) \\ +Pr(H_{2010} = 0|X, H_{2012} = 1)E(Y_0^{2010}|X, H_{2010} = 0, H_{2012} = 0) \end{pmatrix} \end{aligned} \tag{30}$$

Conditional on X and H_{2010}, we can express ATT_{2012} as follows:

$$\begin{aligned} ATT_{2012,X,H_{2010}} = & [E(Y_1^{2012}|X, H_{2010}, H_{2012} = 1) - E(Y_0^{2012}|X, H_{2010}, H_{2012} = 0)] \\ & - [E(Y^{2010}|X, H_{2010}, H_{2012} = 1) - E(Y^{2010}|X, H_{2010}, H_{2012} = 0)] \end{aligned} \tag{31}$$

Where Y^{2010} are the observed outcomes in 2010. This suggests a simple way of matching.

The treatment group includes households who have health insurance in 2012. The control group includes households who do not have health insurance in 2012, but have the observed characteristics (X variables) and health insurance status in 2010 (H_{2010} variable) similar to those of the treatment group. In this case, we control not only X but also H_{2010}.

Then we employ Rosenbaum & Rubin (1983) to match the uninsured and the insured using the probability of being assigned into the program, which is called the propensity score. In this study, the propensity score is the probability of being insured in 2012 given variables X and H_{2010}. With different estimators, we have different number of the uninsured who are matched with the insured. In this study, we use kernel matching estimators. The standard errors are calculated using bootstrap techniques.

The validity of propensity score matching (PSM) depends on two conditions: unconfoundedness or conditional independence (or unobserved factors do not affect participation) and sizable common support or overlap in propensity score across treatment and control groups (or enough nonparticipants to match with participants). Therefore, the PSM estimation is more accurate when only observed characteristics are believed to affect the enrollment and baseline data with a wide range of preprogram characteristics are available.

In this paper, data with various characteristics in 2010 are used as the baseline data. Risk aversion indexes, which possibly affect both health insurance enrollment and vulnerability, are employed to limit the unobserved selection. The common support is checked through the propensity score estimation. The difference-in-difference method is used to control the unobserved time-invariant characteristics. Finally, an indirect test for potential confounders is provided to confirm the use of PSM.

Model specification for robustness analysis

To check the robustness of the matching method, we treat the data set as a panel data set (Jones et al. 2013). Then the impact of owning health insurance on the utility loss of

households can be addressed by adopting the following specification:

$$V_{it} = \alpha + \beta HI_{it} + \gamma HS_{it} + \delta.RA_{it} + \lambda S_{it} + \mu_{it} + C_t + \varepsilon_{it} \tag{32}$$

where: V_{it} denotes the idiosyncratic vulnerability index which is estimated by vulnerability as low expected utility (VEU); i refers to the household; t denotes the time when data was collected.

HI_{it} represents the number of health insurance cards that a household has over the study period. From the data set, households might have health insurance in two surveys, or they may not have any health insurance in both surveys. They can also have insurance in only one surveys. Therefore, in this study, we assign this variable different values. It can be the total health insurance in two surveys, or it can be a dummy reflecting whether households have health insurance or not in a certain survey[17]. β reflects the impact of health insurance coverage on vulnerability.

HS_{it} denotes the health status, and is measured by the total number of days household members could not work because of illness within the 12 months prior to the interview.

RA_{it} is the risk aversion index, showing how much a household dislike risk. Both absolute risk aversion index and cumulative risk aversion index are used.

S_{it} is used to control for impact of covariate shocks that a household experienced in the past three years. Those shocks include droughts, floods, epidemics, livestock diseases, and other shocks.

X_{it} is the vector of baseline characteristics of households at the time of interview. They include household per capita income, asset, head age, marital status, female share, dependent share, education, agricultural job.

C_t represents any commune impact. This includes total number of households in the commune, whether a commune is poor or not, poverty rate, distance to the regular

[17]In our sample of VARHS 2012 there are four households that have two voluntary health insurances (these account for 0.2% of sample); we decided to treat these households as if they had only one health insurance. The category representing health insurance therefore defines whether a household has at least one health insurance.

market, having a secondary school or not, distance to the bus station.

In general, simultaneity bias exists if there is a positive correlation between health insurance coverage and unobserved factors that lead to changes in the vulnerability index. For example, sick vulnerable households have more incentive to have health insurance. In addition, high-income households and risk-averse households might try to buy health insurance. As a result, we would over-estimate the causal effect of health insurance on household vulnerability. However, by adding health status, risk aversion and income into the model, there is a small possibility of causal effects from correlation between health insurance coverage and household vulnerability and the simultaneity bias is least likely to present.

Also, the panel data has several observations per individual. The individual's error term may have some common components that are present for each period. The error terms for each individual may show an inter-correlation within the "cluster" of observations specific to the individual. To relax the usual assumption of zero error correlation over time for the same individual, we can adjust the estimator using cluster corrected standard errors. This also relaxes the assumption of homoscedasticity (Adkins & Hill 2011).

Theoretically, this specification can be estimated by fixed effects model, random effect model, or first difference depending on the assumption of the error term ε_{it}. However, our panel data set has only two waves and households might have health insurance card in both years. As a result, when we use a dummy to represent the health insurance enrollment in each year, the fixed effect and first difference method will treat households who are insured in both year and households who are uninsured in both years the same. Therefore, the best estimator is in this case is the random effect estimator although we can also employ the between estimator. For the random effect estimation to be consistent, we assume that the composite error term ε_{it} is not correlated with any of the explanatory variables included in the model (Gujarati 2011, Jones et al. 2013).

6 Econometric results and discussion

Measuring vulnerability as expected poverty (VEP)

The results of the income function are presented in Table 4, where the FGLS regression results for Equations 6 and 7 are shown for surveys in 2010 and 2012 continuously. In general, the sign of estimated coefficients are as expected, reflecting their effects on income as in the literature.

As can be seen from Table 4, the coefficient of age of household head was positive and significant in both 2010 and 2012, confirming that a household with an older head tends to have higher per capita income. A household with a higher share of females has a lower per capita income, as the estimated coefficients are negative and significant. As expected, the coefficients of dependency burden are negative and significant in both surveys, showing that a household with many old or many young members tends to have lower level of income. The correlation between the marital status of a household head and household income is unclear when the signs of estimated coefficients are positive, but statistically insignificant. The estimated coefficients reflecting the highest level of education of household members are significantly positive, reflecting the fact that a household with a higher level of education has a higher per capita income. In this study, agricultural households are more likely to have a higher income as the dummy coefficients are significant and positive. This might be because all households in this data set are from rural areas. The results also suggest that households living in communes with higher incidence of poverty or residing in areas far away from bus station tend to have lower income.

From the estimates of consumption and the variance of disturbance term in Table 4, we adopt Chaudhuri's measure to calculate each household's vulnerability using Equation 8. Assuming that the log consumption has a normal distribution, we estimate the likelihood that a household's future income is lower than the poverty line. The poverty line used in this study are the national poverty line generated from household income by MOLISA[18].

[18]During 2010 - 2012, the MOLISA income poverty line is VND 4.8 million/person/year (equivalent

Table 4: Estimates of Vulnerability as Expected Poverty in Vietnam 2002, 2004, 2006

	2010		2012	
Variable	Log(Cons)	Variance	Log(Cons)	Variance
headage	0.017*	0.055*	0.029**	0.019
	(1.74)	(1.70)	(2.52)	(0.55)
married	0.042	0.026	0.056	-0.239
	(0.80)	(0.15)	(1.05)	(-1.11)
headage2	-0.0001	-0.0005	-0.0002**	-0.0001
	(-1.55)	(-1.57)	(-2.04)	(-0.34)
femaleshare	-0.249***	0.149	-0.217**	0.224
	(-2.61)	(0.52)	(-2.45)	(0.72)
dependshare	-0.651***	-0.048	-0.534***	-0.929***
	(-8.57)	(-0.19)	(-6.27)	(-3.60)
highestedu	0.145***	0.028	0.108***	0.068
	(7.43)	(0.50)	(5.45)	(1.14)
agrhh	0.108**	0.153	0.265***	0.083
	(2.47)	(1.35)	(5.65)	(0.61)
totalhousehold	0.00002	0.0001	-0.000	-0.00004
	(0.61)	(1.43)	(-0.12)	(-0.61)
targetcommune	0.088	0.083	0.090*	0.402
	(1.64)	(0.65)	(1.81)	(3.08)
povertyrate	-1.378***	0.126	-0.983***	-0.462
	(-6.35)	(0.21)	(-5.83)	(-1.38)
regularmarket	-0.076	-0.024	-0.106	0.172
	(-1.52)	(-0.17)	(-1.58)	(0.97)
secondaryschool	0.153*	0.095	0.093	0.060
	(1.71)	(0.44)	(1.15)	(0.33)
distance2bus	-0.004**	-0.008*	-0.002	-0.002**
	(-2.25)	(-1.91)	(-3.26)	(-2.31)
_cons	8.785***	-4.096***	8.214***	-2.918**
	(28.49)	(-4.12)	(22.74)	(-2.51)
N	1975	1975	1977	1977
R^2	0.2195	0.0081	0.1950	0.0228
F	30.46	1.04	20.62	2.99
Prob>F	0.000	0.4076	0.000	0.0003

Note: t statistics in parentheses
* p <0.05, ** p <0.01, *** p <0.001

Table 5: Summary of estimated VEP in 2010 and 2012

	VEP 2010	VEP 2012
Observation	1942	1944
Mean	0.1295347	0.2736287
Standard Deviation	0.1911949	0.2527675
Min	0.00000183	0.0009027
Max	0.9881003	0.9997653

Source: Author's calculation from VARHS 2010 and 2012

Next, the vulnerability index is the probability of being poor according to the national standard. A summary of the estimated VEP in 2010 and 2012 is presented in Table 5. On average, rural households in Vietnam had a 12.95 per cent probability of falling into poverty in 2010 and this number increased to 27.36 per cent in 2012.

Measuring vulnerability as low expected utility (VEU)

The consumption estimation for Equation 16 is presented in Table 6. As can be seen from this table, communes with a higher population might have higher food consumption because there must be more purchasing activities or more food shops. The positive and significant coefficient of the regular market variable probably supports this explanation. If a commune has a regular market, its average food consumption will increase. Similarly, communes with a secondary school can be expected to have a higher level of food consumption, as the coefficient is significant and positive. In contrast, the estimated coefficients of both the target commune and poverty rate are significantly negative. These imply that when a commune is one of the targeted communes or has a higher incidence of poverty, it will experience a lower average level of food consumption.

Table 7 provides the results from the Panel IV estimation for Equation 19. Since some explanatory variables are time-invariant, we can only use the random effect regression[19].

USD 240).

[19]The random effect regression has been used previously to calculate VEU in (Gaiha & Imai 2008) and (Jha et al. 2010).

Table 6: Covariate risk component (Panel random effect)

Variable	Per capita food consumption
totalhousehold	0.0000496
	(3.33)***
targetcommune	-0.0662523
	(-2.96)***
povertyrate	-0. 6435118
	(-9.22)***
regularmarket	0.0479312
	(1.70)*
secondaryschool	0.0818515
	(1.86)*
distance2bus	-0.0005328
	(1.33)
_cons	0.908447
	(12.16)***
Number of observations	3963
Number of groups	1988
Join significance	Wald $chi^2(6)$=250.01
	Prob>chi^2=0.0000
Hausman test: fixed vs random effect*	$chi^2(6)$=24.53*
	Prob>chi^2 = 0.0004

Notes: p<0.1; ** p<0.05; *** p<0.01. Standard error adjusted for 1988 clusters. Robust z statistics in parentheses.

* The Hausman test supports the use of fixed effect regression. However, according to Clark & Linzer (2014), when the independent variable exhibits only minimal within-unit variation, the random-effects model will tend to produce superior estimates of β when there are few units or observations per unit, and when the correlation between the independent variable and unit effects is relatively low. An increase in efficiency can offset an increase in bias.

In the first stage, total land area owned by a household, and per capita of productive assets (including feed grinding machine, rice milling machine, grain harvesting machine, tractor and plough) are used as instruments for income. It is reasonable that these variables firstly affect income, and then indirectly affect consumption. These instruments for income are also specified in Gaiha & Imai (2008), Jha et al. (2010) and Jha et al. (2013). The Hansen-Sargan statistic of the over-identification test shown in Table 7 indicates that the instruments used in this situation are valid.

Results in the first stage estimation show strong evidence of a relationship between productive assets and household income. Similarly, having more land would increase household income as expected. Other household characteristics also contribute to the level of household income. For example, households with an older head tend to have higher incomes. The negative sign of the head age squared coefficient implies that the marginal effect of age on income will reduce when the head becomes older. If the head is married or any household member experienced a better education, then household income tends to increase. However, a household with a higher share of females or dependents will face a lower level of per capita income. As can be seen from Table 7, in the second stage, the income coefficient is highly significant and positive. This result suggests that per capita income largely determines household food consumption. Marital status of the household head and the education levels of household members both affect household food consumption positively while dependents and agriculture as the only source of income are factors which reduce food consumption. Living in a more populated area contributes slightly to a higher level of household food consumption. In addition, if households reside in a commune with a regular market, their food consumption may increase. As expected, households in poorer communes and targeted communes have lower food consumption. Surprisingly, distance to a bus station is positively correlated with food consumption.

The results obtained from Equation 15 and Equation 16 are used to derive $E(c_{it}|\bar{X}_t)$ and $E(c_{it}|\bar{X}_t, X_{it})$. We then calculate the mean of normalized food consumption to obtain Ec_{it} as shown in Equation 14. Finally, we use the utility function 13 to estimate four

Table 7: Idiosyncratic risk component (Panel random effect IV model)

Variable	First stage (pc income)	Second stage (pc consumption)
ntotalincome		0.3191125
		(6.71)***
headage	0.0326934	0.0103375
	(4.53)***	(1.59)
married	0.2094052	0.1413307
	(5.71)***	(4.13)***
headage2	-0.0002982	-0.0000812
	(-4.51)***	(-1.36)
femaleshare	-0.2029016	-0.0313423
	(-3.00)***	(-0.52)
dependshare	-0.1901757	-0.136678
	(-3.35)***	(-2.69)***
highestedu	0.0967099	0.0868081
	(6.86)***	(6.63)***
agrhh	0.0066595	-0.1872426
	(0.25)	(-8.02)***
totalhousehold	0.0000121	0.0000405
	(0.95)	(3.64)***
targetcommune	0.135024	-0.1037634
	(5.53)***	(-4.48)***
povertyrate	-1.01589	-0.3393418
	(-13.44)***	(-4.21)***
regularmarket	-0.0011191	0.0565362
	(-0.04)	(2.12)**
secondaryschool	0.0356218	0.06378
	(0.88)***	(1.79)*
distance2bus	-0.0017999	0.001261
	(-2.81)***	(2.23)**
totalland	0.1040897	
	(17.11)***	
productiveasset	0.4654674	
	(4.93)***	
_cons	-0.0316537	0.1290584
	(-0.14)	(0.66)
Number of observations	3952	3952
Join significance	Wald $chi(15)$=884	Wald $chi^2(14)$=663.15
Prob>chi^2	0.0000	0.0000
Sargan-Hansen test for	$Chi^2(1)$=1.210	
over-identification restriction	Prob>chi^2=0.2713	

Notes: p<0.1; ** p<0.05; *** p<0.01. Robust z statistics in parentheses.

Table 8: Decomposition of average vulnerability during 2010-2012

VEU	Poverty	Covariate risk	Idiosyncratic risk	Unexplained risk
0.7108	0.4314	-0.3410	0.4288	0.1905

Source: Author's calculation from VARHS 2010 and 2012.

components of Equation 12. A household's VEU is the sum of four separate components. The aggregate VEU and its components are presented in Table 8. The estimate of the average VEU (0.7108) is our estimate of the vulnerability of the whole households. This implies that the utility of the average household is 71 per cent less than the hypothetical situation without any risk or inequality in consumption. This level of utility vulnerability is lower than the estimation of Gaiha & Imai (2008) which is 0.7476 but much higher than the estimation of Jha et al. (2013) which is around 0.3016. Idiosyncratic shocks contribute considerably to the utility loss (approximately 60 per cent). However, the negative sign of the aggregate risk component indicates that economic growth cancels the negative covariate shocks and even reduce the vulnerability. We may argue that the utility loss would be more serious if there had been less economic growth in rural Vietnam during the period of 2010-2012.

Impact of health insurance on VEU and VEP

To estimate the impact of health insurance on vulnerability, we first calculate the propensity scores for households covered in the data set. The probit regression is employed to estimate the propensity score by default[20]. The dependent variable is health insurance coverage which is represented by a dummy taking the value of one for the treatment group and zero for the control group. There are two requirements for the explanatory variables in order to get an accurate estimation of the propensity scores. First, the independent variables need to be exogenous to the health insurance variable used as the dependent variable (Heckman & Vytlacil 1999, Ravallion 2001). Therefore, we decide to choose ex-

[20]The Stata command *pscore* is employed in this study and the probit is used to estimate propensity score by default. The balancing test is also provided. The estimated results are similar with the Stata command '*psmatch2*' (Table A2).

planatory variables from the 2010 VARHS rather than from the 2012 VARHS. Second, the independent variables should affect both the vulnerability index and health insurance coverage (Ravallion 2001). In this study, these variables include health insurance status in 2010, health status, risk aversion, income, asset, age of household head, marital status of the head, female share of the household, dependent share of the household, occupation and distance to the nearest bus station. Other commune variables representing the covariate shocks that might affect health insurance decision such as drought, flood, epidemic, livestock disease and other shocks are also added to the regression. They are all for the year 2010[21].

One might have a concern that compulsory and voluntary health insurance schemes are treated equivalently in our analysis. However, during the time span of the data, the difference between the two schemes would be trivial because of certain reasons: First, the compulsory health insurance scheme in Vietnam is not strictly compulsory and therefore, the coverage rate of this scheme is not 100 per cent for all groups of households (Table 5). Households who are not fully subsidized in compulsory groups will go through a decision making process similar to what households in voluntary groups will do. In addition, the premium is quite small in comparison with other types of consumption; then although households in compulsory groups are partly subsidized, the amount of money they have to pay for a health insurance card is not much different from that of households in voluntary scheme. Also, health insurance for the poor and health insurance for children under six years of age, who are compulsorily insured and fully subsidized, are excluded to keep the incentive gap at the minimal level. For households with labor contract, they are supposed to receive health insurance card from their employers. But if employers refuse to provide health insurance illegally and intentionally, employees can choose to stay or find a better job with health insurance (Monheit & Vistnes 2008). Hence, their probability of having a health insurance card might depend on their risk preference or factors representing their negotiating power such as education, age rather than types of health insurance schemes.

[21]The balancing property is satisfied for 7 blocks with the *pscore* Stata command.

Table 9 shows the results of the probit regression on health insurance. As can be seen from the table, the insured and the uninsured household are statistically different in several characteristics. For instance, households who have health insurance in 2010 are more likely to have health insurance in 2012. Households with a higher income tend to own at least one health insurance in 2012. Households with higher proportion of females increase the probability of purchasing health insurance. Similarly, households living in an area with a high incidence of epidemics tend to have health insurance. However, living in a commune with a high incidence of drought and livestock disease reduce the probability of purchasing health insurance. This might be because these types of risks do not affect household member's health status. Also, households with agricultural jobs or with a higher dependent share have less demand on health insurance. In our study, health status defined by the number of days on sick leave during past 12 month (in survey 2010) does not affect health insurance status in 2012.

In our paper, it seems that risk aversion indexes (both the cumulative risk aversion and the absolute risk aversion) do not affect the decision to purchase health insurance because the estimated coefficients are negative and insignificant (Table 9)[22]. This result contrasts with Condliffe & Fiorentino (2014) where individuals who are more likely to engage risk behavior are less likely to carry health insurance. There are four possible reasons for this. First, risk aversion effect in our paper is offset by 'rigidity effect' that individuals are least likely to change their current insurance plan. Several previous studies have pointed out that individuals tend to appreciate the value of their current health insurance plan; therefore, they are less likely to purchase health insurance if they have never bought it before (Costa-Font & Garcia-Villar 2009, Friedman 1974, Marquis & Holmer 1996)[23]. In our result, the impact of health insurance status in 2010 was positive and strongly significant. Therefore, we have reason to believe that the 'rigidity effect' exists. Second,

[22]In Table A3 in the Appendix, we classified households into three different groups of risk attitude and found that households with low risk aversion (i.e. prefer taking risk) are more likely to have health insurance.

[23]Thaler (1980) calls this the "endowment effect"; Samuelson & Zeckhauser (1988) call this a "status quo" bias; and Costa-Font & Garcia-Villar (2009) call this the "captive preference".

households might prefer other types of insurance over health insurance because the gain from health insurance is uncertain and ambiguous (Marquis & Holmer 1996)[24]. Third, the effect of individual risk aversion might be stronger for decisions taken in the near future and then might reduce considerably in next two years (which is the duration between the two surveys). Once we try to estimate the impact of risk aversion on any type of insurance coverage, we find the positive and significant effects in the same year but not significant in the next two years (Table A4 and Table A5 in Appendix)[25]. Similarly, Bernstein (2009) shows that risk preference does not explain the disparity in health insurance coverage and any increase in insurance coverage is closely associated with changes that result in insurance being more affordable and accessible such as in socio-economic circumstances, incomes, marital status and education. Four, this might reflect the fact that the market for health insurance is limited and mainly provided by few state companies. A health insurance purchasing decision is restrained not only by limited health insurance choices, but also by the complicated purchasing process. For instance, households are strictly required to enroll all household members who have a name on the household certificate, despite the fact that some members had migrated to other places. The complexity for enrolment criteria and process hinders the increase of the coverage as pointed out in Matsushima & Yamada (2014).

Table 10 reports the health insurance impact on vulnerability using propensity score matching and the difference-in-difference method. The kernel-matching estimator is applied with a bandwidth of 0.06 for interpretation[26]. The first and second columns present the difference between treatment and control groups in 2012 and 2010, respectively. They are estimated components of $ATT_{2012,X,H_{2010}}$. Therefore, the difference-in-difference estimates in the last column are attributed to the health insurance impact, or $ATT_{2012,X,H_{2010}}$.

[24]Vietnamese newspapers note that in Phuong (2013) and Trang (2012).

[25]However, we cannot deny that simultaneous bias with this specification because independent variable and dependent variables in the probit model are collected in the same survey.

[26]Bootstrapping for the nearest neighbour matching may not provide accurate standard errors (Abadie & Imbens 2008) even though the nearest neighbour matching and the kernel matching yield similar results.

Table 9: Logit regression of health insurance (with risk aversion index)

	Cumulative risk aversion index		Absolute risk aversion index	
insurance20121	Coefficient	Std. Err.	Coefficient	Std. Err.
insurance20101	0.4493***	0.1096	0.4529***	0.1093
healthstatus	-0.0001	0.0004	-0.0002	0.0004
riskaversion1	-0.0123	0.0284		
abriskaversion1			-0.0716	0.0606
lpcincome	0.2422***	0.0461	0.2428***	0.0460
headage	0.0061	0.0196	0.0060	0.0196
married	0.1101	0.0978	0.1111	0.0978
headage2	0.0001	0.0002	0.0001	0.0002
femaleshare	0.3939**	0.1867	0.3981**	0.1868
dependshare	-0.3992***	0.1543	-0.4028***	0.1543
agrhh	-0.2118***	0.0748	-0.2154***	0.0749
distance2bus	-0.0048	0.0030	-0.0047	0.0030
asset	-0.0890	0.0590	-0.0881	0.0590
drought	-0.0126**	0.0051	-0.0127**	0.0050
flood	-0.0016	0.0039	-0.0018	0.0039
epidemic	0.1712*	0.0891	0.1664*	0.0890
livestock	-0.0114***	0.0042	-0.0112***	0.0042
othershock	0.0197	0.0131	0.0195	0.0131
_cons	-3.2029***	0.6870	-3.1893***	0.6843
Number of obs	1988		Number of obs	1988
LR $chi^2(17)$	195.46		LR $chi^2(17)$	196.65
Prob $>chi^2$	0.0000		Prob $>chi^2$	0.0000
Log likelihood	-1100.671		Log likelihood	-1100.074
Pseudo R^2	0.0815		Pseudo R^2	0.0820

Notes: t statistics in parentheses
* p <0.05, ** p <0.01, *** p <0.001

Table 10: Impact of health insurance on vulnerability

	2012	2010	Difference-in-difference
Covariate risk	0.16***	0.22***	-0.06***
	(4.941)	(6.976)	(-13.338)
Idiosyncratic risk	-0.51**	-0.16***	-0.35**
	(-2.131)	(-4.202)	(-2.243)
VEP	-0.08***	-0.03***	-0.05***
	(-9.446)	(-4.736)	(-7.95)

Notes: *pscore*-Kernel matching with bandwidth of 0.06

Table 10 shows that health insurance coverage has significantly reduced household vulnerability. More specifically, the impact of health insurance on the idiosyncratic component of VEU is -0.35. Now recall that in the estimates from our whole sample, idiosyncratic component causes around 0.43 (or 43 per cent) of utility loss (Table 8). That means health insurance reduces 35 percentage points of utility loss caused by idiosyncratic shocks. In other words, on average, health insurance helps rural households in Vietnam reduce the idiosyncratic component of utility loss by 81 per cent. In addition, the impact of health insurance on the probability of falling into income poverty (VEP) is -0.05 (or -5 per cent). From our previous estimates in Table 5, on average, households in 2012 have a 27 per cent probability of falling into poverty. That means health insurance helps rural households in Vietnam reduce the probability of being poor by about 19 per cent.

Robustness analysis

We examine the robustness of the matching method by treating the data set as a panel data set. The independent variable in the regression is utility loss index due to idiosyncratic shocks because health problems are classified into idiosyncratic shocks. Therefore, the regression is an attempt to estimate the effect of health insurance coverage on idiosyncratic shocks when applicable. The random effect estimator is used because some explanatory variables are time-invariant or have minimal within-unit variation[27]. One

[27]P values in Hausman tests ranges from 0.0641 to 0.1145, showing that we cannot reject the REM at 5%. However, we take the results from the Hausman test with caution for some reasons: 1) According

example is our key explanatory variable representing health insurance coverage. Risk aversion index is used as an explanatory variable in addition to other household characteristics and commune characteristics so that we can minimize the possible correlation between error term and explanatory variables.

Table 11 reports the results for the models used to estimate the impact of health insurance coverage on household vulnerability. Absolute risk aversion index is used as an explanatory variable in this case[28]. Without control variables, the estimated coefficient of health insurance is -0.26 and significant. This implies health insurance coverage helps to reduce utility loss by 26 percentage points. Using the between estimator for panel data, we have larger impact of health insurance at -0.56. If we add household characteristics and commune characteristics into the regression, the random effect estimator produces an impact of health insurance of about -0.23 and the between estimator gives an impact of around -0.49.

Because of the data collection timing, we do not know when households bought health insurance. It could have been at the beginning or at the end of the year. Therefore, we assume that the impact of health insurance coverage should be the impact of total health insurance during the time between the two surveys. Therefore, in our regression, the explanatory variable becomes the total health insurance that a household has during 2010 and 2012. The number is the sum of health insurance they have in the 2010 survey and in the 2012 survey. Dependent variables are the same. As seen in Table 12, with the random effect estimator, having a health insurance will reduce utility loss about -0.21. Similarly, with the between estimator, the impact of health insurance is about -0.24. Although these results are not exactly the same as the estimates from the matching method, they

to Jones et al. (2013), in a finite sample, a standard application of the Hausman test may not lead to a reliable test statistic. 2) According to Clark & Linzer (2014), when the independent variable exhibits only minimal within-unit variation, the random-effects model will tend to produce superior estimates of β when there are few units or observations per unit, and when the correlation between the independent variable and unit effects is relatively low. An increase in efficiency can offset an increase in bias even the Hausman test supports the use of fixed effect regression.

[28]Results with cumulative risk aversion index are also provided in the Table A10 and A11 of Appendix. Hausman tests favour REM because p-values vary from 0.0771 to 0.1321.

Table 11: Impact of health insurance coverage on idiosyncratic VEU (health insurance at the time of interview, absolute)

	Random effect	Between variation	Random effect	Between variation
Health insurance (Yes/No at the time of interview)	-0.261***	-0.558***	-0.231***	-0.486**
	(0.043)	(0.160)	(0.069)	(0.167)
Absolute risk aversion	-0.164*	-0.082	-0.129*	-0.104
	(0.088)	(0.165)	(0.076)	(0.163)
Health status	-0.030	-0.009	-0.068	-0.067
	(0.032)	(0.065)	(0.059)	(0.066)
Per capita income (log)	-0.270***	-0.251***	-0.174***	-0.163**
	(0.058)	(0.060)	(0.045)	(0.066)
Household characteristics	No	No	Yes	Yes
Commune characteristics	No	No	Yes	Yes
N	3952	3952	3952	3952
R^2		0.019		0.066
F		9.524		5.991
p	0.000	0.000	0.000	0.000

Notes: Standard errors in parentheses
* p <0.05, ** p <0.01, *** p <0.001

Table 12: Impact of health insurance coverage on idiosyncratic VEU
(total health insurances across surveys, absolute)

	Random effect	Between variation	Random effect	Between variation
Health insurance	-0.274***	-0.269***	-0.214***	-0.235**
(Total insurance across surveys)	(0.044)	(0.080)	(0.057)	(0.084)
Absolute risk aversion	-0.164*	-0.082	-0.133*	-0.105
	(0.088)	(0.165)	(0.077)	(0.163)
Health status	-0.029	-0.008	-0.070	-0.066
	(0.032)	(0.065)	(0.059)	(0.066)
Per capita income (log)	-0.239***	-0.251***	-0.161***	-0.163**
	(0.055)	(0.060)	(0.043)	(0.067)
Household characteristics	No	No	Yes	Yes
Commune characteristics	No	No	Yes	Yes
N	3952	3952	3952	3952
R^2		0.018		0.065
F		9.273		5.961
p	0.000	0.000	0.000	0.000

Notes: Standard errors in parentheses
* p <0.05, ** p <0.01, *** p <0.001

reinforce our findings about the negative and significant impact of health insurance coverage on household vulnerability. Although we have captured various factors in our model specification and the difference-in-difference method helps to eliminate the impact of unobserved time-invariant factors, there is still a concern about other unobserved variables that might affect both health insurance enrolment and vulnerability. If this situation exists, our matching estimators violate the conditional independence or unconfoundedness assumption (CIA) and may lead to a hidden bias. In this paper, we adopt a sensitivity analysis proposed by Ichino et al. (2008), building on Rosenbaum & Rubin (1983) and Rosenbaum (1987). They suggest that if the CIA is not satisfied given observables but it is satisfied if one could observe an additional binary variable (confounder), then this potential confounder could be simulated in the data and used as an additional covariate in combination with the preferred matching estimator. The comparison of the estimates obtained with and without matching on the simulated confounder shows to what extent the baseline results are robust to specific sources of failure of the CIA, since the distribu-

Table 13: Simulation-based sensitivity analysis for matching estimators (2010, confounders: young and low education)

	ATT_{2010}	Standard error	Outcome effect	Selection effect
Young	-0.147	0.008	1.623	0.456
Low education	-0.154	0.004	3.552	0.582

Notes: Based on the sensitivity analysis with kernel matching algorithm with between-imputation standard error. The binary transformation of the outcome is along the 75 centile. Young variable (=1 if age is less than 41 years, or the 25 centile) and low education (=1 if households do not have any certificate). Both the outcome and the selection effect are odds ratios from logit estimations.

tion of the simulated variable can be constructed to capture different hypotheses on the nature of potential confounding factors (Nannicini 2007).

In this study, we use two covariates to simulate the confounder namely: young (age of household head is less than 47, or in the 25th centile of age distribution) and low education (with no diploma). These covariates are selected to capture the effect of unobservable factors like ability and experience. If the ATT estimates change dramatically with respect to these confounders, our results might be not robust. We employ the kernel matching algorithm with between-imputation standard errors. Since our outcome variable is continuous, the confounders is stimulated on the basis of the binary transformation of the outcome along the 75th centile. The results of the sensitivity analysis are presented in Table 13 and Table 14. For both confounders, the simulated ATT estimated are very close to the baseline estimates. The outcome and selection effect on vulnerability is positive but not very large. The results confirm a robustness of the matching estimates.

7 Policy implication and conclusion

Health shocks are one of the major cause of vulnerability and poverty in Vietnam. Therefore, the government of Vietnam has endeavored to increase the health insurance enrollment in order to attain its goal of universal health insurance coverage. This paper is an attempt to provide empirical evidence for an effective health policy in Vietnam. To the

Table 14: Simulation-based sensitivity analysis for matching estimators (2012, confounders: young and low education)

	ATT_{2012}	Standard error	Outcome effect	Selection effect
Young	-0.512	0.043	1.206	0.440
Low education	-0.508	0.039	2.572	0.565

Notes: Based on the sensitivity analysis with kernel matching algorithm with between-imputation standard error. The binary transformation of the outcome is along the 75 centile. Young variable (=1 if age is less than 41 years, or the 25 centile) and low education (=1 if households do not have any certificate). Both the outcome and the selection effect are odds ratios from logit estimations.

best of our knowledge, this study is the first empirical paper measuring the impact of health insurance coverage on household ex-ante vulnerability.

Using the propensity score matching method and data from Vietnam Access to Resources Household Surveys (VARHS) during 2010-2012, we investigate whether health insurance coverage has any impact on the probability of falling into poverty (VEP) and the magnitude of utility loss (VEU). In particular, household's risk behavior has been taken into account when measuring health insurance demand. Our estimates show that health insurance helps rural households in Vietnam reduce the idiosyncratic component of utility loss by 81 per cent. In addition, health insurance helps rural households in Vietnam reduce the probability of being poor by about 19 per cent. The study's findings suggest that the expansion of health insurance enrollment should be encouraged to reduce household vulnerability. The fact that higher income increase probability of purchasing health insurance suggests that government's subsidies for health insurance purchasers will boost the enrollment expansion. However, the reverse effect of the risk aversion on health insurance enrollment implies not only a potential 'rigidity' effect on health insurance demand but also deficiencies in health insurance market. Therefore, to expand the breadth of coverage from the demand side, the government should enrich information, education and communication about health insurance. Simultaneously, from the supply side, the government should issue health insurance card along with reduction of unnecessary bureaucracy.

Finally yet importantly, although we have reasons to believe the estimation bias in this paper is minimal, future studies could improve upon our results if the data improves in certain regards. First, the two identification assumptions in the PSM method can be checked. In addition, questionnaires about the household health insurance coverage can help to differentiate between compulsory and voluntary schemes; and questionnaires about risk attitudes should be designed to increase the payoff and therefore, draw attention to the answers.

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Appendix

Table A1: Risk attitude from different lotteries and *implied* λ^{risk}= $\omega^{*}(6000\alpha/\text{Loss}\beta)$, ω=$w^{+}(0.5)/w^{-}(0.5)$

	Risk behavior (Lottery choice category)	Percent in year 2010	Percent in year 2012	Implied acceptable loss Thousand VND	Implied ^{risk} under different assumptions of probability weights and diminishing sensitivities for gains and looses (1) $\omega = 1$ $\alpha = 1$ $\beta = 1$	(2) $\omega = 1$ $\alpha = 0.95$ $\beta = 0.92$	(3) $\omega = 0.86$ $\alpha = 1$ $\beta = 1$	(4) $\omega = 0.86$ $\alpha = 0.95$ $\beta = 0.92$
1.	Reject all lotteries	68.00	61.60	<2	>3	>3.57	>2.58	>3.07
2.	Accept lottery a, reject lotteries b to f	3.85	9.63	2	3	3.57	2.58	3.07
3.	Accept lotteries a and b, reject lotteries c to f	12.22	11.90	3	2	2.46	1.72	2.11
4.	Accept lotteries a to c, reject lotteries d to f	9.40	9.96	4	1.5	1.89	1.29	1.62
5.	Accept lotteries a to d, reject lotteries e to f	4.07	4.75	5	1.2	1.54	1.03	1.32
6.	Accept lotteries a to e, reject lotteries f	1.66	0.19	6	1	1.30	0.86	1.12
7.	Accept all lotteries	0.78	1.97	≥7	≥0.86	≥1.13	≥0.74	≥0.97

Notes: The strategy of Gächter et al. (2010) is adopted to choose sensitivity parameter. Parameters on diminishing sensitivity are extracted from Booij & Van de Kuilen (2009) and parameters on ω are from Abdellaoui (2000). (1) Benchmark parameters: no probability weighting, and no diminishing sensitivity. (2) No probability weighting, but diminishing sensitivity. (3) Probability weighting, but no diminishing sensitivity. (4) Probability weighting, and diminishing sensitivity.

Table A2: Impact of health insurance on vulnerability (*psmatch2*)

	2012	2010	Difference-in-difference
Covariate risk	0.14***	0.20***	-0.06***
	(3.42)	(4.63)	(-7.30)
Idiosyncratic risk	-0.49***	-0.14***	-0.35***
	(-3.67)	(-2.93)	(-2.79)

Notes: *psmatch2*-Kernel matching with bandwidth of 0.06

Table A3: Logit regression of health insurance (group dummy)

	Cumulative risk aversion group		Absolute risk aversion group	
insurance20121	Coefficient	Std. Err.	Coefficient	Std. Err.
insurance20101	0.4548***	0.1095	0.4369***	0.1100
healthstatus	-0.0002	0.0004	-0.0003	0.0004
riskavermed	-0.0967	0.0728		
riskaverlow	0.3544***	0.1187		
abrisk1med			0.0378	0.0652
abrisk1low			0.7912***	0.1806
lpcincome	0.2454***	0.0462	0.2436***	0.0461
headage	0.0079	0.0196	0.0083	0.0197
married	0.1161	0.0978	0.1166	0.0984
headage2	0.0001	0.0002	0.0001	0.0002
femaleshare	0.3698**	0.1873	0.4365**	0.1880
dependshare	-0.3897**	0.1546	-0.4091***	0.1546
agrhh	-0.2007***	0.0750	-0.2091***	0.0751
distance2bus	-0.0060**	0.0030	-0.0047	0.0030
asset	-0.0913	0.0593	-0.0900	0.0594
drought	-0.0124**	0.0051	-0.0108**	0.0051
flood	-0.0016	0.0039	-0.0026	0.0039
epidemic	0.1797**	0.0890	0.1522*	0.0900
livestock	-0.0120***	0.0043	-0.0121***	0.0043
othershock	0.0209	0.0131	0.0211	0.0132
_cons	-3.3036***	0.6868	-3.3697***	0.6880
Number of obs	1988		1988	
LR $chi^2(17)$	207.61		214.82	
Prob $>chi^2$	0.0000		0.0000	
Log likelihood	-1094.593		-1090.989	
Pseudo R^2	0.0866		0.0896	

Notes: t statistics in parentheses
* p <0.05, ** p <0.01, *** p <0.001

Table A4: Logit regression of health insurance
(Cumulative risk aversion with any type of insurance)

	Any insurance in 2010		Any insurance in 2012	
insurance20121	Coefficient	Std. Err.	Coefficient	Std. Err.
insurance20101			0.4029**	0.1656
healthstatus	-0.0002	0.0006	0.0004	0.0006
riskaversion1	0.1050***	0.0399	0.0179	0.0360
lpcincome	-0.1352**	0.0635	-0.1593***	0.0572
headage	-0.1126***	0.0331	0.0081	0.0251
married	0.2267*	0.1254	0.1407	0.1203
headage2	0.0009***	0.0003	-0.0001	0.0002
femaleshare	0.1404	0.2579	0.2070	0.2351
dependshare	-0.0381	0.2161	0.7460***	0.2019
agrhh	-0.0659	0.1036	-0.0416	0.0932
distance2bus	0.0030	0.0038	0.0122***	0.0042
asset	0.5673***	0.1252	0.0428	0.0754
drought	0.0356***	0.0079	0.0159**	0.0067
flood	-0.0060	0.0058	-0.0157***	0.0049
epidemic	0.0472	0.1358	0.1470	0.1407
livestock	0.0179***	0.0067	0.0009	0.0054
othershock	0.0702**	0.0338	-0.0090	0.0166
_cons	4.7493***	1.0812	2.0446**	0.8773
Number of obs	1832		1988	
LR $chi^2(17)$	146.95		79.63	
Prob $>chi^2$	0.0000		0.0000	
Log likelihood	-497.0802		-624.2814	
Pseudo R^2	0.1288		0.060	

Notes: t statistics in parentheses
* p <0.05, ** p <0.01, *** p <0.001

Table A5: Logit regression of health insurance
(Absolute risk aversion with any type of insurance)

	Any insurance in 2010		Any insurance in 2012	
insurance20121	Coefficient	Std. Err.	Coefficient	Std. Err.
insurance20101			0.4116**	0.1659
healthstatus	-0.0001	0.0006	0.0005	0.0006
abriskaversion1	0.2542***	0.0714	-0.1267	0.0869
lpcincome	-0.1485**	0.0636	-0.1579***	0.0573
headage	-0.1093***	0.0331	0.0098	0.0251
married	0.2174*	0.1255	0.1380	0.1203
headage2	0.0009***	0.0003	-0.0001	0.0002
femaleshare	0.1333	0.2592	0.2261	0.2357
dependshare	0.0058	0.2156	0.7531***	0.2019
agrhh	-0.0605	0.1039	-0.0527	0.0932
distance2bus	0.0015	0.0038	0.0122***	0.0042
asset	0.5386***	0.1236	0.0435	0.0756
drought	0.0355***	0.0079	0.0163**	0.0067
flood	-0.0058	0.0058	-0.0164***	0.0050
epidemic	0.0661	0.1347	0.1496	0.1408
livestock	0.0173***	0.0067	0.0017	0.0054
othershock	0.0649**	0.0331	-0.0110	0.0166
_cons	4.9514***	1.0811	2.1412**	0.8736
Number of obs	1832		1988	
LR $chi^2(17)$	152.27		81.64	
Prob $>chi^2$	0.0000		0.0000	
Log likelihood	-494.4184		-623.2763	
Pseudo R^2	0.1334		0.0615	

Notes: t statistics in parentheses
* p <0.05, ** p <0.01, *** p <0.001

Table A6: Summary of risk aversion in 2010 and 2012

		2010				2012			
Variable	Obs	Mean	Std.Dev	Min	Max	Mean	Std.Dev	Min	Max
riskaversion1	1988	3.2334	1.1089	0.8571	4	3.2097	1.0804	0.8571	4
riskaversion2	1988	3.8019	1.2262	1.1266	4.6477	3.7771	1.1950	1.1266	4.6477
riskaversion3	1988	2.7807	0.9536	0.7371	3.44	2.7603	0.9291	0.7371	3.44
riskaversion4	1988	3.2697	1.0545	0.9688	3.9970	3.2483	1.0277	0.9688	3.9970
abriskaversion1	1988	0.8198	0.4959	-1.6471	1	0.7533	0.1957	0.1110	1
abriskaversion2	1988	0.8756	0.4437	-1.6471	1	0.9533	0.0864	0.2759	1

Table A7: Cumulative risk aversion in groups

	2010		2012	
Cumulative risk aversion	Freq.	Percent	Freq.	Percent
high	1,305	65.64	1,214	61.07
medium	542	27.26	638	32.09
low	141	7.09	136	6.84
Total	1,988	100.00	1,988	100.00

Table A8: Absolute risk aversion in groups

	2010		2012	
Cumulative risk aversion	Freq.	Percent	Freq.	Percent
high	1,154	58.05	108	5.43
medium	776	39.03	1,880	94.57
low	58	2.92		
Total	1,988	100.00	1,988	100.00

Table A9: Pairwise correlation of risk parameters in 2010

Variable	riskaver1	riskaver2	riskaver3	riskaver4	abriskaver1	abriskaver2
riskaversion1	1					
riskaversion2	1.0000*	1				
riskaversion3	1.0000*	1.0000*	1			
riskaversion4	1.0000*	1.0000*	1.0000*	1		
abriskaversion1	0.3349*	0.3339*	0.3339*	0.3339*	1	
abriskaversion2	0.2552*	0.2560*	0.2552*	0.2560*	0.7104*	1

Notes: * Statistically significant at 5 percent.

Table A10: Impact of health insurance coverage on idiosyncratic VEU
(total health insurances across surveys, cumulative)

	Random effect	Between variation	Random effect	Between variation
Health insurance	-0.273***	-0.269***	-0.213***	-0.235**
(total insurances across surveys)	(0.045)	(0.080)	(0.057)	(0.084)
Cumulative risk aversion	-0.007	0.011	-0.002	-0.005
	(0.026)	(0.053)	(0.027)	(0.054)
Health status	-0.029	-0.009	-0.070	-0.066
	(0.034)	(0.066)	(0.061)	(0.066)
Per capita income	-0.242***	-0.252***	-0.162***	-0.165**
	(0.056)	(0.060)	(0.043)	(0.066)
Household characteristics	No	No	Yes	Yes
Commune characteristics	No	No	Yes	Yes
N	3952	3952	3952	3952
R^2		0.018		0.065
F		9.221		5.943
p	0.000	0.000	0.000	0.000

Notes: Standard errors in parentheses
* p <0.05, ** p <0.01, *** p <0.001

Table A11: Impact of health insurance coverage on idiosyncratic VEU (health insurance at the time of interview, cumulative)

	Random effect	Between variation	Random effect	Between variation
Health insurance	-0.259***	-0.559***	-0.234***	-0.486**
(Yes/No at the time of interview)	(0.043)	(0.160)	(0.070)	(0.167)
Cumulative risk aversion	-0.009	0.011	-0.003	-0.005
	(0.026)	(0.053)	(0.027)	(0.054)
Health status	-0.030	-0.010	-0.068	-0.067
	(0.034)	(0.066)	(0.060)	(0.066)
Per capita income	-0.272***	-0.251***	-0.175***	-0.165**
	(0.058)	(0.060)	(0.045)	(0.066)
Household characteristics	No	No	Yes	Yes
Commune characteristics	No	No	Yes	Yes
N	3952	3952	3952	3952
R^2		0.019		0.065
F		9.472		5.972
p	0.000	0.000	0.000	0.000

Notes: Standard errors in parentheses
* p <0.05, ** p <0.01, *** p <0.001

Table A12: Impact of health insurance coverage on idiosyncratic VEU (health insurance in 2012 and 2010, absolute)

	Random effect	Between variation	Random effect	Between variation
Health insurance 2012	-0.281***	-0.281**	-0.238**	-0.264**
	(0.055)	(0.099)	(0.074)	(0.102)
Health insurance 2010	-0.257***	-0.236	-0.153**	-0.164
	(0.043)	(0.167)	(0.049)	(0.168)
Absolute risk aversion	-0.164*	-0.083	-0.134*	-0.106
	(0.088)	(0.165)	(0.077)	(0.163)
Health status	-0.029	-0.007	-0.070	-0.066
	(0.032)	(0.065)	(0.059)	(0.066)
Per capita income	-0.239***	-0.252***	-0.162***	-0.165**
	(0.056)	(0.060)	(0.044)	(0.067)
Household characteristics	No	No	Yes	Yes
Commune characteristics	No	No	Yes	Yes
N	3952	3952	3952	3952
R^2		0.018		0.065
F		7.425		5.721
p	0.000	0.000	0.000	0.000

Notes: Standard errors in parentheses
* p <0.05, ** p <0.01, *** p <0.001